



Workshop Manual



X250 - XFR

5.0 Litre S/C

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Audio and Climate Control Assembly

Front Door Speaker

Information and Entertainment Display

Information and Entertainment Module

Instrument Panel Speaker

Rear Door Speaker

Steering Wheel Audio Controls

Subwoofer Amplifier

Subwoofer Speaker

Satellite Radio Tuner

415-01B: Information and Entertainment System - DTC: Audio Input Control Module

Diagnosis and Testing

Audio Input Control Module

417: Lighting

417-01: Exterior Lighting

Specification

Description and Operation

Component Location

Overview

System Operation and Component Description

Diagnosis and Testing

Headlamps

General Procedures

Headlamp Adjustment (86.40.18)

Removal and Installation

- Approach Lamp
- Headlamp Assembly
- Headlamp Leveling Front Sensor
- Headlamp Leveling Rear Sensor
- High Mounted Stoplamp
- Rear Fog Lamp
- Rear Lamp Assembly
- Side Turn Signal Lamp

417-02: Interior Lighting

Description and Operation

- Component Location
- Overview
- System Operation and Component Description

Diagnosis and Testing

- Interior Lighting

417-04: Daytime Running Lamps (DRL)

Description and Operation

- Overview
- System Operation and Component Description

418: Electrical Distribution

418-00: Module Communications Network

Description and Operation

- Overview
- System Operation and Component Description

Diagnosis and Testing

- Communications Network

Removal and Installation

- Auxiliary Junction Box (AJB)
- Central Junction Box (CJB)

418-02: Wiring Harnesses

Description and Operation

- Wiring Harness

General Procedures

- Wiring Harness Repair

Removal and Installation

- Luggage Compartment Lid Wiring Harness

419: Electronic Feature Group

419-01A: Anti-Theft - Active

Description and Operation

- Component Location
- Overview

System Operation and Component Description

Diagnosis and Testing

Anti-Theft - Active

Removal and Installation

Anti-Theft Alarm Horn (86.52.03)

419-01B: Anti-Theft - Passive

Description and Operation

Component Location

Overview

System Operation and Component Description

Diagnosis and Testing

Anti-Theft - Passive

419-05: Telematics

Diagnosis and Testing

Telematics

419-07: Navigation System

Description and Operation Diagnosis and Testing

Navigation System

Removal and Installation

Navigation System Antenna (86.62.06)

Navigation System Module (86.62.05)

419-08: Cellular Phone

Removal and Installation

Bluetooth Module

419-10: Multifunction Electronic Modules

Specification

Description and Operation

Component Location

Overview

System Operation and Component Description

Diagnosis and Testing

Driver Door Module (DDM)

Remote Keyless Entry (RKE) Module

Passenger Door Module (PDM)

Removal and Installation

Driver Door Module (DDM)

Driver Seat Module (DSM)

Passenger Door Module (PDM)

Rear Door Module (RDM)

5: Body and Paint

501: Body and Paint

501-02: Front End Body Panels

Specification

Removal and Installation

Air Deflector

Cowl Vent Screen (76.10.01)

Engine Rear Undershield

Fender Splash Shield

Hood

Radiator Splash Shield

Secondary Bulkhead Center Panel

Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

501-03: Body Closures

Removal and Installation

Front Door

Fuel Filler Door

Fuel Filler Door Assembly

Luggage Compartment Lid (76.19.01)

Rear Door

501-05: Interior Trim and Ornamentation

Specification

Removal and Installation

A-Pillar Trim Panel

B-Pillar Lower Trim Panel

B-Pillar Upper Trim Panel

C-Pillar Lower Trim Panel

C-Pillar Trim Panel

Cowl Side Trim Panel

Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol

Front Door Trim Panel (76.34.01)

Front Scuff Plate Trim Panel

Instrument Panel Speaker Grille

Headliner

Loadspace Scuff Plate Trim Panel

Loadspace Trim Panel

Loadspace Trim Panel LH

Loadspace Trim Panel RH

Luggage Compartment Lid Trim Panel

Parcel Shelf

Rear Door Trim Panel

Rear Scuff Plate Trim Panel

Sun Visor (76.10.48)

Sun Visor Vanity Mirror

501-08: Exterior Trim and Ornamentation

Specification

Removal and Installation

Radiator Grille
Luggage Compartment Lid Moulding
Front Fender Moulding
Rocker Panel Moulding

501-09: Rear View Mirrors

Specification

Description and Operation

Component Location
Overview
System Operation and Component Description

Diagnosis and Testing

Rear View Mirrors

Removal and Installation

Exterior Mirror
Exterior Mirror Cover
Exterior Mirror Glass
Exterior Mirror Motor
Interior Rear View Mirror

501-10: Seating

Specification

Description and Operation

Component Location
Overview
System Operation and Component Description
Seat Cover Inspection

Diagnosis and Testing

Seats
Heater Mats
Seats - Vehicles With: Climate Controlled Seats

General Procedures

Seat Smoothing

Removal and Installation

Front Seat (76.70.01)
Front Seat Backrest (76.70.06)
Front Seat Backrest Cover (76.70.15)
Front Seat Bolster
Front Seat Bolster Pump
Front Seat Cushion Cover
Front Seat Track Motor
Lumbar Assembly

Memory Seat Position Switch
Seat Base
Rear Seat Backrest Cover (76.70.48) (78.90.12)
Rear Seat Cushion (76.70.37)
Front Seat Height Adjustment Motor
Front Seat Control Switch
Front Seat Head Restraint Motor (86.75.17)
Rear Seat Bolster
Front Seat Backrest Cover Trim Panel

501-11: Glass, Frames and Mechanisms

Specification

Description and Operation

Component Location
Overview
System Operation and Component Description

Diagnosis and Testing

Glass, Frames and Mechanisms
Fixed Window Glass

General Procedures

Door Window Motor Initialization

Removal and Installation

Driver Door Window Control Switch (86.25.03) (86.25.08)
Front Door Window Glass
Front Door Window Regulator and Motor (76.31.45)
Rear Door Fixed Window Glass
Rear Door Window Glass
Rear Door Window Regulator and Motor
Rear Window Glass
Windshield Glass
Door Window Regulator Motor (86.25.04)

501-12: Instrument Panel and Console

Specification

Description and Operation

Component Location
Overview
System Operation and Component Description

Removal and Installation

Floor Console
Floor Console Cup Holder
Floor Console Double Cup Holder
Floor Console Side Trim Panel
Glove Compartment

Instrument Panel Console
Instrument Panel Lower Trim Panel
Overhead Console

501-14: Handles, Locks, Latches and Entry Systems

Specification

Description and Operation

Component Location
Overview
System Operation and Component Description

Diagnosis and Testing

Locks, Latches and Entry Systems

Removal and Installation

Door Lock Cylinder Cover
Exterior Front Door Handle
Exterior Luggage Compartment Lid Release Switch
Exterior Rear Door Handle
Front Door Latch
Front Door Lock Cylinder
Interior Front Door Handle
Luggage Compartment Lid Latch Actuator
Luggage Compartment Lid Lock Cylinder
Rear Door Latch

501-16: Wipers and Washers

Specification

Description and Operation

Component Location
Overview
System Operation and Component Description

Diagnosis and Testing

Wipers and Washers

Removal and Installation

Headlamp Washer Jet
Headlamp Washer Pump
Rain Sensor
Windshield Washer Reservoir
Windshield Wiper Motor
Windshield Wiper Pivot Arm
Windshield Washer Pump

501-17: Roof Opening Panel

Specification

Description and Operation

Component Location

Overview

System Operation and Component Description

Diagnosis and Testing

Roof Opening Panel

General Procedures

Roof Opening Panel Alignment

Motor Synchronization (76.82.48)

Removal and Installation

Roof Opening Panel Front Drain Hose

Roof Opening Panel Frame

Roof Opening Panel Glass

Roof Opening Panel Motor

Roof Opening Panel Rear Drain Hose

Roof Opening Panel Weatherstrip

501-19: Bumpers

Specification

Removal and Installation

Front Bumper (76.22.08)

Front Bumper Cover

Front Bumper Cover Insert

Rear Bumper Cover

Rear Bumper

501-20A: Safety Belt System

Specification

Description and Operation

Component Location

Overview

System Operation and Component Description

Diagnosis and Testing

Safety Belt System

Removal and Installation

Front Safety Belt Buckle

Front Safety Belt Retractor

Rear Center Safety Belt Retractor

Rear Safety Belt Buckle

Rear Safety Belt Retractor

Safety Belt Shoulder Height Adjuster

501-20B: Supplemental Restraint System

Specification

Description and Operation

Component Location

Overview

System Operation and Component Description

Diagnosis and Testing

Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS)

General Procedures

Air Bag Disposal

Removal and Installation

B-Pillar Side Impact Sensor

Clockspring

C-Pillar Side Impact Sensor

Crash Sensor

Driver Air Bag Module

Occupant Classification Sensor

Passenger Air Bag Module

Restraints Control Module (RCM)

Side Air Bag Module (76.73.47)

Side Air Curtain Module

501-20C: Pedestrian Protection System

Description and Operation

Component Location

Overview

System Operation and Component Description

Diagnosis and Testing

Pedestrian Protection System

Removal and Installation

Pedestrian Impact Sensor

Pedestrian Protection Hood Actuator LH

Pedestrian Protection Hood Actuator RH

Pedestrian Protection Module

501-25A: Body Repairs - General Information

Description and Operation

Body Repairs

501-25B: Body Repairs - Corrosion Protection

Description and Operation

Corrosion Protection

501-25C: Body Repairs - Water Leaks

Description and Operation

Water Leaks

501-26: Body Repairs - Vehicle Specific Information and Tolerance Checks

Description and Operation

Body and Frame

501-27: Front End Sheet Metal Repairs

Description and Operation

Front End Sheet Metal

Removal and Installation

- Fender Apron Closing Panel Front Section
- Fender Apron Panel
- Fender Apron Panel Closing Panel
- Fender Apron Panel Front Extension
- Fender Apron Panel Front Section
- Front Bumper Mounting
- Front Fender
- Front Fender Support Bracket
- Front Side Member
- Front Side Member and Suspension Top Mount Assembly
- Front Side Member Closing Panel
- Front Side Member Closing Panel Section
- Front Side Member Section
- Front Wheelhouse Section
- Hood Latch Panel
- Hood Latch Panel Mounting Bracket

501-28: Roof Sheet Metal Repairs

Description and Operation

Roof

Removal and Installation

- Roof Panel - Vehicles With: Sliding Roof Opening Panel
- Roof Panel - Vehicles Without: Sliding Roof Opening Panel

501-29: Side Panel Sheet Metal Repairs

Description and Operation

Side Panel Sheet Metal

Removal and Installation

- A-Pillar Outer Panel
- A-Pillar Reinforcement
- B-Pillar Inner Panel
- B-Pillar Reinforcement
- Front Door Skin Panel
- Rear Door Skin Panel
- Rocker Panel
- Rocker Panel and B-Pillar Outer Panel
- Rocker Panel Front Section
- Rocker Panel Inner Reinforcement
- Rocker Panel Rear Section

501-30: Rear End Sheet Metal Repairs

Description and Operation

Rear End Sheet Metal

Removal and Installation

Back Panel

Quarter Panel

Quarter Panel Lower Extension

Rear Bumper Mounting

Rear Floor Side Extension

Rear Side Member Closing Panel Section

Rear Side Member Section

Rear Wheelhouse Outer

Spare Wheel Well

502: Frame and Mounting

502-00: Uni-Body, Subframe and Mounting System

Specification

Removal and Installation

Front Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol

Rear Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol

Rear Subframe Rear Bushing (64.25.36) - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

General Information - About This Manual

Description and Operation

Introduction

This manual covers diagnosis and testing and repair procedures.

It is structured into groups and sections, with specific system sections collected together under their relevant group.

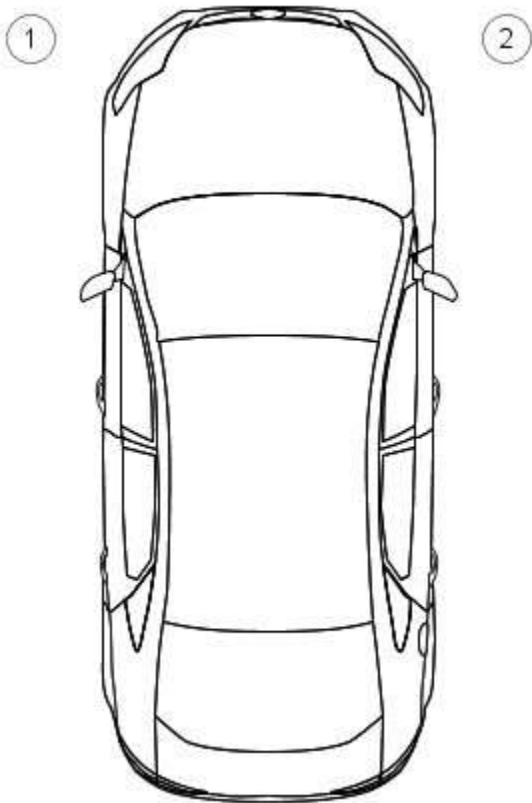
A group covers a specific portion of the vehicle. The manual is divided into five groups, General Information, Chassis, Powertrain, Electrical and Body and Paint. The number of the group is the first number of a section number.

Within Etis, the navigation tree will list the groups. After selecting a group the navigation tree will then list the sections within that group. Each section has a contents list detailing Specifications, Description and Operation, Diagnosis and Testing, General Procedures, Disassembly and Assembly, Removal and Installation.

References to LH (left-hand) and RH (right-hand)

All [LH](#) and [RH](#) references to the vehicle are taken from a position sitting in the driver seat looking forward.

Vehicle [LH](#) and [RH](#) definition

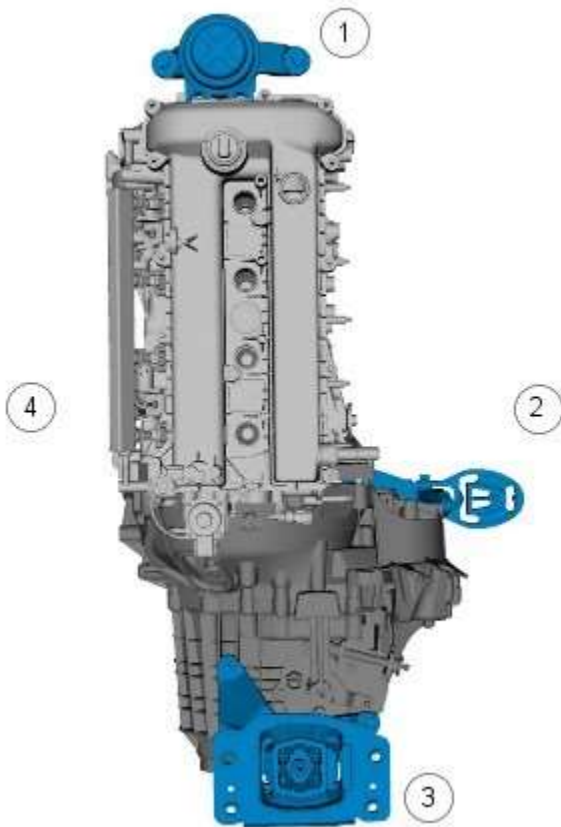


E126780

Item	Part Number	Description
1	-	LH
2	-	RH

All [LH](#) and [RH](#) references to the engine are taken from a position at the flywheel looking towards the crankshaft front pulley.

Powertrain [LH](#) and [RH](#) definition



E126781

Item	Description
1	front
2	right
3	rear
4	left

How to use Repair Procedures

This manual has been written in a format that is designed to meet the needs of technicians worldwide. It provides general descriptions for accomplishing repair work with tested and effective techniques.

Important Safety Instructions

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all motor vehicles as well as the personal safety of the individual carrying out the work.

Anyone who departs from the instructions provided in this manual must first establish that personal safety or vehicle integrity is not compromised by the choice of method, tools or components.

Warnings, Cautions and Notes in This Manual



WARNING: Warnings are used to indicate that failure to follow a procedure correctly may result in personal injury.



CAUTION: Cautions are used to indicate that failure to follow a procedure correctly may result in damage to the vehicle or equipment being used.



NOTE: Notes are used to provide additional essential information required to carry out a complete and satisfactory repair.

Generic warnings or cautions are in their relevant description and operation procedure within section 100-00. If the generic warnings or cautions are required for a procedure, there will be a referral to the appropriate description and operation procedure.

If a warning, caution or note only applies to one step, it is placed at the beginning of the specific step.

Trustmark Authoring Standards (TAS) Repair Procedure



NOTE: TAS style procedures can be identified by steps that have no accompanying step text and the magenta color of the electrical connectors and fasteners such as nuts, bolts, clamps or clips.

A TAS removal and installation procedure uses a sequence of color illustrations to indicate the order to be followed when removing/disassembling or installing/assembling a component.

Many of the TAS procedures will have the installation information within the removal steps. These procedures will have the following note at the beginning of the procedure:



NOTE: Removal steps in this procedure may contain installation details.

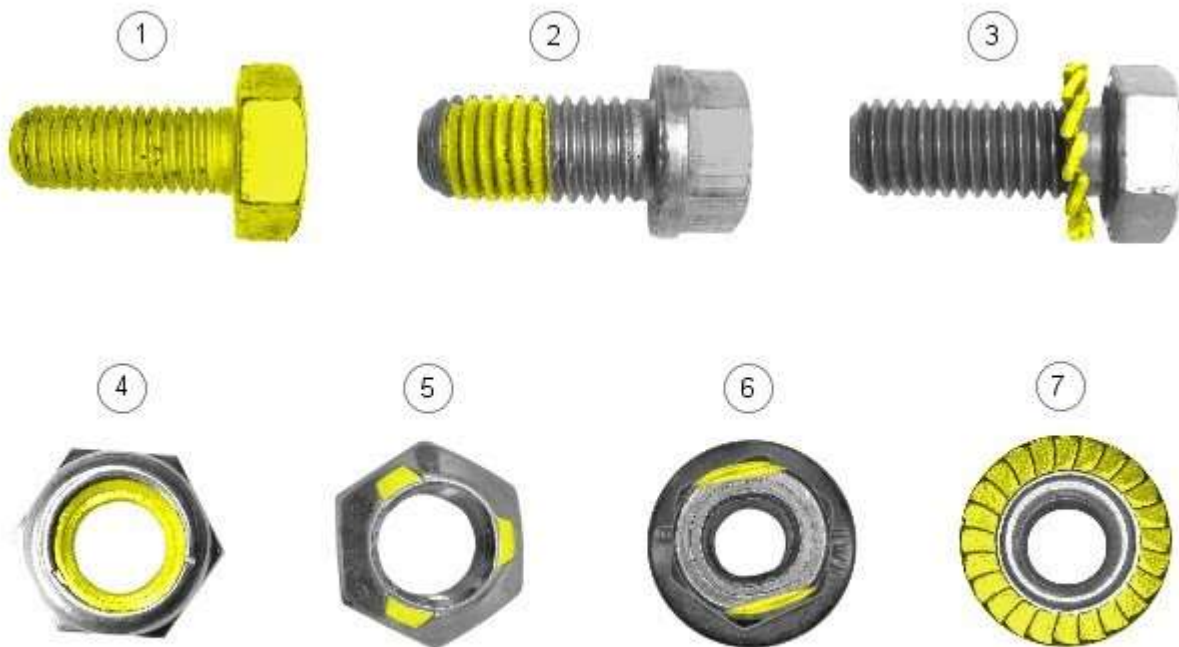
Reuse of fasteners and seals and gaskets

The following list details the general policy for the reuse of fasteners and seals and gaskets.

Types of self-locking nuts and bolts



NOTE: There are more types of self-locking fasteners available than shown in following illustration.



E126782

Item	Description
1	Completely coated self-locking bolt
2	Partially coated self-locking bolt
3	Self-locking bolt with a locking washer
4	Self-locking nut with a plastic locking insert
5	Self-locking nut with thread deformation (3 dents)
6	Self-locking nut with thread deformation (squeeze of thread to oval shape)
7	Self-locking nut with integrated locking ring

- All types of seals and gaskets must be discarded and new seals and gaskets installed unless otherwise stated within the procedure.
- Nuts and bolts with a chemical coating for locking and/or sealing and/or antiseize must be discarded unless the procedure advises to reapply the coating with a specified material.
- Nuts and bolts with a mechanical locking such as thread inserts, thread deformation or locking washers must be discarded and new nuts and bolts installed unless otherwise stated within the procedure.

- Torque to yield bolts must be discarded and new torque to yield bolts installed unless otherwise stated within the procedure, recognizable by a tightening torque with more than one stage together with a torque angle.

Specification data

Specification procedures will only contain technical data that is not already part of a repair procedure.

Sequence of tasks

If components must be removed or installed in a specific sequence, the sequence will be identified numerically in a graphic and the corresponding text will be numbered accordingly.

Special Tools, Equipment, Materials and Torque Figures

Special tools will be shown with the tool numbers in the illustration. The special tool numbers, general equipment, materials and torque figures used for the procedure step will be shown in the text column.

TAS Graphics

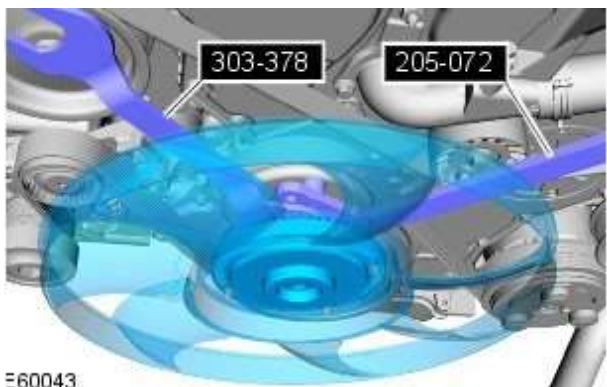
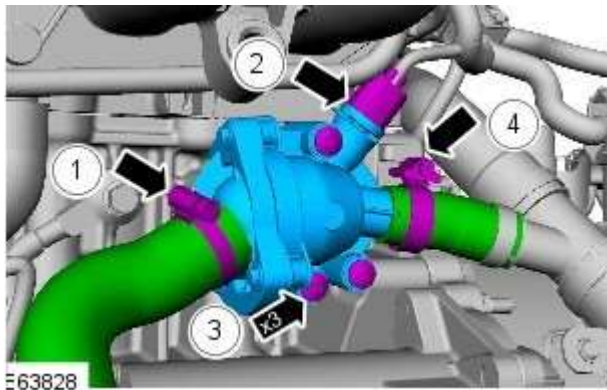
Colors used in the graphic are as follows:

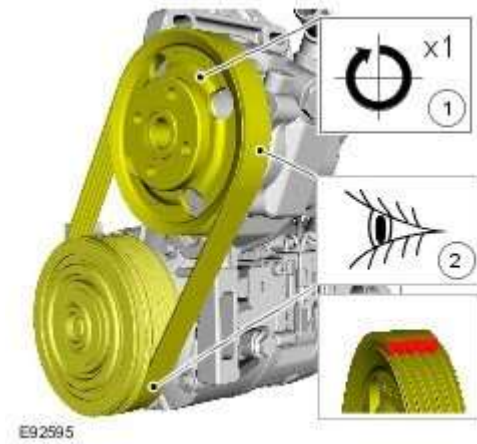
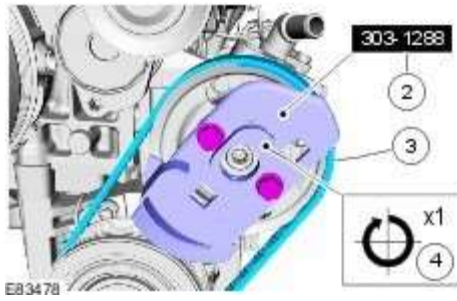
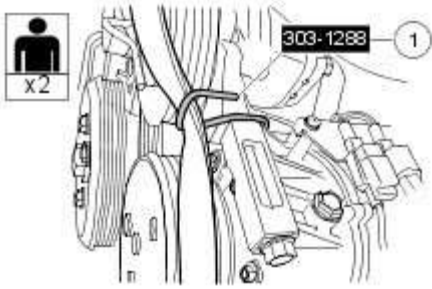
- Blue - Component to be removed/installed or disassembled/assembled.
- Green and Brown - Additional components that need to be removed/installed or disassembled/assembled prior to the target component.
- Yellow - Component that is touched or affected in a way but remains in the vehicle. It may be detached, attached, moved, modified, checked, adjusted etc.
- Magenta - Electrical connectors and fasteners such as nuts, bolts, clamps and clips.
- Pale Blue - Special tool(s) and general equipment.

One illustration may have multiple steps assigned to it.

Numbered pointers are used to indicate the number of electrical connectors and fasteners such as nuts, bolts, clamps and clips.

Items in the illustration can be transparent or use cutouts to show hidden details.

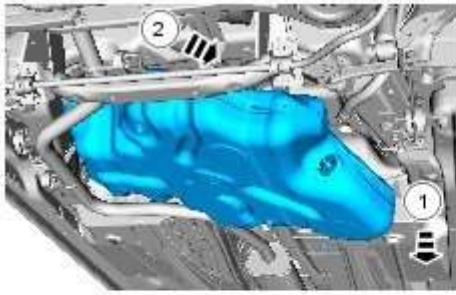




TAS Symbols

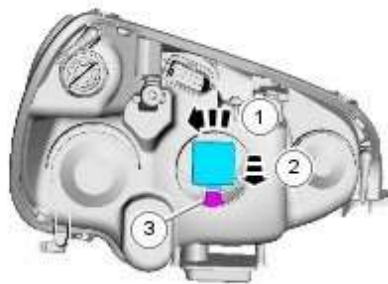
Symbols are used inside the graphics and in the text area to enhance the information display. The following paragraphs describe the various types and categories of symbols. For additional information, refer to: [Symbols Glossary](#) (100-00 General Information, Description and Operation).

Prohibition symbols advise on prohibited actions to either avoid damage or health and safety related risks. These symbols are



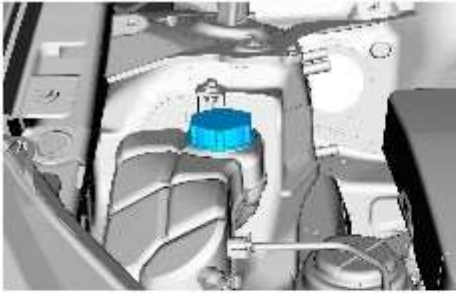
E85026

Health and Safety symbols recommend the use of particular protection equipment to avoid or at least reduce the risk or severity of possible injuries.



E85027

Warning symbols are used to indicate potential risks resulting from a certain component or area.



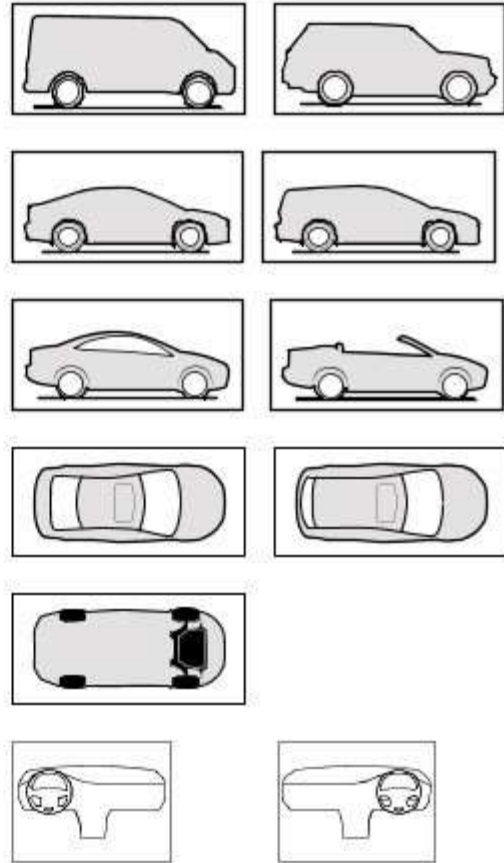
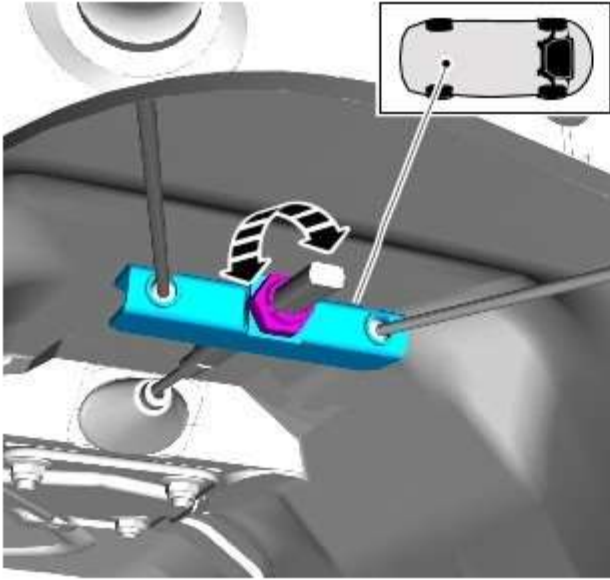
E85028

Instruction symbols are used to apply sealer, lubricant, weight, tape or cleaning detergent to a component.



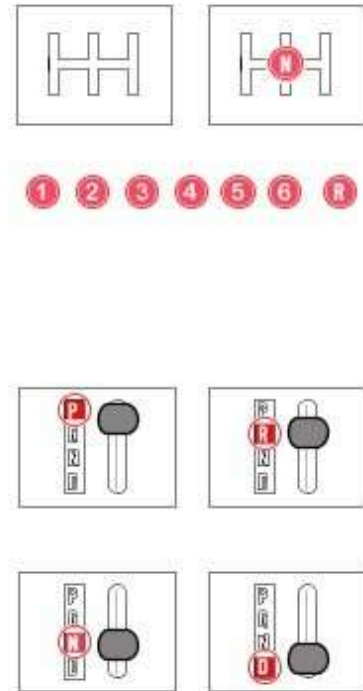
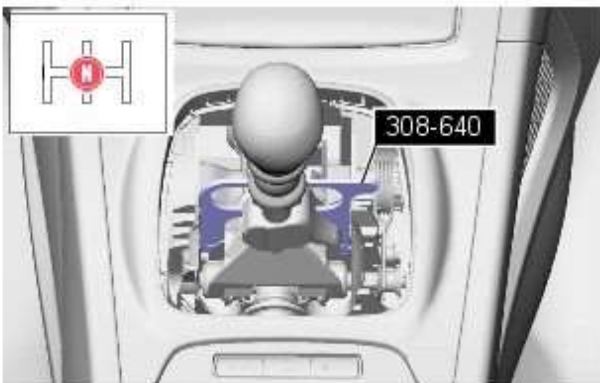
E84834

Location symbols are used to show the location of a component or system within the vehicle.



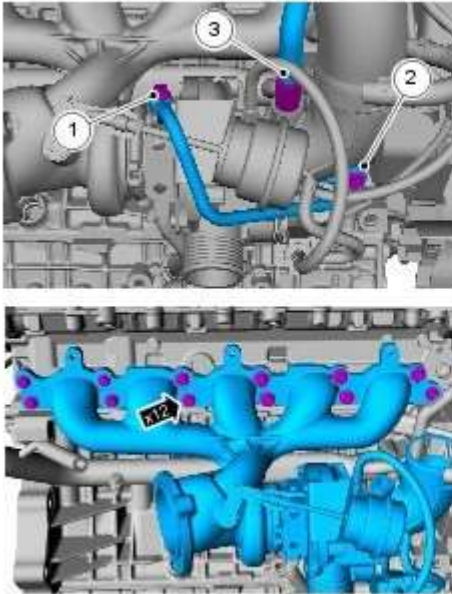
E84835

Gearshift lever or selector lever position symbols are used to show which gearshift lever or selector lever position is to be set.

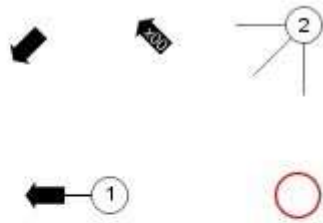


E84836

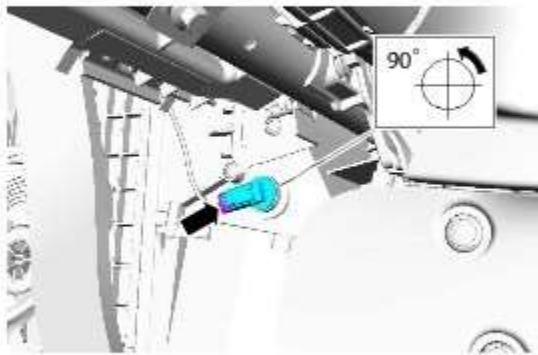
Pointer symbols are used to draw attention to components and give special instructions such as a required sequence or number of components. The number of components is reflected by the value inside the luty arrow. A sequence number is located inside the circle. Numbers inside circles are also used to allocate special information such as tightening torques or chemicals to a particular component.



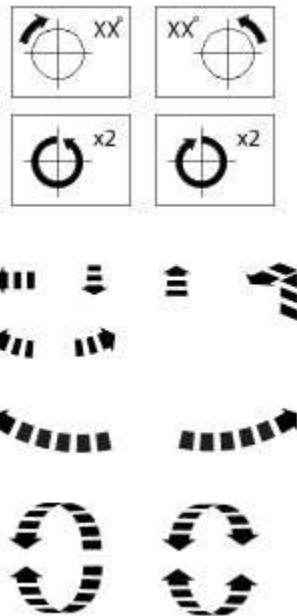
E84837



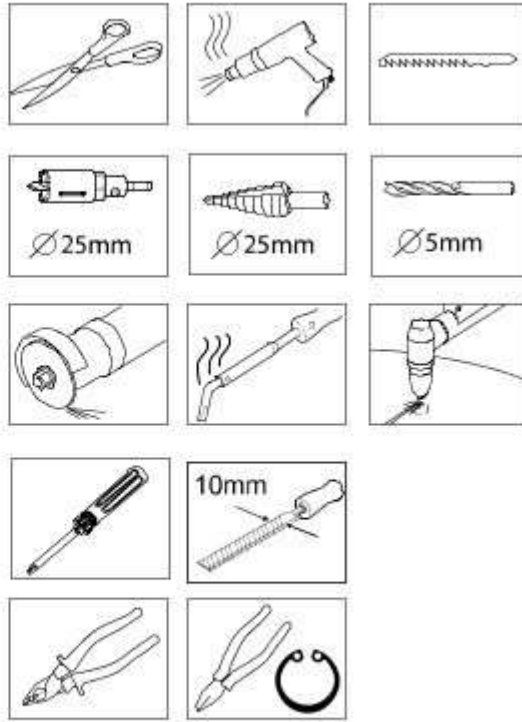
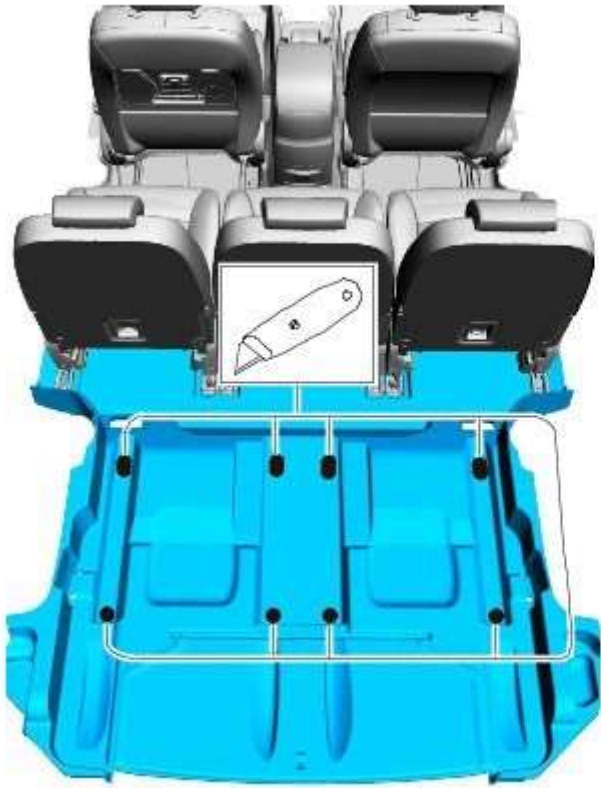
Movement arrows are used to show three dimensional or rotational movements. These movements can include specific values inside the symbol if required.



E84838

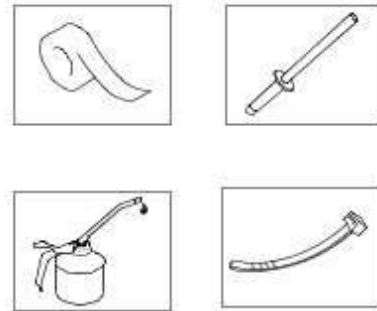
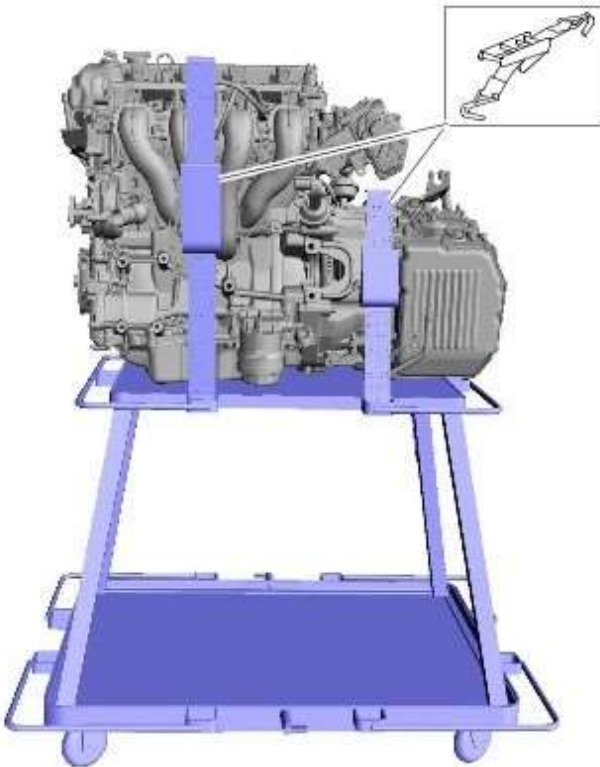


Standard tool symbols recommend the use of certain standard tools. These tools can include dimension values if required.



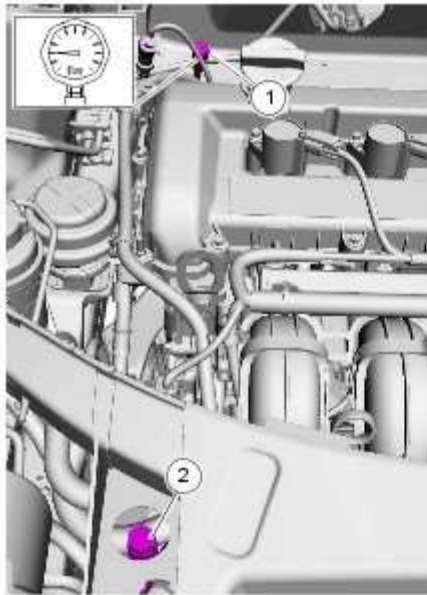
E84839

The following graphic illustrates a set of symbols that are used to provide detailed information on where to apply a material.

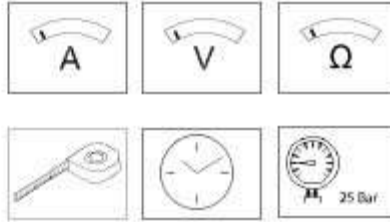


E84840

Measurement symbols provide detailed information on where to carry out a specific measurement. These symbols can include specific values if required.



E84841



How to use Diagnosis and Testing procedures

Inspection and Verification

Visual Inspection Charts, Symptom Charts and other information charts (such as diagnostic routines) or supplement test procedures with technical specifications will navigate the user to a specific test procedure.

Symptom Chart

The symptom chart indicates symptoms, sources and actions to address a condition.

Pinpoint Tests

For electrical systems, pinpoint test steps are used to identify the source of a concern in a logical, step-by-step manner. Pinpoint tests have two columns: CONDITIONS and DETAILS/RESULTS/ACTIONS.

The CONDITIONS column is used exclusively for graphics and icons (with or without captions) and the DETAILS/RESULTS /ACTIONS column provides direction to another test step or specific corrective actions.

The boxed numbers indicate the order in which the described action is to be carried out.

Component Tests

A component test is used when a component is tested in multiple pinpoint tests, or if a procedure is too complicated to be formatted within a single page of the pinpoint test.

Graphics

Test graphics show the measurement or test to be carried out in a test step.

A representative tester graphic is used for voltmeters and ohmmeters.

If multiple measurements are made in a single graphic, the test leads are drawn with a solid line until the test lead splits to indicate the multiple measurements, at which point dashed lines are used.

Breakout box type testers are represented by a double circle test pin. Test pins are labeled with the pin number.

General Information - Application and Use of Specifications

Description and Operation

Torque Specifications

Torque specifications are shown in the torque specifications chart located at the front of the relevant section.

General Information - Battery and Battery Charging Health and Safety

Precautions

Description and Operation

WARNINGS:



Batteries contain sulphuric acid, avoid contact with skin, eyes or clothing. Wear safety goggles when working near the battery to protect against possible splashing of the acid solution.



EYE CONTACT: If acid comes into contact with the eyes, flush immediately with plenty of running water for a minimum of 15 minutes. Seek immediate medical attention.



SKIN CONTACT: If acid comes into contact with the skin, flush immediately with plenty of running water for a minimum of 15 minutes. Seek immediate medical attention.



SWALLOWED: If acid is swallowed, rinse the mouth with plenty of water and then drink plenty of water or milk. Do not induce vomiting. Seek immediate medical attention.



Batteries normally produce explosive gases. Do not allow naked flames, sparks or lighted substances to come near the battery.



When charging the battery shield your face and wear safety goggles. Provide adequate ventilation.



CAUTION: Boost charging with excessive current or voltage above 16 volts will damage the battery.

General Information - Brake System Health and Safety Precautions

Description and Operation

WARNINGS:



EYE CONTACT: Brake fluid contains polyglycol ethers and polyglycols. Avoid contact with the eyes. Wash hands thoroughly after handling. If brake fluid comes into contact with the eyes, flush the eyes with plenty of cold running water for 15 minutes. Seek medical attention for any persistent eye irritation or abnormality.



SWALLOWED: Brake fluid contains polyglycol ethers and polyglycols. If swallowed, drink plenty of water. Seek immediate medical attention.



INHALED: Dust from friction materials can be harmful if inhaled.



Only use new specified brake fluid from airtight containers.



CAUTION: If brake fluid is spilled on the paintwork, the affected area must be immediately washed down with cold water.

General Information - Diesel Fuel System Health and Safety Precautions

Description and Operation

WARNINGS:



Fuel may not give adequate warning before toxic or harmful effects arise.



Exposure to fuel can be harmful and can cause severe health damage or death.



Provide adequate ventilation when working on fuel systems.



Extreme care must be exercised when handling hot fluids. Always wash off spilled fluids from affected areas of skin immediately.



Fuel must not be used as a cleaning agent.



Keep fuel containers tightly closed, out of direct sunlight and in a cool area. Keep away from heat sources, ignition sources and oxidizing agents.



SKIN CONTACT: Fuel is mildly irritating to the skin and may cause dermatitis due to defatting effect. Remove contaminated clothing. Wash affected areas of skin with soap and water. Seek medical attention for any persistent skin irritation or abnormality. Wash contaminated clothing before reuse.



SKIN CONTACT: Excessive or prolonged skin contact with diesel fuel may cause serious skin disorders including skin cancer.



EYE CONTACT: Fuel is mildly irritating to the eyes. Flush with plenty of running water, blinking as often as possible. Do not force the eyelid open. Seek medical attention for any persistent eye irritation or abnormality.



SWALLOWED: Fuel is moderately toxic and tends to foam on vomiting. If drawn into the lungs, inflammation may develop. Do not induce vomiting. If spontaneous vomiting occurs place the victim in a forward position to reduce the risk of fuel being drawn into the lungs. Give nothing by mouth. If breathing but unconscious, place in the recovery position. If breathing has stopped, apply artificial respiration. Seek immediate medical attention.



INHALED: Fuel is toxic to the respiratory and other body systems. Exposure may result in various symptoms including drowsiness, unconsciousness or severe health damage. Move a victim to fresh air. Keep a victim warm and at rest. If unconscious, place in the recovery position. If not breathing, apply artificial respiration. Give cardiac massage if necessary. Seek immediate medical attention.

CAUTIONS:



Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is essential that absolute cleanliness is observed when working with these components.



Make sure that the workshop area in which the vehicle is being worked on is as clean and as dust free as possible.



Make sure that non-plated tools are used.



Tools must be cleaned using a new brush and fresh suitable evaporative cleaning agent.



Make sure to use a steel topped workbench covered with clean, lint-free, non-flocking material.



Make sure that all parts removed from the vehicle are placed on the lint-free, non-flocking material.



Make sure that any protective clothing worn is clean and made from lint-free, non-flocking material.



Make sure to wear non-powdered latex type gloves.



Make sure to protect all electrical components and connectors with lint-free non-flocking material before using the suitable evaporative cleaning agent.



NOTE: Soot, discomfort and irritation usually give adequate warning of hazardous fume concentrations.

General Information - General Service Information

Description and Operation

Repairs and Replacements

When service parts are required, it is essential that only genuine Jaguar/Daimler replacements are used.

Attention is drawn to the following points concerning repairs and the installation of replacement parts and accessories:

- Safety features embodied in the vehicle may be impaired if other than genuine parts are installed. In certain territories, legislation prohibits the installation of parts which are not produced to the vehicle manufacturer's specification.
- Torque wrench setting figures given in this manual must be strictly adhered to. Locking devices, where specified, must be installed. If the efficiency of a locking device is impaired during removal it must be renewed.
- Owners purchasing accessories while travelling abroad should make sure that the accessory and its installed location on the vehicle conform to mandatory requirements existing in their country of origin.
- The vehicle warranty may be invalidated by the installation of other than genuine Jaguar/Daimler parts. All Jaguar/Daimler replacements have the full backing of the factory warranty.
- Jaguar/Daimler dealers are obliged to supply only genuine service parts.

Vehicle Specifications

Purchasers are advised that the specification details set out in this manual apply to a range of vehicles and not to any specific one. For the specification of a particular vehicle, purchasers should consult their dealer.

The Manufacturer reserves the right to vary the specifications, with or without notice, and at such times and in such manner as the Manufacturer thinks fit. Major as well as minor changes may be involved, in accordance with the Manufacturer's policy of continuous improvement.

Whilst every effort is made to make sure the accuracy of the particulars contained in this manual, neither the Manufacturer nor the Dealer, by whom the manual is supplied, shall in any circumstances be held liable for any inaccuracy or the consequences thereof.

Service Repair Operation Numbering

A master index of numbered operations has been compiled for universal application to all vehicles manufactured by Jaguar Land Rover Limited.

Each operation is allocated a number from the master index and cross-refers with an identical number in the Repair Operation Times schedule. The number consists of six digits arranged in three pairs.

Each maintenance procedure in this manual is described in the sequence necessary to complete the operation in the minimum time, as specified in the Repair Operation Times schedule.

References to Bank-1 and Bank-2

References to Bank-1 and Bank-2 are made with regard to the engine. When viewed from the flywheel the right-hand bank will be Bank-1 and the left-hand bank will be Bank-2.

Special Tools

Any special tools and equipment required to perform a maintenance procedure, are shown at the beginning of each procedure. When possible, illustrations are given to assist in identifying the tool needed.

Disconnecting/Connecting the Battery

Always stop the engine before disconnecting the battery negative lead and make sure the battery positive lead is isolated i.e. wrapped in a suitable cloth.



WARNING: Radio code saving devices must not be used when conducting work on Air Bag or Fuel systems. It must be noted that, when using these devices, the vehicle electrical system is still live albeit with a reduced current flow.



NOTE: Before disconnecting the battery make sure that the radio receiver/cassette player/mini disc player and compact disc player keycodes are known and, that no data is required from the Engine Control Module (ECM) as battery disconnection will erase any fault codes and idle/drive values held in the Keep Alive Memory (KAM).

Always disconnect the battery before commencing repair operations which require:

- The vehicle to be jacked up
- Work on the engine
- Work underneath the vehicle
- Arc welding

Alternatively a Radio Code Saver may be used, when not working on the Air Bag or Fuel systems. With the battery

disconnected, a Radio Code Saver will allow sufficient current to pass to maintain the radio receiver/cassette player/mini disc player and compact disc player memory, operate the clock and supply the door operated interior lights while isolating the battery in the event of a short circuit.

Reconnecting the Battery



WARNING: If the battery has been on bench charge the cells may be giving off explosive hydrogen gas. Avoid creating sparks, and if in doubt cover the vent plugs or covers with a damp cloth.

Always make sure that all electrical systems are switched OFF before reconnecting the battery to avoid causing sparks or damage to sensitive electrical equipment.

Always reconnect the battery positive lead first and the negative last, ensuring that there is a good electrical contact and the battery terminals are secure.

Restart the clock (where installed) and set it to the correct time.

Enter the radio receiver/cassette player/mini disc player and compact disc player keycodes and preset' frequencies, if known.

Following reconnection of the battery, the engine should be allowed to idle until it has reached normal operating temperature as the stored idle and drive values contained within the ECM have been lost. Allow the vehicle to idle for a further three minutes. Drive the vehicle at constant speeds of approximately 48 km/h (30 mph), 64 km/h (40 mph), 80 km/h (50 mph), 96 km/h (60 mph) and 112 km/h (70 mph) for three minutes each. This will allow the ECM to relearn idle and drive values, and may cause driveability concerns if the procedure is not carried out.

Connecting a Slave Battery Using Jump Leads



WARNING: If the slave battery has recently been charged and is gassing, cover the vent plugs or covers with a damp cloth to reduce the risk of explosion should arcing occur when connecting the jump leads.

CAUTIONS:

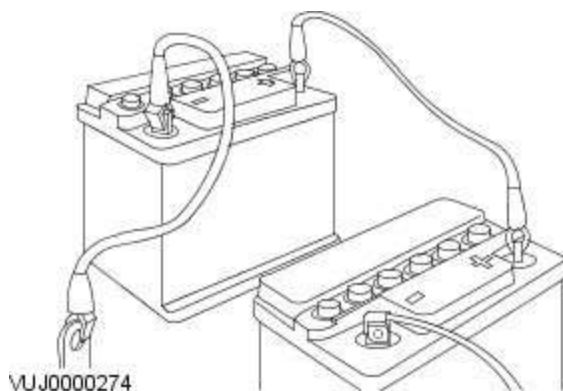


A discharged battery condition may have been caused by an electrical short circuit. If this condition exists there will be an apparently live circuit on the vehicle even when all circuits are switched off. This can cause arcing when the jump leads are connected.



Whilst it is not recommended that the vehicle is jump started, it is recognized that this may occasionally be the only practical way to mobilize a vehicle. In such an instance the discharged battery must be recharged immediately after jump starting to avoid permanent damage.

- Always make sure that the jump leads are adequate for the task. Heavy duty cables must be used.
- Always make sure that the slave battery is of the same voltage as the vehicle battery. The batteries must be connected in parallel.
- Always make sure that switchable electric circuits are switched off before connecting jump leads. This reduces the risk of sparks occurring when the final connection is made.



WARNING: Make sure that the ends of the jump leads do not touch each other or ground against the vehicle body at any time while the leads are attached to the battery. A fully charged battery, if shorted through jump leads, can discharge at a rate well above 1000 amps causing violent arcing and very rapid heating of the jump leads and terminals, and can even cause the battery to explode.

Always connect the jump leads in the following sequence.

- Slave battery positive first then vehicle battery positive.
- Slave battery negative next and then vehicle ground at least, 300 mm (12 in) from the battery terminal e.g. engine lifting bracket.

Always reduce the engine speed to idle before disconnecting the jump leads.

Before removing the jump leads, switch on the heater blower (high) or the heated rear screen, to reduce the voltage peak when the leads are removed.

Always disconnect the jump leads in the reverse order to the connecting sequence and take great care not to short the ends of the leads.

Do not rely on the generator to restore a discharged battery. For a generator to recharge a battery, it would take in excess of 8 hours continuous driving with no additional loads placed on the battery.

Component Cleaning

To prevent ingress of dirt, accumulations of loose dirt and greasy deposits should be removed before disconnecting or dismantling components or assemblies.

Components should be thoroughly cleaned before inspection prior to reassembly.

Cleaning Methods:

- Dry Cleaning
- Removal of loose dirt with soft or wire brushes
- Scraping dirt off with a piece of metal or wood
- Wiping off with a rag



CAUTION: Compressed air is sometimes wet so use with caution, especially on hydraulic systems.

- Blowing dirt off with compressed air (Eye protection should be worn when using this method)
- Removal of dry dust using vacuum equipment. This method should always be used to remove friction lining material dust (asbestos particles)
- Steam Cleaning

Calibration of Essential Measuring Equipment



WARNING: Failure to comply may result in personal injury or damage to components.

It is of fundamental importance that certain essential equipment e.g. torque wrenches, multimeters, exhaust gas analysers, rolling roads etc., are regularly calibrated in accordance with the manufacturers instructions.

Use of Control Modules

Control modules may only be used on the vehicle to which they were originally installed. Do not attempt to use or test a control module on any other vehicle.

Functional Test

On completion of a maintenance procedure, a thorough test should be carried out, to ensure the relevant vehicle systems are working correctly.

Preparation

Before disassembly, clean the surrounding area as thoroughly as possible. When components have been removed, blank off any exposed openings using grease-proof paper and masking tape. Immediately seal fuel, oil and hydraulic lines when separated, using plastic caps or plugs, to prevent loss of fluid and the entry of dirt. Close the open ends of oil ways, exposed by component removal, with tapered hardwood plugs or readily visible plastic plugs. Immediately a component is removed, place it in a suitable container; use a separate container for each component and its associated parts. Before dismantling a component, clean it thoroughly with a recommended cleaning agent; check that the agent will not damage any of the materials within the component. Clean the bench and obtain marking materials, labels, containers and locking wire before dismantling a component.

Dismantling

Observe scrupulous cleanliness when dismantling components, particularly when parts of the brake, fuel or hydraulic systems are being worked on. A particle of dirt or a fragment of cloth could cause a dangerous malfunction if trapped in these systems. Clean all tapped holes, crevices, oil ways and fluid passages with compressed air.



WARNING: Do not permit compressed air to enter an open wound. Always use eye protection when using compressed air.

Make sure that any O-rings used for sealing are correctly reinstalled or renewed if disturbed. Mark mating parts to make sure that they are replaced as dismantled. Whenever possible use marking materials which avoid the possibilities of causing distortion or the initiation of cracks, which could occur if a center punch or scriber were used. Wire together mating parts where necessary to prevent accidental interchange (e.g. roller bearing components). Tie labels on to all parts to be renewed and to parts requiring further inspection before being passed for reassembly. Place labelled parts and other parts for rebuild in separate containers. Do not discard a part which is due for renewal until it has been compared with the new part, to make sure

that the correct part has been obtained.

Inspection

Before inspecting a component for wear or performing a dimensional check, make sure that it is absolutely clean; a slight smear of grease can conceal an incipient failure. When a component is to be checked dimensionally against figures quoted for it, use the correct equipment (surface plates, micrometers, dial gauges etc.) in serviceable condition. The use of makeshift equipment can be dangerous. Reject a component if its dimensions are outside the limits quoted, or if damage is apparent. A component may be reinstalled if its critical dimension is exactly to the limit size and it is otherwise satisfactory. Use Plastigauge 12 Type PG-1 for checking bearing surface clearance, e.g. big end bearing shell to crank journal. Instructions for the use of Plastigauge and a scale giving bearing clearances in steps of 0,0025 mm (0.0001 in) are supplied with the package.

On-Board Diagnostics (OBD)

This vehicle uses programmed electronic control systems to provide engine management and emission regulation, automatic transmission operation and anti-lock braking control. These control systems are integral with the On-Board Diagnostics (OBD) facility that is used in conjunction with either the Jaguar approved diagnostic system or the more restricted scan tools.

The OBD information in this manual provides diagnostic and rectification procedures for emission related electrical and mechanical systems. The information is intended to facilitate fault diagnosis and the subsequent rectification of the vehicle without recourse to the Jaguar approved diagnostic system.

The diagnosis and testing sections within the manual cover:

- System principles of operation with links to the relevant Description and Operation sections
- Self tests (where appropriate)
- Inspection and Verification - manual checks, symptom and Diagnostic Trouble Code (DTC) driven diagnostic charts with actions required to rectify concerns
- Component tests (where appropriate)

Circuit Diagrams

To understand the relationship between the vehicle electrical system and the system circuit diagrams, Refer to the Electrical Guide.

In the interest of clarity, single lines may represent multiple wires. Refer to the color code (1st alpha) followed by the wire reference (numeric/alpha/numeric) to trace origin and destination.

e.g. BW 647B002. BW (black with white trace) 647 (wire reference) B002 (stage from origin).

Glossary of Terms

This glossary of terms is intended to cover mainly emissions-related (to SAE J 1930) terminology, and other abbreviations that may be used in this manual.

The required term may be looked-up in the left-hand column, and subsequent columns give the standard acronym, unit or abbreviation, and definition.

Term(s)	Acronym/Unit /Abbreviation	Definition
Air Conditioning	A/C	
Accelerator Pedal Position	APP	Is a multitrack sensor which inputs the drivers demand into the engine control module (ECM)
After Bottom Dead Center	ABDC	Event occurring after bottom dead center
After Top Dead Center	ATDC	Event occurring after top dead center
Anti-lock Brake System	ABS	System which prevents wheel lock-up under braking by sensing lack of rotation of a wheel(s) and diverting fluid pressure away from it (them)
Alternating Current	ac	
Amplitude Modulation	AM	
Automatic Temperature Control	ATC	
Automatic Transmission Fluid	ATF	
Ampere	A	SI unit of current
Ampere hour	Ah	
Barometric Pressure	BARO	Pressure of surrounding air at any given temperature and altitude
Battery positive voltage	B+	The positive voltage from a battery or any circuit connected directly to it
Before Bottom Dead Center	BBDC	Event occurring before bottom dead center
Before Top Dead Center	BTDC	Event occurring before top dead center
Bottom Dead Center	BDC	Lowest point of piston travel in a reciprocating engine
Battery Junction Box	BJB	
Brake Pedal Position	BPP	
Brake Horsepower	BHP	Effective horsepower developed by an engine or motor, as measured by a brake applied to its output shaft
British Standard	BS	Standard specification issued by the British Standards Institution
Brake Traction Control System	BTCS	

Term(s)	Acronym/Unit /Abbreviation	Definition
Bus	Topology of a communication network	
Coast Clutch Solenoid	CCS	
Camshaft Position	CMP	Indicates camshaft position
Carbon dioxide	CO ²	Colorless gas with a density of approximately 1.5 times that of air
Carbon monoxide	CO	Poisonous gas produced as the result of incomplete combustion
Chlorofluorocarbon	CFC	
Catalytic converter		In-line exhaust system device used to reduce the level of engine exhaust emissions
Celsius	C	SI term for the Centigrade scale, with freezing point at zero and boiling point at 100 degrees
Compact Disc	CD	
Cylinder Head Temperature Sensor	CHT Sensor	A sensor for measuring the temperature of the cylinder head
Central Junction Box	CJB	
Crankshaft Position	CKP	Indicates crankshaft position
Clutch Pedal Position	CPP	Indicates clutch pedal position
Controller Area Network	CAN	A communication system which allows control modules to be linked together
Constant Velocity	CV	
Cubic centimeter	cm ³	
Central Security Module	CSM	Electronic module to support security system functionality
Data Link Connector	DLC	Connector providing access and/or control of the vehicle information, operating conditions, and diagnostic information
Driver Door Module	DDM	Electronic module to support driver door functionality
Driver Seat Module	DSM	Electronic module to support driver seat functionality
Daytime Running Lamps	DRL	
Deutsche Institut fur Normung	DIN	German standards regulation body
Diagnostic Trouble Code	DTC	An alpha/numeric identifier for a fault condition identified by the On-Board Diagnostic (OBD) system
Direct current	dc	Current which flows in one direction only, though it may have appreciable pulsations in its magnitude
Domestic Data Bus	D2B	
Digital Versatile Disc	DVD	
Electronic Automatic Temperature Control	EATC	
Exhaust Gas Recirculation	EGR	
Exhaust Gas Recirculation Temperature Sensor	EGRT	Sensing EGR function based on temperature change
Electronic Brake Force Distribution	EBD	
Engine Control Module	ECM	Electronic module to support engine functionality
Electronic Crash Sensor	ECS	Sensor to measure severity of impact
Engine Coolant Temperature	ECT	
Engine Oil Pressure	EOP	
European On-Board Diagnostic	EOBD	
Electronic Pressure Control	EPC	
Electrically Erasable Programmable Read-Only Memory	EEPROM	
Erasable Programmable Read-Only Memory	EPROM	
Evaporative Emission	EVAP	System designed to prevent fuel vapor from escaping into the atmosphere. Typically includes a charcoal filled canister to absorb fuel vapor
Flash Electrically Erasable Programmable Read-Only Memory	FEEPROM	
Front Electronic Module	FEM	
Flash Erasable Programmable Read-Only Memory	FEPRM	
Frequency Modulation	FM	
Fuel Pump Driver Module	FPDM	
Fuel Rail Pressure	FRP	
Generic Electronic Module	GEM	
Ground	GND	Electrical conductor used as a common return for an electrical circuit or circuits, and with a relative zero potential
Global Positioning System	GPS	
Global System for Mobile Communication	GSM	
Gross Vehicle Weight	GVW	
Heated Oxygen Sensor	HO2S	Electrically heated oxygen sensor which induces fuelling corrections

Term(s)	Acronym/Unit /Abbreviation	Definition
Hydrofluorocarbon	HFC	
High tension	HT	
Hydrocarbon	HC	
Idle Air Control	IAC	Stepper motor driven device which varies the volume of air by-passing the throttle to maintain the programmed idle speed
Intake Air Temperature	IAT	Temperature of intake air
Inertia Fuel Shut-off	IFS	An inertia system that shuts off the fuel supply when activated by pre-determined force limits brought about by (e.g.) collision
Input Shaft Speed	ISS	Indicates input shaft speed
Key On, Engine Off	KOEO	
Key On, Engine Running	KOER	
Kilogram (mass)	kg	
Kilogram (force)	kgf	
Kilogram force per square centimeter	kgf/cm ²	
Kilometer	km	
Kilometer per hour	km/h	
Kilopascal	kPa	
Kilovolt	kV	
Knock Sensor	KS	Sensor which detects the onset of detonation, and signals the ECM to retard the ignition
Liquid Crystal Display	LCD	Optical digital display system, to which applied voltage varies the way the crystals reflect light, thereby modifying the display
Lighting Control Module	LCM	
Light Emitting Diode	LED	
Low Tension	LT	Primary circuit of the ignition system, linking the battery to the primary winding in the ignition coil
Left-Hand	LH	
Left-Hand Drive	LHD	
Mass Air Flow	MAF	System which provides information on the mass flow rate of the intake air to the engine
Manifold Absolute Pressure	MAP	Absolute pressure of the intake manifold air
Manifold Absolute Pressure and Temperature	MAPT	
Malfunction Indicator Lamp	MIL	A required on-board indicator to alert the driver of an emission related malfunction
Meter (measurement)	m	
Metric (screw thread, e.g. M8)	M	
Farad	F	Unit of electrical capacitance
Millimeter	mm	
Millimeter of mercury	mmHg	
Millisecond	ms	
Model year	MY	
Newton	N	SI unit of force. 1 N = 0.2248 pounds force
Newton Meter	Nm	SI unit of torque. Must not be confused with nm (nanometer)
Negative Temperature Coefficient	NTC	
Naturally aspirated	N/A	Fuelling system using intake air at atmospheric pressure; not supercharged or turbocharged
Noise, Vibration and Harshness	NVH	
North American Specification	NAS	Vehicles for sale in the USA and Canadian markets
On-Board Diagnostic	OBD	A system that monitors some or all computer input and output control signals. Signal(s) outside the pre-determined limits imply a fault in the system or a related system
Oxides of Nitrogen	Nox	
Oxygen Sensor	O2S	A sensor which detects oxygen content in the exhaust gases
On-board Refuelling Vapour Recovery	ORVR	
Output State Control	OSC	
Output Shaft Speed	OSS	
Passenger Air Bag Deactivation	PAD	
Pulsed Secondary Air Injection	PAIR	
Passive Anti-Theft System	PATS	
Positive Crankcase Ventilation	PCV	
Parameter Identification	PID	An index number referring to a parameter within a module without knowledge of its storage location
Park/Neutral Position	PNP	
Pulse Width Modulation	PWM	
Programmable Electronic Control Units System	PECUS	Process whereby a common ECM is programmed on the production line to suit the market requirements of a particular vehicle

Term(s)	Acronym/Unit /Abbreviation	Definition
Programmable Read-only Memory	PROM	ROM with some provision for setting the stored data after manufacture
Portable Support Electronics	PSE	
Power Steering Pressure	PSP	
Polytetrafluoroethylene	PTFE	
Random Access Memory	RAM	Fast access memory store which is accessible for entry or extraction of data
Read Only Memory	ROM	Fast access memory in which data is fixed and may not be changed
Restraints Control Module	RCM	Electronic module to support functionality of the Supplemental Restraints System
Radio Data System	RDS	
Rear Electronic Module	REM	
Remote Keyless Entry	RKE	
Right-hand	RH	
Right-hand drive	RHD	
Research Octane Number	RON	
Rear Seat Module	RSM	Electronic module to support functionality of rear seats
Supercharger	SC	An intake system which utilizes a supercharger (mechanically driven device that pressurizes intake air, thereby increasing density of charge air and the consequent power output from a given displacement)
Serial Communications Link	SCL	
Standard Corporate Protocol	SCP	A high-speed, serial communications system linking all body system control modules. Control messages and data are passed between modules at up to 786 messages per second
Supplemental Restraints System	SRS	
Shift Solenoid	SS	Controls shifting in an automatic transmission
Seat Control Module	SCM	Module controlling the seat motor systems (not electric raise/lower-only seats)
Secondary Air Injection	AIR	System used for a period of time each time the engine is started, unless certain temperature criteria are met. Pumps air directly into the exhaust system which generates extra heat and reduces the time taken for the catalytic converters to reach operating temperature
Service Repair Operation (number)	SRO	Number generated by Jaguar Methods & Techniques system which relates to the time allowed to complete a repair operation. Further information on the system can be found in the separate Jaguar Publications (for each model range) entitled 'Repair Operation Times'
Society of Automotive Engineers	SAE	
Timing/Coast Clutch Solenoid	T/CCS	
Torque Converter Clutch	TCC	
Transmission Control Indicator Lamp	TCIL	
Throttle Position	TP	
Top Dead Center	TDC	
Transmission Control Module	TCM	Controls the shifting pattern of the (automatic) transmission
Transmission Control Switch	TCS	Modifies the operation of electronically controlled transmissions
Transmission Fluid Temperature	TFT	Indicates temperature of transmission fluid
Transmission Range	TR	The range in which the transmission is operating
Turbine Shaft Speed	TSS	Indicates rotational speed of transmission output shaft or turbine shaft
Variable Assist Power Steering	VAPS	
Variable Camshaft Timing	VCT	A system by which the relationship of the crankshaft and camshaft may be altered during engine running
Vehicle Identification Number	VIN	Number assigned to the vehicle by the manufacturer, primarily for licensing and identification purposes
Vehicle Speed Sensor	VSS	Sensor which provides vehicle speed information
Worldwide Diagnostic System	WDS	Jaguar approved diagnostic system
Wide Open Throttle	WOT	Full throttle position

General Information - Health and Safety Precautions

Description and Operation

The Health and Safety Precautions subsection refers to some commonly used chemicals and materials, hazards associated with their use, and safety measures to be taken. Some of these chemicals may be included in the following list either in their own right or as an ingredient in a sealer or adhesive.

Acids and Alkalis

See also Battery Acids.

e.g. caustic soda, sulphuric acid.

Used in batteries and cleaning materials.

Irritant and corrosive to the skin, eyes, nose and throat. Cause burns. Can destroy ordinary protective clothing.

Avoid splashes to the skin, eyes and clothing. Wear suitable protective impervious apron, gloves and goggles. Do not breath mists.

Ensure access to eye wash bottles, shower and soap are readily available for splashing accidents.

Display Eye Hazard sign.

Air Bags

See also Fire, Chemical Materials - General

Highly flammable, explosive – observe No Smoking policy.

Used as a part of the Supplemental Restraint System (SRS), mounted in various positions around the vehicle.

The inflator contains a high-energetic propellant which, when ignited, produces a VERY HOT GAS (2500° C).

The gas generant used in air bags is Sodium Azide. This material is hermetically sealed in the module and is completely consumed during deployment. No attempt should be made to open an air bag inflator as this will lead to the risk of exposure to Sodium Azide. If a gas generator is ruptured, full protective clothing should be worn when dealing with the spillage.

After normal deployment, gloves and safety goggles should be worn during the handling process.

Deployed air bags should be disposed of in a plastic bag in accordance with local regulations at an approved chemical waste site.

Following any direct contact with gas generant.

- Wash affected areas thoroughly with water
- Seek medical assistance if necessary



WARNING: To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any SRS components. To deplete the backup power supply energy, disconnect the battery negative cable and wait for one minute. Failure to follow this instruction may result in personal injury.



NOTE: The storage, transportation, disposal and/or recycling of air bag modules must be carried out in accordance with all applicable federal, state and local regulations including, but not limited to, those governing building and fire codes, environmental protection, occupational health and safety and transportation.

Air Bags - Do's

- Do store in an air bag safe when not installed to the vehicle.
- Do store modules in an upright position
- Do keep modules dry
- Do carry modules with the cover side pointing away from the body
- Do place modules with their cover side upwards
- Do carefully inspect modules for damage
- Do stand to one side when connecting modules
- Do make sure all test equipment is properly calibrated and maintained
- Do wash you hands after handling deployed air bags
- Do wear safety glasses when carrying out repairs to the SRS or when handling an air bag module
- Only carry out a system test with the air bag modules fully installed
- Do inspect the condition of the impact sensor mounting bracket and sensor flylead if the vehicle has been involved in an impact. Replace if damaged, even if there has been no deployment.

Air Bags - Do Nots

- Do not store highly flammable material together with modules or gas generators
- Do not store gas generators at temperatures exceeding 80° C

- Do not store modules upside down
- Do not attempt to open a gas generator housing
- Do not expose gas generators to open flame or sources of heat
- Do not place anything on top of a module cover
- Do not use damaged modules
- Do not handle a deployed device or gas generator for at least 20 minutes
- Do not probe air bag module electrical connectors or any other SRS component

Air Conditioning Refrigerant

See also Chlorofluorocarbon, Chemical Materials

Highly flammable, combustible – observe No Smoking policy.

Skin contact may result in frostbite.

Instructions given by the manufacturer must be followed. Avoid naked lights, wear suitable protective gloves and goggles.

If refrigerant comes into contact with the skin or eyes, rinse the affected areas with water immediately. Eyes should also be rinsed with an appropriate irrigation solution and should not be rubbed. SEEK MEDICAL ASSISTANCE IF NECESSARY.

Air Conditioning Refrigerant - Do Nots

- Do not expose refrigerant bottles to sunlight or heat
- Do not expose refrigerant bottles to frost
- Do not drop refrigerant bottles
- Do not vent refrigerant to atmosphere under any circumstance
- Do not mix refrigerants i.e. R12 (Freon) and R134a

Antifreeze

See also Fire, Solvents.

e.g. isopropanol, ethylene glycol, methanol.

Highly flammable, flammable, combustible.

Used in vehicle coolant systems, brake air pressure systems, screenwash solutions.

Vapors may be given off from coolant antifreeze (glycol) when heated. Avoid breathing these vapors.

Antifreeze may be absorbed through the skin in toxic or harmful quantities. Antifreeze, if swallowed can be fatal and medical attention should be sought immediately.

These products must not be used in any cooling or industrial water system which is connected or linked to general, food preparation or drinking water supplies.

Asbestos

Used in brake and clutch linings, transmission brake bands and gaskets. Jaguar original production and replacement items are asbestos free.

See also Warning Symbols on Vehicles at the end of this subsection.

Breathing asbestos dust may cause lung damage or, in some cases, cancer.

The use of drum cleaning units, vacuum cleaning or damp wiping is preferred.

Asbestos dust waste should be dampened, placed in a sealed container and marked to make sure safe disposal. If any cutting or drilling is attempted on materials containing asbestos the item should be dampened and only hand tools or low speed power tools used.

Battery Acids

See also Acids and Alkalis.

Gases released during charging are explosive. Never use naked flames or allow sparks near charging or recently charged batteries.

Ensure adequate ventilation.

Brake and Clutch Linings and Pads

See Asbestos.

Brake Fluids (Polyalkylene Glycols)

See also Fire.

Splashes to the skin and eyes may cause irritation. Avoid skin and eye contact as far as possible. Vapor inhalation hazards do not arise at ambient temperatures because of the very low vapor pressure.

Brazing

See Welding.

Chemical Materials

See also Legal Aspects.

Chemical materials such as solvents, sealers, adhesives, paints, resin foams, battery acids, antifreeze, brake fluids, fuels, oils and grease should always be used with caution and stored and handled with care. They may be toxic, harmful, corrosive, irritant or highly flammable and give rise to hazardous fumes and dusts.

The effects of excessive exposure to chemicals may be immediate or delayed; briefly experienced or permanent; cumulative; superficial; life threatening; or may reduce life-expectancy.

Chemical Materials - Do's

- Do carefully read and observe hazard and precaution warnings given on material containers (labels) and in any accompanying leaflets, posters or other instructions. Material health and safety data sheets can be obtained from manufacturers
- Do remove chemical materials from the skin and clothing as soon as practical after soiling. Change heavily soiled clothing and have it cleaned
- Do organise work practices and protective clothing to avoid soiling of the skin and eyes, and the breathing in of vapors, aerosols, dusts or fumes
- Do wash before breaks, before eating, smoking, drinking or using toilet facilities when handling chemical materials
- Do keep work areas clean, uncluttered and free from spills
- Do store chemical materials according to national and local regulations
- Do keep chemical materials out of the reach of children

Chemical Materials - Do Nots

- Do not mix chemical materials except under the manufacturer's instructions; some chemicals can form other toxic or harmful chemicals, give off toxic or harmful fumes or become explosive when mixed together
- Do not spray chemical materials, particularly those based on solvents, in confined spaces e.g. when people are inside a vehicle
- Do not apply heat or flame to chemical materials except under the manufacturer's instructions. Some are highly flammable and some may release toxic or harmful fumes
- Do not leave containers open. Fumes given off can build up to toxic, harmful or explosive concentrations. Some fumes are heavier than air and will accumulate in confined areas, pits etc.
- Do not transfer chemical materials to unlabeled containers
- Do not clean hands or clothing with chemicals. Chemicals, particularly solvents and fuels, will dry skin and may cause irritation leading to dermatitis or be absorbed through the skin in toxic or harmful quantities
- Do not use emptied containers for other materials except when they have been cleaned under supervised conditions
- Do not sniff or smell chemical materials. Brief exposure to high concentrations of fumes can be toxic or harmful

Chlorofluorocarbons (CFC)

There is concern in the scientific community that CFCs and Halons are depleting the upper ozone layer which filters out harmful ultraviolet radiation. Decreased filtration of ultraviolet radiation may result in increases in skin cancer, cataracts and immune system suppression in humans, as well as decreased productivity of crops and aquatic systems.

CFCs are used primarily as refrigerants in vehicle air conditioning systems and as aerosol propellants. Halons are used as fire extinguishants.

Jaguar supports worldwide elimination of CFC usage and it is recommended that Company subsidiaries and affiliates should phase out CFC usage as soon as acceptable substitutes are commercially available.

Clutch Fluids

See Brake fluids.

Clutch Linings and Pads

See Asbestos.

Corrosion Protection Materials

See also Solvents, Fire.

Highly flammable, flammable – observe No Smoking policy.

These materials are varied and the manufacturer's instructions should be followed. They may contain solvents, resins, petroleum products etc. Skin and eye contact should be avoided. They should only be sprayed in conditions of adequate ventilation and not in confined spaces.

Cutting

See Welding.

Dewaxing

See Solvents and Fuels (Kerosene).

Dusts

Powder, dusts or clouds may be irritant, harmful or toxic. Avoid breathing dusts from powdery chemical materials or those arising from dry abrasion operations. Wear respiratory protection if ventilation is inadequate.

Fine dusts of combustible material can present an explosion hazard. Avoid explosive limits and/or sources of ignition.

Electric Shock

Electric shock can result from the use of faulty electrical equipment or from the misuse of equipment in good condition.

Ensure that electrical equipment is maintained in good condition and frequently tested. Faulty equipment should be labelled and preferably removed from the work station.

Ensure that flexes, cables, plugs and sockets are not frayed, kinked, cut, cracked or otherwise damaged.

Ensure that electrical equipment and flexes do not come into contact with water.

Ensure that electrical equipment is protected by the correct rated fuse.

Never misuse electrical equipment and never use equipment which is in any way faulty. The results could be fatal.

Ensure that the cables of mobile electrical equipment cannot get trapped and damaged, such as in a vehicle hoist.

Ensure that the designated electrical workers are trained in basic First Aid.

In cases of electrocution:

- Switch off the power supply before approaching the victim
- If this is not possible push or drag the victim from the source of electricity using dry non-conductive material
- Commence resuscitation if trained to do so
- SUMMON MEDICAL ASSISTANCE

Engine Oils

See Lubricants and Grease.

Exhaust Fumes

These contain asphyxiating, harmful and toxic chemicals and particles such as carbon oxides, nitrogen oxides, aldehydes, lead and aromatic hydrocarbons. Engines should be run only under conditions of adequate exhaust extraction or general ventilation and not in confined spaces.

Gasolene (petrol) engine

There may not be adequate warning of odour or of irritation before toxic or harmful effects arise. These may be immediate or delayed.

Fibre Insulation

See also Dusts.

Used in noise and sound insulation.

The fibrous nature of surfaces and cut edges can cause skin irritation. This is usually a physical and not a chemical effect.

Precautions should be taken to avoid excessive skin contact through careful organization of work practices and the use of gloves.

Fire

See also Welding, Foams, Legal Aspects.

Many of the materials found on or associated with the repair of vehicles are highly flammable. Some give off toxic or harmful fumes if burnt.

Observe strict fire safety when storing and handling flammable materials or solvents, particularly near electrical equipment or welding processes.

Ensure, before using electrical or welding equipment, that there is no fire hazard present.

Have a suitable fire extinguisher available when using welding or heating equipment.

First Aid

Apart from meeting any legal requirements it is desirable for someone in the workshop to be trained in First Aid procedures.

Splashes in the eye should be flushed carefully with clean water for at least ten minutes.

Soiled skin should be washed with soap and water.

Individuals affected by inhalation of gases, fumes etc. should be removed to fresh air immediately. If effects persist, consult a doctor.

If liquids are swallowed inadvertently, consult a doctor giving the information on the container or label. Do not induce vomiting unless this action is indicated on the label.

Fluoroelastomer

See Viton.

Foams - Polyurethane

See also Fire.

Used in sound and noise insulation. Cured foams used in seat and trim cushioning.

Follow manufacturer's instructions.

Unreacted components are irritating and may be harmful to the skin and eyes. Wear gloves and goggles.

Individuals with chronic respiratory diseases, asthma, bronchial medical problems, or histories of allergic diseases should not work in or near uncured materials.

The components, vapors or spray mists can cause direct irritation, sensitivity reactions and may be toxic or harmful.

Vapors and spray mists must not be inhaled. These materials must be applied with adequate ventilation and respiratory protection. Do not remove the respirator immediately after spraying, wait until the vapor/mists have cleared.

Burning of the uncured components and the cured foams can generate toxic and harmful fumes. Smoking, naked flames or the use of electrical equipment during foaming operations and until vapors/mists have cleared should not be allowed. Any heat cutting of cured foams or partially cured foams should be conducted with extraction ventilation.

Freon

See Air Conditioning Refrigerant.

Fuels

See also, Fire, Legal Aspects, Chemicals and Solvents.

Avoid skin contact with fuel where possible. Should contact occur, wash the affected skin with soap and water.

Gasoline (Petrol)

Highly flammable - observe No Smoking policy.

Swallowing can result in mouth and throat irritation and absorption from the stomach can result in drowsiness and unconsciousness. Small amounts can be fatal to children. Aspiration of liquid into the lungs e.g. through vomiting, is a very serious hazard.

Gasoline dries the skin and can cause irritation and dermatitis on prolonged or repeated contact. Liquid in the eye causes severe pain.

Motor gasoline may contain appreciable quantities of benzene, which is toxic upon inhalation, and the concentration of gasoline vapors must be kept very low. High concentrations will cause eye, nose and throat irritation, nausea, headache, depression and symptoms of drunkenness. Very high concentrations will result in rapid loss of consciousness.

Ensure there is adequate ventilation when handling and using gasoline. Great care must be taken to avoid the serious consequences of inhalation in the event of vapor build up arising from spillages in confined spaces.

Special precautions apply to cleaning and maintenance operations on gasoline storage tanks.

Gasoline should not be used as a cleaning agent. It must not be siphoned by mouth. See First Aid.

Gas - oil (Diesel Fuel)

See warnings and cautions in relevant manual sections.

Combustible.

Gross or prolonged skin contact with high boiling point gas oils may also cause serious skin disorders including skin cancer.

Kerosene (Paraffin)

Used also as heating fuel, solvent and cleaning agent.

Flammable - observe No Smoking policy.

Irritation of the mouth and throat may result from swallowing. The main hazard from swallowing arises if liquid aspiration into the lungs occurs.

Liquid contact dries the skin and can cause irritation or dermatitis. Splashes in the eye may be slightly irritating.

In normal circumstances the low volatility does not give rise to harmful vapors. Exposure to mists and vapors from kerosene at elevated temperature should be avoided (mists may arise in dewaxing). Avoid skin and eye contact and make sure there is adequate ventilation.

Gas Cylinders

See also Fire.

Gases such as oxygen, acetylene, argon and propane are normally stored in cylinders at pressures of up to 13.790 kPa, (2000 lb/in²) and great care should be taken in handling these cylinders to avoid mechanical damage to them or to the valve gear attached. The contents of each cylinder should be clearly identified by appropriate markings.

Cylinders should be stored in well ventilated enclosures, and protected from ice and snow, or direct sunlight. Fuel gases (e.g. acetylene and propane) should not be stored in close proximity to oxygen cylinders.

Care should be exercised to prevent leaks from gas cylinders and lines, and to avoid sources of ignition.

Only trained personnel should undertake work involving gas cylinders.

Gases

See Gas Cylinders.

Gaskets (Fluoroelastomer)

See Viton.

General Workshop Tools and Equipment

It is essential that all tools and equipment are maintained in good condition and the correct safety equipment is used where required.

Never use tools or equipment for any purpose other than that for which they were designed. Never over – load equipment such as hoists, jacks, axle and chassis stands or lifting slings. Damage caused by overloading is not always immediately apparent and may result in a fatal failure the next time that the equipment is used.

Do not use damaged or defective tools or equipment, particularly high speed equipment such as grinding wheels. A damaged grinding wheel can disintegrate without warning and cause serious injury.

Wear suitable eye protection when using grinding, chiselling or sand blasting equipment.

Wear a suitable breathing mask when using abrasive blasting equipment, working with asbestos-based materials or using spraying equipment.

Ensure adequate ventilation to control dusts, mists and fumes.

High Pressure Air, Lubrication and Oil Test Equipment

See also Lubricants and Greases.

Always keep high pressure equipment in good condition, and regularly maintained, particularly at joints and unions.

Never direct a high pressure nozzle, e.g. diesel injector, at the skin as the fluid may penetrate to the under - lying tissue etc., and cause serious injury.

Halon

See CFCs.

Legal Aspects

Many laws and regulations make requirements relating to health and safety in the use and disposal of materials and equipment in workshops. Some of these laws which apply in the UK are listed. Similar laws exist for other territories:

- The Factories Act (1961)

- The Asbestos Regulations (1969)
- Highly Flammable Liquids and Liquefied Petroleum Gases Regulations (1972)
- Control of Pollution Act (1974)
- Health and Safety at Work Act (1974)
- The Classification, Packaging and Labelling of Dangerous Substances Regulations (1978, 1981, 1983, 1984)
- Control of Lead at Work Regulations (1980)
- Control of Substances Hazardous to Health (COSHH) Regulations (1989)
- Abrasive Wheels Regulations (1970)
- Reporting of injuries, diseases and dangerous occurrences regulations 1985 (RIDDOR)

Workshops should be familiar, in detail, with these and associated laws and regulations.

Consult the local factory inspectorate if in any doubt.

Lubricants and Greases

Avoid all prolonged and repeated contact with mineral oils. All lubricants and greases may be irritating to the eyes and skin.

Used Engine Oil

Prolonged and repeated contact with mineral oil will result in the removal of natural oils from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

Do not employ used engine oils as lubricants or for any application where appreciable skin contact is likely to occur.

There are publications describing the problems and advising on precautionary measures. For the UK a typical Health and Safety Executive publication is: SHW 397: Cautionary Notice: Effects of mineral oil on the skin.

Health Protection Precautions

- Avoid prolonged and repeated contact with oils, particularly used engine oils
- Wear protective clothing, including impervious gloves where practicable
- Do not put oily rags into pockets
- Avoid contaminating clothing with oil
- Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly
- First Aid treatment should be obtained immediately for open cuts and wounds.
- Use barrier creams, applying them before each work period, to enable easier removal of dirty oil and grease from the skin
- Wash with soap and water to make sure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed
- Do not use gasoline (petrol), kerosene (paraffin), diesel fuel (gas oil), thinners or solvents for cleaning skin.
- If skin disorders develop, obtain medical advice without delay
- Where practical, degrease components prior to handling
- Where there is a risk of eye contact, eye protection should be worn, for example, goggles or face shields; in addition an eye wash facility should be provided

Environmental Precautions

Burning used engine oil in small space heaters or boilers can be recommended only for units of approved design. In the UK the heating system must meet the requirements of HM Inspectorate of Pollution for small burners of less than 0.4 MW. If in doubt check with the appropriate local authority and/or manufacturer of approved appliances.

Dispose of used oil and used oil filters through authorized waste disposal contractors or licensed waste disposal sites, or to the waste oil reclamation trade, batteries should also be disposed off under similar arrangements. If in doubt, contact the relevant local authority for advice on disposal facilities.

It is illegal to pour used oil, antifreeze and automatic transmission fluid on to the ground, down sewers, drains, or into water courses.

Noise

Some operations may produce high noise levels which could, in time, damage hearing. In these cases, suitable ear protection must be worn.

Noise Insulation Materials

See Foams, Fibre Insulation.

O-Rings (Fluoroelastomer)

See Viton.

Paints

See also body and paint manual.

See also Solvents, Chemical Materials.

Highly flammable, flammable - observe No Smoking policy

Pressurized Equipment

See High Pressure Air, Lubrication and Oil Test Equipment.

Solder

Solders are a mixture of metals such that the melting point of the mixture is below that of the constituent metals (normally lead and tin). Solder application does not normally give rise to toxic lead fumes, provided a gas/air flame is used. Oxy-acetylene flames should not be used, as they are much hotter and will cause lead fumes to be produced.

Some fumes may be produced by the application of any flame to surfaces coated with grease etc. and inhalation of these should be avoided.

Removal of excess solder should be undertaken with care, to make sure that fine lead dust is not produced, which can give toxic effects if inhaled. Respiratory protection may be necessary.

Solder spillage and filings should be collected and removed promptly to prevent general air contamination by lead.

High standards of personal hygiene are necessary in order to avoid ingestion of lead or inhalation of solder dust from clothing.

Solvents

See also Chemical Materials, Fuels (Kerosene), Fire.

e.g. acetone, white spirit, toluene, xylene, trichloroethane.

Used in cleaning and de-waxing materials, paints, plastics, resins, thinners etc.

Some may be highly flammable or flammable.

Skin contact will degrease the skin and may result in irritation and dermatitis following repeated or prolonged contact. Some can be absorbed through the skin in toxic or harmful quantities.

Splashes in the eye may cause severe irritation and could lead to loss of vision.

Brief exposure to high concentrations of vapors or mists will cause eye and throat irritation, drowsiness, dizziness, headaches and, in the worst circumstances, unconsciousness.

Repeated or prolonged exposure to excessive but lower concentrations of vapors or mists, for which there might not be adequate warning indications, can cause more serious toxic or harmful effects.

Aspiration into the lungs (e.g. through vomiting) is the most serious consequence of swallowing.

Avoid splashes to the skin, eyes and clothing. Wear protective gloves, goggles and clothing if necessary.

Ensure good ventilation when in use, avoid breathing fumes, vapors and spray mists and keep containers tightly sealed. Do not use in confined spaces.

When spraying materials containing solvents, e.g. paints, adhesive, coatings, use extraction ventilation or personal respiratory protection in the absence of adequate general ventilation.

Do not apply heat or flame except under specific and detailed manufacturer's instructions.

Sound Insulation

See Fibre Insulation, Foams.

Suspended Loads



CAUTION: Never improvise lifting tackle.

There is always a danger when loads are lifted or suspended. Never work under an unsupported, suspended or raised load e.g. suspended engine, etc.

Always make sure that lifting equipment such as jacks, hoists, axle stands, slings, etc., are adequate and suitable for the job, in good condition and regularly maintained.

Transmission Brake Bands

See Asbestos.

Underseal

See Corrosion Protection.

Viton

In common with many other manufacturers' vehicles, some components installed to the Jaguar range have 'O' rings, seals or gaskets which contain a material known as 'Viton'.

Viton is a fluoroelastomer, that is a synthetic rubber type which contains Fluorine. It is commonly used for 'O' rings, gaskets and seals of all types. Although Viton is the most well known fluoroelastomer, there are others, including Fluorel and Tecmoflon.

When used under design conditions fluoroelastomers are perfectly safe. If, however, they are exposed to temperatures in excess of 400° C, the material will not burn, but will decompose, and one of the products formed is hydrofluoric acid.

This acid is extremely corrosive and may be absorbed directly, through contact, into the body.

'O' rings, seals or gaskets which have been exposed to very high temperatures will appear charred or as a black sticky substance.

DO NOT, under any circumstances touch them or the attached components.

Enquiries should be made to determine whether Viton or any other fluoroelastomer has been used in the affected 'O' ring, seal or gasket. If they are of natural rubber or nitrile there is no hazard. If in doubt, be cautious and assume that the material may be Viton or any fluoroelastomer.

If Viton or any other fluoroelastomers have been used, the affected area should be decontaminated before the commencement of work.

Disposable heavy duty plastic gloves should be worn at all times, and the affected area washed down using wire wool and a limewater (calcium hydroxide) solution to neutralize the acid before disposing of the decomposed Viton residue and final cleaning of the area. After use, the plastic gloves should be discarded carefully and safely.

Welding

See also Fire, Electric Shock, Gas Cylinders.

Welding processes include Resistance Welding (Spot Welding), Arc Welding and Gas Welding (and cutting).

Resistance Welding (Spot Welding)

This process may cause particles of molten metal to be emitted at a high velocity, and the eyes and skin must be protected.

Arc Welding

This process emits a high level of ultraviolet radiation which may cause arc-eye and skin burns to the operator and to other persons nearby. Gas-shielded welding processes are particularly hazardous in this respect. Personal protection must be worn, and screens used to shield other people.

CONTACT LENS WEARERS ARE ADVISED TO REVERT TO ORDINARY SPECTACLES WHEN ARC WELDING as the arc spectrum is believed to emit microwaves which dry out the fluid between the lens and the eye. This may result in blindness when the lens is removed from the eye.

Metal spatter will also occur, and appropriate eye and skin protection is necessary.

The heat of the welding arc will produce fumes and gases from the metals being welded, the rods and from any applied coatings or contamination on the surfaces being worked on. These gases and fumes may be toxic and inhalation of these should be avoided. The use of extraction ventilation to remove the fumes from the working area may be necessary particularly in cases where the general ventilation is poor, or where considerable welding work is anticipated. In extreme cases or confined spaces where adequate ventilation cannot be provided, air-fed respirators may be necessary.

Gas Welding (and Cutting)

Oxy-acetylene torches may be used for welding and cutting, and special care must be taken to prevent leakage of these gases, with consequent risk of fire and explosion.

The process will produce metal spatter and eye and skin protection is necessary.

The flame is bright, and eye protection should be used, but the ultraviolet emission is much less than that from arc welding, and lighter filters may be used.

The process itself produces few toxic fumes, but such fumes and gases may be produced from coatings on the work, particularly during cutting away of damaged body parts, and inhalation of the fumes should be avoided.

In brazing, toxic fumes may be produced from the metals in the brazing rod, and a severe hazard may arise if brazing rods containing cadmium are used. In this event particular care must be taken to avoid inhalation of fumes and expert advice may be required.

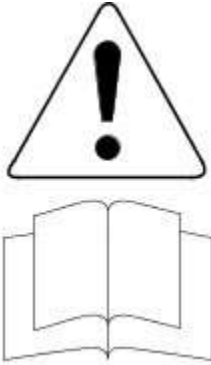
SPECIAL PRECAUTIONS MUST BE TAKEN BEFORE ANY WELDING OR CUTTING TAKES PLACE ON VESSELS WHICH HAVE CONTAINED COMBUSTIBLE MATERIALS, E.G. BOILING OR STEAMING OUT OF FUEL TANKS.

Warning Symbols on Vehicles

Decals showing warning symbols will be found on various vehicle components.

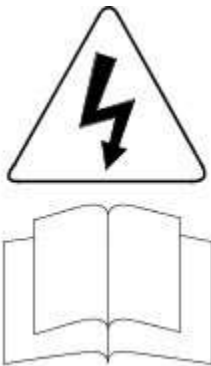
These decals must not be removed. The warnings are for the attention of owners/operators and persons carrying out service or repair operations on the vehicle.

The most commonly found decals are reproduced below together with an explanation of the warnings.



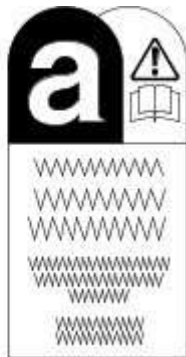
VUJ0000269

1. Components or assemblies displaying the warning triangle and open book symbol advise consultation of the relevant section of the owners handbook before touching or attempting adjustments of any kind.



VUJ0000270

2. Components or assemblies displaying the warning triangle with the electrified arrow and open book symbol give warning of inherent high voltages. Never touch these with the engine running or the ignition switched on. See Electric Shock in this subsection.



VUJ0000271

3. Jaguar vehicles and replacement parts which contain asbestos are identified by this symbol. See Asbestos in this subsection.



VUJ0000272

4. Components or assemblies displaying this symbol give warning that the component contains a corrosive substance. See Acids and Alkalis in this subsection.



VUJ0000273

5. Vehicles displaying the caution circle with a deleted lighted match symbol, caution against the use of naked lights or flames within the immediate vicinity due to the presence of highly flammable or explosive liquids or vapors. See Fire in this subsection.



VUJ0002037

6. All vehicles with the passenger air bag installed from the factory have a warning sticker attached to the instrument panel, prohibiting the use of rear facing child seats in the front seating position. Failure to follow this instruction may result in personal injury.

White Spirit

See Solvents.

Safety Precautions

WARNINGS:



Working on the fuel system results in fuel and fuel vapor being present in the atmosphere. Fuel vapor is extremely flammable, hence great care must be taken whilst working on the fuel system. Adhere strictly to the following precautions:

- Do not smoke in the work area
- Display 'no smoking' signs around the area
- Disconnect the battery before working on the fuel system
- Do not connect/disconnect electrical circuits, use electrical equipment or other tools or engage in working practices which in any way may result in the production of sparks
- Ensure that a CO² fire extinguisher is close at hand
- Ensure that dry sand is available to soak up any fuel spillage
- Empty fuel using suitable fire proof equipment into an authorized explosion proof container

- Do not empty fuel while working in a workshop or a pit
- Ensure that working area is well ventilated
- Ensure that any work on the fuel system is only carried out by experienced and well qualified maintenance personnel
- Ensure that fume extraction equipment is used where appropriate



Fume extraction equipment must be in operation when solvents are used e.g. Trichloroethane, white spirit, sbp3, methylene chloride, perchlorethylene. Do not smoke in the vicinity of volatile degreasing agents.

Whenever possible, use a ramp or pit whilst working beneath a vehicle, in preference to jacking. Position chocks at the wheels as well as applying the parking brake. Never rely on a jack alone to support a vehicle. Use axle stands, or blocks carefully placed at the jacking points, to provide a rigid location. Check that any lifting equipment used has adequate capacity and is fully serviceable. Ensure that a suitable form of fire extinguisher is conveniently located. When using electrical tools and equipment, inspect the power lead for damage and check that it is properly earthed. Disconnect the earth (grounded) terminal of the vehicle battery. Do not disconnect any pipes of the air conditioning refrigeration system unless you are trained and instructed to do so. A refrigerant is used which can cause blindness if allowed to come into contact with the eyes. Ensure that adequate ventilation is provided when volatile degreasing agents are being used.

Adhere strictly to handling and safety instructions given on containers and labels. Keep oils and solvents away from naked flames and other sources of ignition. Do not apply heat in an attempt to free seized nuts or fittings; as well as causing damage to protective coatings, there is a risk of damage from stray heat to electronic equipment and brake lines. Do not leave tools, equipment, spilt oil etc. around the work area. Wear protective overalls and use barrier cream when necessary.

Environmental Protection

In some countries it is illegal to pour used oil onto the ground, down sewers or drains, or into water courses. The burning of used engine oil in small space heaters or boilers is not recommended unless emission control equipment is installed. Dispose of used oil through authorized waste disposal contractors, to licensed waste disposal sites or to the waste oil reclamation trade. If in doubt, contact the Local Authority for advice on disposal facilities.

General Information - How To Use This Manual

Description and Operation

Workshop Manual Organization

This manual covers descriptive, diagnostic (including OBD), and repair aspects to service the vehicle effectively.

The manual is arranged in sections, each section dealing with a specific part of a vehicle system. For example, Section 412-03 [Air Conditioning] covers air conditioning, which is part of the climate control system.

The first digit of the section number indicates the group (in the above example this being Electrical). There are five groups:

- General Information.
- Chassis.
- Powertrain.
- Electrical. Body
and Paint.

The second and third digits of the section number indicate the vehicle system (12 in the above example being Climate Control).

The last two digits of the section number indicate the part of the system covered by the section (03 in the example denotes Air Conditioning).

General Information - Important Safety Instructions

Description and Operation

Safety Notice

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all motor vehicles, as well as the safety of the person doing the work. This manual provides general directions for accomplishing service and repair work with tested effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing vehicles, as well as in the skill of the person doing the work. This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in the manual must first establish that neither personal safety or vehicle integrity is compromised from choices of methods, tools or parts.

General Information - Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions

Description and Operation

WARNINGS:



Fuel may not give adequate warning before toxic or harmful effects arise.



Exposure to fuel can be harmful and can cause severe health damage or death.



Extreme care must be exercised when handling hot fluids. Always wash off spilled fluids from affected areas of skin immediately.



Highly flammable mixtures are always present and may ignite when working on fuel systems. Do not allow naked flames, sparks or lighted substances to come near fuel related components.



Fuel must not be used as a cleaning agent.



Keep fuel containers tightly closed, out of direct sunlight and in a cool area. Keep away from heat sources, ignition sources and oxidizing agents.



SKIN CONTACT: Excessive or prolonged skin contact with diesel fuel may cause serious skin disorders including skin cancer.



SKIN CONTACT: Fuel is mildly irritating to the skin and may cause dermatitis due to defatting effect. Remove contaminated clothing. Wash affected areas of skin with soap and water. Seek medical attention for any persistent skin irritation or abnormality. Wash contaminated clothing before reuse.



EYE CONTACT: Fuel is mildly irritating to the eyes. Flush with plenty of running water, blinking as often as possible. Do not force the eyelid open. Seek medical attention for any persistent eye irritation or abnormality.



SWALLOWED: Fuel is moderately toxic and tends to foam on vomiting. If drawn into the lungs, inflammation may develop. Do not induce vomiting. If spontaneous vomiting occurs place the victim in a forward position to reduce the risk of fuel being drawn into the lungs. Give nothing by mouth. If breathing but unconscious, place in the recovery position. If breathing has stopped, apply artificial respiration. Seek immediate medical attention.



INHALED: Fuel is toxic to the respiratory and other body systems. Exposure may result in various symptoms including drowsiness, unconsciousness or severe health damage. Move a victim to fresh air. Keep a victim warm and at rest. If unconscious, place in the recovery position. If not breathing, apply artificial respiration. Give cardiac massage if necessary. Seek immediate medical attention.

CAUTIONS:



Fuel injection equipment is manufactured to very precise tolerances and fine clearances. It is essential that absolute cleanliness is observed when working with these components.



Make sure that the workshop area in which the vehicle is being worked on is as clean and as dust free as possible.

General Information - Solvents, Sealants and Adhesives

Description and Operation



WARNING: Always handle all solvents, sealers and adhesives with extreme care. Some contain chemicals or give off fumes which can be dangerous to health. Always follow the manufacturers instructions. If in doubt about any substance, particularly a solvent, DO NOT use it.



CAUTION: If in doubt about the suitability of any proprietary solvent or sealer for a particular application, contact the manufacturer of the product for information regarding storage, handling and application.

The Solvents, Sealers and Adhesives subsection refers to some commonly used chemicals and materials, hazards associated with their use, and safety measures to be taken.

Adhesives and Sealers

Highly flammable, flammable, combustible – observe No Smoking policy.

Generally should be stored in No Smoking' areas. Cleanliness and tidiness in use should be observed e.g. disposable paper covering benches; should be dispensed from applicators where possible; containers, including secondary containers, should be labelled appropriately.

Solvent - based Adhesives/Sealers - See Solvents

Follow manufacturer's instructions.

Water - based Adhesives/Sealers

Those based on polymer emulsions and rubber latexes may contain small amounts of volatile toxic and harmful chemicals. Skin and eye contact should be avoided and adequate ventilation provided during use.

Hot Melt Adhesives

In the solid state, they are safe. In the molten state they may cause burns and health hazards may arise from the inhalation of toxic fumes.

Use appropriate protective clothing and a thermostatically controlled heater with a thermal cut - out and adequate extraction.

Resin - based Adhesives/Sealers e.g. Epoxide and Formaldehyde Resin - based

Mixing should be carried out in well ventilated areas, as harmful or toxic volatile chemicals may be released.

Skin contact with uncured resins and hardeners can result in irritation, dermatitis, and absorption of toxic or harmful chemicals through the skin. Splashes can damage the eyes.

Provide adequate ventilation and avoid skin and eye contact.

Anaerobic, Cyanoacrylate (Super - glues) and other Acrylic Adhesives

Many are irritant, sensitizing or harmful to the skin and/or respiratory tract. Some are eye irritants.

Skin and eye contact should be avoided and the manufacturer's instructions followed.

Cyanoacrylate adhesives (super-glues) MUST NOT contact the skin or eyes. If skin or eye tissue is bonded, cover with a clean moist pad and seek immediate medical attention. Do not attempt to pull tissue apart. Use in well ventilated areas as vapors can cause irritation to the nose and eyes.

For two - pack systems see Resin - based and Isocyanate Adhesives/Sealers.

Isocyanate (Polyurethane) Adhesives/Sealers

See also Resin - based Adhesives

Individuals suffering from asthma or respiratory allergies should not work with or near these materials as sensitivity reactions can occur.

Over exposure is irritating to the eyes and respiratory system. Excessive concentrations may produce effects on the nervous system including drowsiness. In extreme cases, loss of consciousness may result. Long term exposure to vapor concentrations may result in adverse health effects.

Prolonged contact with the skin may lead to skin irritation and, in some cases, dermatitis.

Splashes entering the eye will cause discomfort and possible damage.

Any spraying should preferably be carried out in exhaust ventilated booths removing vapors and spray droplets from the breathing zone.

Wear appropriate gloves, eye and respiratory protection.

General Information - Standard Workshop Practices

Description and Operation

Protecting the Vehicle

Always install covers to protect the fenders before commencing work in the engine compartment. Always install the interior protection kit, wear clean overalls and wash hands or wear gloves before working inside the vehicle. Avoid spilling hydraulic fluid, antifreeze or battery acid on the paintwork. In the event of spillage, wash off with water immediately. Use polythene sheets in the luggage compartment to protect carpets. Always use the recommended service tool, or a satisfactory equivalent, where specified. Protect temporarily exposed screw threads by replacing nuts or installing caps.

Vehicle in Workshop

When working on a vehicle in the workshop always make sure that:

- The parking brake is applied or the wheels are securely chocked to prevent the vehicle moving forwards or backwards
- If the engine is to be run, there is adequate ventilation, or an extraction hose to remove exhaust fumes is installed
- There is adequate room to jack up the vehicle and remove the wheels, if necessary
- Fender covers are always installed if any work is to be carried out in the engine compartment
- The battery is disconnected if working on the engine, underneath the vehicle, or if the vehicle is jacked up



CAUTION: When electric arc welding on a vehicle, always disconnect the generator wiring to prevent the possibility of a surge of current causing damage to the internal components of the generator.

- If using welding equipment on the vehicle, ensure a suitable fire extinguisher is readily available.

Screw Threads

- Damaged nuts, bolts and screws must always be discarded. Attempting to recut or repair damaged threads with a tap or die impairs the strength and fit of the threads and is not recommended.

NOTES:



During certain repair operations, it may be necessary to remove traces of thread locking agents using a tap. Where this is necessary, the instruction to do so will appear in the relevant operation and it is essential that a tap of the correct size and thread is used.



New Taptite bolts when used cut their own threads on the first application.

- Some bolts are coated with a thread locking agent and unless stated otherwise, they must not be reused. New bolts having the same part number as the original must always be installed. When nuts or bolts are to be discarded, the repair operation and relevant torque chart will include an instruction to that effect. Do not use proprietary thread locking agents as they may not meet the specification required. See also Encapsulated ('Patched') Bolts and Screws.
- Always make sure that replacement nuts and bolts are at least equal in strength to those that they are replacing. Castellated nuts must not be loosened to accept a split pin except in recommended cases when this forms part of an adjustment.
- Do not allow oil or grease to enter blind holes, the hydraulic action resulting from tightening the bolt or stud can split the housing and also give a false torque reading.
- Always tighten a nut, bolt or screw to the specified torque figure, damaged or corroded threads can give a false torque reading.
- Nut and bolt loosening and tightening sequences, where given, must ALWAYS be followed. Distortion of components or faulty sealing of joints will result if the sequences are not followed. Where an instruction is given to tighten in stages, these stages must be adhered to; do not attempt to combine stages particularly where certain stages involve tightening by degrees.
- To check or re-tighten a fixing to a specified torque, first loosen a quarter of a turn, then retighten to the specified torque figure.
- Unless instructed otherwise, do not lubricate bolt or nut threads prior to installing.

Where it is stated that bolts and screws may be reused, the following procedures must be carried out:

- Check that threads are undamaged.
- Remove all traces of locking agent from the threads.



CAUTION: DO NOT use a wire brush; take care that threads are not damaged.

- Make sure that threads are clean and free from oil or grease.
- Apply the specified locking agent to the bolt threads.

Supplementary Restraint System (SRS) Precautions



WARNING: Do not install rear facing child seats in the front passenger seat.

The SRS contains components which are potentially hazardous to service personnel if not handled correctly. The following guidelines and precautions are intended to alert personnel to potential sources of danger and emphasise the importance of ensuring the integrity of the SRS components installed to the vehicle.



WARNING: The following precautions **MUST** be adhered to when working on the SRS system:

- **The correct procedures must always be used when working on SRS components.**
- **Persons working on the SRS system must be fully trained and have been issued with the safety guidelines.**
- **The airbag modules contain extremely flammable and hazardous compounds. Contact with water, acids or heavy metals may produce harmful or explosive results. Do not dismantle, incinerate or bring into contact with electricity before the unit has been deployed.**
- **Always replace a seat belt assembly that has withstood the strain of a severe vehicle impact or if the webbing shows signs of fraying.**
- **Always disconnect the vehicle battery before carrying out any electric welding on a vehicle installed with an SRS system.**



CAUTION: Do not expose airbag modules or seat belt pre-tensioners to temperatures exceeding 85° C (185° F).

It should be noted that these precautions are not restricted to operations performed when servicing the SRS system. The same care should be exercised when working on ancillary systems and components located in the vicinity of SRS components; these include but are not limited to:

- Steering wheel airbag, rotary coupler.
- Passenger front airbag.
- Head airbag modules - front and rear.
- Seat belt pre-tensioners.
- SRS harnesses, link leads and connectors.
- Side (thorax) air bags.

Making the system safe

Before working on or in the vicinity of SRS components, make sure the system is rendered safe by performing the following operations:

- Remove the ignition key.
- Disconnect battery, earth lead first.
- Wait 2 minutes for the SRS power circuit to discharge before commencing work.



NOTE: The SRS uses energy reserve capacitors to keep the system active in the event of electrical supply failure under crash conditions. It is necessary to allow the capacitors sufficient time to discharge (2 minutes) in order to avoid the risk of accidental deployment.

Installation

In order to make sure system integrity, it is essential that the SRS system is regularly checked and maintained so that it is ready for effective operation in the event of a collision. Carefully inspect SRS components before installation. Do not install a part that shows signs of being dropped or improperly handled, such as dents, cracks or deformation.



WARNING: The integrity of the SRS systems is critical for safety reasons. Make sure the following precautions are always adhered to:

- **Do not install accessories or other objects to trim panels which cover ITS airbags.**
- **Never install used SRS components from another vehicle or attempt to repair an SRS component.**
- **When repairing an SRS system, only use genuine new parts.**
- **Never apply electrical power to an SRS component unless instructed to do so as part of an approved test procedure.**
- **Special fixings are necessary for installing an airbag module – do not use other fixings and make sure that all fixings are tightened to the correct torque.**
- **Always use new fixings when replacing an SRS component.**

CAUTIONS:



Take care not to trap airbag modules when installing interior trim components.



Make sure SRS components are not contaminated by oil or grease.

NOTES:



Following seat belt pre-tensioner deployment, the seat belts can still be used as conventional seat belts but will need to

be replaced as soon as possible to make sure full SRS protection.



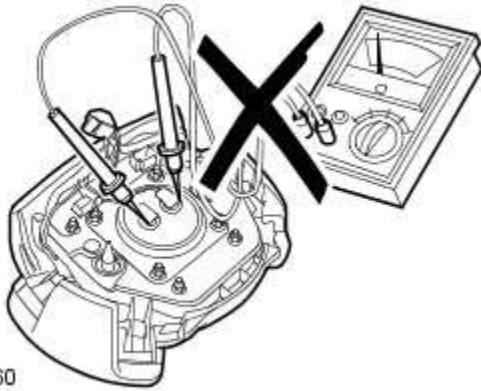
If the SRS components are to be replaced, the part number/bar code of the new unit must be recorded.

SRS component testing precautions

The SRS components are triggered using relatively low operating currents, always adhere to the following :



WARNING: Never use a multimeter or other general purpose equipment on SRS components. Use only approved JLR diagnostic equipment to diagnose system faults.



E48960



WARNING: Do not use electrical test equipment on the SRS harness while it is connected to any of the SRS components, it may cause accidental deployment and injury.

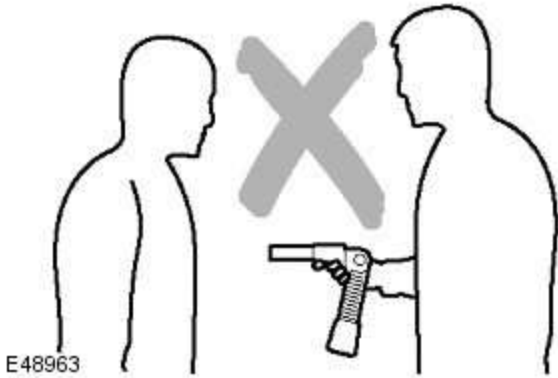
Handling and storage

Always observe the following precautions when handling SRS components:



E48961

- Never drop an SRS component. The airbag diagnostic control unit is a particularly shock sensitive device and must be handled with extreme care. Airbag modules and seat belt pre-tensioners could deploy if subjected to a strong shock.
- Never wrap your arms around an airbag module. If a module has to be carried, hold it by the cover with the cover uppermost and the base away from your body.
- Never transport airbag modules or seat belt pre-tensioners in the passenger compartment of a vehicle. Always use the luggage compartment of the vehicle for carrying airbag modules and seat belt pre-tensioner units.
- Never attach anything to an airbag cover or any trim component covering an airbag module. Do not allow anything to rest on top of an airbag module.
- Always keep components cool, dry and free from contamination.
- Never apply grease or cleaning solvents to seat belt pre-tensioner units, component failure could result.
- Always store an airbag module with the deployment side uppermost. If it is stored deployment side down, accidental deployment will propel the airbag module with sufficient force to cause serious injury.
- Keep new airbag modules in their original packaging until just prior to installing. Place the old module in the empty packaging for carriage.



WARNINGS:



When handling an inflatable tubular structure (ITS) airbag module, hold by the gas generator housing, DO NOT hold by the airbag. Do not wrap the thumb around the gas generator while holding. Do not drape airbag over shoulder or around neck. For seat buckle type pre-tensioners, hold by the piston tube, with the open end of the piston tube pointing towards the ground and the buckle facing away from your body. Do not cover the end of the piston tube. DO NOT hold buckle type pre-tensioners by the bracket assembly or cable. Never point the piston tube towards your body or other people.



Airbag modules and seat belt pre-tensioners are classed as explosive devices. For overnight and longer term storage, they must be stored in a secure steel cabinet which has been approved as suitable for the purpose and has been registered with the local authority.



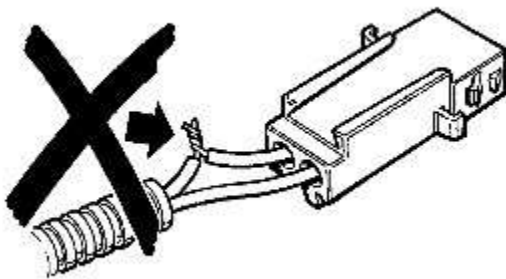
Store airbag modules or seat belt pre-tensioners in a designated storage area. If there is no designated storage area available, store in the locked luggage compartment of the vehicle and inform the workshop supervisor.



CAUTION: Improper handling or storage can internally damage the airbag module making it inoperative. If you suspect the airbag module has been damaged, install a new module and refer to the deployment/disposal procedures for disposal of the damaged module.

SRS harness and connectors

Always observe the following precautions with regards to SRS system electrical wiring:

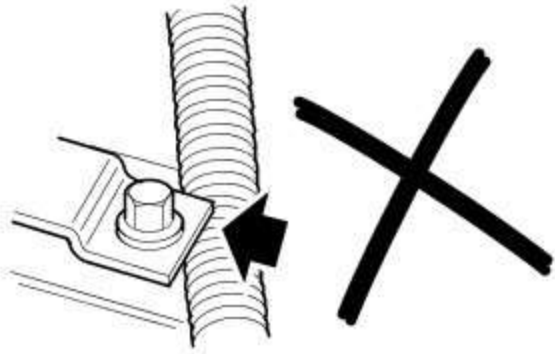


E48965

- Never attempt to modify, splice or repair SRS wiring.
- Never install electrical equipment such as a mobile telephone, two-way radio or in-car entertainment system in such a way that it could generate electrical interference in the airbag harness. Seek specialist advice when installing such equipment.

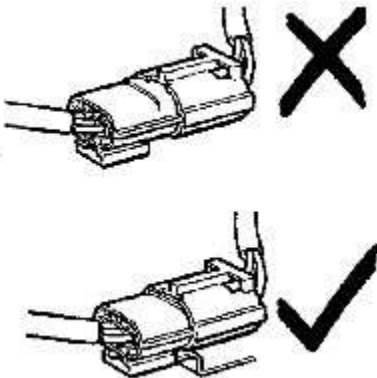


NOTE: SRS wiring can be identified by a special yellow outer sleeve protecting the wires (black with yellow stripe protective coverings are sometimes used).



E48964

 **WARNING:** Always make sure SRS wiring is routed correctly. Be careful to avoid trapping or pinching the SRS wiring.




E48966


 **WARNING:** Do not leave the connectors hanging loose or allow SRS components to hang from their harnesses. Look for possible chafing points.

Side impact crash sensor inspection

After any degree of side body damage, inspect the side impact crash sensors. Replace a crash sensor if there is any sign of damage.

 **CAUTION:** Take extra care when painting or carrying out bodywork repairs in the vicinity of the crash sensors. Avoid direct exposure of the crash sensors or link harnesses to heat guns, welding or spraying equipment. Take care not to damage sensor or harness when reinstalling components.

Rotary coupler

 **CAUTION:** Always follow the procedure for installing and checking the rotary coupler as instructed in the SRS repairs section. Comply with all safety and installation procedures to make sure the system functions correctly. Observe the following precautions:

- Do not unlock and rotate the rotary coupler when it is removed from the vehicle.
- Do not turn the road wheels when the rotary coupler is removed from the vehicle.
- Always make sure the rotary coupler is removed and installed in its central position and with the front road wheels in the straight ahead position - refer to SRS repair section for the correct removal and installation procedure.
- If a new rotary coupler is being installed, make sure the locking tab holding the coupler's rotational position is not broken; units with a broken locking tab must not be used.

Airbag location labels

WAITING AIRBAG LOCATION AND DESIGN LABELS - DUE MARCH - NEIL HARRISON 46404

Airbag and pre-tensioner deployment

 **WARNING:** During deployment parts of the airbag module become hot enough to burn you. Wait 30 minutes after deployment before touching the airbag module.

Deployment procedures and precautions as detailed in this manual should be strictly adhered to. Only personnel who have undergone the appropriate training should undertake deployment of airbag and pre-tensioner modules. The following precautions must be complied with:

- Only use deployment equipment approved for the intended purpose.
- Deployment of airbag / pre-tensioner modules must be performed in a well ventilated area which has been designated for the purpose.
- Make sure airbag / pre-tensioner modules are not damaged or ruptured before attempting to deploy.
- Where local legislation exists, notify the relevant authorities of intention to deploy airbag and pretensioner units.
- When deploying airbag pre-tensioner units, make sure that all personnel are at least 15 metres (45 feet) away from the deployment zone.
- Make sure deployment tool is connected correctly, in compliance with the instructions detailed in the SRS section of this manual. In particular, make sure deployment tool is NOT connected to battery supply before connecting to airbag module connector.
- When deploying seat belt pre-tensioners, make sure pre-tensioner unit is secured correctly to the seat.
- When removing deployed airbag modules and pre-tensioner units, wear protective clothing. Use gloves and seal deployed units in a plastic bag.
- Following deployment of any component of the SRS system within the vehicle, all SRS components must be replaced. DO NOT reuse or salvage any parts of the SRS system.
- Do not lean over an airbag module when connecting deployment equipment.

If a vehicle is to be scrapped, undeployed airbag modules and pre-tensioner units must be manually deployed. In this case airbags can be deployed in the vehicle. Before deployment, make sure the airbag module is secure within its correct mounting position. Deployment of the driver's airbag in the vehicle may damage the steering wheel; if the vehicle is not being scrapped, deploy the module outside of the vehicle.

SRS Component Replacement Policy

CAUTIONS:



The Restraints Control Module (RCM) will log a crash fault after every impact which is severe enough to cause airbag deployment. **It is possible to have three crashes/impacts logged after one event where, for example, a front, side and rollover has occurred. After the third fault is logged, the SRS warning lamp will be illuminated and the RCM must be installed. After any airbag deployment a new RCM must be installed.**



The SRS side impact sensor must be replaced if there are any signs of physical damage or if the restraints control module (RCM) is registering a fault.

The following information details the policy for replacement of SRS components as a result of a vehicle accident.

Impacts which do not deploy the airbags or pre-tensioners

Check for structural damage in the area of the impact paying particular attention to bumper armatures, longitudinals and bracketry.

Impacts which deploy the airbags or pre-tensioners

The replacement and inspection policy is dependent on the type and severity of the crash condition. The following guidelines are the minimum that should be exercised as a result of the deployment of specific SRS components.

Check for structural damage in the area of impact paying particular attention to bumper armatures, longitudinals and bracketry.

Front Airbag Deployment - Driver and Passenger



CAUTION: If the front airbags are deployed, the following components must be replaced:

- Driver airbag module
- Passenger airbag module
- Fly leads (where applicable) connecting front airbag modules to SRS harness
- Front seat belt buckle pre-tensioner
- Rear seat belt pre-tensioners - if installed
- Driver's seat belt retractor - if installed
- Rotary coupler
- Any front impact sensors that have been physically damaged or if a fault is being registered
- Restraints control module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Front passenger's seat belt retractor and webbing, tongue latching function, 'D' loop and body anchorage point
- Rear seat belt buckles, webbing, buckle covers, body anchorage points and tongue latching function
- Fascia moulding adjacent to passenger airbag module
- Steering wheel
- Front seat frames and head restraints
- Steering column - if adjustment is lost or if there are signs of collapse
- Seat belt height adjusters

- Rear seat belts

Side Air Bags



CAUTION: If the side (thorax) air bags are deployed, the following components must be replaced on the side of the vehicle on which the deployment occurred:

- Side (thorax) airbag
- Any side impact sensors that have been physically damaged or if a fault is being registered
- Restraints Control Module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Front seat belts, retractors and webbing, tongue latching function, 'D' loop and body anchorage points
- Rear seat belt buckles, webbing, buckle covers, tongue latching function, and body anchorage points
- Front seat frame and head restraints
- Door trim casing
- Seat belt height adjusters
- Rear seat belts

Head airbag modules



CAUTION: If the head airbag modules are deployed, the following components must be replaced on the side of the vehicle on which the deployment occurred:

- Head airbag modules
- Link lead between airbag gas generator and restraints control module (RCM) harness
- Airbag retaining clips
- Internal trim finisher
- Front seat belt buckle pre-tensioners
- Any side impact sensors that have been physically damaged or if a fault is being registered
- Restraints Control Module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Headlining
- Component mounting brackets
- Front seat belts, retractors and webbing, tongue latching function, 'D' loop and body anchorage points
- Rear seat belt buckles, webbing, buckle covers, tongue latching function, and body anchorage points
- Adjacent trim components
- Seat belt height adjusters

Rear impacts



CAUTION: If the seat belt pre-tensioners are deployed during a rear impact, the following components must be replaced:

- Seat belt pre-tensioners
- Front and rear seat belt retractors used during the impact
- Restraints Control Module (RCM) if the three crashes/impacts have been stored

Additionally, the following items must be inspected for damage and replaced as necessary:

- Seat belt height adjusters
- Front seat belts, retractors and webbing, tongue latching function, 'D' loop and body anchorage points
- Rear seat belt buckles, webbing, buckle covers, tongue latching function, and body anchorage points

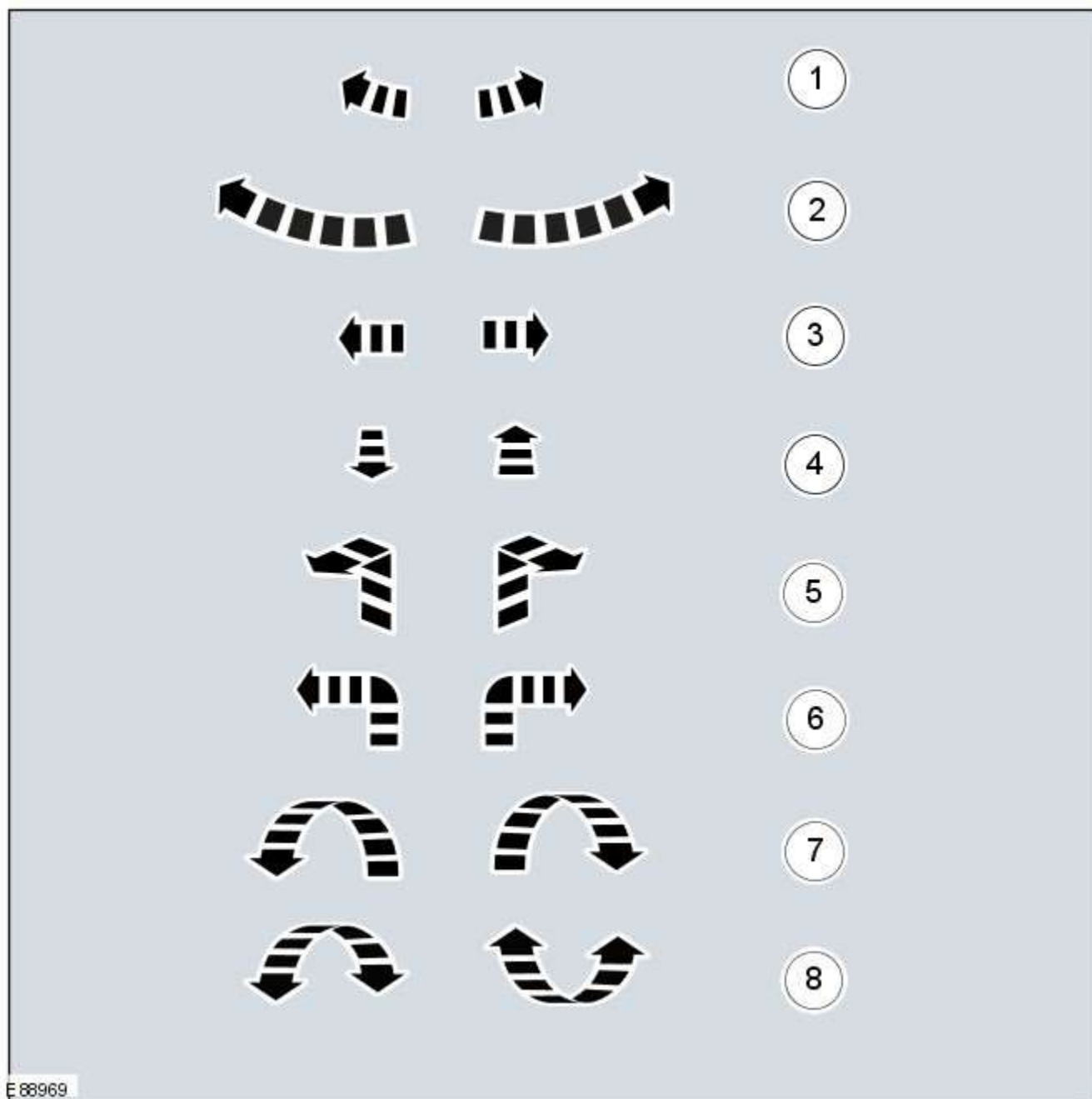
General Information - Symbols Glossary

Description and Operation

Symbols are used inside the graphics and in the text area to enhance the information display.

Movement Symbols

Movement symbols provide detailed information to a required component movement. These component movements can be rotational or 1-3 dimensional movements.

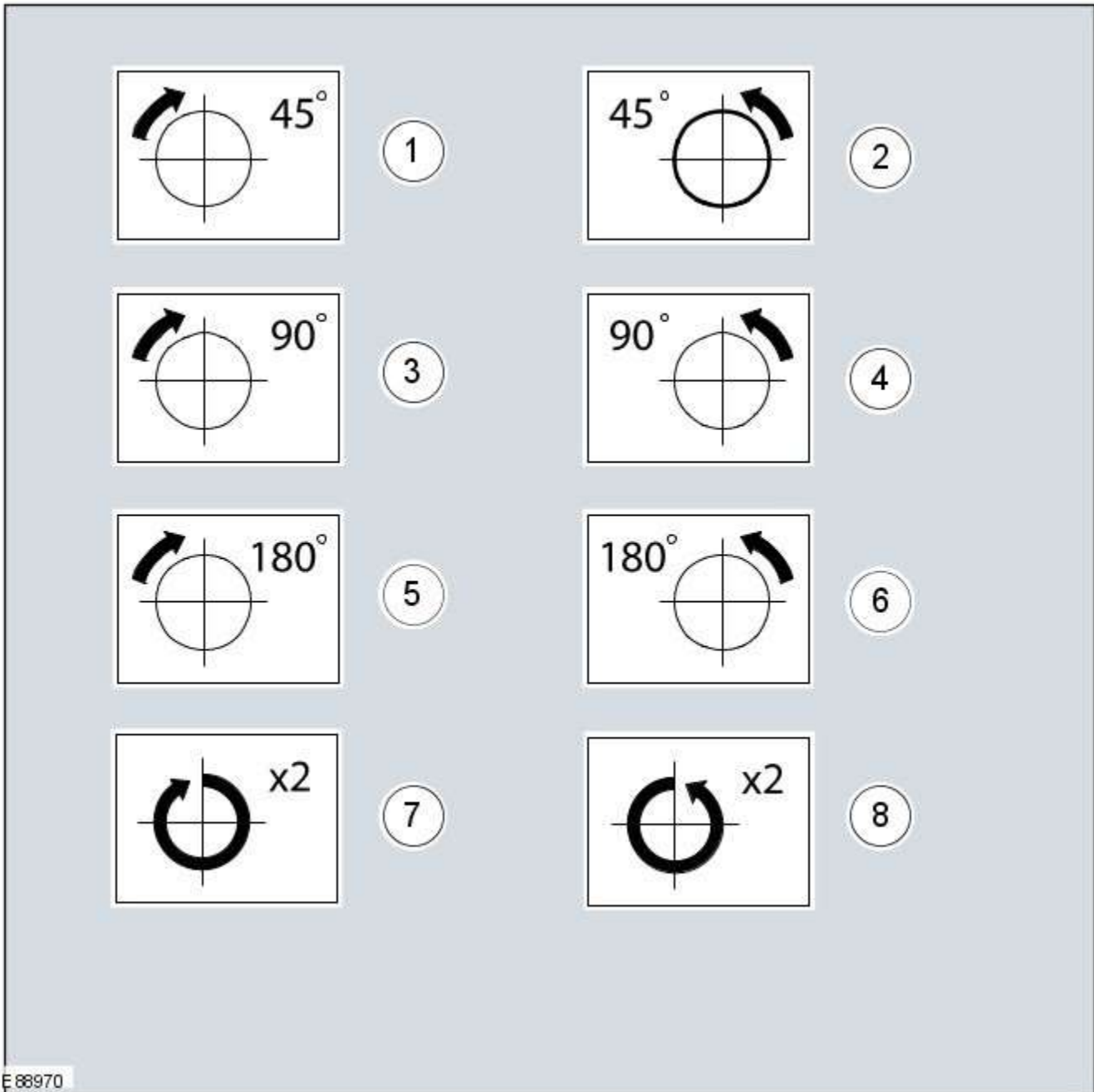


E 88969

Item	Part Number	Description
1	-	Minor component movement clockwise/counterclockwise
2	-	Major component movement clockwise/counterclockwise
3	-	Component movement to the left/right/up/down
4	-	Component movement towards/away
5	-	3 dimensional component movement
6	-	2 dimensional component movement
7	-	3 dimensional component rotation
8	-	3 dimensional component cycling

Turn Symbols

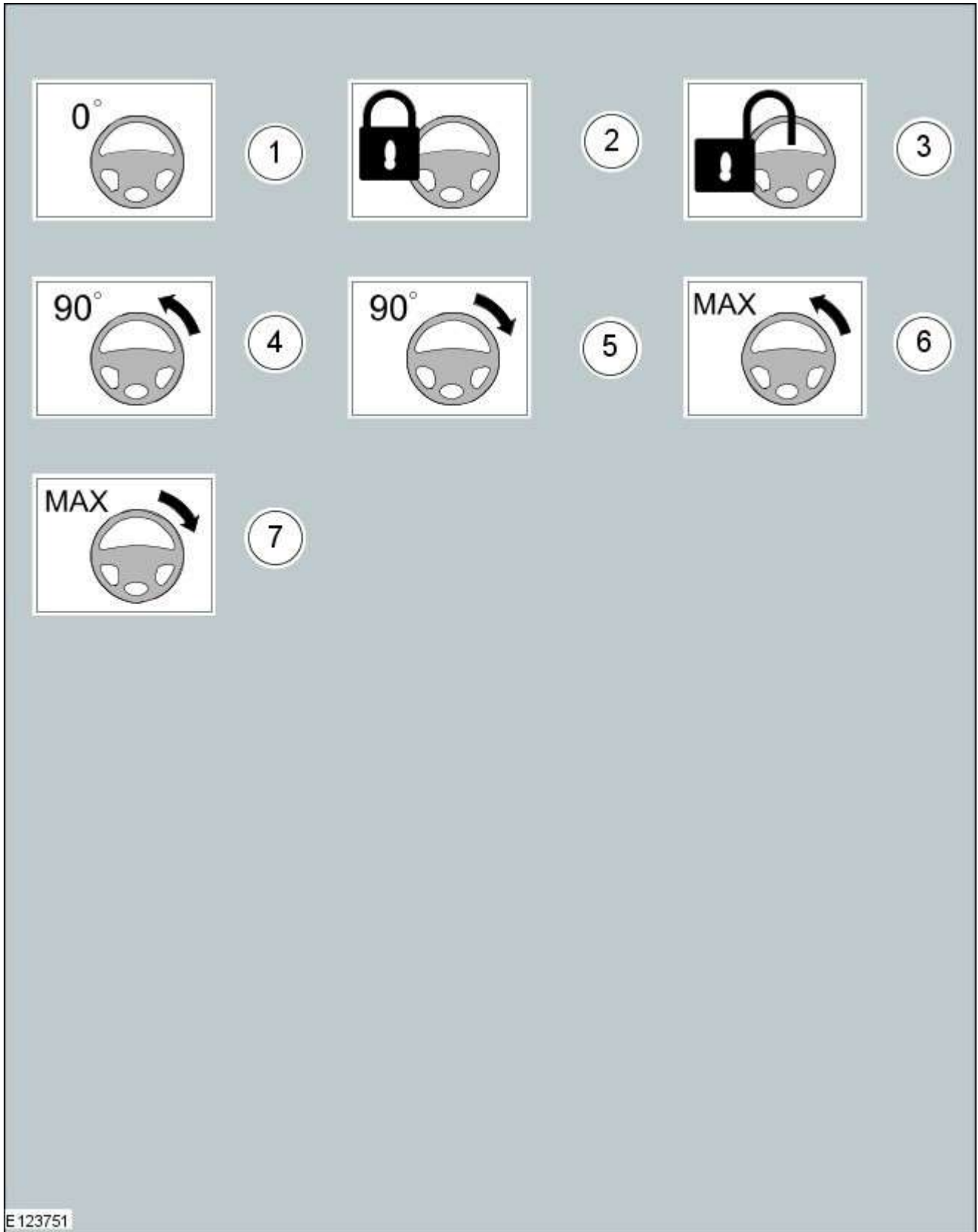
Turn symbols are used to provide further information on the direction or angle of component turns.



Item	Description
1	Turn the component clockwise through 45°
2	Turn the component counterclockwise through 45°
3	Turn the component clockwise through 90°
4	Turn the component counterclockwise through 90°
5	Turn the component clockwise through 180°
6	Turn the component counterclockwise through 180°
7	Turn the component clockwise through 2 complete turns
8	Turn the component counterclockwise through 2 complete turns

Steering Wheel Symbols

Steering wheel symbols are used to provide further information to a required steering wheel position or steering column lock status.



E 123751

Item	Description
1	Steering wheel in straight ahead position
2	Steering column lock locked
3	Steering column lock unlocked

4	Turn the steering wheel to the 90° left position
5	Turn the steering wheel to the 90° right position
6	Turn the steering wheel to the left-hand end position
7	Turn the steering wheel to the right-hand end position

Diagram 1: Side view of a sedan.

Diagram 2: Side view of a wagon.

Diagram 3: Side view of a sports utility vehicle (SUV).

Diagram 4: Side view of a coupe.

Diagram 5: Side view of a convertible.

Diagram 6: Side view of a van.

Diagram 7: Top view of a sedan.

Diagram 8: Top view of a wagon.

Diagram 9: Underview of a sedan.

Diagram 10: Right-hand drive (RHD) vehicle interior view.

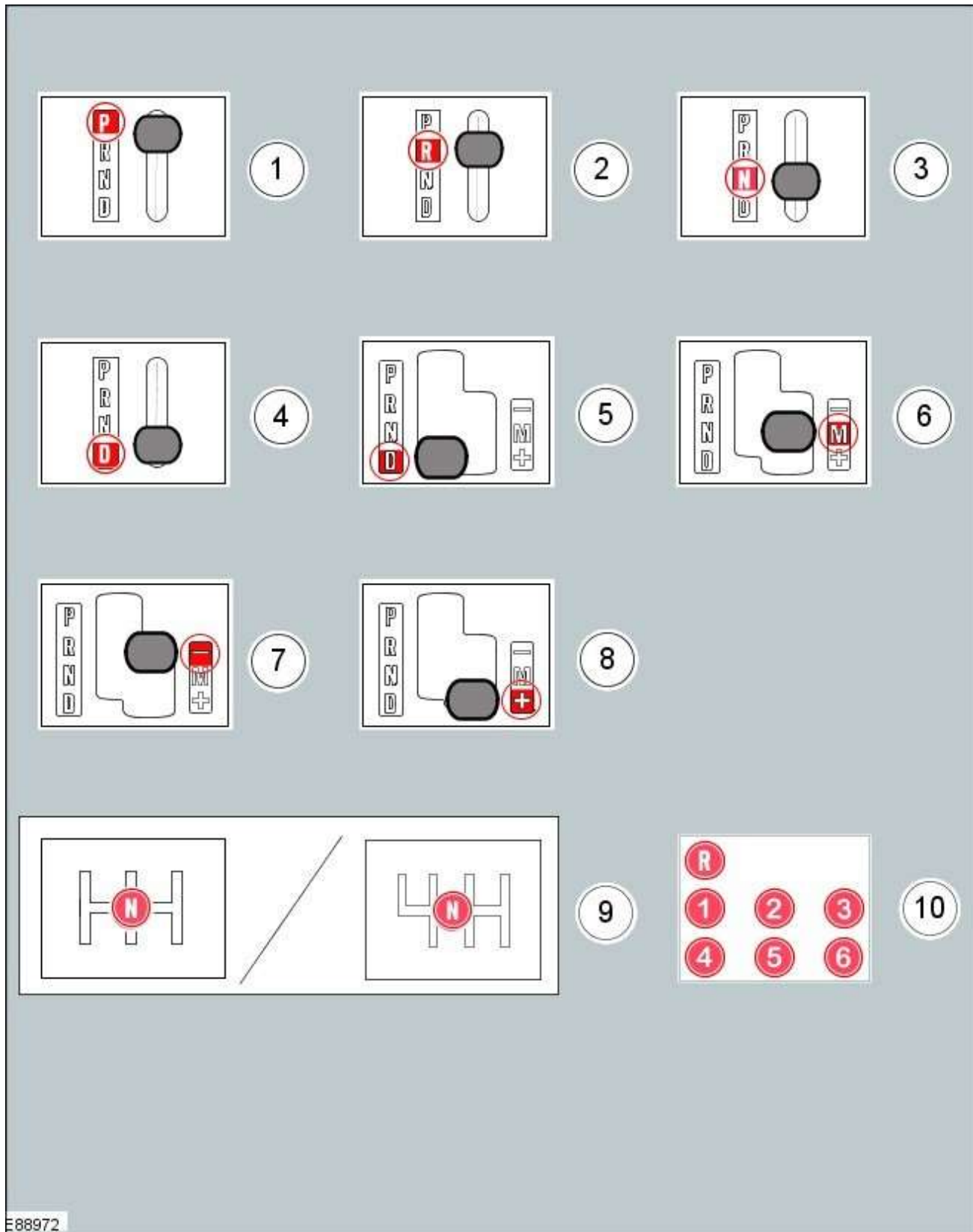
Diagram 11: Left-hand drive (LHD) vehicle interior view.

E 88971

Item	Description
1	3, 4, 5-door body style
2	Wagon body style
3	Sports utility vehicle body style
4	Coupe body style
5	Convertible body style
6	Van body style
7	3, 4, 5-door body style - Top View
8	Wagon body style - Top View
9	Underview
10	Right-hand drive (RHD) vehicle
11	Left-hand drive (LHD) vehicle

Gearshift lever and selector lever position symbols

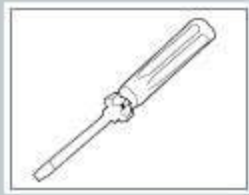
Gearshift lever and selector lever position symbols are used to show the lever position that is required to be selected to carry out a procedure step.



Item	Description
1	Set the selector lever to the park (P) position
2	Set the selector lever to the reverse (R) position
3	Set the selector lever to the neutral (N) position
4	Set the selector lever to the drive (D) position
5	Set the selector lever with manual shift pattern to the park (D) position
6	Set the selector lever with manual shift pattern to the manual (M) position
7	Set the selector lever with manual shift pattern to the shift down (-) position
8	Set the selector lever with manual shift pattern to the shift up (+) position
9	Set the gearshift lever to the neutral (N) position
10	Further gearshift lever positions that may appear in illustrations

Screwdriver symbols

The screwdriver symbols are used to show which screwdriver bit is recommended to carry out a procedure step.



1



2



3



4



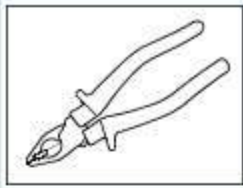
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E88973

Item	Description
1	Screwdriver
2	Cross bladed screwdriver
3	Flat bladed screwdriver
4	Hexagonal screwdriver
5	TORX screwdriver

Pliers symbols

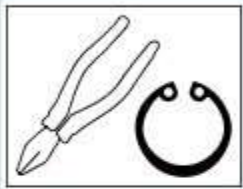
The pliers symbols are used to show which pliers is recommended to carry out a procedure step.



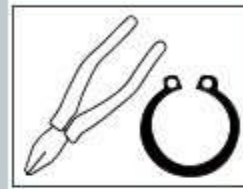
1



2



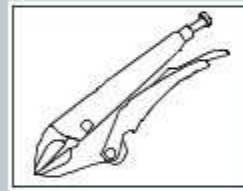
3



4



5



6



7

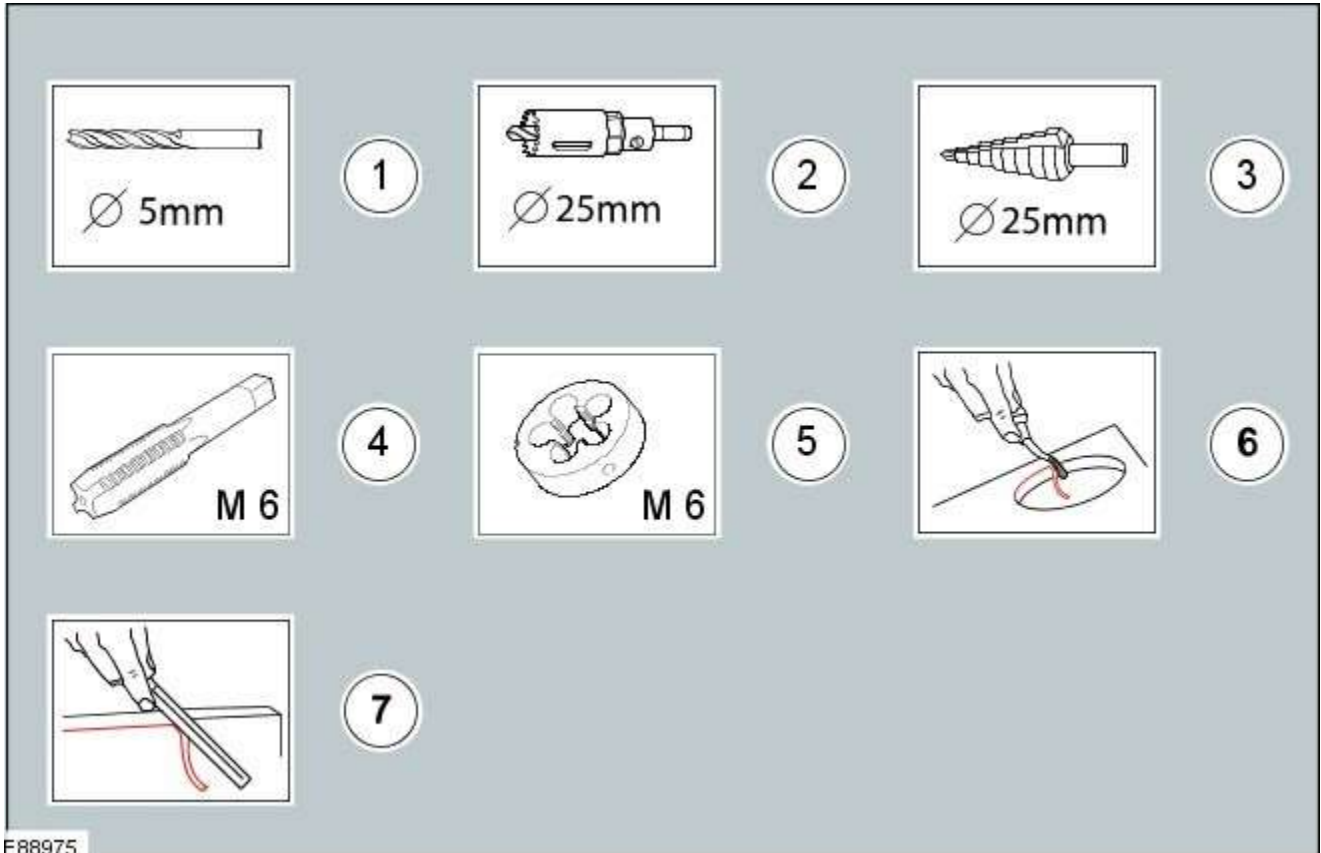
E88974

Item	Description
1	Combination pliers
2	Side cutter pliers

3	Securing ring pliers - inner
4	Securing ring pliers - outer
5	Hose clamp pliers
6	Locking pliers
7	Long nose pliers

Drill symbols

The drill symbols are used to show which type and size of drill bit is recommended to carry out a procedure step.

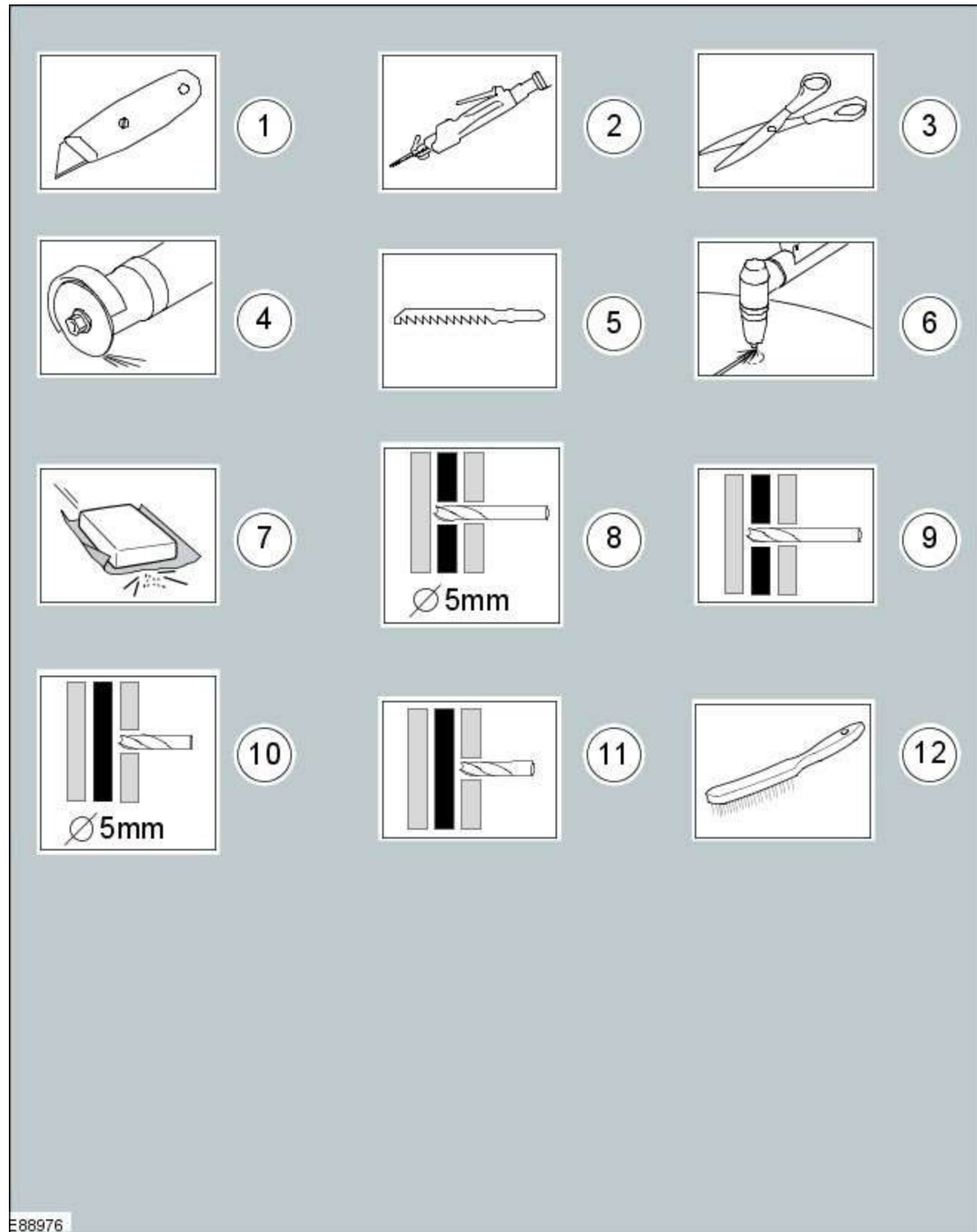


E88975

Item	Description
1	Drill bit with a specified diameter
2	Hole saw with a specified diameter
3	Stepped drill bit with a specified diameter
4	Tap with a specified diameter
5	Die with a specified diameter
6	Scraper for circular holes
7	Scraper for straight edges

Cutting tool symbols

The cutting tool symbols are used to show which type of cutting tool is recommended to carry out a procedure step.



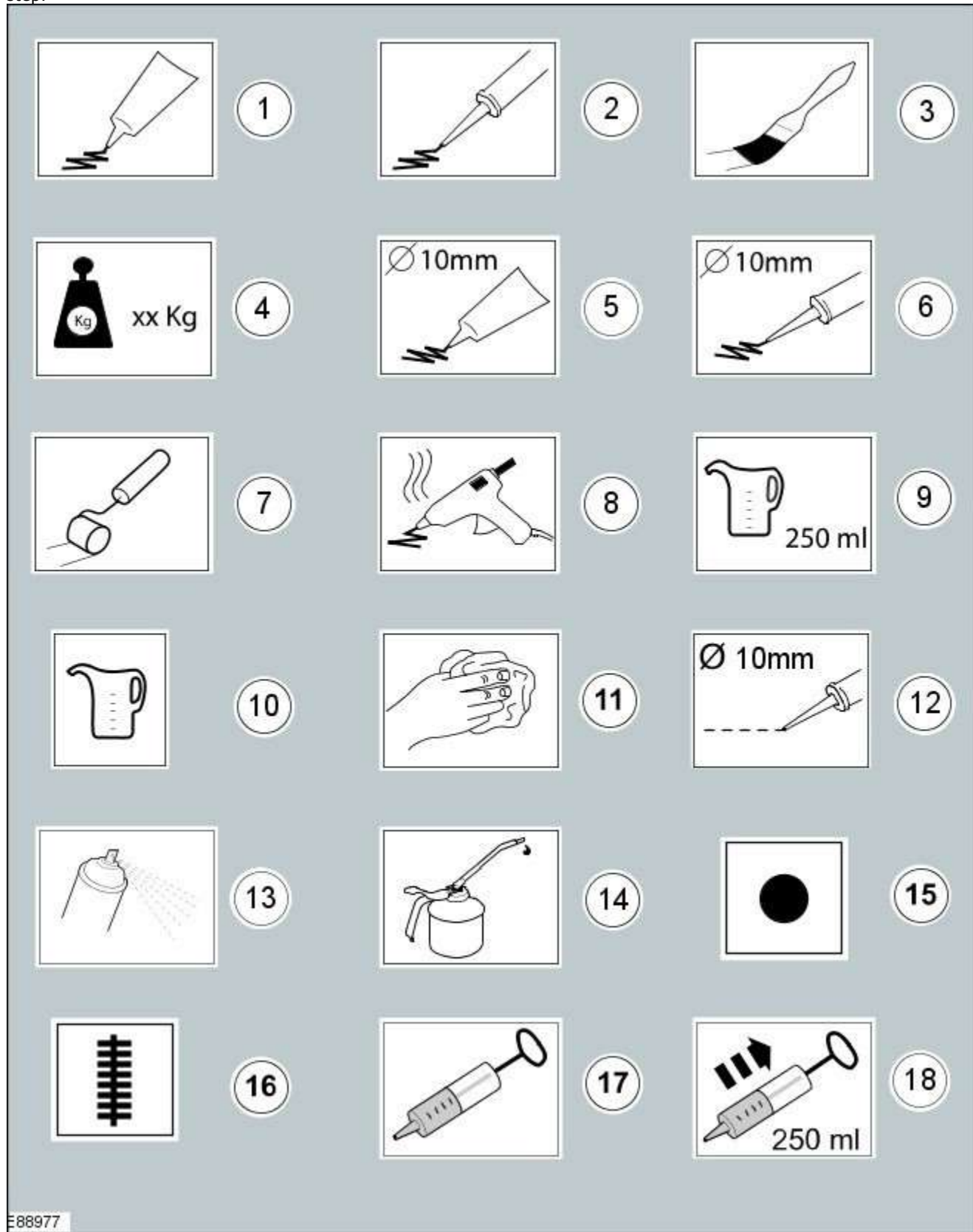
E88976

Item	Description
1	Cutting knife
2	Air body saw
3	Scissors
4	Grinder
5	Jig saw

6		Plasma cutter
7		Sanding Paper
8		Drill through the shown number of body panel layers with a specified diameter
9		Drill through the shown number of body panel layers with a suitable diameter
10		Drill through 1 body panel layer with a specified diameter
11		Drill through 1 body panel layer with a suitable diameter
12		Wire brush

Apply Chemical or load symbols

The apply chemical or load symbols are used to show where to apply which type of chemical or load to carry out a procedure step.



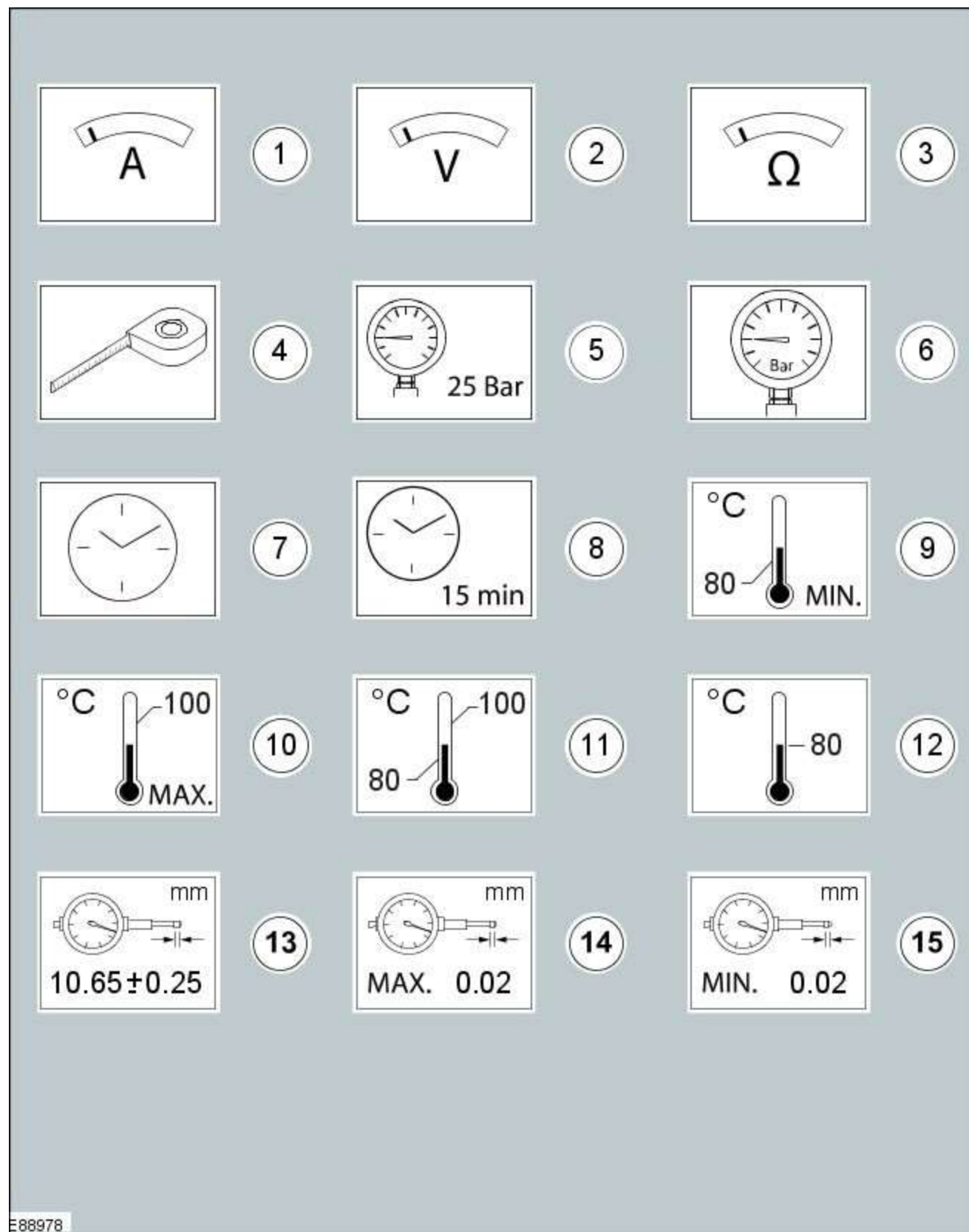
E88977

Item	Description
1	Apply a bead from the specified tube
2	Apply a bead from the specified cartridge
3	Apply the specified chemical with a brush
4	Apply the specified load to the specified component
5	Apply a bead with a specific diameter from the specified tube

6	Apply a bead with a specific diameter from the specified cartridge
7	Apply the specified chemical with a roller
8	Apply hot glue to the specified component
9	Apply the specified amount of fluid from the fluid can
10	Apply fluid from the fluid can
11	Clean the specified component with the specified material
12	Apply a broken bead from the specified tube
13	Apply the specified chemical from a spray can
14	Apply the specified lubricant to the specified component
15	Apply spot welds to the specified component
16	Apply a continuous weld to the specified component
17	Handle the fluid using a syringe
18	Extract the specified amount of fluid using a syringe

Measurement symbols

The measurement symbols are used to show where to measure which type of measurement to carry out a procedure step.



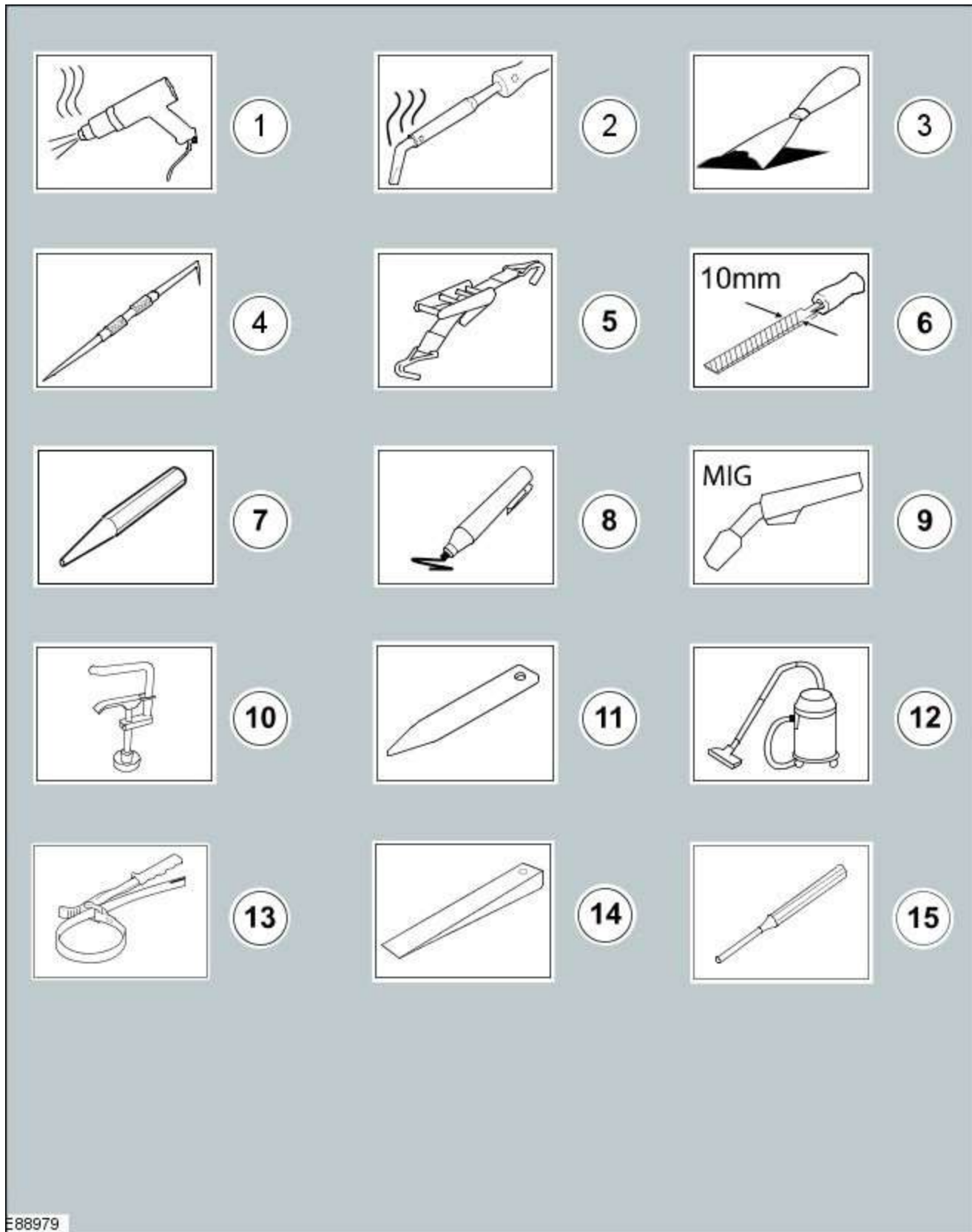
E88978

Item	Description
1	Measure the current using a digital multimeter
2	Measure the voltage using a digital multimeter
3	Measure the resistance using a digital multimeter
4	Measure the length/distance
5	Check that the specified pressure is available using a suitable pressure gauge

6	Measure the pressure at the specified port using a suitable pressure gauge
7	Measure the time using a suitable stopwatch
8	Wait for the specified period of time
9	The specified task requires the specified minimum temperature
10	The specified task requires the specified maximum temperature not to be exceeded
11	The specified task requires the specified temperature range
12	The specified task requires the specified temperature
13	Measure and check for the specified value using a dial indicator gauge
14	Measure and check for the specified MAX value using a dial indicator gauge
15	Measure and check for the specified MIN value using a dial indicator gauge

General equipment symbols

The general equipment symbols are used to show where to use which type of general equipment to carry out a procedure step.



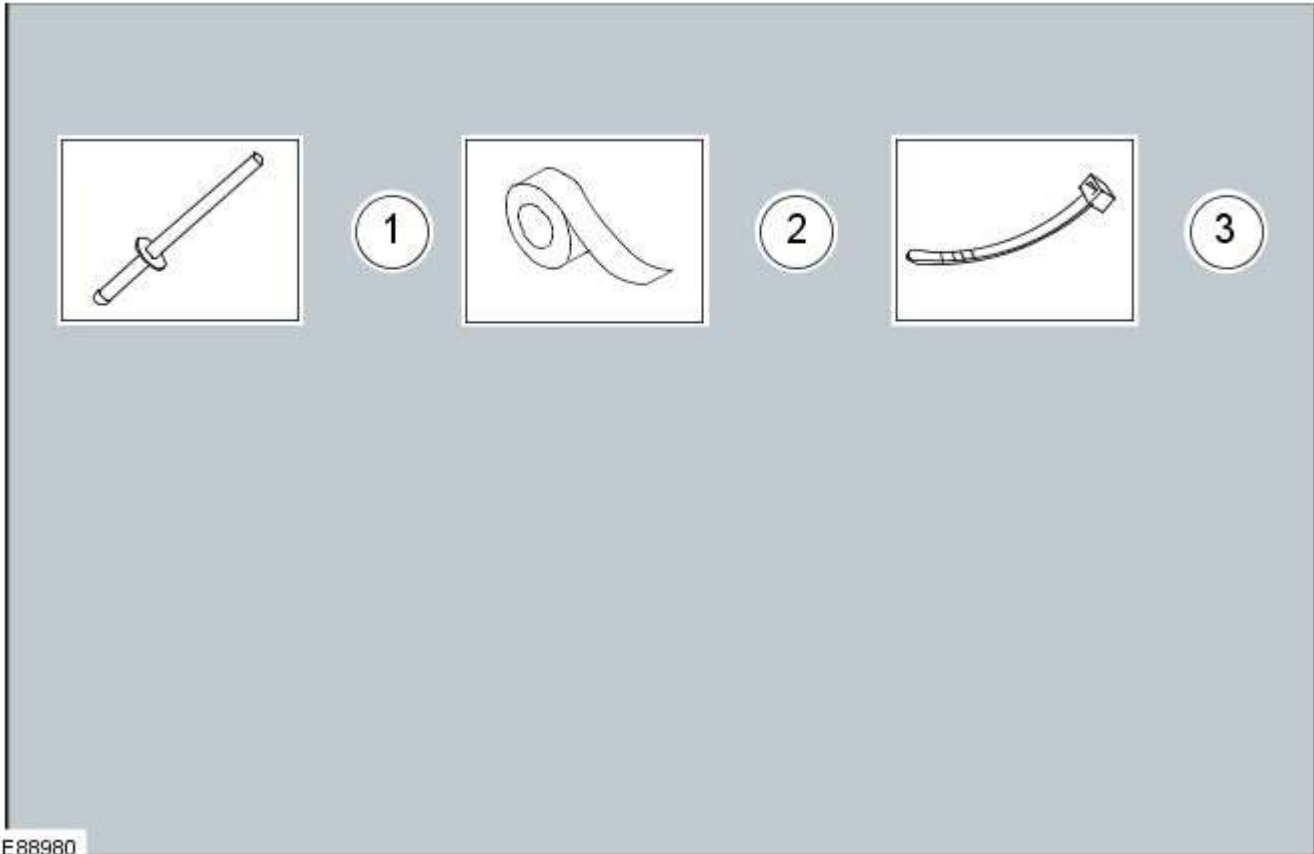
E88979

Item	Description
1	Hot air gun
2	Soldering iron
3	Scraper
4	Scriber
5	Securing strap

6		File with a specified size
7		Center punch
8		Marker
9		Metal inert gas (MIG) welding equipment
10		Hose clamp
11		Interior trim remover
12		Vacuum cleaner
13		Strap wrench
14		Wedge
15		Pin Punch

Material symbols

The material symbols are used to show where to use which type of material to carry out a procedure step.

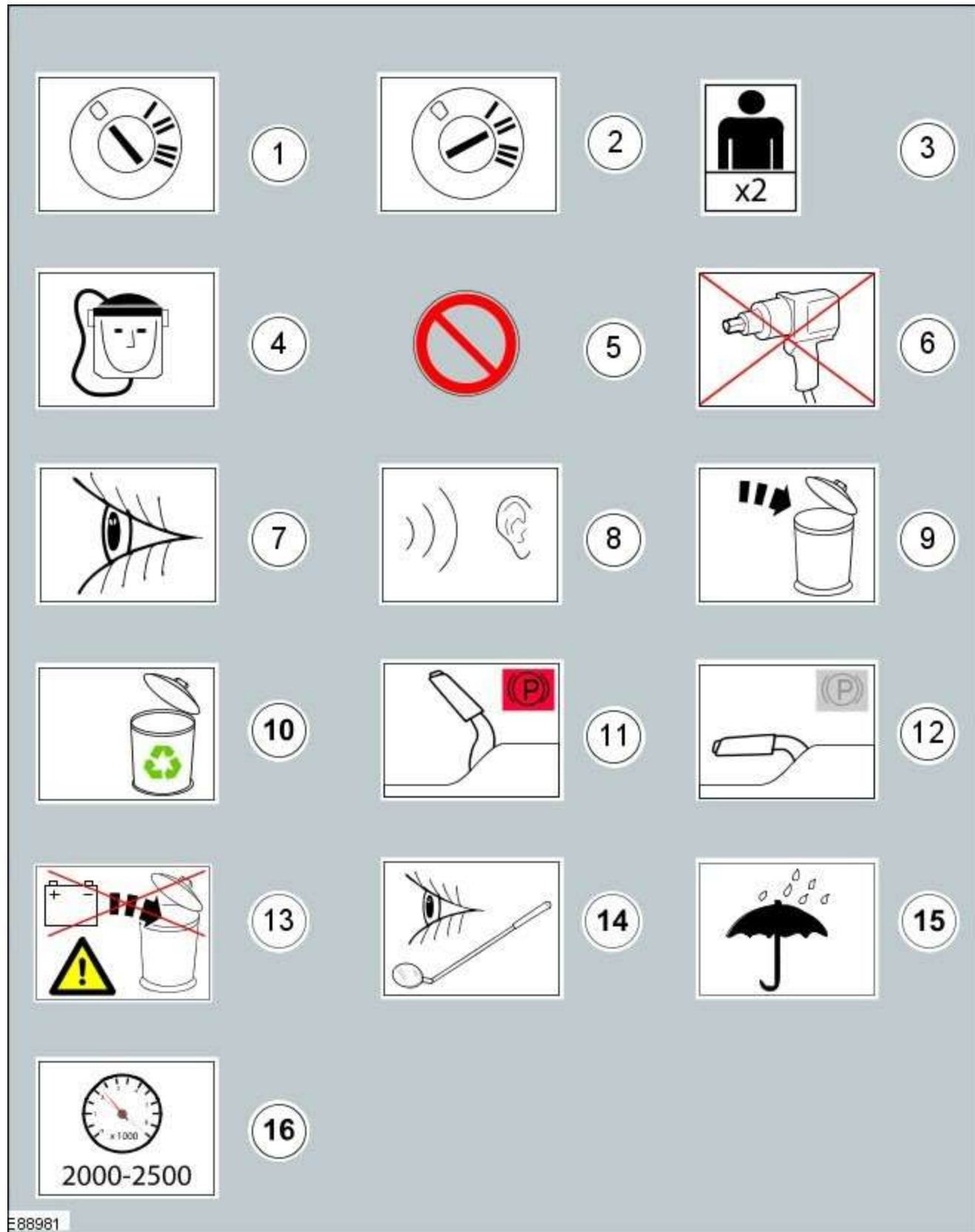


E88980

Item	Description
1	Remove/Install the specified blind rivet
2	Apply tape to the specified component/area
3	Remove/Install the specified cable tie

Miscellaneous symbols

These symbols provide further information that is required to carry out a procedure step.



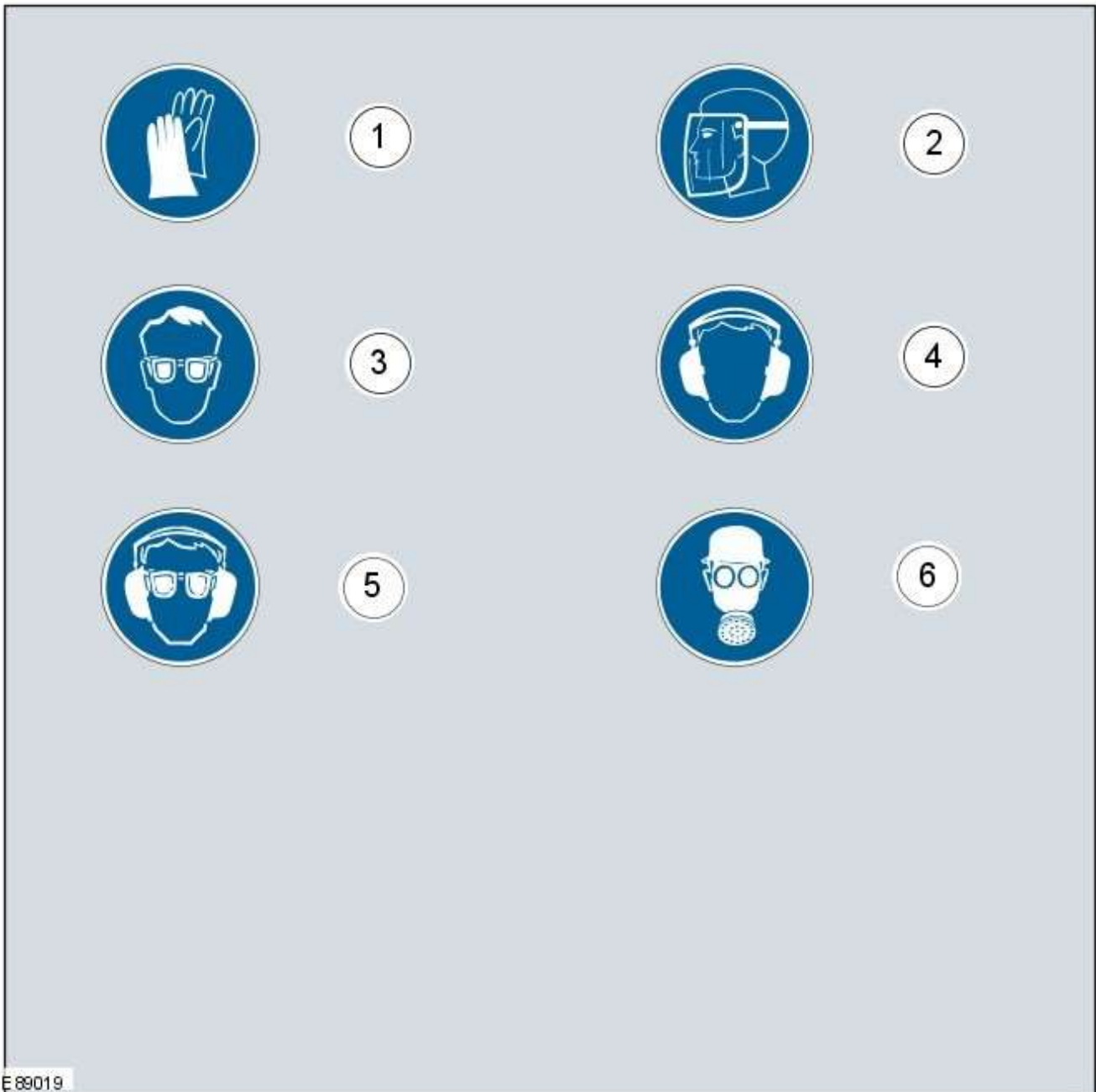
E88981

Item	Description
1	Set the ignition switch to the 0 position
2	Set the ignition switch to the II position
3	The procedure step requires the aid of the specified number of supporting technicians
4	Self contained breathing apparatus
5	General prohibition used in combination with another symbol

6	Do not use power tools
7	Visual check
8	Noise check
9	Dispose the specified component
10	Replaced by item 9 (Dispose the specified component)
11	Set the engine speed to the specified value
12	Fully apply the parking brake lever
13	Fully release the parking brake lever
14	Do not dispose of batteries into the waste bin
15	Visual check using a mirror
16	Area/component must be dry

Mandatory Protective equipment - Health and safety symbols

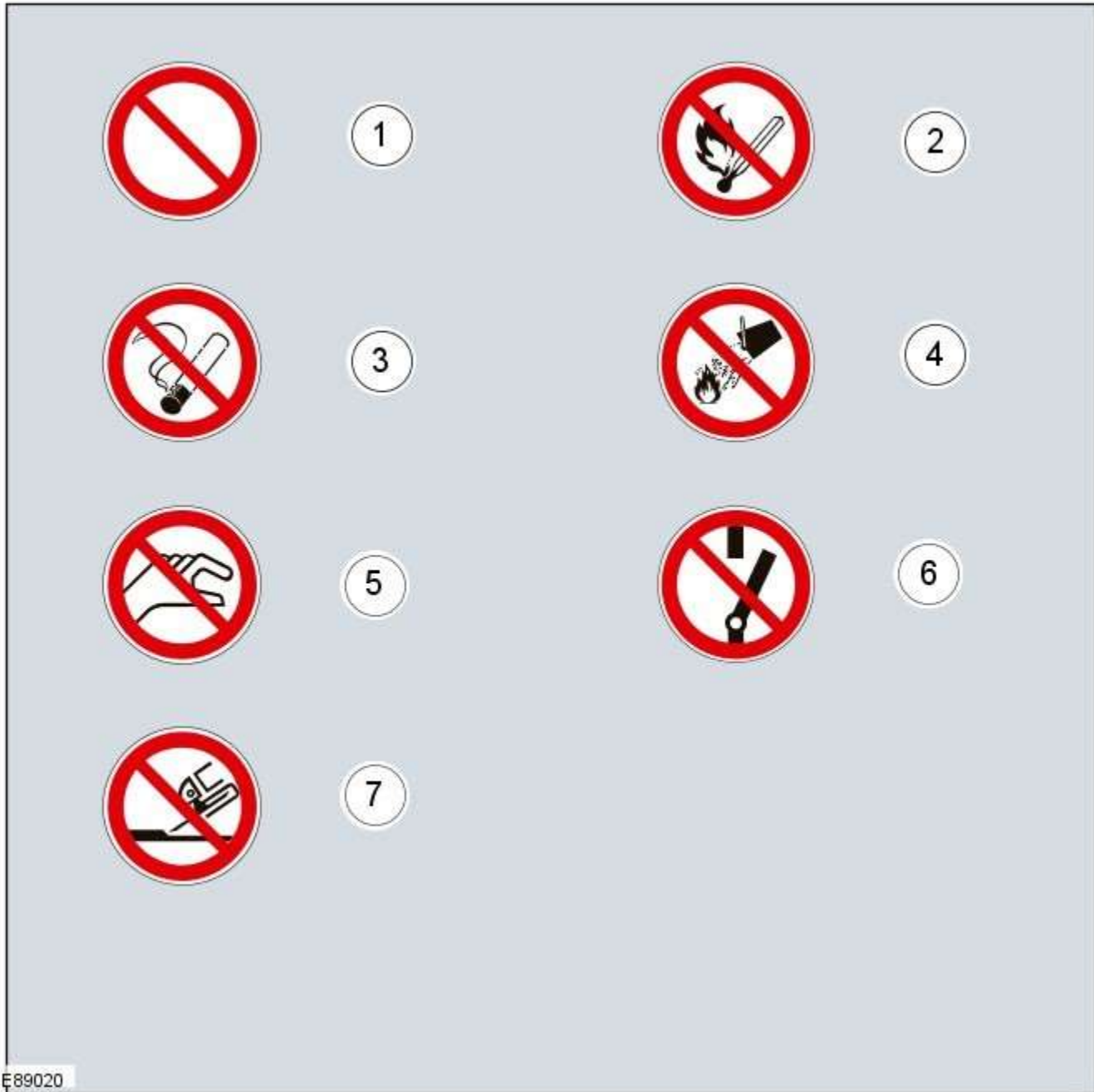
The protective equipment symbols advise to use a mandatory protective equipment to avoid or at least reduce possible health and safety risks.



Item	Description
1	Wear protective gloves
2	Wear face guard
3	Wear safety goggles
4	Wear ear protectors
5	Wear safety goggles and ear protectors
6	Wear a respirator

Prohibition - Health and safety symbols and component damage

The prohibition symbols are used to prohibit the specified actions to avoid or at least reduce possible component damage and health and safety risks.



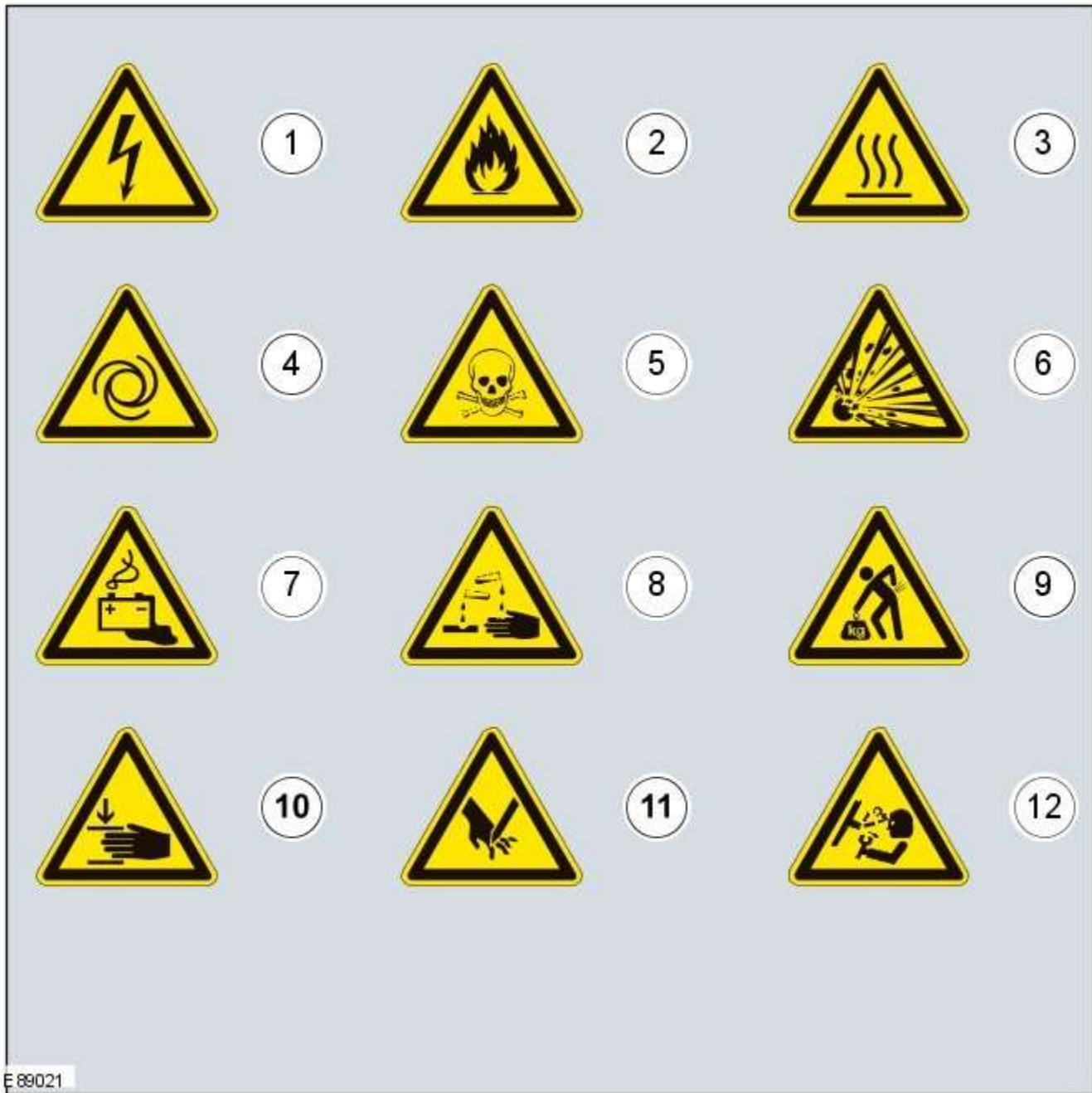
E89020

Item	Description
1	General prohibition symbol
2	No naked flames
3	No smoking
4	No water
5	Do not touch

6	Do not switch
7	No grinding

Warning symbols - Health and safety and component damage

The warning symbols are used to advise on hazardous conditions to avoid or at least reduce possible component damage and health and safety risks.



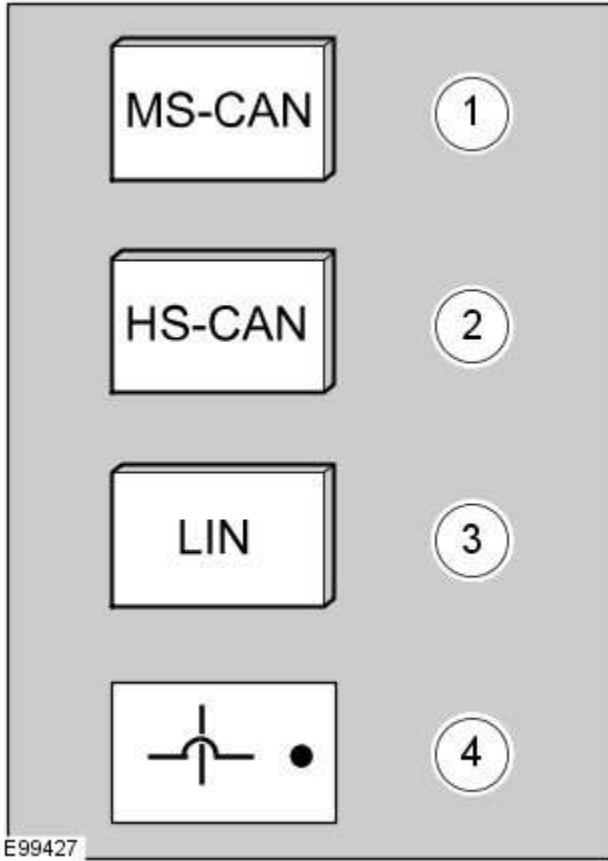
E 89021

Item	Description
1	Hazardous voltage/Electrical shock/Electrocution
2	Fire Hazard/Highly flammable
3	Burn hazard/Hot surface
4	Automatic start-up
5	Toxic
6	Explosive material
7	Battery hazard
8	Corrosive material
9	Lifting hazard

10		Hand crush/Force from above
11		Cutting of fingers or hand
12		Pressure hazard

Control Diagram symbols - Description and Operation procedures

These symbols provide further information on the type of connectivity, direction of flow or type of data bus of a system.



Item		Description
1		Mid-speed Controller Area Network (CAN)
2		High-speed Controller Area Network (CAN)
3		Local Interconnect Network (LIN)
4		Wires crossing not connected

General Information - Supplemental Restraint System (SRS) Health and Safety Precautions

Description and Operation

WARNINGS:



Only qualified technicians are allowed to work on pyrotechnic components.



INHALED: Exposure to pyrotechnic residue may cause low blood pressure, severe headache, irritation of mucous membranes, fainting, shortness of breath or rapid pulse. Move a victim to fresh air. Seek immediate medical attention.



EYE CONTACT: Exposure to unburned pyrotechnic residue may cause irritation, burning and etching of the eyes. Flush immediately with plenty of cold running water for at least 15 minutes. Seek immediate medical attention.



EYE CONTACT: Exposure to burned pyrotechnic residue may cause irritation, burning and etching of the eyes. Flush immediately with diluted boric acid solution. Seek immediate medical attention.



SKIN CONTACT: Unburned pyrotechnic residue may be rapidly absorbed through the skin in toxic quantities. Wash immediately with plenty of soap and water. Seek medical attention.



SKIN CONTACT: Burned pyrotechnic residue may be rapidly absorbed through the skin in toxic quantities. Wash with plenty of water. Do not use soap. Seek medical attention.



SWALLOWED: Unburned pyrotechnic residue is extremely toxic. If conscious drink plenty of water then induce vomiting. Seek immediate medical attention. If unconscious, or in convulsions do not attempt to induce vomiting or give anything by mouth. Seek immediate medical attention.



SWALLOWED: Burned pyrotechnic residue is extremely toxic. Drink plenty of water and seek immediate medical attention.



The deployment key must only be accessible to authorized personnel.



Make sure that the deployment key remains removed from the deployment equipment except during deployment.



If permanently disabling or enabling the passenger air bag a new seat belt for vehicles without or with a passenger air bag must be installed.



Undeployed pyrotechnic components must not be deployed in the vehicle.



Pyrotechnic components must be deployed following local regulations.



Check thoroughly that no loose objects can be spread during the deployment of pyrotechnic components.



Pyrotechnic components must be transported following local regulations.



Never carry out any electrical measurement on disconnected, undeployed pyrotechnic components.



Pyrotechnic components must not be disassembled.



Pyrotechnic components are not interchangeable between vehicles.



Always carry a live air bag module away from the body with the air bag or trim cover pointing upwards.



Live air bag modules must be placed in a suitable cage when removed from the vehicle. The air bag or trim cover must be facing upwards.



Do not install a rearward facing child safety seat to the passenger seat with an activated passenger air bag.

CAUTIONS:



Pyrotechnic components must not be subjected to temperatures higher than 110°C.



Never install aftermarket accessories to the vehicle on or adjacent to the supplemental restraint system module.

General Information - Road/Roller Testing

Description and Operation

Road or roller testing may be carried out for various reasons and a procedure detailing pre-test checks, through engine starting and stopping, pre-driving checks, on-test checks to final checks on completion of the test is given in this section.

Unless complete vehicle performance is being checked, the full road test procedure need not be carried out. Instead, those items particularly relevant to the system/s being checked can be extracted.

Pre - Test Checks



WARNING: If the brake system hydraulic fluid level is low, pedal travel is excessive or a hydraulic leak is found, do not attempt to road test the vehicle until the reason for the low fluid level, excessive pedal travel or hydraulic leak is found and rectified.

It is suggested that pre-test checks, and functional tests of those systems/circuits which affect the safe and legal operations of the vehicle, such as brakes, lights and steering, should always be carried out before the road or roller test.

- Engine oil level
- Engine coolant level
- Tires, for correct pressure, compatible types and tread patterns, and wear within limits
- There is sufficient fuel in the tank to complete the test
- All around the engine, transmission and under the vehicle for oil, coolant, hydraulic and fuel leaks. Make a note of any apparent leaks and wipe off the surrounding areas to make it easier to identify the extent of the leak on completion of the test

Starting the Engine



CAUTION: On initial drive away from cold and within the first 1.5 km (1 mile), do not depress accelerator pedal beyond half travel until the vehicle has attained a minimum speed of 25 km/h (15 miles/h). Never operate at high engine speed or with the accelerator pedal at full travel whilst the engine is cold.

With the ignition switched off, check:

- The parking brake is applied
- The transmission selector lever is in Park
- All instrument gauges (except fuel gauge) read zero

With the ignition switched on, check:

- Ignition controlled warning lamps come on
- Engine coolant temperature gauge registers a reading compatible with the engine coolant temperature
- Fuel gauge registers a reading appropriate to the fuel level in the tank
- The operation of the parking brake and brake fluid level warning lamps

On Road or Roller Test Check:



CAUTION: If road testing, check the brake operation while still travelling at low speed before continuing with the test. If the brakes pull to one side, or appear to be otherwise faulty, do not continue with the road test until the fault has been found and rectified.

- Initial gear engagement is smooth
- Parking brake control operates smoothly and the parking brake releases quickly and completely
- Transmission takes up the drive smoothly, without judder
- The engine power output is satisfactory, full power is achieved, acceleration is smooth and pedal operation not stiff or heavy, and engine speed returns to idle correctly
- There is no excessive or abnormally colored smoke from the engine under normal driving, heavy load or overrun conditions
- Steering operation, including power steering, is smooth, accurate, not excessively heavy or with excessive free play or vibration. Does not pull to one side and self centres smoothly after cornering
- Speedometer, oil pressure warning lamp, coolant temperature gauge and tachometer register the correct readings or operate correctly
- Switches and controls operate smoothly and positively, warning lamps operate correctly and the direction indicator control self cancels when the steering is returned to the straight ahead position
- Heating and ventilation systems work correctly and effectively
- Brake operation and efficiency

Brake Testing



WARNING: When brake testing, avoid breathing the smoke or fumes from hot brakes, this may contain asbestos dust which is hazardous to health, see Health and Safety Precautions.

Avoid brake testing on busy roads where it can cause inconvenience or danger to other road users.



CAUTION: Brake testing which includes heavy brake applications should not be carried out with new brake pads/discs or linings/drums until the components have bedded-in. New brake friction components will not reach full efficiency until the bedding-in process is complete.

Test the brakes at several speeds within the normal operating range using both light and heavy pedal pressure. Note any tendency to snatch, pull or drag, and any undue delay in application or release.

Allow the vehicle to coast and note any tendency to pull to one side, or evidence that the brakes are binding.

After stopping the vehicle (not immediately after a period of heavy braking), carefully check the brake temperature. A disc which feels hot, or appreciably hotter than the others, indicates that the brake is binding.

After completion of the test, check for:

- Oil, coolant, hydraulic, air and fuel leaks
- Abnormal temperature of any moving components or assemblies, e.g. wheel hubs, transmission, axle etc., which might indicate over tightness or lack of lubrication

General Information - Window Glass Health and Safety Precautions

Description and Operation

WARNINGS:



Cured polyurethane (PU) adhesive can degrade if subjected to high temperatures. Isocyanide compounds can be released when grinding or welding in close proximity to cured PU adhesive.



SKIN CONTACT: Prolonged exposure to polyurethane (PU) adhesive may cause skin irritation. If PU adhesive comes into contact with the skin, remove any contaminated clothing. Immediately wash the skin with soap and water. Seek medical attention for any persistent skin irritation or abnormality.



EYE CONTACT: Polyurethane (PU) adhesive may cause severe irritation or damage. If PU adhesive comes into contact with the eyes, immediately flush eyes with plenty of running water for at least 15 minutes. Seek immediate medical attention.



SWALLOWED: If polyurethane (PU) adhesive is swallowed, flush the mouth thoroughly. Do not induce vomiting. Provide rest, warmth and fresh air. Seek immediate medical attention.



INHALED: Persons having a respiratory allergy may have an allergic reaction when handling polyurethane (PU) adhesive.



INHALED: Polyurethane (PU) adhesive can cause asthma like symptoms. Isocyanate vapor from primer or PU adhesive can cause allergies in the respiratory tract.



INHALED: If polyurethane (PU) adhesive fumes are inhaled, move victim to fresh air. Provide oxygen if necessary. If breathing stops, provide artificial respiration. Keep a victim warm and at rest. Seek immediate medical attention.

CAUTIONS:



Make sure that the direct glazing for bonded glass cutting blades are changed where the cutting depth changes to avoid damage to the body and trim panels.



During the curing period of the PU adhesive, the door windows must be left open to avoid a build up of pressure when the doors are opened and closed.

General Information - Diagnostic Trouble Code (DTC) Index DTC: Adaptive Damping Module (SUMB)

Description and Operation

Adaptive Damping Module (SUMB)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

The table below lists all diagnostic trouble codes (DTCs) that could be logged in the adaptive damping module, for additional diagnosis and testing information refer to the relevant diagnosis and testing section
For additional information, refer to: Vehicle Dynamic Suspension (204-05 Vehicle Dynamic Suspension, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
C101D-12	Left Front vertical acceleration sensor - Short to power	<ul style="list-style-type: none"> Left Front vertical acceleration sensor circuit short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left front vertical acceleration sensor circuit for short to power or another circuit. Repair circuit, clear the DTC and retest the system
C101D-14	Left Front vertical acceleration sensor - Short to ground, open circuit	<ul style="list-style-type: none"> Left Front vertical acceleration sensor circuit short to ground, open circuit Vertical acceleration sensor fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check front vertical acceleration sensor circuit for short to ground, open circuit. If no fault found on wiring suspect sensor. Replace sensor, clear DTC and retest the system
C101D-22	Left Front vertical acceleration sensor - Signal amplitude > maximum	<ul style="list-style-type: none"> Left front vertical acceleration sensor insecurely mounted Left front vertical acceleration sensor signal circuit short to another circuit Left front vertical acceleration sensor 	<ul style="list-style-type: none"> With vehicle parked on a level surface, read Left Front Vertical Accelerometer voltage and check it lies in range 1.9 to 2.1 volts. If not OK then check electrical wiring for shorts, loose connections and repair as required. If wiring OK then suspect faulty sensor/incorrectly fitted sensor. Check the sensor is correctly mounted, secure or replace sensor as required. Refer to the new module/component installation note at the top of the DTC Index, clear DTC and retest system

DTC	Description	Possible Causes	Action
		internal fault	
C101D-26	Left Front vertical acceleration sensor - Signal rate of change below threshold	<ul style="list-style-type: none"> Left front vertical acceleration sensor signal circuit short to another circuit Left front vertical acceleration sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Left Front Vertical Accelerometer signal circuit for faults, if circuit is correct suspect faulty sensor, refer to the new module/component installation note at the top of the DTC Index. Replace the sensor, clear the DTC and retest the system
C101D-78	Left Front vertical acceleration sensor - Alignment or adjustment incorrect	<ul style="list-style-type: none"> Left front vertical acceleration sensor bracket bent Left front vertical acceleration sensor damaged 	<ul style="list-style-type: none"> Check Left Front Vertical Accelerometer for location and security, if correct suspect faulty Accelerometer, refer to the new module installation note at the top of the DTC Index. Replace the sensor/bracket as required, clear the DTC and retest the system
C101E-12	Right Front vertical acceleration sensor - Short to power	<ul style="list-style-type: none"> Right Front vertical acceleration sensor circuit short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right front vertical acceleration sensor circuit for short to power or another circuit. Repair circuit, clear the DTC and retest the system
C101E-14	Right Front vertical acceleration sensor - Short to ground, open circuit	<ul style="list-style-type: none"> Right Front vertical acceleration sensor circuit short to ground, open circuit Vertical acceleration sensor fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right front vertical acceleration sensor circuit for short to ground, open circuit. If no fault found on wiring suspect sensor. Replace sensor, clear DTC and retest the system
C101E-22	Right Front vertical acceleration sensor - Signal amplitude > maximum	<ul style="list-style-type: none"> Right front vertical acceleration sensor insecurely mounted Right front vertical acceleration sensor signal circuit short to another circuit Right front vertical acceleration sensor internal fault 	<ul style="list-style-type: none"> With vehicle parked on a level surface, read Right Front Vertical Accelerometer voltage and check it lies in range 1.9 to 2.1 volts. If not OK then check electrical wiring for shorts, loose connections and repair as required. If wiring OK then suspect faulty sensor/incorrectly fitted sensor. Check the sensor is correctly mounted, secure or replace sensor as required. Refer to the new module/component installation note at the top of the DTC Index, clear DTC and retest system
C101E-26	Right Front vertical acceleration sensor - Signal rate of change below threshold	<ul style="list-style-type: none"> Right front vertical acceleration sensor signal circuit short to another circuit Right front vertical acceleration sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Right Front Vertical Accelerometer signal circuit for faults, if circuit is correct suspect faulty sensor, refer to the new module/component installation note at the top of the DTC Index. Replace the sensor, clear the DTC and retest the system
C101E-78	Right Front vertical acceleration sensor - Alignment or adjustment incorrect	<ul style="list-style-type: none"> Right front vertical acceleration sensor bracket bent Right front vertical acceleration sensor damaged 	<ul style="list-style-type: none"> Check Right Front Vertical Accelerometer for location and security, if correct suspect faulty Accelerometer, refer to the new module installation note at the top of the DTC Index. Replace the sensor/bracket as required, clear the DTC and retest the system
C1024-00	System Temporarily Disabled Due To Power Interruption During Driving - No sub type information	<ul style="list-style-type: none"> Loss of power to control module whilst driving 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check power and ground circuits to Adaptive Damping Control Module for intermittent or poor connection. Repair wiring circuits as required, clear DTC and retest the system
C1030-12	Left Rear vertical acceleration sensor - Short to power	<ul style="list-style-type: none"> Left Rear vertical acceleration sensor circuit short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left Rear vertical acceleration sensor circuit for short to power or another circuit. Repair circuit, clear the DTC and retest the system

DTC	Description	Possible Causes	Action
C1030-14	Left Rear vertical acceleration sensor - Short to ground, open circuit	<ul style="list-style-type: none"> Left rear vertical acceleration sensor circuit short to ground, open circuit Vertical acceleration sensor fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left Rear vertical acceleration sensor circuit for short to ground, open circuit. If no fault found on wiring suspect sensor. Replace sensor, clear DTC and retest the system
C1030-22	Left Rear vertical acceleration sensor - Signal amplitude > maximum	<ul style="list-style-type: none"> Left Rear vertical acceleration sensor insecurely mounted Left Rear vertical acceleration sensor signal circuit short to another circuit Left Rear vertical acceleration sensor internal fault 	<ul style="list-style-type: none"> With vehicle parked on a level surface, read Left Rear Vertical Accelerometer voltage and check it lies in range 1.9 to 2.1 volts. If not OK then check electrical wiring for shorts, loose connections and repair as required. If wiring OK then suspect faulty sensor/incorrectly fitted sensor. Check the sensor is correctly mounted, secure or replace sensor as required. Refer to the new module/component installation note at the top of the DTC Index, clear DTC and retest system
C1030-26	Left Rear vertical acceleration sensor - Signal rate of change below threshold	<ul style="list-style-type: none"> Left Rear vertical acceleration sensor signal circuit short to another circuit Left Rear vertical acceleration sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Left Rear Vertical Accelerometer signal circuit for faults, if circuit is correct suspect faulty sensor, refer to the new module/component installation note at the top of the DTC Index. Replace the sensor, clear the DTC and retest the system
C1030-78	Left Rear vertical acceleration sensor - Alignment or adjustment incorrect	<ul style="list-style-type: none"> Left Rear vertical acceleration sensor bracket bent Left Rear vertical acceleration sensor damaged 	<ul style="list-style-type: none"> Check Left Rear Vertical Accelerometer for location and security, if correct suspect faulty Accelerometer, refer to the new module installation note at the top of the DTC Index. Replace the sensor/bracket as required, clear the DTC and retest the system
C1A03-12	Left Front Height Sensor - Circuit short to power	<ul style="list-style-type: none"> Height sensor circuit shorted to another cable Height sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Front Left Height Sensor circuit for short to power, If circuit correct suspect Sensor internal fault, replace as required
C1A03-14	Left Front Height Sensor - Circuit short to ground or open	<ul style="list-style-type: none"> Wiring to sensor (signal) open circuit Wiring to height sensor partial short to ground Wiring to height sensor short to other cable Height sensor internal electrical fault 	<ul style="list-style-type: none"> Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within $\pm 0.15v$
C1A03-21	Left Front Height Sensor - Signal amplitude < minimum	<ul style="list-style-type: none"> Height sensor linkage not connected Height sensor or bracket loose Height sensor bracket bent Incorrect height calibration Height sensor linkage toggled Height sensor water ingress Wiring to height sensor partial short to ground Wiring to height sensor short to other cable Height sensor 	<ul style="list-style-type: none"> Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is fitted, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within $\pm 0.15v$. To check sensor operation on the vehicle: Check for water ingress around the height

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> electrical fault • Height sensor linkage bent • Incorrect height sensor fitted 	<p>sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range $\pm 40^\circ$ around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond $\pm 40^\circ$, the sensor signal will clamp to a voltage of $\sim 0.15\text{v}$ or $\sim 4.85\text{v}$, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure</p>
C1A03-22	Left Front Height Sensor - Signal amplitude > maximum	<ul style="list-style-type: none"> • Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor fitted 	<ul style="list-style-type: none"> • Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is fitted, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be $\sim 0\text{v}$ • Voltage to sensor signal connection should be $\sim 0\text{v}$ • Voltage to sensor supply connection should be $\sim 5\text{v}$ All voltages should be within $\pm 0.15\text{v}$. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range $\pm 40^\circ$ around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond $\pm 40^\circ$, the sensor signal will clamp to a voltage of $\sim 0.15\text{v}$ or $\sim 4.85\text{v}$, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A03-76	Left Front Height Sensor - Wrong mounting position	<ul style="list-style-type: none"> • Incorrect height calibration 	<ul style="list-style-type: none"> • Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C1A03-78	Left Front Height Sensor - Alignment or adjustment incorrect	<ul style="list-style-type: none"> • Incorrect height calibration 	<ul style="list-style-type: none"> • Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system

DTC	Description	Possible Causes	Action
C1A04-12	Right Front Height Sensor - Circuit short to power	<ul style="list-style-type: none"> Height sensor circuit shorted to another cable Height sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Front Right Height Sensor circuit for short to power, If circuit correct suspect Sensor internal fault, replace as required
C1A04-14	Right Front Height Sensor - Circuit short to ground or open	<ul style="list-style-type: none"> Wiring to sensor (signal) open circuit Wiring to height sensor partial short to ground Wiring to height sensor short to other cable Height sensor internal electrical fault 	<ul style="list-style-type: none"> Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. <ul style="list-style-type: none"> Voltage to sensor ground connection should be ~0v Voltage to sensor signal connection should be ~0v Voltage to sensor supply connection should be ~5v All voltages should be within $\pm 0.15v$
C1A04-21	Right Front Height Sensor - Signal amplitude < minimum	<ul style="list-style-type: none"> Height sensor linkage not connected Height sensor or bracket loose Height sensor bracket bent Incorrect height calibration Height sensor linkage toggled Height sensor water ingress Wiring to height sensor partial short to ground Wiring to height sensor short to other cable Height sensor electrical fault Height sensor linkage bent Incorrect height sensor fitted 	<ul style="list-style-type: none"> Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is fitted, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. <ul style="list-style-type: none"> Voltage to sensor ground connection should be ~0v Voltage to sensor signal connection should be ~0v Voltage to sensor supply connection should be ~5v All voltages should be within $\pm 0.15v$. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range $\pm 40^\circ$ around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond $\pm 40^\circ$, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A04-22	Right Front Height Sensor - Signal amplitude > maximum	<ul style="list-style-type: none"> Height sensor linkage not connected Height sensor or bracket loose Height sensor bracket bent Incorrect height calibration Height sensor linkage toggled Height sensor water ingress Wiring to height 	<ul style="list-style-type: none"> Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is fitted, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor fitted 	<p>height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within $\pm 0.15v$. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range $\pm 40^\circ$ around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond $\pm 40^\circ$, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure</p>
C1A04-76	Right Front Height Sensor - Wrong mounting position	<ul style="list-style-type: none"> • Incorrect height calibration 	<ul style="list-style-type: none"> • Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C1A04-78	Right Front Height Sensor - Alignment or adjustment incorrect	<ul style="list-style-type: none"> • Incorrect height calibration 	<ul style="list-style-type: none"> • Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C1A05-12	Left Rear Height Sensor - Circuit short to power	<ul style="list-style-type: none"> • Height sensor circuit shorted to another cable • Height sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check Rear Left Height Sensor circuit for short to power, If circuit correct suspect Sensor internal fault, replace as required
C1A05-14	Left Rear Height Sensor - Circuit short to ground or open	<ul style="list-style-type: none"> • Wiring to sensor (signal) open circuit • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor internal electrical fault 	<ul style="list-style-type: none"> • Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within $\pm 0.15v$
C1A05-21	Left Rear Height Sensor - Signal amplitude < minimum	<ul style="list-style-type: none"> • Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress • Wiring to height sensor partial short to ground • Wiring to height sensor short to other 	<ul style="list-style-type: none"> • Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is fitted, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor fitted 	<p>voltages should be within $\pm 0.15v$. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range $\pm 40^\circ$ around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond $\pm 40^\circ$, the sensor signal will clamp to a voltage of $\sim 0.15v$ or $\sim 4.85v$, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure</p>
C1A05-22	Left Rear Height Sensor - Signal amplitude > maximum	<ul style="list-style-type: none"> • Height sensor linkage not connected • Height sensor or bracket loose • Height sensor bracket bent • Incorrect height calibration • Height sensor linkage toggled • Height sensor water ingress • Wiring to height sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor fitted 	<ul style="list-style-type: none"> • Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is fitted, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be $\sim 0v$ • Voltage to sensor signal connection should be $\sim 5v$ • Voltage to sensor supply connection should be $\sim 5v$ All voltages should be within $\pm 0.15v$. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range $\pm 40^\circ$ around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond $\pm 40^\circ$, the sensor signal will clamp to a voltage of $\sim 0.15v$ or $\sim 4.85v$, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A05-76	Left Rear Height Sensor - Wrong mounting position	<ul style="list-style-type: none"> • Incorrect height calibration 	<ul style="list-style-type: none"> • Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C1A05-78	Left Rear Height Sensor - Alignment or adjustment incorrect	<ul style="list-style-type: none"> • Incorrect height calibration 	<ul style="list-style-type: none"> • Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system

DTC	Description	Possible Causes	Action
C1A06-12	Right Rear Height Sensor - Circuit short to power	<ul style="list-style-type: none"> Height sensor circuit shorted to another cable Height sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Rear Right Height Sensor circuit for short to power, If circuit correct suspect Sensor internal fault, replace as required
C1A06-14	Right Rear Height Sensor - Circuit short to ground or open	<ul style="list-style-type: none"> Wiring to sensor (signal) open circuit Wiring to height sensor partial short to ground Wiring to height sensor short to other cable Height sensor internal electrical fault 	<ul style="list-style-type: none"> Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. <ul style="list-style-type: none"> Voltage to sensor ground connection should be ~0v Voltage to sensor signal connection should be ~0v Voltage to sensor supply connection should be ~5v All voltages should be within $\pm 0.15v$
C1A06-21	Right Rear Height Sensor - Signal amplitude < minimum	<ul style="list-style-type: none"> Height sensor linkage not connected Height sensor or bracket loose Height sensor bracket bent Incorrect height calibration Height sensor linkage toggled Height sensor water ingress Wiring to height sensor partial short to ground Wiring to height sensor short to other cable Height sensor electrical fault Height sensor linkage bent Incorrect height sensor fitted 	<ul style="list-style-type: none"> Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is fitted, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within height sensor connector (sensor not connected), with respect to vehicle body. <ul style="list-style-type: none"> Voltage to sensor ground connection should be ~0v Voltage to sensor signal connection should be ~0v Voltage to sensor supply connection should be ~5v All voltages should be within $\pm 0.15v$. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range $\pm 40^\circ$ around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond $\pm 40^\circ$, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure
C1A06-22	Right Rear Height Sensor - Signal amplitude > maximum	<ul style="list-style-type: none"> Height sensor linkage not connected Height sensor or bracket loose Height sensor bracket bent Incorrect height calibration Height sensor linkage toggled Height sensor water ingress Wiring to height 	<ul style="list-style-type: none"> Inspect for damage or loose fixings. NOTE If any height sensor fixings were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Confirm that the correct height sensor part number is fitted, as specified in the service parts database. To check height sensor: Disconnect electrical connector to height sensor and inspect connector pins & terminals for evidence of corrosion or water ingress. If no corrosion found, disconnect harness at Control Module. A: Check for short circuits between any of the 3 terminals and vehicle ground. B: Check for electrical continuity between the two connectors for each of the 3 terminals. Reconnect electrical connector at Control Module only. C: Check voltages at terminals within

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> • sensor partial short to ground • Wiring to height sensor short to other cable • Height sensor electrical fault • Height sensor linkage bent • Incorrect height sensor fitted 	<p>height sensor connector (sensor not connected), with respect to vehicle body. • Voltage to sensor ground connection should be ~0v • Voltage to sensor signal connection should be ~0v • Voltage to sensor supply connection should be ~5v All voltages should be within $\pm 0.15v$. To check sensor operation on the vehicle: Check for water ingress around the height sensors, electrical connectors or shaft end. Check for excessive movement in the shaft in all directions. Raise vehicle (ideally on wheels-free ramp) until suspension on corner under investigation is at rebound to gain access to height sensor. Access may be improved by removing road wheel. Carefully disconnect the height sensor link from the upper suspension arm. Monitor the height sensor signal voltage output for the height sensor under investigation. Position the sensor arm so it is in the mid position and confirm that the voltage is around 2.5 volts. Move the sensor arm over the range $\pm 40^\circ$ around the mid position and confirm that the voltage changes smoothly between around 0.2 volts and 4.8 volts. If voltages are incorrect or do not change smoothly then replace sensor. NOTE: For angles of movement beyond $\pm 40^\circ$, the sensor signal will clamp to a voltage of ~0.15v or ~4.85v, depending on position of sensor lever. This is normal. When investigation is complete, refit height sensor link to upper arm. If any fixings to the height sensor body or mounting bracket were slackened or found to be loose or if a height sensor was changed, the vehicle ride height MUST be re-calibrated. Refer to the relevant section of the workshop manual for the calibration procedure</p>
C1A06-76	Right Rear Height Sensor - Wrong mounting position	<ul style="list-style-type: none"> • Incorrect height calibration 	<ul style="list-style-type: none"> • Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C1A06-78	Right Rear Height Sensor - Alignment or adjustment incorrect	<ul style="list-style-type: none"> • Incorrect height calibration 	<ul style="list-style-type: none"> • Refer to the workshop manual and perform the height sensor calibration procedure. Clear the DTC and retest the system
C110C-01	Left Front Damper Solenoid - General electrical failure	<ul style="list-style-type: none"> • Left front damper solenoid circuit fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check Front Left damper solenoid circuit for faults, If no faults are evident suspect a faulty control module, refer to the new module installation note at the top of the DTC Index
C110C-18	Left Front Damper Solenoid - Circuit current below threshold	<ul style="list-style-type: none"> • Front Left Damper Actuator open circuit at startup 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check Front Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110C-19	Left Front Damper Solenoid - Circuit current above threshold	<ul style="list-style-type: none"> • Front Left Damper Solenoid circuit current above threshold 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check Front Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110C-14	Left Front Damper Solenoid - Short to ground, open circuit	<ul style="list-style-type: none"> • Left front damper solenoid circuit - short to ground, open circuit • Left front damper failure 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left front damper solenoid circuit for short to ground, open circuit. Check and install a new damper as required. Refer to the warranty policy and procedures manual if a module/component is suspect
C110C-1D	Left Front Damper Solenoid - Circuit current out of range	<ul style="list-style-type: none"> • Left front damper solenoid circuit - short to ground/power, open circuit • Left front damper failure 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left front damper solenoid circuit for short to ground, power, open circuit. Check and install a new damper as required. Refer to the warranty policy and procedures manual if a module/component is suspect
C110C-64	Left Front Damper Solenoid - Signal plausibility failure	<ul style="list-style-type: none"> • Front Left Damper Solenoid Measured Current control loop failed • Front Left Damper Solenoid open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check Front Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms

DTC	Description	Possible Causes	Action
C110D-01	Right Front Damper Solenoid - General electrical failure	<ul style="list-style-type: none"> Right front damper solenoid circuit fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Front Right damper solenoid circuit for faults, If no faults are evident suspect a faulty control module, refer to the new module installation note at the top of the DTC Index
C110D-18	Right Front Damper Solenoid - Circuit current below threshold	<ul style="list-style-type: none"> Front Right Damper Actuator open circuit at startup 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Front Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110D-19	Right Front Damper Solenoid - Circuit current above threshold	<ul style="list-style-type: none"> Front Right Damper Solenoid circuit current above threshold 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Front Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110D-14	Right Front Damper Solenoid - Short to ground, open circuit	<ul style="list-style-type: none"> Right front damper solenoid circuit - short to ground, open circuit Right front damper failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check Right front damper solenoid circuit for short to ground, open circuit. Check and install a new damper as required. Refer to the warranty policy and procedures manual if a module/component is suspect
C110D-1D	Right Front Damper Solenoid - Circuit current out of range	<ul style="list-style-type: none"> Right front damper solenoid circuit - short to ground/power, open circuit Right front damper failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check Right front damper solenoid circuit for short to ground, power, open circuit. Check and install a new damper as required. Refer to the warranty policy and procedures manual if a module/component is suspect
C110D-64	Right Front Damper Solenoid - Signal plausibility failure	<ul style="list-style-type: none"> Front Right Damper Solenoid Measured Current control loop failed Front Right Damper Solenoid open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Front Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110E-01	Left Rear Damper Solenoid - General electrical failure	<ul style="list-style-type: none"> Left Rear damper solenoid circuit fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Rear Left damper solenoid circuit for faults, If no faults are evident suspect a faulty control module, refer to the new module installation note at the top of the DTC Index
C110E-18	Left Rear Damper Solenoid - Circuit current below threshold	<ul style="list-style-type: none"> Rear Left Damper Actuator open circuit at startup 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Rear Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110E-19	Left Rear Damper Solenoid - Circuit current above threshold	<ul style="list-style-type: none"> Rear Left Damper Solenoid circuit current above threshold 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Rear Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110E-14	Left Rear Damper Solenoid - Short to ground, open circuit	<ul style="list-style-type: none"> Left Rear damper solenoid circuit - short to ground, open circuit Left Rear damper failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left Rear damper solenoid circuit for short to ground, open circuit. Check and install a new damper as required. Refer to the warranty policy and procedures manual if a module/component is suspect
C110E-1D	Left Rear Damper Solenoid - Circuit current out of range	<ul style="list-style-type: none"> Left Rear damper solenoid circuit - short to ground/power, open circuit Left Rear damper failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left Rear damper solenoid circuit for short to ground, power, open circuit. Check and install a new damper as required. Refer to the warranty policy and procedures manual if a module/component is suspect
C110E-64	Left Rear Damper Solenoid - Signal	<ul style="list-style-type: none"> Rear Left Damper Solenoid Measured Current control loop 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Rear Left Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms

DTC	Description	Possible Causes	Action
	plausibility failure	<ul style="list-style-type: none"> failed Rear Left Damper Solenoid open circuit 	
C110F-01	Right Rear Damper Solenoid - General Electrical Failure	<ul style="list-style-type: none"> Right Rear damper solenoid circuit fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Rear Right damper solenoid circuit for faults, If no faults are evident suspect a faulty control module, refer to the new module installation note at the top of the DTC Index
C110F-18	Right Rear Damper Solenoid - Circuit current below threshold	<ul style="list-style-type: none"> Rear Right Damper Actuator open circuit at startup 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Rear Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110F-19	Right Rear Damper Solenoid - Circuit current above threshold	<ul style="list-style-type: none"> Rear Right Damper Solenoid circuit current above threshold 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Rear Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C110F-14	Right Rear Damper Solenoid - Short to ground, open circuit	<ul style="list-style-type: none"> Right Rear damper solenoid circuit - short to ground, open circuit Right Rear damper failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check Right Rear damper solenoid circuit for short to ground, open circuit. Check and install a new damper as required. Refer to the warranty policy and procedures manual if a module/component is suspect
C110F-1D	Right Rear Damper Solenoid - Circuit current out of range	<ul style="list-style-type: none"> Right Rear damper solenoid circuit - short to ground/power, open circuit Right Rear damper failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check Right Rear damper solenoid circuit for short to ground, power, open circuit. Check and install a new damper as required. Refer to the warranty policy and procedures manual if a module/component is suspect
C110F-64	Right Rear Damper Solenoid - Signal plausibility failure	<ul style="list-style-type: none"> Rear Right Damper Solenoid Measured Current control loop failed Rear Right Damper Solenoid open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Rear Right Damper Solenoid circuit resistance. Damper solenoid circuit should lie in range of 2 to 3.5 ohms
C1B14-1C	Sensor Supply Voltage A - Out of range	<ul style="list-style-type: none"> Left Front Height Sensor or Right Front Height Sensor or Left Rear Height Sensor or Right Rear Height Sensor supply partial short to other circuit or ground Left Front Height Sensor or Right Front Height Sensor or Left Rear Height Sensor or Right Rear Height Sensor internal failure Internal control module failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check sensor supply for circuit fault. Check all height sensors. Check module sensor supply output voltage measured voltage should be between 4.995 volts and 4.85 volts
C1B15-1C	Sensor Supply Voltage B - Out of range	<ul style="list-style-type: none"> Left Front Vertical Acceleration Sensor or Right Front Vertical Acceleration Sensor or Left Rear Vertical Acceleration Sensor or Right Rear Vertical Acceleration Sensor supply partial short to other circuit or ground. Left Front Vertical Acceleration Sensor or Right Front Vertical Acceleration 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check sensor supply for circuit fault. Check all Vertical Acceleration Sensors. Check control module sensor supply output voltage measured voltage should be between 4.995 volts and 4.85 volts

DTC	Description	Possible Causes	Action
		Sensor or Left Rear Vertical Acceleration Sensor or Right Rear Vertical Acceleration Sensor supply partial short to other circuit or ground <ul style="list-style-type: none"> • Left Front Vertical Acceleration Sensor or Right Front Vertical Acceleration Sensor or Left Rear Vertical Acceleration Sensor or Right Rear Vertical Acceleration Sensor internal failure • Internal control module failure 	
U0001-88	High speed CAN communication bus - Bus off	<ul style="list-style-type: none"> • Lost Communication With Engine Control Module (ECM) (CAN Bus circuit fault) 	<ul style="list-style-type: none"> • Check Engine Control Module for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus circuit for faults, check CAN circuits for open circuits or shorts to power, ground or other circuits
U0100-00	Lost Communication With ECM/PCM A - No sub type information	<ul style="list-style-type: none"> • Missing message from ECM 	<ul style="list-style-type: none"> • Check Engine Control Module for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus for circuit fault
U0101-00	Lost Communication with TCM - No sub type information	<ul style="list-style-type: none"> • Lost Communication with Transmission control module (TCM) (CAN Bus circuit fault) 	<ul style="list-style-type: none"> • Check Transmission Control Module for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus for circuit fault
U0103-00	Lost Communication With Gear Shift Control Module A - No sub type information	<ul style="list-style-type: none"> • Lost Communication With Gear Shift Module (GSM) (CAN Bus circuit fault) 	<ul style="list-style-type: none"> • Check Gear Shift Module for stored DTCs. Refer to the electrical circuit diagrams and check Can Bus for circuit faults
U0121-00	Lost Communication With Anti-Lock Brake System (ABS) Control Module - No sub type information	<ul style="list-style-type: none"> • Lost Communication With Anti-Lock Brake System (ABS) Control Module (CAN Bus circuit fault) 	<ul style="list-style-type: none"> • Check Anti lock Brake System Control Module for stored DTCs. Refer to the electrical circuit diagrams and check Can Bus circuit to Anti lock Brake System Control Module for circuit faults
U0132-00	Lost Communication With Suspension Control Module A - No sub type information	<ul style="list-style-type: none"> • Lost Communication With Air Suspension Control Module (CAN Bus circuit fault) 	<ul style="list-style-type: none"> • Check Air Suspension Control Module for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus circuit to Air Suspension Control Module for circuit faults
U0136-00	Lost Communication With Differential Control Module - Rear - No sub type information	<ul style="list-style-type: none"> • Lost Communication With Rear Differential Control Module (CAN Bus circuit fault) 	<ul style="list-style-type: none"> • Check Rear Differential Control Module for stored DTCs. Refer to the electrical circuit diagrams and check Can Bus circuit to Rear Differential Control Module for circuit faults
U0140-00	Lost Communication With Body Control Module - No sub type information	<ul style="list-style-type: none"> • Lost Communication With Body Control Module (Front Smart Junction Box) (CAN Bus circuit fault) 	<ul style="list-style-type: none"> • Check Body Control Module for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus circuit to Body Control Module for faults
U0142-00	Lost Communication With Body Control Module B - No sub type information	<ul style="list-style-type: none"> • Lost Communication with rear smart junction box (CAN Bus circuit fault) 	<ul style="list-style-type: none"> • Check Rear Smart Junction Box for stored DTCs. Refer to the electrical circuit diagrams and check Can Bus circuit to Rear Smart Junction Box for faults
U0155-00	Lost Communication With Instrument Panel Cluster	<ul style="list-style-type: none"> • Lost Communication With Instrument Panel Cluster (IPC) Control 	<ul style="list-style-type: none"> • Check Instrument Panel Cluster for stored DTCs. Refer to the electrical circuit diagrams and check CAN Bus to Instrument Panel Cluster for circuit fault

DTC	Description	Possible Causes	Action
	(IPC) Control Module - No sub type information	Module (CAN bus circuit fault)	
U0300-00	Internal control module software incompatibility - No sub type information	<ul style="list-style-type: none"> CAN master configuration ID incorrect 	<ul style="list-style-type: none"> Check Front Smart Junction Box vehicle configuration file, check part number of adaptive damping control module
U0401-68	Invalid Data Received from ECM/PCM A - Event information	<ul style="list-style-type: none"> Invalid Data Received from Engine Control Module 	<ul style="list-style-type: none"> Check Engine Control Module for DTCs. Refer to the relevant DTC index
U0402-68	Invalid Data Received from TCM - Event information	<ul style="list-style-type: none"> Invalid Data Received from Transmission control module 	<ul style="list-style-type: none"> Check for Transmission Control Module DTCs. Refer to relevant DTC index
U0404-68	Invalid Data Received from Gear Shift Control Module A - Event information	<ul style="list-style-type: none"> Invalid data received from gear shift control module 	<ul style="list-style-type: none"> Check Gear Shift Control Module for DTCs. Refer to the relevant DTC index
U0415-68	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module - Event information	<ul style="list-style-type: none"> Invalid Data Received From Anti-Lock Brake System (ABS) Control Module 	<ul style="list-style-type: none"> Check for Anti lock Brake System DTCs. Refer to the relevant DTC index
U0421-68	Invalid Data Received from Suspension Control Module A - Event information	<ul style="list-style-type: none"> Invalid Data Received From Air Suspension Control Module 	<ul style="list-style-type: none"> Check Air Suspension Control Module for stored DTCs. Refer to the relevant DTC index
U0422-68	Invalid Data Received From Body Control Module - Event information	<ul style="list-style-type: none"> Invalid Data Received From Body Control Module (Front Smart Junction Box) 	<ul style="list-style-type: none"> Check Body Control Module (Front Smart Junction Box) for stored DTCs. Refer to the relevant DTC index
U0437-68	Invalid Data Received From Differential Control Module - Rear - Event information	<ul style="list-style-type: none"> Invalid Data Received From Rear Differential Control Module 	<ul style="list-style-type: none"> Check Rear Differential Control Module for stored DTCs. Refer to the relevant DTC index
U0443-68	Invalid Data Received From Body Control Module B - Event information	<ul style="list-style-type: none"> Invalid Data Received From body control module B (Rear Smart Junction Box) 	<ul style="list-style-type: none"> Check rear smart junction box for DTCs and refer to relevant DTC index
U1A14-00	CAN initialization failure - No sub type information	<ul style="list-style-type: none"> CAN network harness short, disconnected 	<ul style="list-style-type: none"> Refer to circuit diagrams and check CAN Bus circuit for fault (short to power, ground or open circuit)
U2100-00	Initial Configuration Not Complete - No sub type information	<ul style="list-style-type: none"> Car Configuration Data not loaded (New Body Control Module (Front Smart Junction Box) fitted to vehicle and not initialized) Internal Body Control Module (Front Smart Junction Box) failure 	<ul style="list-style-type: none"> Install car config to Front Smart Junction Box. Clear DTC and retest systems
U2101-00	Control Module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> Car Configuration Data transmitted over CAN does not match adaptive damping control module internal config 	<ul style="list-style-type: none"> Carry out the new module software installation procedure

DTC	Description	Possible Causes	Action
U3000-01	Control module - General Electrical Failure	<ul style="list-style-type: none"> General electrical failure 	<ul style="list-style-type: none"> Check integrity of electrical connectors and pins to module. Check damper negative circuits for short to Ground. Refer to the new module installation note at the top of the DTC Index. Install a new Adaptive Damping Control Module
U3000-04	Control Module - System Internal Failure	<ul style="list-style-type: none"> Module Internal failure 	<ul style="list-style-type: none"> Refer to the electrical wiring diagrams and check all damper solenoid circuits for short to power. If no harness faults are found suspect adaptive damping control module. Install a new module, refer to new module installation note at top of DTC Index
U3000-43	Control Module - Special memory failure	<ul style="list-style-type: none"> Module Internal failure 	<ul style="list-style-type: none"> Suspect Adaptive Damping Control Module internal failure. Install a new module, refer to the new module/component installation note at the top of the DTC Index
U3000-45	Control Module - Program memory failure	<ul style="list-style-type: none"> Module Internal failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check power and ground circuit for fault. Clear DTC turn off ignition, wait 1 minute. Turn on ignition, check for DTCs. If DTC returns suspect Adaptive Damping Control Module internal failure. Install a new module, refer to the new module/component installation note at the top of the DTC Index
U3000-47	Control Module - Watchdog / safety Micro controller failure	<ul style="list-style-type: none"> Module Internal Failure 	<ul style="list-style-type: none"> If this DTC is logged contact your local in-market support
U3000-52	Control Module - Not activated	<ul style="list-style-type: none"> Adaptive Damping Control Module has been replaced and not programmed 	<ul style="list-style-type: none"> Install the latest software / Carry out the new-module (software) install procedure
U3000-54	Control Module - Missing calibration	<ul style="list-style-type: none"> Adaptive damping control module has been replaced and no software is installed 	<ul style="list-style-type: none"> Install the latest software / Carry out the new-module (software) install procedure
U3003-1C	Battery voltage - Circuit voltage out of range	<ul style="list-style-type: none"> Circuit voltage out of range (Supply Voltage at adaptive damping control module < 10.5v or Supply Voltage at adaptive damping control module > 18v for 30s) 	<ul style="list-style-type: none"> Check the battery is in good condition and fully charged, refer to the battery care manual. Refer to the starting and charging section of the workshop manual and check the performance of the charging system. Refer to the electrical circuit diagrams and check power and ground circuit to adaptive damping control module for faults, including intermittent high resistance
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> High Resistance Connections Adaptive Damping Control module Internal Failure 	<ul style="list-style-type: none"> Check the battery is in good condition and fully charged, refer to the battery care manual. Refer to the starting and charging section of the workshop manual and check the performance of the charging system. Refer to the electrical circuit diagrams and check power and ground circuit to adaptive damping control module for faults, including intermittent high resistance

General Information - Diagnostic Trouble Code (DTC) Index DTC: Anti-Lock Braking System (ABS)

Description and Operation

Anti-Lock Braking System (ABS)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the anti-lock braking system module, for additional diagnosis and testing information refer to the relevant Diagnosis and Testing Section.

For additional information, refer to: Anti-Lock Control - Stability Assist (206-09 Anti-Lock Control - Stability Assist, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
C0021-09	Brake Booster Performance - Component Failures	<ul style="list-style-type: none"> No vacuum available from engine due to split/leaking hose etc Brake booster servo has failed due to lack of vacuum 	<ul style="list-style-type: none"> Check integrity of brake booster vacuum hose. Check and install a new brake booster as required
C0030-38	Left Front Tone Wheel - Signal frequency incorrect	<ul style="list-style-type: none"> Left front magnetic pulse ring damaged/contaminated Incorrect component installed Sensor internal fault 	<ul style="list-style-type: none"> Check the left front magnetic pulse ring for damage or contamination. Clean or replace as required. If no damage/contamination found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph for more than 10 seconds
C0031-12	Left Front Wheel Speed Sensor - Short to battery	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to power. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a

DTC	Description	Possible Causes	Action
			module/component is suspect
C0031-14	Left Front Wheel Speed Sensor - Circuit short to ground or open	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0031-25	Left Front Wheel Speed Sensor - Signal shape/waveform failure	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for partial or intermittently grounded signal circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0031-2F	Left Front Wheel Speed Sensor - Signal erratic	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0031-31	Left Front Wheel Speed Sensor - No signal	<ul style="list-style-type: none"> Electrical wiring harness fault Magnetic pulse ring de-magnetised or damaged Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for open circuit or high resistance. Check connectors for damage or corrosion. Check the wheel speed sensor for correct location and contamination. Check the magnetic pulse wheel for contamination, damage or de-magnetisation. Clean or replace the sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0031-62	Left Front Wheel Speed Sensor - Signal compare failure	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0031-64	Left Front Wheel Speed Sensor - Signal plausibility failure	<ul style="list-style-type: none"> Incorrect wheels/tyres installed Electrical wiring harness fault EMC influences on left front wheel speed sensor and supply line Magnetic pulse wheel damaged/contaminated, de-magnetised Sensor internal fault 	<ul style="list-style-type: none"> Check the correct wheels and tyres are installed. Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, or ground. Check for EMC influences on the speed sensor and circuits. Check magnetic pulse wheel for damage/contamination and de-magnetisation. Repair Wiring harness, install a new sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0032-11	Left Front wheel Speed Sensor Supply - Circuit short to ground	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect

DTC	Description	Possible Causes	Action
C0033-38	Right Front Tone Wheel - Signal frequency incorrect	<ul style="list-style-type: none"> • Right front magnetic pulse ring damaged/contaminated • Incorrect component installed • Sensor internal fault 	<ul style="list-style-type: none"> • Check the right front magnetic pulse ring for damage or contamination. Clean or replace as required. If no damage/contamination found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph for more than 10 seconds
C0034-12	Right Front Wheel Speed Sensor - Short to battery	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to power. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0034-14	Right Front Wheel Speed Sensor - Circuit short to ground or open	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0034-25	Right Front Wheel Speed Sensor - Signal shape/waveform failure	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for partial or intermittently grounded signal circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0034-2F	Right Front Wheel Speed Sensor - Signal erratic	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0034-31	Right Front Wheel Speed Sensor - No signal	<ul style="list-style-type: none"> • Electrical wiring harness fault • Magnetic pulse ring de-magnetised or damaged • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for open circuit or high resistance. Check connectors for damage or corrosion. Check the wheel speed sensor for correct location and contamination. Check the magnetic pulse wheel for contamination, damage or de-magnetisation. Clean or replace the sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0034-62	Right Front Wheel Speed Sensor - Signal compare failure	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0034-64	Right Front Wheel Speed Sensor - Signal plausibility failure	<ul style="list-style-type: none"> • Incorrect wheels/tyres installed • Electrical wiring harness fault • EMC influences on right front 	<ul style="list-style-type: none"> • Check the correct wheels and tyres are installed. Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, or ground. Check for EMC influences on the speed sensor and circuits. Check magnetic pulse

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> wheel speed sensor and supply line Magnetic pulse wheel damaged/contaminated, de-magnetised Sensor internal fault 	wheel for damage/contamination and de-magnetisation. Repair wiring harness, install a new sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0035-11	Right Front Wheel Speed Sensor Supply - Circuit short to ground	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0036-38	Left Rear Tone Wheel - Signal frequency incorrect	<ul style="list-style-type: none"> Left rear magnetic pulse ring damaged/contaminated Incorrect component installed Sensor internal fault 	<ul style="list-style-type: none"> Check the left rear magnetic pulse ring for damage or contamination. Clean or replace as required. If no damage/contamination found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph for more than 10 seconds
C0037-12	Left Rear Wheel Speed Sensor - Short to battery	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to power. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0037-14	Left Rear Wheel Speed Sensor - Circuit short to ground or open	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0037-25	Left Rear Wheel Speed Sensor - Signal shape/waveform failure	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for partial or intermittently grounded signal circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0037-2F	Left Rear Wheel Speed Sensor - Signal erratic	<ul style="list-style-type: none"> Electrical wiring harness fault Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0037-31	Left Rear Wheel Speed Sensor - No signal	<ul style="list-style-type: none"> Electrical wiring harness fault Magnetic pulse ring de-magnetised or damaged Sensor internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for open circuit or high resistance. Check connectors for damage or corrosion. Check the wheel speed sensor for correct location and contamination. Check the magnetic pulse wheel for contamination, damage or de-magnetisation. Clean or replace the sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph

DTC	Description	Possible Causes	Action
C0037-62	Left Rear Wheel Speed Sensor - Signal compare failure	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C0037-64	Left Rear Wheel Speed Sensor - Signal plausibility failure	<ul style="list-style-type: none"> • Incorrect wheels/tyres installed • Electrical wiring harness fault • EMC influences on left rear wheel speed sensor and supply line • Magnetic pulse wheel damaged/contaminated, de-magnetised • Sensor internal fault 	<ul style="list-style-type: none"> • Check the correct wheels and tyres are installed. Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, or ground. Check for EMC influences on the speed sensor and circuits. Check magnetic pulse wheel for damage/contamination and de-magnetisation. Repair Wiring harness, install a new sensor or wheel bearing as required. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0038-11	Left Rear Wheel Speed Sensor Supply - Circuit short to ground	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C0039-38	Right Rear Tone Wheel - Signal frequency incorrect	<ul style="list-style-type: none"> • Right rear magnetic pulse ring damaged/contaminated • Incorrect component installed • Sensor internal fault 	<ul style="list-style-type: none"> • Check the right rear magnetic pulse ring for damage or contamination. Clean or replace as required. . If no damage/contamination found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph for more than 10 seconds
C003A-12	Right Rear Wheel Speed Sensor - Short to battery	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to power. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C003A-14	Right Rear Wheel Speed Sensor - Circuit short to ground or open	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for short to ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C003A-25	Right Rear Wheel Speed Sensor - Signal shape/waveform failure	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for partial or intermittently grounded signal circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph
C003A-2F	Right Rear Wheel Speed Sensor - Signal erratic	<ul style="list-style-type: none"> • Electrical wiring harness fault • Sensor internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the wheel speed sensor circuit for intermittent short to power, ground or open circuit. Repair harness as required. If no harness fault found, suspect wheel speed sensor. Refer to the Warranty Policy and Procedures manual if a module/component is suspect. To validate the repair and extinguish the lamps, the vehicle needs to be driven above 9mph/15kph

General Information - Diagnostic Trouble Code (DTC) Index DTC: Audio Amplifier Module (AAM)

Description and Operation

Audio Amplifier Module (AAM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Audio Amplifier Module (AAM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Information and Entertainment System](#) (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1A01-11	Speaker #1 - Circuit short to ground	<ul style="list-style-type: none"> Front left tweeter or mid-range speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front left tweeter speaker circuit for short to ground
B1A01-12	Speaker #1 - Circuit short to battery	<ul style="list-style-type: none"> Front left tweeter or mid-range speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front left tweeter speaker circuit for short to power
B1A01-13	Speaker #1 - Circuit open	<ul style="list-style-type: none"> Front left tweeter or mid-range speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front left tweeter speaker circuit for open circuit
B1A01-1A	Speaker #1 - Circuit resistance below threshold	<ul style="list-style-type: none"> Front left tweeter or mid-range speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
B1A01-49	Speaker #1 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A02-11	Speaker #2 - Circuit short to ground	<ul style="list-style-type: none"> Front right tweeter or mid-range speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front right tweeter speaker circuit for short to ground
B1A02-12	Speaker #2 - Circuit short to battery	<ul style="list-style-type: none"> Front right tweeter or mid-range speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front right tweeter speaker circuit for short to power
B1A02-13	Speaker #2 - Circuit open	<ul style="list-style-type: none"> Front right tweeter or mid-range speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front right tweeter speaker circuit for open circuit
B1A02-1A	Speaker #2 - Circuit resistance below threshold	<ul style="list-style-type: none"> Front right tweeter or mid-range speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A02-49	Speaker #2 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A03-11	Speaker #3 - Circuit short to ground	<ul style="list-style-type: none"> Front left woofer speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front left woofer speaker circuit for short to ground
B1A03-12	Speaker #3 - Circuit short to battery	<ul style="list-style-type: none"> Front left woofer speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front left woofer speaker circuit for short to power
B1A03-13	Speaker #3 - Circuit open	<ul style="list-style-type: none"> Front left woofer speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front left woofer speaker circuit for open circuit
B1A03-1A	Speaker #3 - Circuit resistance below threshold	<ul style="list-style-type: none"> Front left woofer speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A03-49	Speaker #3 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A04-11	Speaker #4 - Circuit short to ground	<ul style="list-style-type: none"> Front right woofer speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front right woofer speaker circuit for short to ground
B1A04-12	Speaker #4 - Circuit short to battery	<ul style="list-style-type: none"> Front right woofer speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front right woofer speaker circuit for short to power
B1A04-13	Speaker #4 - Circuit open	<ul style="list-style-type: none"> Front right woofer speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front right woofer speaker circuit for open circuit

DTC	Description	Possible Causes	Action
B1A04-1A	Speaker #4 - Circuit resistance below threshold	<ul style="list-style-type: none"> Front right woofer speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A04-49	Speaker #4 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A05-11	Speaker #5 - Circuit short to ground	<ul style="list-style-type: none"> Rear left speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear left speaker circuit for short to ground
B1A05-12	Speaker #5 - Circuit short to battery	<ul style="list-style-type: none"> Rear left speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear left speaker circuit for short to power
B1A05-13	Speaker #5 - Circuit open	<ul style="list-style-type: none"> Rear left speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear left speaker circuit for open circuit
B1A05-1A	Speaker #5 - Circuit resistance below threshold	<ul style="list-style-type: none"> Rear left speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A05-49	Speaker #5 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A06-11	Speaker #6 - Circuit short to ground	<ul style="list-style-type: none"> Rear right speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear right speaker circuit for short to ground
B1A06-12	Speaker #6 - Circuit short to battery	<ul style="list-style-type: none"> Rear right speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear right speaker circuit for short to power
B1A06-13	Speaker #6 - Circuit open	<ul style="list-style-type: none"> Rear right speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear right speaker circuit for open circuit
B1A06-1A	Speaker #6 - Circuit resistance below threshold	<ul style="list-style-type: none"> Rear right speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A06-49	Speaker #6 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A07-11	Speaker #7 - Circuit short to ground	<ul style="list-style-type: none"> Rear left surround speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear left surround speaker circuit for short to ground
B1A07-12	Speaker #7 - Circuit short to battery	<ul style="list-style-type: none"> Rear left surround speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear left surround speaker circuit for short to power
B1A07-13	Speaker #7 - Circuit open	<ul style="list-style-type: none"> Rear left surround speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear left surround speaker circuit for open circuit

DTC	Description	Possible Causes	Action
B1A07-1A	Speaker #7 - Circuit resistance below threshold	<ul style="list-style-type: none"> Rear left surround speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A07-49	Speaker #7 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A08-11	Speaker #8 - Circuit short to ground	<ul style="list-style-type: none"> Rear right surround speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear right surround speaker circuit for short to ground
B1A08-12	Speaker #8 - Circuit short to battery	<ul style="list-style-type: none"> Rear right surround speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear right surround speaker circuit for short to power
B1A08-13	Speaker #8 - Circuit open	<ul style="list-style-type: none"> Rear right surround speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check rear right surround speaker circuit for open circuit
B1A08-1A	Speaker #8 - Circuit resistance below threshold	<ul style="list-style-type: none"> Rear right surround speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A08-49	Speaker #8 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A09-11	Speaker #9 - Circuit short to ground	<ul style="list-style-type: none"> Center speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check center speaker circuit for short to ground
B1A09-12	Speaker #9 - Circuit short to battery	<ul style="list-style-type: none"> Center speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check center speaker circuit for short to power
B1A09-13	Speaker #9 - Circuit open	<ul style="list-style-type: none"> Center speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check center speaker circuit for open circuit
B1A09-1A	Speaker #9 - Circuit resistance below threshold	<ul style="list-style-type: none"> Center speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A09-49	Speaker #9 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A10-11	Speaker #10 - Circuit short to ground	<ul style="list-style-type: none"> Left subwoofer speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check left subwoofer speaker circuit for short to ground
B1A10-12	Speaker #10 - Circuit short to battery	<ul style="list-style-type: none"> Left subwoofer speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check left subwoofer speaker circuit for short to power
B1A10-13	Speaker #10 - Circuit open	<ul style="list-style-type: none"> Left subwoofer speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check left subwoofer speaker circuit for open circuit

DTC	Description	Possible Causes	Action
B1A10-1A	Speaker #10 - Circuit resistance below threshold	<ul style="list-style-type: none"> Left subwoofer speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A10-49	Speaker #10 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A11-11	Speaker #11 - Circuit short to ground	<ul style="list-style-type: none"> Right subwoofer speaker circuit - Short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check right subwoofer speaker circuit for short to ground
B1A11-12	Speaker #11 - Circuit short to battery	<ul style="list-style-type: none"> Right subwoofer speaker circuit - Short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check right subwoofer speaker circuit for short to power
B1A11-13	Speaker #11 - Circuit open	<ul style="list-style-type: none"> Right subwoofer speaker circuit - Open circuit 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check right subwoofer speaker circuit for open circuit
B1A11-1A	Speaker #11 - Circuit resistance below threshold	<ul style="list-style-type: none"> Right subwoofer speaker circuit - Resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A11-49	Speaker #11 - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the audio amplifier module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U2003-98	Fibre Optic Communication Bus - Component or system over temperature	<ul style="list-style-type: none"> Component or system over temperature 	<ul style="list-style-type: none"> Clear DTC and allow system to cool, monitor for re-occurrence of DTC
U3000-05	Control module - System programming failures	<ul style="list-style-type: none"> Software incompatibility The version of the Local Configuration file does not match that expected 	<ul style="list-style-type: none"> Re-configure the audio amplifier as an existing control module, using the manufacturer approved diagnostic system
U3000-42	Control module - General memory failure	<ul style="list-style-type: none"> General memory failure 	<ul style="list-style-type: none"> Re-configure the audio amplifier as an existing control module, using the manufacturer approved diagnostic system. Clear DTC, cycle ignition and read DTCs. If DTC returns, suspect audio amplifier module and install a new module. Refer to the new module/component installation note at the top of the DTC Index
U3000-44	Control module - Data memory failure	<ul style="list-style-type: none"> Data memory failure 	<ul style="list-style-type: none"> Re-configure the audio amplifier as an existing control module, using the manufacturer approved diagnostic system. Clear DTC, cycle ignition and read DTCs. If DTC returns, suspect audio amplifier module and install a new module. Refer to the new module/component installation note at the top of the DTC Index
U3000-55	Control Module - Not configured	<ul style="list-style-type: none"> Incorrect car configuration data received 	<ul style="list-style-type: none"> Check/up-date Car Configuration File using manufacturer approved diagnostic system
U3000-87	Control Module - Missing message	<ul style="list-style-type: none"> Missing message 	<ul style="list-style-type: none"> Check CJB for DTCs and refer to DTC Index. Check information and entertainment module for Car Configuration File and MOST network DTCs and refer to relevant DTC Index. Carry out MOST/CAN network tests using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
U3003-16	Battery Voltage - Circuit voltage below threshold	<ul style="list-style-type: none"> • Circuit voltage below threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U3003-17	Battery Voltage - Circuit voltage above threshold	<ul style="list-style-type: none"> • Circuit voltage above threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

General Information - Diagnostic Trouble Code (DTC) Index DTC: Blind Spot Monitoring System Module (SODL/SODR)

Description and Operation

Blind Spot Monitoring System Module (SODL/SODR)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Blind Spot Monitoring System Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section. For additional information, refer to: Warning Devices (413-09 Warning Devices, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B11C9-11	Driver Display Status LED - Circuit short to ground	<ul style="list-style-type: none"> Circuit short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check driver display status LED circuit for short to ground
B11C9-15	Driver Display Status LED - Circuit short to battery or open	<ul style="list-style-type: none"> Circuit short to power or open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check driver display status LED circuit for short to ground
B11D6-11	Driver Display Alert LED - Circuit short to ground	<ul style="list-style-type: none"> Circuit short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check driver display status LED circuit for short to ground
B11D6-15	Driver Display Alert LED - Circuit short to battery or open	<ul style="list-style-type: none"> Circuit short to power or open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check driver display status LED circuit for short to ground
U0010-00	Medium Speed CAN Communication Bus - No sub type information	<ul style="list-style-type: none"> No sub type information 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check

DTC	Description	Possible Causes	Action
			the CAN network
U0140-00	Lost Communication With Body Control Module - No sub type information	<ul style="list-style-type: none"> No sub type information 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Central Junction Box and Blind Spot Monitoring System Module
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	<ul style="list-style-type: none"> No sub type information 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Instrument Cluster and Blind Spot Monitoring System Module
U0232-00	Lost Communication With Blind Spot Monitoring System Module - Left - No sub type information	<ul style="list-style-type: none"> CAN bus circuit fault Harness fault between left side mirror and left side module 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the left Blind Spot Monitoring System Module and the right Blind Spot Monitoring System Module Refer to the electrical circuit diagrams and check the left side harness between the left side mirror and left hand module
U0233-00	Lost Communication With Blind Spot Monitoring System Module - Right - No sub type information	<ul style="list-style-type: none"> CAN bus circuit fault Harness fault between right side mirror and right side module 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the left Blind Spot Monitoring System Module and the right Blind Spot Monitoring System Module Refer to the electrical circuit diagrams and check the right side harness between the right side mirror and right hand module
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> No sub type information 	<ul style="list-style-type: none"> Check Central Junction Box for related DTCs and refer to the relevant DTC Index. Check Restraints Control Module for related DTCs and refer to DTC Index. Check correct components are installed and that the latest software version is installed
U0415-68	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module - event information	<ul style="list-style-type: none"> Event information 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check the central junction box and the anti-lock brake system (ABS) control module for related DTCs and refer to the relevant DTC Index
U0422-68	Invalid Data Received From Body Control Module - Event information	<ul style="list-style-type: none"> Event information 	<ul style="list-style-type: none"> Check the Central Junction Box for related DTCs and refer to the relevant DTC index
U2100-00	Initial Configuration Not Complete - No sub type information	<ul style="list-style-type: none"> Car Configuration File information not received completely 	<ul style="list-style-type: none"> Check/amend Car Configuration File using manufacturer approved diagnostic system
U2101-00	Control Module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> Car Configuration File information incompatible to Control module 	<ul style="list-style-type: none"> Check/amend Car Configuration File using manufacturer approved diagnostic system
U3000-44	Control Module - Data memory failure	<ul style="list-style-type: none"> Control module data memory failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground circuits to the component. Refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
U3000-47	Control Module - Watchdog/safety microcontroller failure	<ul style="list-style-type: none"> Control module internal watchdog/safety MicroController failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground circuits to the component. Refer to the warranty policy and procedures manual if a module is suspect
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> Control module internal electronic failure (internal error) 	<ul style="list-style-type: none"> Clear DTC, cycle ignition and retest. If fault persists, refer to the electrical circuit diagrams and check the power and ground circuits to the component. Repair as required, clear DTC and retest If fault persists, check and install a new blindspot monitoring control module as required. Refer to the warranty policy and procedures manual if a module is suspect
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> Mis-match in battery voltage, between Central Junction Box and Blind Spot Monitoring System module, of 2 volts or more 	<ul style="list-style-type: none"> Check the module connector for security and integrity. Refer to the electrical circuit diagrams and check the Control module supply voltage. Check vehicle battery voltage and state of charge. Check the power signal line to the module

General Information - Diagnostic Trouble Code (DTC) Index DTC: Central

Junction Box (CJB)

Description and Operation

Central Junction Box (CJB)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Central Junction Box (CJB). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Communications Network](#) (418-00 Module Communications Network, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B00D5-11	Restraint System Passenger Disable Indicator - Circuit short to ground	<ul style="list-style-type: none"> PAD lamp supply circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check PAD lamp supply circuit for short to ground
B00D5-12	Restraint System Passenger Disable Indicator - Circuit short to battery	<ul style="list-style-type: none"> PAD lamp supply circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check PAD lamp supply circuit for short to power
B00D5-13	Restraint System Passenger Disable Indicator - Circuit open	<ul style="list-style-type: none"> PAD lamp supply circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check PAD lamp supply circuit for open circuit
B1009-51	Ignition Authorisation - Not programmed	<ul style="list-style-type: none"> Faulty instrument cluster Target SID re-synchronisation error following programming CAN fault 	<ul style="list-style-type: none"> Check ignition, power and ground supplies to CJB and instrument cluster. Re-synchronize ID by re-configuring the instrument cluster as a new module. Check CAN communications between instrument cluster and tester
B1009-62	Ignition Authorisation - Signal compare failure	<ul style="list-style-type: none"> Low speed CAN fault CJB fault Instrument cluster fault Incorrect module installed (CJB/Instrument cluster) Target SID synchronisation 	<ul style="list-style-type: none"> Check CAN communications between CJB and instrument cluster. Check ignition, power and ground supplies to CJB and instrument cluster. Confirm correct module is installed. Re-synchronise ID by re-configuring the instrument cluster as a new module. Check CAN

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> error following re-programming Noise/EMC related error 	network for interference/EMC related issues
B1009-63	Ignition Authorisation - Circuit/component protection time-out	<ul style="list-style-type: none"> CJB fault Low speed CAN fault Instrument cluster fault Low battery voltage <9V 	<ul style="list-style-type: none"> Check Power and Ground supplies to CJB and instrument cluster. Check CAN communications between CJB and instrument cluster. Check battery is in fully charged and serviceable condition, refer to the battery care manual
B1009-64	Ignition Authorisation - Signal plausibility failure	<ul style="list-style-type: none"> CJB fault Low speed CAN fault Instrument cluster fault 	<ul style="list-style-type: none"> Check power and ground supplies to CJB and instrument cluster. Check CAN communications between CJB and instrument cluster
B102B-67	Passive Key - Signal incorrect after event	<ul style="list-style-type: none"> CJB fault Low speed CAN fault Remote Keyless Entry (RKE) module fault Write target SID synchronisation error following re-programming 	<ul style="list-style-type: none"> Check power and ground supplies to CJB and RKE module. Check CAN communications between CJB and RKE module. Re-synchronise ID by re-configuring the RKE module as a new module
B102B-87	Passive Key - Missing message	<ul style="list-style-type: none"> CJB fault Low speed CAN fault RKE module fault Key fob battery low/battery contact issue Interference from other RF signal EMC/noise Receiver fault Receiver not programmed correctly Serial communications fault (between receiver and RKE module) Key fault Passive antenna fault Confirm placement of key within vehicle 	<ul style="list-style-type: none"> Check power and ground supplies to CJB, RKE module and receiver. Check CAN communications between CJB and instrument cluster. Check key fob battery. Confirm vehicle surroundings, move vehicle. Check CAN network for interference/EMC related issues. Disconnect battery, then re-connect - confirm operation by re-programming keys. Check serial circuit between receiver and RKE module. Confirm spare key works. Refer to the electrical circuit diagrams and test circuits to all 3 antennas. Check whereabouts of key
B1084-13	Boot/Trunk Motor Close Switch - Circuit open	<ul style="list-style-type: none"> Trunk latch open signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check trunk latch open signal circuit for open circuit
B1087-83	LIN Bus "A" - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> Checksum of the received LIN frame from battery backed sounder, roof header console, and/or rain/light sensor is incorrect 	<ul style="list-style-type: none"> Check operation of rain/light sensor by covering sensor or applying water to screen, install a new sensor as required
B1087-88	LIN Bus "A" - Bus off	<ul style="list-style-type: none"> Bus off. Battery backed sounder, roof header console, and/or rain/light sensor LIN circuit - short to ground, power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check battery backed sounder, roof header console, and rain/light sensor LIN circuit for short to ground, power
B108A-11	Start Button - Circuit short to ground	<ul style="list-style-type: none"> Start/Stop switch analogue input circuits 1 or 2 - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Start/Stop switch analogue input circuits 1 and 2 for short to ground
B108A-12	Start Button - Circuit short to battery	<ul style="list-style-type: none"> Start/Stop switch analogue input circuits 1 or 2 - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Start/Stop switch analogue input circuits 1 and 2 for short to power
B1095-12	Wiper On/Off Relay - Circuit short to battery	<ul style="list-style-type: none"> Wiper On/Off relay control circuit - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check wiper On/Off relay control circuit for

DTC	Description	Possible Causes	Action
			short to power
B1095-14	Wiper On/Off Relay - Circuit short to ground or open	<ul style="list-style-type: none"> Wiper On/Off relay control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check wiper On/Off relay control circuit for short to ground, open circuit
B1096-12	Wiper High/Low Relay - Circuit short to battery	<ul style="list-style-type: none"> Wiper Fast/Slow relay control circuit - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check wiper Fast/Slow relay control circuit for short to power
B1096-14	Wiper High/Low Relay - Circuit short to ground or open	<ul style="list-style-type: none"> Wiper Fast/Slow relay control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check wiper Fast/Slow relay control circuit for short to ground, open circuit
B1097-12	Heated Windshield Relay - Circuit short to battery	<ul style="list-style-type: none"> Heated windshield relay control circuit - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check heated windshield relay control circuit for short to power
B1097-14	Heated Windshield Relay - Circuit short to ground or open	<ul style="list-style-type: none"> Heated windshield relay control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check heated windshield relay control circuit for short to ground, open circuit
B10A6-12	Main Light Switch - Circuit short to battery	<ul style="list-style-type: none"> Master light switch signal from roof header console circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check master light switch signal from roof header console circuit for short to power
B10A6-23	Main Light Switch - Signal stuck low	<ul style="list-style-type: none"> Master light switch signal from roof header console signal stuck low. Switch is read as ON for too long a time 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check master light switch signal from roof header console for short to ground
B10AD-09	Rain Sensor - Component failures	<ul style="list-style-type: none"> Component failures 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Suspect the rain/light sensor, check and install a new sensor as required
B10AD-11	Rain Sensor - Circuit short to ground	<ul style="list-style-type: none"> Rain/light sensor power circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check rain/light sensor power circuit for short to ground
B10AD-96	Rain Sensor - Component internal failure	<ul style="list-style-type: none"> Component internal failure 	<ul style="list-style-type: none"> Suspect the rain/light sensor, check and install a new sensor as required
B10E5-11	PCM Wake-up Signal - Circuit short to ground	<ul style="list-style-type: none"> ECM wake-up signal circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check ECM wake-up signal circuit for short to ground
B10E5-12	PCM Wake-up Signal - Circuit short to battery	<ul style="list-style-type: none"> ECM wake-up signal circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check ECM wake-up signal circuit for short to power
B10E5-13	PCM Wake-up Signal - Circuit open	<ul style="list-style-type: none"> ECM wake-up signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check ECM wake-up signal circuit for open circuit
B10F1-11	Key In Switch - Circuit short to ground	<ul style="list-style-type: none"> Keyless vehicle module, key IN status circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check keyless vehicle module, key IN status circuit for short to ground

DTC	Description	Possible Causes	Action
B10F1-12	Key In Switch - Circuit short to battery	<ul style="list-style-type: none"> Keyless vehicle module, key IN status circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check keyless vehicle module, key IN status circuit for short to power
B10F1-13	Key In Switch - Circuit open	<ul style="list-style-type: none"> Keyless vehicle module, key IN status circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check keyless vehicle module, key IN status circuit for open circuit
B10F2-11	Sunroof Control - Circuit short to ground	<ul style="list-style-type: none"> Sunroof enable signal circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check sunroof enable signal circuit for short to ground
B10F2-12	Sunroof Control - Circuit short to battery	<ul style="list-style-type: none"> Sunroof enable signal circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check sunroof enable signal circuit for short to power
B10F2-13	Sunroof Control - Circuit open	<ul style="list-style-type: none"> Sunroof enable signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check sunroof enable signal circuit for open circuit
B10F3-11	Left Front Position Light - Circuit short to ground	<ul style="list-style-type: none"> Left front side lamps circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left front side lamps circuit for short to ground
B10F3-15	Left Front Position Light - Circuit short to battery or open	<ul style="list-style-type: none"> Left front side lamps circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left front side lamps circuit for short to power, open circuit
B10F4-11	Right Front Position Light - Circuit short to ground	<ul style="list-style-type: none"> Right front side lamps circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right front side lamps circuit for short to ground
B10F4-15	Right Front Position Light - Circuit short to battery or open	<ul style="list-style-type: none"> Right front side lamps circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right front side lamps circuit for short to power, open circuit
B10F8-12	Accessory socket 'A' relay - Circuit short to battery	<ul style="list-style-type: none"> Accessory socket 'A' relay control circuit - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check accessory socket 'A' relay control circuit for short to power
B10F8-14	Accessory socket 'A' relay - Circuit short to ground or open	<ul style="list-style-type: none"> Accessory socket 'A' relay control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check accessory socket 'A' relay control circuit for short to ground, open circuit
B10F9-12	Accessory socket 'B' relay - Circuit short to battery	<ul style="list-style-type: none"> Front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits for short to power
B10F9-14	Accessory socket 'B' relay - Circuit short to ground or open	<ul style="list-style-type: none"> Front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits - short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits for short to ground, open circuit

DTC	Description	Possible Causes	Action
B10F9-93	Accessory socket 'B' relay - No operation	<ul style="list-style-type: none"> • Front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits - short to power, ground, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits for short to power, ground, open circuit
B10FA-93	Delayed Power Off relay - No operation	<ul style="list-style-type: none"> • ADRC ECM, roof header console lamp, glove box lamp , RH/LH footwell lamps, JAG Sense glove box module, RH/LH sunvisor lamps, rear dome lamps switched power circuits - short to power, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check ADRC ECM, roof header console lamp, glove box lamp , RH/LH footwell lamps, JAG Sense glove box module, RH/LH sunvisor lamps, rear dome lamps switched power circuits for short to power, open circuit
B10FF-11	Ignition control - Circuit short to ground	<ul style="list-style-type: none"> • ECM and FPDB ignition control circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check ECM and FPDB ignition control circuit for short to ground
B10FF-13	Ignition control - Circuit open	<ul style="list-style-type: none"> • ECM and FPDB ignition control circuit - open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check ECM and FPDB ignition control circuit for open circuit
B1100-11	O2 sensor heater relay - Circuit short to ground	<ul style="list-style-type: none"> • FPDB O2 sensor heater relay control circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check FPDB O2 sensor heater relay control circuit for short to ground
B113D-12	Sunroof Global Open/Close Control - Circuit short to battery	<ul style="list-style-type: none"> • Roof opening panel global open/close control circuit - short to power 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check roof opening panel global open/close control circuit for short to power
B113D-14	Sunroof Global Open/Close Control - Circuit short to ground or open	<ul style="list-style-type: none"> • Roof opening panel global open/close control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check roof opening panel global open/close control circuit for short to ground, open circuit
B1140-11	Engine Crank Authorisation - Circuit short to ground	<ul style="list-style-type: none"> • Engine crank authorisation signal circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check engine crank authorisation signal circuit for short to ground
B1142-11	Ignition Status 1 - Circuit short to ground	<ul style="list-style-type: none"> • Ignition supply 1 circuits - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check all ignition supply 1 circuits for short to ground
B1143-11	Ignition Status 2 - Circuit short to ground	<ul style="list-style-type: none"> • Ignition supply 2 circuits - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check all ignition supply 2 circuits for short to ground
B1144-11	Heated Steering Wheel Supply - Circuit short to ground	<ul style="list-style-type: none"> • Heated steering wheel supply circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check heated steering wheel supply circuit for short to ground

DTC	Description	Possible Causes	Action
B1145-11	Glovebox Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> Glovebox latch locking motor circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check glovebox latch locking motor circuit for short to ground
B1145-12	Glovebox Locking Motor - Circuit short to battery	<ul style="list-style-type: none"> Glovebox latch locking motor control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check glovebox latch locking motor control circuit for short to power
B1145-13	Glovebox Locking Motor - Circuit open	<ul style="list-style-type: none"> Glovebox latch locking motor control circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check glovebox latch locking motor control circuit for open circuit
B1146-12	Passive sounder Supply - Circuit short to battery	<ul style="list-style-type: none"> Security passive sounder control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check security passive sounder control circuit for short to power
B1146-14	Passive sounder Supply - Circuit short to ground or open	<ul style="list-style-type: none"> Security passive sounder control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check security passive sounder control circuit for short to ground, open circuit
B1158-11	Front Passenger Seat Heater Sensor - Circuit short to ground	<ul style="list-style-type: none"> Front passenger seat heater sensor circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front passenger seat heater sensor circuit for short to ground
B1158-13	Front Passenger Seat Heater Sensor - Circuit open	<ul style="list-style-type: none"> Front passenger seat heater sensor circuit - open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front passenger seat heater sensor circuit for open circuit
B1159-11	Driver Seat Heater Sensor - Circuit short to ground	<ul style="list-style-type: none"> Driver seat heater sensor circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat heater sensor circuit for short to ground
B1159-13	Driver Seat Heater Sensor - Circuit open	<ul style="list-style-type: none"> Driver seat heater sensor circuit - open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat heater sensor circuit for open circuit
B115A-11	Front Passenger Seat Heater - Circuit short to ground	<ul style="list-style-type: none"> Front passenger seat heater supply circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front passenger seat heater supply circuit for short to ground
B115A-15	Front Passenger Seat Heater - Circuit short to battery or open	<ul style="list-style-type: none"> Front passenger seat heater supply circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front passenger seat heater supply circuit for short to power, open circuit
B115B-11	Driver Seat Heater - Circuit short to ground	<ul style="list-style-type: none"> Driver seat heater supply circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat heater supply circuit for short to ground

DTC	Description	Possible Causes	Action
B115B-15	Driver Seat Heater - Circuit short to battery or open	<ul style="list-style-type: none"> Driver seat heater supply circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat heater supply circuit for short to power, open circuit
B1175-13	Driver Door Ajar Switch - Circuit open	<ul style="list-style-type: none"> Driver door ajar switch signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check driver door ajar switch signal circuit for open circuit
B1176-13	Passenger Door Ajar Switch - Circuit open	<ul style="list-style-type: none"> Passenger door ajar switch signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check passenger door ajar switch signal circuit for open circuit
B1177-12	Screenwash Level Switch - Circuit short to battery	<ul style="list-style-type: none"> Screenwash level switch signal circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check screenwash level switch signal circuit for short to power
B11C0-13	Driver Side Rear Door Ajar Switch - Circuit open	<ul style="list-style-type: none"> Left rear door ajar switch signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left rear door ajar switch signal circuit for open circuit
B11C1-13	Passenger Side Rear Door Ajar Switch - Circuit open	<ul style="list-style-type: none"> Right rear door ajar switch signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right rear door ajar switch signal circuit for open circuit
B1222-23	Master Lock/Unlock Switch - Signal stuck low	<ul style="list-style-type: none"> Master lock or unlock switch digital input circuit - signal stuck low 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check master lock and unlock switch digital input circuits for short to ground, open circuit
B1237-11	Gear Shift Module Early Wake-up - Circuit short to ground	<ul style="list-style-type: none"> Transmission shift module wake-up control circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check transmission shift module wake-up control circuit for short to ground
B1237-12	Gear Shift Module Early Wake-up - Circuit short to battery	<ul style="list-style-type: none"> Transmission shift module wake-up control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check transmission shift module wake-up control circuit for short to power
B1237-13	Gear Shift Module Early Wake-up - Circuit open	<ul style="list-style-type: none"> Transmission shift module wake-up control circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check transmission shift module wake-up control circuit for open circuit
B123E-13	Crank Enable - Circuit open	<ul style="list-style-type: none"> OK to crank signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check OK to crank signal circuit for open circuit
B1A85-96	Ambient Light Sensor - Component internal failure	<ul style="list-style-type: none"> Light sensor internal electronic failure 	<ul style="list-style-type: none"> Check and install a new sensor as required
B1C45-13	Front Wiper Park Position Switch - Circuit open	<ul style="list-style-type: none"> Windshield wiper motor park switch signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check windshield wiper motor park switch signal circuit for open circuit
B1C45-23	Front Wiper Park Position Switch - Signal stuck low	<ul style="list-style-type: none"> Signal stuck low 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check front wiper park position switch input circuit for short, open circuit
B1C78-12	Powerwash Relay - Circuit short to battery	<ul style="list-style-type: none"> Powerwash relay control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check powerwash relay control circuit for short to power
B1C78-14	Powerwash Relay - Circuit short to ground or open	<ul style="list-style-type: none"> Powerwash relay control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check powerwash relay control circuit for short to ground, open circuit

General Information - Diagnostic Trouble Code (DTC) Index DTC: Climate Control Module (HVAC)

Description and Operation

Climate Control Module



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Climate Control Module. For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Climate Control System](#) (412-00 Climate Control System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B105A-01	Cabin Temperature Sensor Fan - General electrical failure	<ul style="list-style-type: none"> Aspirator motor diagnostic circuit - short to ground, open circuit Aspirator fan component failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check aspirator motor diagnostic circuit for short to ground, open circuit
B1081-00	Left Temperature Damper Motor - No sub type information	<ul style="list-style-type: none"> Left hand blend stepper motor internal or external fault 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1081-49	Left Temperature Damper Motor - Internal electronic failure	<ul style="list-style-type: none"> Left hand blend stepper motor internal electronic failure 	<ul style="list-style-type: none"> Suspect the left hand blend stepper motor. Check and install a new stepper motor as required, refer to the new module/component installation note at the top of the DTC Index
B1082-00	Right Temperature Damper Motor - No sub type information	<ul style="list-style-type: none"> Right hand blend stepper motor internal or external fault 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
B1082-49	Right Temperature Damper Motor - Internal electronic failure	<ul style="list-style-type: none"> Right hand blend stepper motor internal electronic failure 	<ul style="list-style-type: none"> Suspect the right hand blend stepper motor. Check and install a new stepper motor as required, refer to the new module/component installation note at the top of the DTC Index
B1083-01	Recirculation Damper Motor - General electrical failure	<ul style="list-style-type: none"> RECIRC servo motor circuits - short to ground, power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check RECIRC servo motor circuit for short to ground, power, open circuit
B1085-00	Defroster Damper Motor - No sub type information	<ul style="list-style-type: none"> Defrost stepper motor internal or external fault 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1085-49	Defroster Damper Motor - Internal electronic failure	<ul style="list-style-type: none"> Defrost stepper motor internal electronic failure 	<ul style="list-style-type: none"> Suspect the defrost stepper motor. Check and install a new stepper motor as required, refer to the new module/component installation note at the top of the DTC Index
B1086-00	Air Distribution Damper Motor - No sub type information	<ul style="list-style-type: none"> Panel/foot stepper motor internal or external fault 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1086-49	Air Distribution Damper Motor - Internal electronic failure	<ul style="list-style-type: none"> Panel/foot stepper motor internal electronic failure 	<ul style="list-style-type: none"> Suspect the panel/foot stepper motor. Check and install a new stepper motor as required, refer to the new module/component installation note at the top of the DTC Index
B1087-88	LIN Bus "A" - Bus off	<ul style="list-style-type: none"> LIN Bus power #1 circuit - open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check LIN Bus power #1 circuit for open circuit
B1088-88	LIN Bus "B" - Bus off	<ul style="list-style-type: none"> LIN Bus power #2 circuit - open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check LIN Bus power #2 circuit for open circuit
B11ED-68	Electric Heater Control Module - Event information	<ul style="list-style-type: none"> Event information. Electric heater - invalid communication message 	<ul style="list-style-type: none"> Clear DTC. With engine coolant temperature low, set climate temperature to high and re-test. If DTC remains in isolation suspect the PTC heater, check and install a new heater as required, refer to the new module/component installation note at the top of the DTC Index. If additional LIN related DTCs are logged refer to the Actions for these DTCs
B11ED-87	Electric Heater Control Module - Missing message	<ul style="list-style-type: none"> Electric heater - missing communication message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B11ED-96	Electric Heater Control Module - Component internal failure	<ul style="list-style-type: none"> Component internal failure 	<ul style="list-style-type: none"> Suspect the PTC heater, check and install a new heater as required, refer to the new module/component installation note at the top of the DTC Index
B11ED-98	Electric Heater Control Module - Component or system over temperature	<ul style="list-style-type: none"> Component or system over temperature 	<ul style="list-style-type: none"> Clear DTC. With engine coolant temperature low, set climate temperature to high and re-test. If DTC remains suspect the PTC heater, check and install a new heater as required, refer to the new module/component installation note at the top of the DTC Index
B11EE-01	A/C Compressor - General electrical failure	<ul style="list-style-type: none"> Air conditioning compressor clutch solenoid circuits - short to ground, power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check air conditioning compressor clutch solenoid circuits for short to ground, power, open circuit

DTC	Description	Possible Causes	Action
B11F0-11	Air Intake Damper Position Sensor - Circuit short to ground	<ul style="list-style-type: none"> • RECIRC servo motor air intake feedback and 5 volt supply circuits - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check RECIRC servo motor air intake feedback and 5 volt supply circuits for short to ground
B11F0-15	Air Intake Damper Position Sensor - Circuit short to battery or open	<ul style="list-style-type: none"> • RECIRC servo motor air intake feedback and ground circuits - short to power, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check RECIRC servo motor air intake feedback and ground circuits for short to power, open circuit
B11F8-00	Left Outer Vent - No sub type information	<ul style="list-style-type: none"> • Left outer IP vent actuator internal or external fault 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B11F8-49	Left Outer Vent - Internal electronic failure	<ul style="list-style-type: none"> • Left outer IP vent actuator internal electronic failure 	<ul style="list-style-type: none"> • Suspect the left outer IP vent actuator. Check and install a new actuator as required, refer to the new module/component installation note at the top of the DTC Index
B11F9-00	Left Inner Vent - No sub type information	<ul style="list-style-type: none"> • Left inner IP vent actuator internal or external fault 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B11F9-49	Left Inner Vent - Internal electronic failure	<ul style="list-style-type: none"> • Left inner IP vent actuator internal electronic failure 	<ul style="list-style-type: none"> • Suspect the left inner IP vent actuator. Check and install a new actuator as required, refer to the new module/component installation note at the top of the DTC Index
B11FA-00	Right Inner Vent - No sub type information	<ul style="list-style-type: none"> • Right inner IP vent actuator internal or external fault 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B11FA-49	Right Inner Vent - Internal electronic failure	<ul style="list-style-type: none"> • Right inner IP vent actuator internal electronic failure 	<ul style="list-style-type: none"> • Suspect the right inner IP vent actuator. Check and install a new actuator as required, refer to the new module/component installation note at the top of the DTC Index
B11FB-00	Right Outer Vent - No sub type information	<ul style="list-style-type: none"> • Right outer IP vent actuator internal or external fault 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B11FB-49	Right Outer Vent - Internal electronic failure	<ul style="list-style-type: none"> • Right outer IP vent actuator internal electronic failure 	<ul style="list-style-type: none"> • Suspect the right outer IP vent actuator. Check and install a new actuator as required, refer to the new module/component installation note at the top of the DTC Index
B11FF-84	A/C Refrigerant Pressure - Signal below allowable range	<ul style="list-style-type: none"> • Signal below allowable range. A/C System Refrigerant Pressure too low 	<ul style="list-style-type: none"> • This DTC can be logged by the system due to low ambient temperature soak (below 3°C) reducing the pressure in the refrigerant gas system. If the cabin temperature logged along with the DTC at the time is below 10°C this could indicate low temperature. If the air conditioning performance is satisfactory and the in-cabin temperature is below 10°C then it is likely that the system contains a suitable amount of gas and the DTC is being recorded as an effect of the low ambient temperature. If this is not the case carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check air conditioning pressure sensor circuits for short, open circuit. Check for correct charge weight
B11FF-85	A/C Refrigerant Pressure - Signal above allowable range	<ul style="list-style-type: none"> • Signal above allowable range. A/C System Refrigerant pressure too high 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check air conditioning pressure sensor circuits for short, open circuit

DTC	Description	Possible Causes	Action
B1A59-11	Sensor 5 Volt Supply - Circuit short to ground	<ul style="list-style-type: none"> Air conditioning pressure sensor or RECIRC servo motor 5 volt supply circuits - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check air conditioning pressure sensor and RECIRC servo motor 5 volt supply circuits for short to ground
B1A59-13	Sensor 5 Volt Supply - Circuit open	<ul style="list-style-type: none"> Air conditioning pressure sensor 5 volt supply circuits - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check air conditioning pressure sensor 5 volt supply circuit for open circuit
B1A60-11	Pollution Sensor - Hydrocarbon - Circuit short to ground	<ul style="list-style-type: none"> Pollution sensor hydrocarbon input circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check pollution sensor hydrocarbon input circuit for short to ground
B1A61-11	Cabin Temperature Sensor - Circuit short to ground	<ul style="list-style-type: none"> In car temperature sensor circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check In car temperature sensor circuit for short to ground
B1A61-15	Cabin Temperature Sensor - Circuit short to battery or open	<ul style="list-style-type: none"> In car temperature sensor circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check In car temperature sensor circuit for short to power, open circuit
B1A63-11	Right Solar Sensor - Circuit short to ground	<ul style="list-style-type: none"> Right sun load sensor signal circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right sun load sensor signal circuit for short to ground
B1A64-11	Left Solar Sensor - Circuit short to ground	<ul style="list-style-type: none"> Left sun load sensor signal circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left sun load sensor signal circuit for short to ground
B1A67-13	Sensor Ground - Circuit open	<ul style="list-style-type: none"> Sensor ground circuits - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check sensor ground circuits for open circuit
B1A69-01	Humidity Sensor - General electrical failure	<ul style="list-style-type: none"> Humidity sensor PWM input circuit - short to ground, power, open circuit Sensor component failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check humidity sensor PWM input circuit for short to ground, power, open circuit. Check and install a new sensor as required
B1B62-11	Pollution Sensor - NOx - Circuit short to ground	<ul style="list-style-type: none"> Pollution sensor NOx input circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check pollution sensor NOx input circuit for short to ground
B1B71-11	Evaporator Temperature Sensor - Circuit short to ground	<ul style="list-style-type: none"> Evaporator temperature sensor signal circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check evaporator temperature sensor signal circuit for short to ground
B1B71-15	Evaporator Temperature Sensor - Circuit short to battery or open	<ul style="list-style-type: none"> Evaporator temperature sensor signal circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check evaporator temperature sensor signal circuit for short to power, open circuit
B1B72-11	LIN Bus #1 Power Supply Circuit - Circuit short to ground	<ul style="list-style-type: none"> Stepper motor circuit LIN Bus #1 power supply - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check stepper motor circuit LIN Bus #1 power supply for short to ground
C1B14-13	Sensor Supply Voltage A - Circuit open	<ul style="list-style-type: none"> RECIRC servo motor 5 volt supply circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check RECIRC servo motor 5 volt supply circuit for open circuit

DTC	Description	Possible Causes	Action
C1B15-13	Sensor Supply Voltage B - Circuit open	<ul style="list-style-type: none"> RECIRC servo motor and EVAP sensor ground circuits - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check RECIRC servo motor and EVAP sensor ground circuits for open circuit
P0530-11	A/C Refrigerant Pressure Sensor A Circuit - Circuit short to ground	<ul style="list-style-type: none"> Air conditioning pressure sensor signal circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check air conditioning pressure sensor signal circuit for short to ground
P0530-15	A/C Refrigerant Pressure Sensor A Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> Air conditioning pressure sensor signal circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check air conditioning pressure sensor signal circuit for short to power, open circuit
U0010-88	Medium Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> Bus off 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> Invalid configuration message is received 	<ul style="list-style-type: none"> Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC is still logged suspect the climate control module, refer to the new module/component installation note at the top of the DTC Index
U1A14-49	CAN Initialisation Failure - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the climate control module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-55	Control Module - Not configured	<ul style="list-style-type: none"> Incorrect car configuration data received 	<ul style="list-style-type: none"> Re-configure the RJB using the manufacturer approved diagnostic system. Clear DTC and re-test. If the DTC remains suspect the climate control module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-87	Control Module - Missing message	<ul style="list-style-type: none"> Missing message 	<ul style="list-style-type: none"> Re-configure the RJB using the manufacturer approved diagnostic system. Check climate control module for DTCs and refer to the DTC Index. Carry out CAN network integrity tests using the manufacturer approved diagnostic system. If DTC remains suspect the climate control module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3002-81	Vehicle Identification Number - Invalid serial data received	<ul style="list-style-type: none"> Vehicle/component mis-match. Corrupt VIN data being transmitted, module previously installed to other vehicle 	<ul style="list-style-type: none"> Check and install original/new module as required, refer to the new module/component installation note at the top of the DTC Index

General Information - Diagnostic Trouble Code (DTC) Index DTC: Digital Audio Broadcast Module (DABM)

Description and Operation

Digital Audio Broadcast Module (DABM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

The table below lists all diagnostic trouble codes (DTCs) that could be logged on the digital audio broadcast module, for additional diagnosis and testing information refer to the relevant diagnosis and testing section.

For additional information, refer to: Information and Entertainment System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B11A4-11	L-Band Antenna - Circuit short to ground	<ul style="list-style-type: none"> Digital audio broadcast L-band antenna circuit - short circuit to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check digital audio broadcast L-band antenna circuit for short circuit to ground
B11A4-15	L-Band Antenna - Circuit short to battery or open	<ul style="list-style-type: none"> Digital audio broadcast L-band antenna circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check digital audio broadcast L-band antenna circuit for short circuit to power, open circuit, high resistance
B11A5-11	Band 3 Antenna - Circuit short to ground	<ul style="list-style-type: none"> Digital audio broadcast band 3 antenna circuit - short circuit to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check digital audio broadcast band 3 antenna circuit for short circuit to ground
B11A5-15	Band 3 Antenna - Circuit short to battery or open	<ul style="list-style-type: none"> Digital audio broadcast band 3 antenna circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check digital audio broadcast band 3 antenna circuit for short circuit to power, open circuit, high resistance

General Information - Diagnostic Trouble Code (DTC) Index DTC: Driver Door Module/Passenger Door Module (DDM/PDM)

Description and Operation

Driver/Passenger Door Module (DDM/PDM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Driver/Passenger Door Modules (DDM/PDM). For additional diagnosis and testing information refer to the relevant diagnosis and testing section. For additional information, refer to: Driver Door Module (DDM) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B108F-23	Cabin Lock/Unlock Switch - Signal stuck low	<ul style="list-style-type: none"> Cabin lock/unlock switch signal stuck Switch pressed for longer than 20 seconds Switch circuit short circuit to power or ground Switch failure 	<ul style="list-style-type: none"> Check the switch operation and serviceability. Refer to the electrical circuit diagrams and check the switch circuit
B109C-11	Front Courtesy Light - Circuit short to ground	<ul style="list-style-type: none"> Short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test front courtesy light circuit for short to ground
B109C-15	Front Courtesy Light - Circuit short to battery or open	<ul style="list-style-type: none"> Short to power or open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test front courtesy light circuit for short to power or open circuit
B10EB-11	Driver Door Double Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> Short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test driver door double locking motor circuit for short to ground

DTC	Description	Possible Causes	Action
B10EB-15	Driver Door Double Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test driver door double locking motor circuit for short to power or open circuit
B10EC-11	Passenger Door Double Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test passenger door double locking motor circuit for short to ground
B10EC-15	Passenger Door Double Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test passenger door double locking motor circuit for short to power or open circuit
B10ED-11	Rear Door Driver Side Double Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Rear driver door double locking motor circuit short circuit to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the circuit
B10ED-15	Rear Door Driver Side Double Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Rear driver door double locking motor circuit short circuit to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the circuit
B10EE-11	Rear Door Passenger Side Double Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Rear passenger door double locking motor circuit short circuit to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the circuit
B10EE-15	Rear Door Passenger Side Double Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Rear passenger door double locking motor circuit short circuit to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the circuit
B1108-11	Driver Door Central Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test driver door central locking motor circuit for short to ground
B1108-15	Driver Door Central Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test driver door central locking motor circuit for short to power or open circuit
B1109-11	Passenger Door Central Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test passenger door central locking motor circuit for short to ground
B1109-15	Passenger Door Central Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test passenger door central locking motor circuit for short to power or open circuit
B110A-11	Rear Door Driver Side Central Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Rear driver door central locking motor circuit short circuit to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the circuit
B110A-15	Rear Door Driver Side Central Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Rear driver door central locking motor circuit short circuit to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the circuit
B110B-11	Rear Door Passenger Side Central Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Rear passenger door central locking motor circuit short circuit to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the circuit
B110B-15	Rear Door Passenger Side Central Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Rear passenger door central locking motor circuit short circuit to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the circuit
B1163-11	Left Mirror Heater Output Short To Ground - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test left mirror heater output circuit for short to ground

DTC	Description	Possible Causes	Action
B1163-15	Left Mirror Heater Output Short To Power - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test left mirror heater output circuit for short to power or open circuit
B1164-11	Right Mirror Heater Output Short To Ground - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test right mirror heater output circuit for short to ground
B1164-15	Right Mirror Heater Output Short To Power - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test right mirror heater output circuit for short to power or open circuit
B1165-11	Left Front Puddle Lamp Output Short To Ground - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test left front puddle lamp output circuit for short to ground
B1165-15	Left Front Puddle Lamp Output Open Load Or Short To Power - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test left front puddle lamp output circuit for short to power or open circuit
B1166-11	Right Front Puddle Lamp Output Short To Ground - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test right front puddle lamp output circuit for short to ground
B1166-15	Right Front Puddle Lamp Output Open Load Or Short To Battery - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test right front puddle lamp output circuit for short to power or open circuit
B117C-07	Rear Power Window Up - Mechanical Failures	<ul style="list-style-type: none"> • Set when window is reversed during window up due to mechanical problems, window channel restriction preventing window closure or Window mechanism fault 	<ul style="list-style-type: none"> • Check for mechanical problems with the window operation. Check for obstructions in the window channels and that the glass is not restricted in the full range of travel
B117C-72	Rear Power Window Up - Actuator stuck open	<ul style="list-style-type: none"> • Door module internal relay sticking open 	<ul style="list-style-type: none"> • Renew the relevant rear door module. Refer to the warranty policy and procedures manual if a module is suspect
B117C-73	Rear Power Window Up - Actuator stuck closed	<ul style="list-style-type: none"> • Door module internal relay sticking closed 	<ul style="list-style-type: none"> • Renew the relevant rear door module. Refer to the warranty policy and procedures manual if a module is suspect
B117C-92	Rear Power Window Up - Performance or incorrect operation	<ul style="list-style-type: none"> • Set when auto window up was interrupted (e.g. by pressing local switch) 	<ul style="list-style-type: none"> • Check the window operation. Clear the DTC and retest
B117D-72	Rear Power Window Down - Actuator stuck open	<ul style="list-style-type: none"> • Door module internal relay sticking open 	<ul style="list-style-type: none"> • Renew the relevant rear door module. Refer to the warranty policy and procedures manual if a module is suspect
B117D-73	Rear Power Window Down - Actuator stuck closed	<ul style="list-style-type: none"> • Door module internal relay sticking closed 	<ul style="list-style-type: none"> • Renew the relevant rear door module. Refer to the warranty policy and procedures manual if a module is suspect
B117E-07	Front Power Window Up - Mechanical Failures	<ul style="list-style-type: none"> • Set when window is reversed during window up due to mechanical problems, window channel restriction preventing window closure or Window mechanism fault 	<ul style="list-style-type: none"> • Check for mechanical problems with the window operation. Check for obstructions in the window channels and that the glass is not restricted in the full range of travel

DTC	Description	Possible Causes	Action
B117E-72	Front Power Window Up - Actuator stuck open	<ul style="list-style-type: none"> • Door module internal relay sticking open 	<ul style="list-style-type: none"> • Renew the relevant front door module. Refer to the warranty policy and procedures manual if a module is suspect
B117E-73	Front Power Window Up - Actuator stuck closed	<ul style="list-style-type: none"> • Door module internal relay sticking closed 	<ul style="list-style-type: none"> • Renew the relevant front door module. Refer to the warranty policy and procedures manual if a module is suspect
B117E-92	Front Power Window Up - Performance or incorrect operation	<ul style="list-style-type: none"> • Set when auto window up was interrupted (e.g. by pressing local switch) 	<ul style="list-style-type: none"> • Check the window operation. Clear the DTC and retest
B117F-72	Front Power Window Down - Actuator stuck open	<ul style="list-style-type: none"> • Door module internal relay sticking open 	<ul style="list-style-type: none"> • Renew the relevant front door module. Refer to the warranty policy and procedures manual if a module is suspect
B117F-73	Front Power Window Down - Actuator stuck closed	<ul style="list-style-type: none"> • Door module internal relay sticking closed 	<ul style="list-style-type: none"> • Renew the relevant front door module. Refer to the warranty policy and procedures manual if a module is suspect
B1189-29	Front Window Position Sensor - Signal invalid	<ul style="list-style-type: none"> • Missing signal from hall sensor 1 or 2 • Sensor circuit fault • Hall sensor fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the hall sensor circuit between the door module and window motor. Repair as necessary. If the problem persists, renew the window motor
B118A-29	Rear Window Position Sensor - Signal invalid	<ul style="list-style-type: none"> • Missing signal from hall sensor 1 or 2 • Sensor circuit fault • Hall sensor fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the hall sensor circuit between the door module and window motor. Repair as necessary. If the problem persists, renew the window motor
B11D1-83	LIN Bus "C" - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> • LIN Bus checksum error; driver switchpack internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the LIN Bus circuit between the driver door window switch and the door module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the driver door window switch
B11D1-86	LIN Bus "C" - Signal invalid	<ul style="list-style-type: none"> • LIN Bus header error; driver switchpack internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the LIN Bus circuit between the driver door window switch and the door module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the driver door window switch
B11D1-87	LIN Bus "C" - Missing message	<ul style="list-style-type: none"> • Slave node LIN communication missing; driver switchpack internal fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the LIN Bus circuit between the driver door window switch and the door module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the driver door window switch
B11F6-11	Driver Folding Mirror Motor - Circuit short to ground	<ul style="list-style-type: none"> • Driver folding mirror motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror fold circuit between the drivers door module and the mirror assembly. Repair as necessary
B11F6-15	Driver Folding Mirror Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver mirror heater output circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror fold circuit between the drivers door module and the mirror assembly. Repair as necessary

DTC	Description	Possible Causes	Action
B11F7-11	Passenger Folding Mirror Motor - Circuit short to ground	<ul style="list-style-type: none"> • Passenger folding mirror motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror fold circuit between the passenger door module and the mirror assembly. Repair as necessary
B11F7-15	Passenger Folding Mirror Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Passenger mirror heater output circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror fold circuit between the passenger door module and the mirror assembly. Repair as necessary
B1A98-83	LIN Bus Circuit #1 - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Value of signal protection calculation incorrect 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the LIN Bus circuit between the rear door control unit and the Driver Door Module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the rear door control module
B1A98-86	LIN Bus Circuit #1 - Signal invalid	<ul style="list-style-type: none"> • Signal invalid 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the LIN Bus circuit between the rear door control unit and the Driver Door Module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the rear door control module
B1A98-87	LIN Bus Circuit #1 - Missing message	<ul style="list-style-type: none"> • Missing message 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the LIN Bus circuit between the rear door control unit and the Driver Door Module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the rear door control module
B1C09-11	Driver Left/Right Mirror Motor Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to ground • Mirror left/right motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the drivers door module and the mirror assembly. Repair as necessary
B1C09-15	Driver Left/Right Mirror Motor Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to power or open circuit • Mirror left/right motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the drivers door module and the mirror assembly. Repair as necessary
B1C10-11	Driver Up/Down Mirror Motor Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the drivers door module and the mirror assembly. Repair as necessary
B1C10-15	Driver Up/Down Mirror Motor Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the drivers door module and the mirror assembly. Repair as necessary
B1C11-11	Passenger Left/Right Mirror Motor Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary
B1C11-15	Passenger Left/Right Mirror Motor Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary
B1C12-11	Passenger Up/Down Mirror Motor Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary

General Information - Diagnostic Trouble Code (DTC) Index DTC: Driver/Passenger Seat Module (DSM/PSM)

Description and Operation

Driver/Passenger Seat Module (DSM/PSM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Driver/Passenger Seat Module (DSM/PSM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual.

For additional information, refer to: [Seats](#) (501-10 Seating, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B105F-11	Seat Cushion Extension Motor Output - Circuit short to ground	<ul style="list-style-type: none"> Driver seat cushion extension motor circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat cushion extension motor circuit for short to ground
B105F-15	Seat Cushion Extension Motor Output - Circuit short to battery or open	<ul style="list-style-type: none"> Driver seat cushion extension motor circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat cushion extension motor circuit for short to power, open circuit
B1060-11	Seat Headrest Motor Output - Circuit short to ground	<ul style="list-style-type: none"> Driver seat headrest motor circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat headrest motor circuit for short to ground

DTC	Description	Possible Causes	Action
B1060-15	Seat Headrest Motor Output - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver seat headrest motor circuit - short to power, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat headrest motor circuit for short to power, open circuit
B1063-31	Seat Cushion Extension Motor Speed/Position Sensor - No signal	<ul style="list-style-type: none"> • Harness/connector problem • No signal from sensor • Sensor/motor malfunction 	<ul style="list-style-type: none"> • Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat cushion motor sensor circuit. Repair circuit as required. Clear DTC and retest
B1064-31	Seat Headrest Motor Speed/Position Sensor - No signal	<ul style="list-style-type: none"> • Harness/connector problem • No signal from sensor • Sensor/motor malfunction 	<ul style="list-style-type: none"> • Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat headrest motor sensor circuit. Repair circuit as required. Clear DTC and retest
B1065-24	Cushion extend switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and cushion extend circuit for short to ground
B1066-24	Cushion retract switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and cushion retract circuit for short to ground
B106D-24	Headrest up switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and headrest up circuit for short to ground
B106E-24	Headrest down switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and headrest down circuit for short to ground
B1A98-83	LIN Bus Circuit #1 - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Value of signal protection calculation incorrect 	<ul style="list-style-type: none"> • Check LIN network for interference/EMC related issues
B1A98-86	LIN Bus Circuit #1 - Signal invalid	<ul style="list-style-type: none"> • LIN bus Header error 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check LIN network for interference/EMC related issues
B1A98-87	LIN Bus Circuit #1 - Missing message	<ul style="list-style-type: none"> • Slave node communication missing. LIN bus circuit - short to ground, power, open circuit (ECU Types 7 & 8) 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test LIN Bus between seat switch pack and control module for short to ground, power, open circuit, check power and ground supplies to switch pack
B1A98-88	LIN Bus Circuit #1 - Bus off	<ul style="list-style-type: none"> • Bus off 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and test LIN Bus between seat switch pack and control module for short to ground or power

DTC	Description	Possible Causes	Action
B1B86-11	Seat Height Motor Relay - Circuit short to ground	<ul style="list-style-type: none"> • Driver seat parallel height motor circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat parallel height motor circuit for short to ground
B1B86-15	Seat Height Motor Relay - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver seat parallel height motor circuit - short to power, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat parallel height motor circuit for short to power, open circuit
B1B87-31	Seat Height Motor Speed/Position Sensor - No signal	<ul style="list-style-type: none"> • Harness/connector problem • No signal from sensor • Sensor/motor malfunction 	<ul style="list-style-type: none"> • Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat height motor sensor circuit. Repair circuit as required. Clear DTC and retest
B1B88-11	Seat Slide Motor Relay - Circuit short to ground	<ul style="list-style-type: none"> • Driver seat slide motor circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat slide motor circuit for short to ground
B1B88-15	Seat Slide Motor Relay - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver seat slide motor circuit - short to power, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat slide motor circuit for short to power, open circuit
B1B89-31	Seat Slide Motor Speed/Position Sensor - No signal	<ul style="list-style-type: none"> • Harness/connector problem • No signal from sensor • Sensor/motor malfunction 	<ul style="list-style-type: none"> • Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat slide motor speed sensor circuit. Repair circuit as required. Clear DTC and retest
B1B90-11	Seat Tilt Motor Relay - Circuit short to ground	<ul style="list-style-type: none"> • Driver seat tilt motor circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat tilt motor circuit for short to ground
B1B90-15	Seat Tilt Motor Relay - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver seat tilt motor circuit - short to power, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat tilt motor circuit for short to power, open circuit
B1B91-31	Seat Tilt Motor Speed/Position Sensor - No signal	<ul style="list-style-type: none"> • Harness/connector problem • No signal from sensor • Sensor/motor malfunction 	<ul style="list-style-type: none"> • Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat tilt motor speed sensor circuit. Repair circuit as required. Clear DTC and retest
B1B92-11	Seat Recline Motor Relay - Circuit short to ground	<ul style="list-style-type: none"> • Driver seat recline motor circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat recline motor circuit for short to ground

DTC	Description	Possible Causes	Action
B1B92-15	Seat Recline Motor Relay - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver seat recline motor circuit - short to power, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat recline motor circuit for short to power, open circuit
B1B93-31	Seat Recline Motor Speed/Position Sensor - No signal	<ul style="list-style-type: none"> • Harness/connector problem • No signal from sensor • Sensor/motor malfunction 	<ul style="list-style-type: none"> • Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat recline motor speed sensor circuit. Repair circuit as required. Clear DTC and retest
B1B94-24	Seat Height Up Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat height up circuit for short to ground
B1B95-24	Seat Height Down Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat height down circuit for short to ground
B1B96-24	Seat Slide Forward Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat slide forward circuit for short to ground
B1B97-24	Seat Slide Backward Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat slide backward circuit for short to ground
B1B98-24	Seat Tilt Up Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat tilt up circuit for short to ground
B1B99-24	Seat Tilt Down Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat tilt down circuit for short to ground
B1C00-24	Seat Recline Up Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat recline up circuit for short to ground
B1C01-24	Seat Recline Down Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and check seat recline down circuit for short to ground
B1C02-24	Memory Store Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit

DTC	Description	Possible Causes	Action
B1C03-24	Memory #1 Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit
B1C04-24	Memory #2 Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit
B1C05-24	Memory #3 Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high 	<ul style="list-style-type: none"> • Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit
U0010-88	Medium speed Can communication Bus - Bus off	<ul style="list-style-type: none"> • Bus off 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CAN network to climate controlled seat module for short, open circuit
U0140-00	Lost communication with CJB - No sub type information	<ul style="list-style-type: none"> • Lost communication with CJB 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CJB for related DTCs and refer to the relevant DTC Index
U0142-00	Lost communication with RJB - No sub type information	<ul style="list-style-type: none"> • Lost communication with RJB 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check RJB for related DTCs and refer to the relevant DTC Index
U0155-00	Lost communications with instrument cluster - No sub type information	<ul style="list-style-type: none"> • Lost communications with instrument cluster 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CAN network to climate controlled seat module and instrument cluster for short, open circuit
U0199-00	Lost communication with Driver Door Module (DDM) - No sub type information	<ul style="list-style-type: none"> • Lost communication with DDM 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U0300-00	Internal control module software incompatibility - No sub type information	<ul style="list-style-type: none"> • Invalid configuration message is received 	<ul style="list-style-type: none"> • Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC is still logged suspect the DSM/PSM, refer to the new module installation note at the top of the DTC Index
U1A14-49	CAN Initialisation failure - Internal electronic failure	<ul style="list-style-type: none"> • Internal electronic failure 	<ul style="list-style-type: none"> • Install a new DSM, refer to the new module installation note at the top of the DTC Index
U1A4C-68	Build/end of line mode active - Event information	<ul style="list-style-type: none"> • Manufacturing mode has not been removed 	<ul style="list-style-type: none"> • Place DSM in to customer mode using manufacturer approved diagnostic system
U3000-49	Control module - Internal electronic failure	<ul style="list-style-type: none"> • Internal electronic failure 	<ul style="list-style-type: none"> • Install a new DSM, refer to the new module installation note at the top of the DTC Index

DTC	Description	Possible Causes	Action
U3000-55	Stored vehicle configuration data does not match - Not configured	<ul style="list-style-type: none"> • Incorrect car configuration data received 	<ul style="list-style-type: none"> • Re-configure the RJB using the manufacturer approved diagnostic system. Clear DTC and re-test. If the DTC remains suspect the DSM, refer to the new module installation note at the top of the DTC Index
U3000-87	Control Module - Missing message	<ul style="list-style-type: none"> • Missing message 	<ul style="list-style-type: none"> • Re-configure the RJB using the manufacturer approved diagnostic system. Check DSM for DTCs and refer to the DTC Index. Check CAN network integrity using the manufacturer approved diagnostic system
U3001-46	Control module improper shutdown - Calibration/parameter memory failure	<ul style="list-style-type: none"> • Calibration/parameter memory failure 	<ul style="list-style-type: none"> • Check for DTCs that could indicate power failure to the module and refer to the DTC Index
U3002-81	Vehicle Identification Number (VIN) - Invalid serial data received	<ul style="list-style-type: none"> • Vehicle/component mis-match. Corrupt VIN data being transmitted, module previously installed to other vehicle 	<ul style="list-style-type: none"> • Install original module, check for DTCs and refer to relevant DTC Index
U3003-16	Battery Voltage - Circuit voltage below threshold	<ul style="list-style-type: none"> • Circuit voltage below threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U3003-17	Battery Voltage - Circuit voltage above threshold	<ul style="list-style-type: none"> • Circuit voltage above threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

General Information - Diagnostic Trouble Code (DTC) Index DTC: Electric Parking Brake (PBM)

Description and Operation

Electric Parking Brake (PBM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSM's which may be valid for the specific customer complaint and carry out the recommendations as needed.


The table below lists all diagnostic trouble codes (DTCs) that could be logged in the electric parking brake module, for additional diagnosis and testing information refer to the relevant diagnosis and testing section.




For additional information, refer to: Parking Brake (206-05 Parking Brake and Actuation, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
P1536-62	Parking Brake Switch Circuit - Signal compare failure	<ul style="list-style-type: none"> Wiring harness fault Switch internal fault 	<ul style="list-style-type: none"> All signals from the switch are active at the same time. Refer to the electrical circuit diagrams and check all the switch apply, release and return circuits for short circuit or open circuit. Repair wiring harness as required If no fault with wiring harness suspect switch has an internal fault. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
P1536-66	Parking Brake Switch Circuit - Signal has too many transitions / events	<ul style="list-style-type: none"> System abuse Wiring harness fault Switch internal fault 	<p>NOTE: The Electric Parking Brake system will be locked out if the module receives more than 30 apply/release requests within 1 minute.</p> <ul style="list-style-type: none"> Cycle the ignition to clear the fault mode. Clear the DTC and test the system Refer to the electrical circuit diagrams and check all the switch apply, release and return circuits for intermittent short circuit or open circuit. Repair wiring harness as required If there are no wiring faults and the DTC resets

DTC	Description	Possible Causes	Action
			suspect the switch. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
P1571-64	Brake Switch - Signal plausibility failure	<ul style="list-style-type: none"> Wiring harness fault Brake pedal switch fault 	<ul style="list-style-type: none"> The signal from the hardwired brake pedal switch does not agree with the brake status message broadcast on CAN. Refer to the electrical circuit diagrams and check the brake pedal switch circuits for short circuit or open circuit. Repair wiring harness as required If there are no wiring harness faults suspect switch. Refer to the Warranty Policy and Procedures manual if a module/component is suspect
C1127-31	Position Sensor - No Signal	<ul style="list-style-type: none"> Parking brake motor hall effect position sensor power circuit fault Parking brake motor hall effect position sensor ground circuit fault Parking brake motor hall effect position sensor signal circuit fault Mechanical fault with sensor/actuator 	<ul style="list-style-type: none"> Inspect mechanical linkages for faults/damage. Repair as required. Refer to the electrical circuit diagrams and check parking brake motor hall effect position sensor circuits for short, open circuit. Check and install a new sensor actuator as required
C1129-39	Actuator engage - Incorrect has too few pulses	<ul style="list-style-type: none"> Motor engage current reached before full apply travel distance Service brake adjustment incorrect after brake lining replacement Brake cables broken, seized, trapped. Caliper malfunction 	<ul style="list-style-type: none"> Carry out parking brake calibration procedure. check for mechanical failure of parking brake system
C1129-3A	Actuator engage - Incorrect has too many pulses	<ul style="list-style-type: none"> Motor engage current not reached or travelled too far upon apply Service brake adjustment incorrect after brake lining replacement Brake cables broken, seized, trapped Caliper malfunction 	<ul style="list-style-type: none"> Carry out parking brake calibration procedure. check for mechanical failure of parking brake system
C112A-39	Actuator disengage - Incorrect has too few pulses	<ul style="list-style-type: none"> Intermittent motor or circuit - open circuit Actuator malfunction 	<ul style="list-style-type: none"> Check for additional motor or circuit DTCs and refer to DTC index. check for mechanical failure of parking brake
C1D00-11	Park brake apply switch - Circuit short to ground	<ul style="list-style-type: none"> Connector fault - bent, loose or corroded pin(s) Harness fault - short to ground Switch fault 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check the switch primary and secondary apply circuits for short to ground. Repair circuit faults or install a new switch as required
C1D00-15	Park brake apply switch circuit - Circuit short to battery or open	<ul style="list-style-type: none"> Connector fault - bent, loose or corroded pin(s) Harness fault - short to power or open circuit Switch fault 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check the switch primary and secondary apply circuits for short to power or open circuit. Repair circuit faults or install a new switch as required
C1D00-1C	Park brake apply switch - Voltage out of range	<ul style="list-style-type: none"> Connector fault - bent, loose or corroded pin(s) Harness fault - low resistance to ground Switch fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test primary parking brake apply switch circuits for short to ground Check and install a new switch as required

DTC	Description	Possible Causes	Action
C1D00-62	Park brake apply switch - Signal compare failure	<ul style="list-style-type: none"> Connector fault - bent, loose or corroded pin(s) Harness fault Switch fault 	<ul style="list-style-type: none"> Apply switch active then release switch active, refer to electrical circuit diagrams and check apply/release switch circuits Check and install a new switch as required
C1D00-64	Park brake apply switch - Signal plausibility failure	<ul style="list-style-type: none"> Connector fault - bent, loose or corroded pin(s) Harness fault - primary or secondary apply circuit Switch fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test parking brake primary and secondary apply circuits Check and install a new switch as required
C1D01-11	Park brake release switch - Circuit short to ground	<ul style="list-style-type: none"> Connector fault - bent, loose or corroded pin(s) Harness fault - short to ground Switch fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test park brake primary and secondary circuit for short to ground Check and install a new switch as required
C1D01-15	Park brake release switch - Circuit short to battery or open	<ul style="list-style-type: none"> Connector fault - bent, loose or corroded pin(s) Harness fault - open circuit Harness fault - short to power Switch fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test parking brake primary and secondary release circuits for open circuits or short to power Check and install a new switch as required
C1D01-1C	Park brake release switch - Voltage out of range	<ul style="list-style-type: none"> Connector fault - bent, loose or corroded pin(s) Harness fault - low resistance to ground Switch fault 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and test park brake switch primary and secondary switch circuits for low resistance to ground Check and install a new switch as required
C1D01-62	Park brake release switch - Signal compare failure	<ul style="list-style-type: none"> Connector fault - bent, loose or corroded pin(s) Harness fault Switch fault 	<ul style="list-style-type: none"> Release switch active then apply switch active. Refer to electrical circuit diagrams and check switch circuits for open circuits or shorts. Repair circuit or replace switch as required
C1D01-64	Park brake release switch - Signal plausibility failure	<ul style="list-style-type: none"> Connector fault - bent, loose or corroded pin(s) Harness fault Switch fault 	<ul style="list-style-type: none"> Primary and secondary release switch inputs signals do not match. Check connectors for damaged pins, Refer to electrical circuit diagrams and check switch circuits for open circuits or shorts. Repair circuit or replace switch as required
B1142-64	Ignition Status 1 - Signal plausibility failure	<ul style="list-style-type: none"> The hard wired ignition status signal does not agree with CAN messages. Ignition power supply is detected open circuit when ignition status is set to 'ON' 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check parking brake module ignition power supply for short to ground, open circuit
U0001-87	High Speed CAN communication bus - Missing message	<ul style="list-style-type: none"> CAN Bus circuit fault Power distribution fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0001-88	High speed CAN communication Bus - Bus off	<ul style="list-style-type: none"> CAN Bus circuit fault Power distribution fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0100-00	Lost Communication with ECM/PCM A - No sub type information	<ul style="list-style-type: none"> Engine control module / system fault Wiring harness fault 	<ul style="list-style-type: none"> Check the Engine Control Module for related DTCs and refer to the relevant DTC index Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic

DTC	Description	Possible Causes	Action
			system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0103-00	Lost communication With Gear Shift Module A - No sub type information	<ul style="list-style-type: none"> • Gear shift control module / system fault • Wiring harness fault 	<ul style="list-style-type: none"> • Check the Gear Shift Control Module for related DTCs and refer to the relevant DTC index • Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0104-00	Lost communication With Cruise Control Module A - No sub type information	<ul style="list-style-type: none"> • Speed control module / system fault • Wiring harness fault 	<ul style="list-style-type: none"> • Check the Speed Control Module for related DTCs and refer to the relevant DTC index • Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0121-00	Lost communication with Anti-Lock Braking System (ABS) Control Module - No sub type information	<ul style="list-style-type: none"> • Anti-Lock Braking System control module / system fault • Wiring harness fault 	<ul style="list-style-type: none"> • Check the Anti-Lock Braking System Control Module for related DTCs and refer to the relevant DTC index • Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	<ul style="list-style-type: none"> • Instrument Cluster / system fault • Wiring harness fault 	<ul style="list-style-type: none"> • Check the Instrument Cluster for related DTCs and refer to the relevant DTC index • Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> • Car configuration file stored in Park Brake Module does not match the master car configuration file • Master car configuration file not being transmitted by master control module 	<ul style="list-style-type: none"> • Check all control modules for related DTCs and refer to the relevant DTC index • Check the components installed on the vehicle were installed by the factory or a dealer • Install the original components or a new one as required
U0401-00	Invalid Data Received From ECM/PCM - No sub type information	<ul style="list-style-type: none"> • Invalid message from the Engine Control Module 	<ul style="list-style-type: none"> • Check the Engine Control Module for related DTCs and refer to the relevant DTC index
U0404-00	Invalid Data Received From Gear Shift Control Module A - No sub type information	<ul style="list-style-type: none"> • Invalid message from the gear shift control module 	<ul style="list-style-type: none"> • Check the Gear Shift Control Module for related DTCs and refer to the relevant DTC index
U0415-00	Invalid Data Received From Anti-Lock Braking System (ABS) Control Module - No sub type information	<ul style="list-style-type: none"> • Invalid message from the anti-lock Braking system module 	<p> NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a electronic park brake concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis</p> <ul style="list-style-type: none"> • Check the Anti-Lock Braking System Control Module for related DTCs and refer to the relevant DTC index
U0422-00	Invalid data received from Central Junction Box - No sub type information	<ul style="list-style-type: none"> • Invalid message from the Central Junction Box 	<ul style="list-style-type: none"> • Check the Central Junction Box for related DTCs and refer to the relevant DTC index

DTC	Description	Possible Causes	Action
U0423-00	Invalid Data Received From Instrument Panel Control Module - No subtype information	<ul style="list-style-type: none"> Invalid message from the instrument panel control module 	<ul style="list-style-type: none"> Check the Instrument Cluster for related DTCs and refer to the relevant DTC index
U0433-64	Invalid Data Received From Cruise Control Front Distance Range Sensor - Signal plausibility failure	<ul style="list-style-type: none"> Incorrect apply request from the speed control module when the conditions were not correct 	 <p>NOTE: The Park Brake Module has received a request to apply the parkbrake from the Adaptive Speed Control module but the conditions were not correct for the apply to take place. E.g. the vehicle was moving. The module will ignore the request but this DTC is logged for safety reference</p> <ul style="list-style-type: none"> Check the Speed Control Module for related DTCs and refer to the relevant DTC index
U2001-68	Reduced System Function - Event information	<ul style="list-style-type: none"> Invalid or missing message from Anti-Lock Braking System with ignition OFF and vehicle speed > 3Kph 	 <p>NOTE: There has been invalid or missing data detected from the Anti-Lock Brake System Control Module. This DTC may be logged if the ignition is switched off with the vehicle still moving. This DTC will never be recorded as confirmed and is stored for historical analysis only</p> <ul style="list-style-type: none"> Check the Speed Control Module for related DTCs and refer to the relevant DTC index
U2005-64	Vehicle Speed - Signal implausibility failure	<ul style="list-style-type: none"> Implausible speed message from the Anti-Lock Braking System control module 	 <p>NOTE: Implausible speed is defined as passing from high speed dynamic mode to static mode without passing through low speed dynamic mode</p> <ul style="list-style-type: none"> Check the Anti-Lock Braking System Control Module for related DTCs and refer to the relevant DTC index
U200D-4B	Control Module Output Power A - Over temperature	<ul style="list-style-type: none"> Actuator FET circuit over current / over temperature 	<ul style="list-style-type: none"> Refer to electrical wiring diagrams and check the actuator circuit for low resistance. Repair circuit faults or install a new actuator as required
U2011-11	Motor - Circuit short to ground	<ul style="list-style-type: none"> Electric park brake motor output short to ground 	<ul style="list-style-type: none"> Refer to electrical wiring diagrams and check the actuator circuit for short to ground. Repair circuit faults or install a new actuator as required
U2011-12	Motor - Circuit short to battery	<ul style="list-style-type: none"> Electric park brake motor output short to power 	<ul style="list-style-type: none"> Refer to electrical wiring diagrams and check the actuator circuit for short to power. Repair circuit faults or install a new actuator as required
U2011-13	Motor - Circuit open	<ul style="list-style-type: none"> Electric park brake motor output open circuit 	<ul style="list-style-type: none"> Refer to electrical wiring diagrams and check the actuator circuit for open circuit. Repair circuit faults or install a new actuator as required
U3000-47	Control Module - Watchdog/safety micro controller failure	<ul style="list-style-type: none"> Defective ECU 	<ul style="list-style-type: none"> Lost communication with secondary micro processor, check power and ground connections to module. Clear DTC, perform battery reset and retest system. If DTC reoccurs suspect the Parking Brake control module Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U3002-81	Vehicle Identification Number (VIN) - Invalid serial number	<ul style="list-style-type: none"> The Park Brake Module has previously been installed to another vehicle 	<ul style="list-style-type: none"> Check and install the original, or a new Park Brake Module Refer to the Warranty Policy and Procedures manual if a module/component is suspect
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> Power distribution fault Wiring harness fault 	<ul style="list-style-type: none"> There is a difference of more than 2 volts between the power supply to the parking brake module and the battery voltage value broadcast on CAN. Check other control modules for battery voltage related DTCs. Refer to the electrical circuit diagrams and check the power and ground

DTC	Description	Possible Causes	Action
			supply circuits to the Park Brake Module. Repair wiring as required, clear the DTC and retest the system
U3006-16	Control Module Input Power A - Circuit voltage below threshold	<ul style="list-style-type: none"> • ECU logic voltage is high (over 18 volts for 40mS) • Wiring harness fault • Charging system fault 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams, check power supplies and ground connections to the park brake control module. Check battery voltage and charging system. Repair wiring harness or charging system as required, clear DTC, perform battery reset. Retest system
U3006-17	Control Module Input Power A - Circuit voltage above threshold	<ul style="list-style-type: none"> • ECU logic voltage is low (below 8 volts for 2000mS) • Wiring harness fault • Charging system fault 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams, check power supplies and ground connections to the park brake control module. Check battery voltage and charging system. Repair wiring harness or charging system as required, clear DTC, perform battery reset. Retest system
U3007-14	Control Module Input Power B - Circuit short to ground or open	<ul style="list-style-type: none"> • Connector fault - bent, loose or corroded pin(s) • Harness fault 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams, check Park Brake Module high power feed circuit for open circuits or short to ground. Repair wiring harness as required, clear DTC

General Information - Diagnostic Trouble Code (DTC) Index V8 S/C 5.0L

Petrol, DTC: Engine Control Module (ECM)

Description and Operation

Engine Control Module (PCM) 5.0L SC V8 - AJ133



WARNING: Fuel injector voltage will reach 65 Volts during operation and have a high current requirement.



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer-approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.




If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

















Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.









The table below lists all diagnostic trouble codes (DTCs) that could be logged in the electronic engine control module, for additional diagnosis and testing information refer to the relevant diagnosis and testing section. For additional information, refer to: Electronic Engine Controls (303-14 Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).





DTC	Description	Possible Causes	Action
B10A2-31	Crash Input - No signal	<p>NOTE: - Circuit SRS_SIGNAL -</p> <ul style="list-style-type: none"> Loss of communication between restraints control module and engine control module 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check restraints control module pulse width modulated SRS signal line circuit, hard wired connection between engine control module and restraints control module for short circuit to ground, short circuit to power, open circuit. Repair circuit as required, clear the DTC and retest
B10AC-81	Cruise Control Switch - Invalid serial data received	<ul style="list-style-type: none"> The engine control module has received an invalid command from the steering wheel switch pack 	<ul style="list-style-type: none"> Clear the DTC and press all the steering wheel switches, re-check for DTCs. Refer to the electrical circuit diagrams and check the speed control switch circuit for open circuit, short circuit to power, short circuit to ground, disconnected Check and install a new steering wheel module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new







DTC	Description	Possible Causes	Action module/component
B10AC-82	Cruise Control Switch - Alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> • Cruise buttons alive counter is not incrementing. Which suggests that the LIN bus is faulty • Steering wheel module is not connected • Steering wheel module failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the speed control switch circuit for open circuit, short circuit to power, short circuit to ground, disconnected • Refer to the electrical circuit diagrams and check the LIN bus between steering wheel module and the CAN gateway • Check and install a new steering wheel module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B10AC-83	Cruise Control Switch - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Cruise buttons checksum incorrect, incorrect cruise switches fitted to vehicle 	<ul style="list-style-type: none"> • Check and install new cruise switches as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B10AC-96	Cruise Control Switch - Component internal failure	<ul style="list-style-type: none"> • Speed control switch circuit, open circuit, short circuit to power, short circuit to ground, disconnected • Speed control switch failure • Steering wheel module failure 	<ul style="list-style-type: none"> • Check for related DTCs in other central junction boxes • Refer to the electrical circuit diagrams and check the speed control switch circuit for open circuit, short circuit to power, short circuit to ground, disconnected • Check and install a new speed control switch as required. Check and install a new steering wheel module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B10FF-68	Ignition Control - Event information	<ul style="list-style-type: none"> • Spark plug(s) fault • Wiring harness fault • Ignition coil(s) fault 	<ul style="list-style-type: none"> • Refer to repair manual and check spark plug(s) for condition and security. Replace any defective components as required • Refer to electrical wiring diagrams and check ignition coil circuit for intermittent open circuit, short circuit to power, short circuit to ground • Check and install a new coil(s) as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B11DB-01	Battery Monitoring Module - General electrical failure	 <p>NOTE: - Circuit BATTERY -</p> <ul style="list-style-type: none"> • Charging system fault Battery • monitoring signal line circuit fault • Vehicle battery fault 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check charging system for faults. Perform any repairs required • Refer to the electrical wiring diagrams and check the battery monitoring system module circuit for open circuit, short circuit to ground, short circuit to power • Refer to the workshop manual and the battery care manual, inspect the vehicle battery and ensure it is fully charged and serviceable before performing further tests




DTC	Description	Possible Causes	Action
B11DB-87	Battery Monitoring Module - Missing message	 <p>NOTE: - Circuit BATTERY -</p> <ul style="list-style-type: none"> Battery signal line circuit fault 	<ul style="list-style-type: none"> Refer to the electrical wiring diagrams and check the battery monitoring system module circuit for open circuit, short circuit to ground, short circuit to power Refer to the electrical circuit diagrams and check the LIN circuit for short circuit to ground, short circuit to power, open circuit
B1206-68	Crash Occurred - Event information	 <p>NOTE: - Circuit SRS_SIGNAL -</p> <ul style="list-style-type: none"> Engine control module has detected the vehicle has crashed - event information DTC only 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the engine control module to restraints control module circuit for short circuit to ground, short circuit to power, open circuit. Repair circuit as required, clear the DTC and retest
C0031-00	Left Front Wheel Speed Sensor - No sub type information	<ul style="list-style-type: none"> Invalid data received from anti-lock braking system module - left front wheel speed signal fault 	<ul style="list-style-type: none"> Check anti-lock braking system module for related DTCs and refer to relevant DTC index
C0034-00	Right Front Wheel Speed Sensor - No sub type information	<ul style="list-style-type: none"> Invalid data received from anti-lock braking system module - right front wheel speed signal fault 	<ul style="list-style-type: none"> Check anti-lock braking system module for related DTCs and refer to relevant DTC index
C0037-00	Left Rear Wheel Speed Sensor - No sub type information	<ul style="list-style-type: none"> Invalid data received from anti-lock braking system module - left rear wheel speed signal fault 	<ul style="list-style-type: none"> Check anti-lock braking system module for related DTCs and refer to relevant DTC index
C003A-00	Right Rear Wheel Speed Sensor - No sub type information	<ul style="list-style-type: none"> Invalid data received from anti-lock braking system module - right rear wheel speed signal fault 	<ul style="list-style-type: none"> Check anti-lock braking system module for related DTCs and refer to relevant DTC index
P0010-13	Intake (A) Camshaft Position Actuator (Bank 1) - Circuit open	 <p>NOTE: - Circuit VFS_IN_A -</p> <ul style="list-style-type: none"> Intake (A) camshaft position actuator (Bank 1) open circuit Engine control module interface harness open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check intake (A) camshaft position actuator (Bank 1) circuit for open circuit Refer to the electrical circuit diagrams and check engine control module interface harness for open circuit
P0011-00	Intake (A) Camshaft Position Timing - Over-Advanced (Bank 1) - No sub type information	 <p>NOTE: - Circuit VFS_IN_A -</p> <ul style="list-style-type: none"> Intake (A) camshaft position actuator (Bank 1) open circuit Engine control module interface harness open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check intake (A) camshaft position actuator (Bank 1) circuit for open circuit Refer to the electrical circuit diagrams and check engine control module interface harness for open circuit
P0013-13	Exhaust (B) Camshaft Position Actuator (Bank 1) - Circuit open	 <p>NOTE: - Circuit VFS_EX_A -</p> <ul style="list-style-type: none"> Exhaust (B) camshaft position actuator (Bank 1) open circuit Engine control module interface harness open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check exhaust (B) camshaft position actuator (Bank 1) circuit for open circuit Refer to the electrical circuit diagrams and check engine control module interface harness for open circuit
P0015-00	Exhaust (B) Camshaft Position Timing - Over-Retarded (Bank 1) - No sub type information	 <p>NOTE: - Circuit VFS_EX_A -</p> <ul style="list-style-type: none"> Exhaust (B) camshaft position actuator (Bank 1) open circuit, short circuit to ground, short circuit to power 	<ul style="list-style-type: none"> Check for related DTC P0365-00. Refer to the electrical circuit diagrams and check exhaust (B) camshaft position actuator (Bank 1) for open circuit, short circuit to ground, short circuit to power







DTC	Description	Possible Causes	Action
P0016-00	Crankshaft Position - Camshaft Position Correlation - Bank 1 Sensor A - No sub type information	 NOTE: - Circuit VFS_EX_A - <ul style="list-style-type: none"> The relative positions of the crankshaft position sensor and cam timing plate teeth are not correct Engine timing incorrect Timing chain installed incorrectly Variable valve timing forced fully advanced 	<ul style="list-style-type: none"> Check engine timing. Check camshaft sensor timing plate is installed correctly. Check timing chain is installed correctly
P0017-00	Crankshaft Position - Camshaft Position Correlation - Bank 1 Sensor B - No sub type information	 NOTE: - Circuit VFS_EX_A - <ul style="list-style-type: none"> The relative positions of the crankshaft position sensor and camshaft timing plate teeth are not correct Engine timing incorrect Timing chain installed incorrectly Variable valve timing forced fully advanced 	<ul style="list-style-type: none"> Check for related DTC P0365-00. Check engine timing. Check camshaft sensor timing plate is installed correctly. Check timing chain is installed correctly Refer to the electrical circuit diagrams and check exhaust (B) camshaft position actuator (Bank 1) for open circuit, short circuit to ground, short circuit to power
P0018-00	Crankshaft Position - Camshaft Position Correlation - Bank 2 Sensor A - No sub type information	 NOTE: - Circuit VFS_IN_B - <ul style="list-style-type: none"> The relative positions of the crankshaft position sensor and camshaft timing plate teeth are not correct Engine timing incorrect Timing chain installed incorrectly Variable valve timing forced fully advanced 	<ul style="list-style-type: none"> Check engine timing. Check camshaft sensor timing plate is installed correctly. Check timing chain is installed correctly
P0019-00	Crankshaft Position - Camshaft Position Correlation - Bank 2 Sensor B - No sub type information	 NOTE: - Circuit VFS_EX_B - <ul style="list-style-type: none"> The relative positions of the crankshaft position sensor and camshaft timing plate teeth are not correct Engine timing incorrect Timing chain installed incorrectly Variable valve timing forced fully advanced 	<ul style="list-style-type: none"> Check engine timing. Check camshaft sensor timing plate is installed correctly. Check timing chain is installed correctly
P0020-13	Intake (A) Camshaft Position Actuator (Bank 2) - Circuit open	 NOTE: - Circuit VFS_IN_B - <ul style="list-style-type: none"> Intake valve solenoid 2 open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check intake valve solenoid 2 for open circuit
P0023-13	Exhaust (B) Camshaft Position Actuator (Bank 2) - Circuit open	 NOTE: - Circuit VFS_EX_B - <ul style="list-style-type: none"> Exhaust (B) Camshaft Position actuator (Bank 2) circuit, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check exhaust (B) camshaft position actuator (Bank 2) circuit for open circuit
P0026-72	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1) - Actuator stuck open	 NOTE: - Circuit VFS_IN_A - <ul style="list-style-type: none"> Intake valve solenoid 1 angle less than target Intake valve solenoid 1 slow or not operating 	<ul style="list-style-type: none"> Check operation of intake valve solenoid 1. Check and install a new intake valve solenoid 1 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0026-77	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1) - Commanded position not reachable	 NOTE: - Circuit VFS_IN_A - <ul style="list-style-type: none"> Intake valve solenoid 1 angle greater than target Intake valve solenoid 1 not returning to target in time 	<ul style="list-style-type: none"> Check operation of intake valve solenoid 1. Check and install a new intake valve solenoid 1 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of




DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> Intake valve solenoid 1 stuck advanced 	a new module/component
P0027-72	Exhaust Valve Control Solenoid Circuit Range/Performance (Bank 1) - Actuator stuck open	 <p>NOTE: - Circuit VFS_EX_A -</p> <ul style="list-style-type: none"> Exhaust valve solenoid 1 angle less than target Exhaust valve solenoid 1 slow or not operating 	<ul style="list-style-type: none"> Check operation of exhaust valve solenoid 1. Check and install a new exhaust valve solenoid 1 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0027-77	Exhaust Valve Control Solenoid Circuit Range/Performance (Bank 1) - Commanded position not reachable	 <p>NOTE: - Circuit VFS_EX_A -</p> <ul style="list-style-type: none"> Exhaust valve solenoid 1 angle greater than target Exhaust valve solenoid 1 not returning to target in time Exhaust valve solenoid 1 stuck advanced 	<ul style="list-style-type: none"> Check operation of exhaust valve solenoid 1. Check and install a new exhaust valve solenoid 1 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0028-72	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2) - Actuator stuck open	 <p>NOTE: - Circuit VFS_IN_B -</p> <ul style="list-style-type: none"> Intake valve solenoid 2 angle less than target Intake valve solenoid 2 slow or not operating 	<ul style="list-style-type: none"> Check operation of intake valve solenoid 2. Check and install a new intake valve solenoid 2 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0028-77	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2) - Commanded position not reachable	 <p>NOTE: - Circuit VFS_IN_B -</p> <ul style="list-style-type: none"> Intake valve solenoid 2 angle greater than target Intake valve solenoid 2 not returning to target in time Intake valve solenoid 2 stuck advanced 	<ul style="list-style-type: none"> Check operation of intake valve solenoid 2. Check and install a new intake valve solenoid 2 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0029-72	Exhaust Valve Control Solenoid Circuit Range/Performance (Bank 2) - Actuator stuck open	 <p>NOTE: - Circuit VFS_EX_B -</p> <ul style="list-style-type: none"> Exhaust valve solenoid 2 angle less than target Exhaust valve solenoid 2 slow or not operating 	<ul style="list-style-type: none"> Check operation of exhaust valve solenoid 2. Check and install a new exhaust valve solenoid 2 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0029-77	Exhaust Valve Control Solenoid Circuit Range/Performance (Bank 2) - Commanded position not reachable	 <p>NOTE: - Circuit VFS_EX_B -</p> <ul style="list-style-type: none"> Exhaust valve solenoid 2 angle greater than target Exhaust valve solenoid 2 not returning to target in time Exhaust valve solenoid 2 stuck advanced 	<ul style="list-style-type: none"> Check operation of exhaust valve solenoid 2. Check and install a new exhaust valve solenoid 2 as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0031-11	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) - Circuit short to ground	<p>NOTES:</p>  <p>- Circuit HTR_CTRL_A_UPSTREAM -</p>  <p>LR - Circuit UHEGO HEATER A -</p> <ul style="list-style-type: none"> Pre catalyst oxygen sensor-odd heater control circuit (Bank 1, Sensor 1) circuit short circuit to ground 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check datalogger signal, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1) Refer to the electrical circuit diagrams and check pre catalyst oxygen sensor-odd heater control circuit (Bank 1, Sensor 1) circuit for short circuit to ground





DTC	Description	Possible Causes	Action
P0031-13	HO2S Heater Control Circuit Low (Bank 1, Sensor 1) - Circuit open	<p>NOTES:</p>  - Circuit HTR_CTRL_A_UPSTREAM -	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check datalogger signal, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1) Refer to the electrical circuit diagrams and check pre catalyst oxygen sensor-odd heater control circuit (Bank 1, Sensor 1) circuit for open circuit
P0032-12	HO2S Heater Control Circuit High (Bank 1, Sensor 1) - Circuit short to battery	<p>NOTES:</p>  - Circuit HTR_CTRL_A_UPSTREAM -	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check datalogger signal, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1) Refer to the electrical circuit diagrams and check pre catalyst oxygen sensor-odd heater control circuit (Bank 1, Sensor 1) circuit for short circuit to power
P0036-00	HO2S Heater Control Circuit (Bank 1, Sensor 2) - No sub type information	<p>NOTE: - Circuit HTR_HEGO_A -</p> <ul style="list-style-type: none"> Catalyst oxygen sensor heater circuit control fuse failure Post catalyst oxygen sensor-odd heater control circuit short circuit to ground, short circuit to power, open circuit Catalyst oxygen sensor heater circuit control relay circuit short circuit to ground, short circuit to power, open circuit Catalyst oxygen sensor heater circuit control relay failure Post catalyst oxygen sensor-odd failure 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check datalogger signal, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 2 (0x03A2) Refer to the electrical circuit diagrams and check post catalyst oxygen sensor-odd sensor fuse for open circuit Refer to the electrical circuit diagrams and check post catalyst oxygen sensor-odd sensor circuit for short circuit to ground, short circuit to power, open circuit Refer to the electrical circuit diagrams and check catalyst oxygen sensor heater circuit control relay circuit for short circuit to ground, short circuit to power, open circuit Check and install a new catalyst oxygen sensor heater control relay, as required. Check and install a new post catalyst oxygen sensor-odd as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0051-11	HO2S Heater Control Circuit Low (Bank 2, Sensor 1) - Circuit short to ground	<p>NOTES:</p>  - Circuit HTR_CTRL_B_UPSTREAM -	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check datalogger signal, Oxygen Sensor (O2S) Heater Duty Cycle Bank 2 Sensor 1 (0x03A4) Refer to the electrical circuit diagrams and check pre catalyst oxygen sensor-even heater control circuit (Bank 2, Sensor 1) circuit for short circuit to ground
P0051-13	HO2S Heater Control Circuit Low (Bank 2, Sensor 1) - Circuit open	<p>NOTES:</p>  - Circuit HTR_CTRL_B_UPSTREAM -	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check datalogger signal, Oxygen Sensor (O2S) Heater Duty Cycle Bank 2 Sensor 1 (0x03A4) Refer to the electrical circuit diagrams and check pre catalyst oxygen sensor-even heater control circuit (Bank 2, Sensor 1) circuit for

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> Pre catalyst oxygen sensor-even heater control circuit (Bank 2, Sensor 1) circuit, open circuit 	open circuit
P0052-12	HO2S Heater Control Circuit High (Bank 2, Sensor 1) - Circuit short to battery	<p>NOTES:</p>  - Circuit HTR_CTRL_B_UPSTREAM -  LR - Circuit UHEGO HEATER B -	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check datalogger signal, Oxygen Sensor (O2S) Heater Duty Cycle Bank 2 Sensor 1 (0x03A4) Refer to the electrical circuit diagrams and check pre catalyst oxygen sensor-even heater control circuit (Bank 2, Sensor 1) circuit for short circuit to power
P0054-00	HO2S Heater Resistance (Bank 1, Sensor 2) - No sub type information	<p>NOTES:</p>  - Circuit HTR_CTRL_A_UPSTREAM -  LR - Circuit UHEGO HEATER A -	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check datalogger signal, Oxygen Sensor (O2S) Heater Duty Cycle Bank 1 Sensor 1 (0x03A1) Refer to the electrical circuit diagrams and check post catalyst oxygen sensor-odd sensor fuse for open circuit Refer to the electrical circuit diagrams and check post catalyst oxygen sensor-odd sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance Refer to the electrical circuit diagrams and check catalyst oxygen sensor heater circuit control relay circuit for short circuit to ground, short circuit to power, open circuit Check and install a new catalyst oxygen sensor heater control relay, as required. Check and install a new post catalyst oxygen sensor-odd as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0056-00	HO2S Heater Control Circuit (Bank 2, Sensor 2) - No sub type information	 NOTE: - Circuit HTR_HEGO_B -	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check datalogger signal, Oxygen Sensor (O2S) Heater Duty Cycle Bank 2 Sensor 2 (0x03A5) Refer to the electrical circuit diagrams and check post catalyst oxygen sensor-even sensor circuit for short circuit to ground, short circuit to power, open circuit Refer to the electrical circuit diagrams and check catalyst oxygen sensor heater circuit control relay circuit for short circuit to ground, short circuit to power, open circuit Check and install a new catalyst oxygen sensor heater control relay, as required. Check and install a new post catalyst oxygen sensor-even, as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0060-00	HO2S Heater Resistance (Bank 2, Sensor 2) - No sub type information	<p>NOTES:</p>  - Circuit HTR_CTRL_B_UPSTREAM -	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check datalogger signal, Oxygen Sensor (O2S) Heater Duty Cycle Bank 2 Sensor 2 (0x03A5)

DTC	Description	Possible Causes	Action
		 LR - Circuit UHEGO HEATER B - <ul style="list-style-type: none"> • Catalyst oxygen sensor heater circuit control fuse failure • Post catalyst oxygen sensor-even heater control circuit short circuit to ground, short circuit to power, open circuit, high resistance • Catalyst oxygen sensor heater circuit control relay circuit short circuit to ground, short circuit to power, open circuit • Catalyst oxygen sensor heater circuit control relay failure • Post catalyst oxygen sensor-even failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check post catalyst oxygen sensor-even sensor fuse for open circuit • Refer to the electrical circuit diagrams and check post catalyst oxygen sensor-even sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Refer to the electrical circuit diagrams and check catalyst oxygen sensor heater circuit control relay circuit for short circuit to ground, short circuit to power, open circuit • Check and install a new catalyst oxygen sensor heater control relay, as required. Check and install a new post catalyst oxygen sensor-even as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0069-29	MAP - Barometric Pressure Correlation - Signal invalid	<ul style="list-style-type: none"> • Manifold absolute pressure sensor failure • Engine control module failure 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check datalogger signal, Barometric Pressure Sensor Voltage (0x035A). Check for related manifold absolute pressure sensor DTCs • Refer to the electrical circuit diagrams and check manifold absolute pressure sensor circuit for short circuit to ground, short circuit to power, open circuit • Check and install new manifold absolute pressure sensor as required. Check and install a new engine control module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0071-21	Ambient Air Temperature Sensor Range/Performance - Signal amplitude < minimum	<p>NOTES:</p>  Jaguar - Circuit AMBIENT_TEMP_SENSOR -	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check datalogger signal, Ambient Air Temperature Sensor Voltage (0x03BA) • Refer to the electrical circuit diagrams and check ambient air temperature sensor circuit for short circuit to ground, short circuit to power, open circuit • Refer to the electrical circuit diagrams and check temperature and manifold absolute pressure sensor circuit for short circuit to ground, short circuit to power, open circuit • Check and install a new ambient air temperature sensor as required. Check and install a new temperature and manifold absolute pressure sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0071-22	Ambient Air Temperature Sensor Range/Performance - Signal amplitude > maximum	<p>NOTES:</p>  Circuit AMBIENT_TEMP_SENSOR -	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check datalogger signal, Ambient Air Temperature Sensor Voltage (0x03BA) • Refer to the electrical circuit

DTC	Description	Possible Causes	Action
		 LR - Circuit TAMB TEMP - <ul style="list-style-type: none"> • Ambient air temperature sensor circuit short circuit to ground, short circuit to power, open circuit • Temperature and manifold absolute pressure sensor circuit short circuit to ground, short circuit to power, open circuit • Ambient air temperature sensor failure • Temperature and manifold absolute pressure sensor failure 	<ul style="list-style-type: none"> • diagrams and check ambient air temperature sensor circuit for short circuit to ground, short circuit to power, open circuit • Refer to the electrical circuit diagrams and check temperature and manifold absolute pressure sensor circuit for short circuit to ground, short circuit to power, open circuit • Check and install a new ambient air temperature sensor as required. Check and install a new temperature and manifold absolute pressure sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0072-00	Ambient Air Temperature Sensor Circuit Low - No sub type information	NOTES:  Circuit AMBIENT_TEMP_SENSOR -  LR - Circuit TAMB TEMP - <ul style="list-style-type: none"> • Ambient air temperature sensor circuit short circuit to ground, open circuit, high resistance • Ambient air temperature sensor failure 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check datalogger signal, Ambient Air Temperature Sensor Voltage (0x03BA) • Refer to the electrical circuit diagrams and check ambient air temperature sensor circuit for short circuit to ground, open circuit, high resistance • Check and install a new ambient air temperature sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0073-00	Ambient Air Temperature Sensor Circuit High - No sub type information	NOTES:  Circuit AMBIENT_TEMP_SENSOR -  LR - Circuit TAMB TEMP - <ul style="list-style-type: none"> • Ambient air temperature sensor ground circuit high resistance, open circuit • Ambient air temperature sensor signal circuit short circuit to power • Ambient air temperature sensor failure 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check datalogger signals Ambient Air Temperature Sensor Voltage (0x03BA) • Refer to the electrical circuit diagrams and check ambient air temperature sensor circuit for short circuit to ground, high resistance, short circuit to power. Check connector terminals for corrosion or damage • Check and install a new ambient air temperature sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P007B-23	Charge Air Cooler Temperature Sensor Circuit Range/Performance (Bank 1) - Signal stuck low	 NOTE: - Circuit TMAP_TEMP_SENSOR <ul style="list-style-type: none"> • Charge air cooler temperature sensor circuit poor / intermittent connection • Charge air cooler temperature sensor failure 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check datalogger signal, Charge Air Temperature Voltage (0x03EE) • Refer to the electrical circuit diagrams and check charge air cooler temperature sensor circuit for poor, intermittent connection • Check and install a new charge air cooler temperature sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

DTC	Description	Possible Causes	Action
P007B-24	Charge Air Cooler Temperature Sensor Circuit Range/Performance (Bank 1) - Signal stuck high	 <p>NOTE: Jaguar circuit reference IC_COOLANT_PMP_CTRL & BOOST_PRESS_SENSOR_TEMP_SIG. Land Rover circuit reference O_S_CACWPR & I_A_BTS</p> <ul style="list-style-type: none"> • Connector is disconnected, connector pin is backed out, connector pin corrosion • Fuse failure • Temperature and manifold absolute pressure sensor circuit, short circuit to ground, short circuit to power, open circuit, high resistance • Temperature and manifold absolute pressure sensor failure • Air charge coolant pump and control circuit, short circuit to ground, short circuit to power, open circuit, high resistance • Air charge coolant pump relay failure • Air charge coolant pump failure 	<ul style="list-style-type: none"> • Inspect connectors for signs of water ingress, and pins for damage and/or corrosion • Refer to electrical circuit diagrams and check for fuse failure, install new fuse as required • Refer to electrical circuit diagrams and check the temperature and manifold absolute pressure sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Check and install a new temperature and manifold absolute pressure sensor as required • Refer to electrical circuit diagrams and check the air charge coolant pump and control circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Refer to electrical circuit diagrams and check the air charge coolant pump for open circuit, high resistance • Refer to the relevant section of the workshop manual and check the air charge coolant pump for correct operation. Check and install a new air charge coolant pump as required • Clear DTC and retest
P007B-29	Charge Air Cooler Temperature Sensor Circuit Range/Performance (Bank 1) - Signal invalid	 <p>NOTE: Jaguar circuit reference IC_COOLANT_PMP_CTRL & BOOST_PRESS_SENSOR_TEMP_SIG. Land Rover circuit reference O_S_CACWPR & I_A_BTS</p> <ul style="list-style-type: none"> • Connector is disconnected, connector pin is backed out, connector pin corrosion • Fuse failure • Temperature and manifold absolute pressure sensor circuit, short circuit to ground, short circuit to power, open circuit, high resistance • Temperature and manifold absolute pressure sensor failure • Air charge coolant pump and control circuit, short circuit to ground, short circuit to power, open circuit, high resistance • Air charge coolant pump relay failure • Air charge coolant pump failure 	<ul style="list-style-type: none"> • Inspect connectors for signs of water ingress, and pins for damage and/or corrosion • Refer to electrical circuit diagrams and check for fuse failure, install new fuse as required • Refer to electrical circuit diagrams and check the temperature and manifold absolute pressure sensor circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Check and install a new temperature and manifold absolute pressure sensor as required • Refer to electrical circuit diagrams and check the air charge coolant pump and control circuit for short circuit to ground, short circuit to power, open circuit, high resistance • Refer to electrical circuit diagrams and check the air charge coolant pump for open circuit, high resistance • Refer to the relevant section of the workshop manual and check the air charge coolant pump for correct operation. Check and install a new air charge coolant pump as required • Clear DTC and retest
P007C-00	Charge Air Cooler Temperature Sensor Circuit Low (Bank 1) - No sub type information	 <p>NOTE: - Circuit TMAP_TEMP_SENSOR</p> <ul style="list-style-type: none"> • Charge air cooler temperature sensor (Bank 1) circuit short circuit to ground, open circuit, high resistance • Charge air cooler temperature sensor (Bank 1) failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check charge air cooler temperature sensor (Bank 1) circuit for short circuit to ground, open circuit, high resistance • Check and install a new charge air cooler temperature sensor (Bank 1) as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

DTC	Description	Possible Causes	Action
P007D-00	Charge Air Cooler Temperature Sensor Circuit High (Bank 1) - No sub type information	 <p>NOTE: - Circuit TMAP_TEMP_SENSOR</p> <ul style="list-style-type: none"> • Charge air cooler temperature sensor (Bank 1) circuit short circuit to power, open circuit, high resistance • Charge air cooler temperature sensor (Bank 1) failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check charge air cooler temperature sensor (Bank 1) circuit for short circuit to power, open circuit, high resistance • Check and install a new charge air cooler temperature sensor (Bank 1) as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0087-00	Fuel Rail/System Pressure - Too Low - No sub type information	 <p>NOTE: - Circuit FUEL_HIGH_PRESS_SENSOR -</p> <ul style="list-style-type: none"> • Fuel rail pressure sensor circuit short circuit to ground, open circuit, high resistance • Fuel rail pressure sensor failure • Fuel lines leaking or restricted • Fuel pump failure 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check datalogger signal, Fuel Rail Pressure Sensor - High Range Sensor Voltage (0x0377) • Refer to the electrical circuit diagrams and check fuel rail pressure sensor circuit for short circuit to ground, open circuit, high resistance • Check for fuel pump related DTCs. Check fuel lines for leakage or restriction • Check and install new fuel rail pressure sensor as required. Check and install a new fuel pump as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0088-00	Fuel Rail/System Pressure - Too High - No sub type information	 <p>NOTE: - Circuit FUEL_HIGH_PRESS_SENSOR -</p> <ul style="list-style-type: none"> • Fuel rail pressure sensor circuit short to each other, high resistance, short circuit to power • Fuel rail pressure sensor failure 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check datalogger signal, Fuel Rail Pressure Sensor - High Range Sensor Voltage (0x0377) • Refer to the electrical circuit diagrams and check fuel rail pressure sensor circuit for short to each other, high resistance, short circuit to power • Check and install new fuel rail pressure sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P008A-00	Low Pressure Fuel System Pressure - Too Low - No sub type information	 <p>NOTE: - Circuit LOW_PRESS_FUEL_PRESS_SENSOR -</p> <ul style="list-style-type: none"> • Low pressure fuel sensor circuit failure, short circuit to ground, short circuit to power, open circuit • Fuel pump driver module circuit short circuit to ground, short circuit to power, open circuit • Low pressure fuel • Fuel pump driver module failure 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check datalogger signal, Fuel Rail Pressure - Low Range Sensor Voltage (0x0376) • Check fuel system for leakage • Refer to the electrical circuit diagrams and check low pressure fuel sensor circuit for short circuit to ground, short circuit to power, open circuit • Refer to the electrical circuit diagrams and check fuel pump driver module circuit short circuit to ground, short circuit to power, open circuit • Check and install a new low pressure fuel sensor as required. Check and install a new fuel pump driver module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

General Information - Diagnostic Trouble Code (DTC) Index DTC: Front Seat Climate Control Module (DCSM)

Description and Operation

Front Seat Climate Control Module (DCSM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system

The table below lists all diagnostic trouble codes (DTCs) that could be logged in the seat climate control module, for additional diagnosis and testing information refer to the relevant diagnosis and testing section.

For additional information, refer to: Seats (501-10 Seating, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B10B9-13	Blower Control - Circuit open	<ul style="list-style-type: none"> Connectors disconnected or connector pin damage Seat blower left circuit - Open circuit Blower motor assembly - Short circuit to ground Front seat climate control module failure 	<ul style="list-style-type: none"> Check for any disconnected connectors or damaged connector pins Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_FANS_RTN, Circuit reference LH_FANS_PWR - For open circuit. Repair circuit as required, clear DTC and retest Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B10B9-4B	Blower Control - Over temperature	<ul style="list-style-type: none"> Mechanical restriction in blower motor assembly Seat blower left circuit - Short circuit to ground Blower motor assembly - Short circuit to ground Front seat climate control module failure 	<ul style="list-style-type: none"> Check for mechanical restriction or debris in seat blower Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_FANS_RTN, Circuit reference LH_FANS_PWR - For short circuit to ground. Repair circuit as required, clear DTC and retest


DTC	Description	Possible Causes	Action
B1157-13	Blower Control "B" - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat blower right circuit - Open circuit • Blower motor assembly - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_FANS_RTN, Circuit reference RH_FANS_PWR - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1157-4B	Blower Control "B" - Over temperature	<ul style="list-style-type: none"> • Mechanical restriction in blower motor assembly • Seat blower right circuit - Short circuit to ground • Blower motor assembly - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for mechanical restriction or debris in seat blower • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_FANS_RTN, Circuit reference RH_FANS_PWR - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B120E-13	Right Thermal Electric Device Control - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat backrest thermal electric device right circuit - Open circuit • Seat cushion thermal electric device right circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_TED+, Circuit reference RH_SEAT_BACK_TED- - For open circuit. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_TED+, Circuit reference RH_CUSHION_TED- - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B120E-19	Right Thermal Electric Device Control - Circuit current above threshold	<ul style="list-style-type: none"> • Seat backrest thermal electric device right circuit - Short circuit to ground • Seat cushion thermal electric device right circuit - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_TED+, Circuit reference RH_SEAT_BACK_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_TED+, Circuit reference RH_CUSHION_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
B120E-4B	Right Thermal Electric Device Control - Over temperature	<ul style="list-style-type: none"> • Restriction in thermal electric device air path • Seat backrest thermal electric device right circuit - Short circuit to ground • Seat cushion thermal electric device right circuit - Short circuit to ground • Front seat climate control module failure 	<p>tests associated with this DTC using the manufacturer approved diagnostic system</p> <ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device air path • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_TED+, Circuit reference RH_SEAT_BACK_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_TED+, Circuit reference RH_CUSHION_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B120F-98	Left Seat Cushion - Component or system over temperature	<ul style="list-style-type: none"> • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric device fan movement 	<ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device fan exhaust vent • Check for restricted thermal electric device fan movement • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1223-13	Right Seat Cushion Temperature Sensor - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat cushion temperature sensor right circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_SENSOR, Circuit reference RH_CUSHION_SENSOR RTN - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1224-13	Left Thermal Electric Device Control - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat backrest thermal electric device left circuit - Open circuit • Seat cushion thermal electric device left circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_TED+, Circuit reference LH_SEAT_BACK_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_TED+, Circuit reference LH_CUSHION_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
B1224-19	Left Thermal Electric Device Control - Circuit current above threshold	<ul style="list-style-type: none"> • Seat backrest thermal electric device left circuit - Short circuit to ground • Seat cushion thermal electric device left circuit - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_TED+, Circuit reference LH_SEAT_BACK_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_TED+, Circuit reference LH_CUSHION_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1224-4B	Left Thermal Electric Device Control - Over temperature	<ul style="list-style-type: none"> • Restriction in thermal electric device air path • Seat backrest thermal electric device left circuit - Short circuit to ground • Seat cushion thermal electric device left circuit - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device air path • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_TED+, Circuit reference LH_SEAT_BACK_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_TED+, Circuit reference LH_CUSHION_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1225-13	Right Seat Back Temperature Sensor - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat backrest temperature sensor right circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_SENSOR, Circuit reference RH_SEAT_BACK_SENSOR_RTN - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1229-13	Left Seat Back Temperature Sensor - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat backrest temperature sensor left circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_SENSOR, Circuit reference LH_SEAT_BACK_SENSOR_RTN - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
B122A-11	Right Seat Cushion Blower Speed Sensor - Circuit short to ground	<ul style="list-style-type: none"> • Seat cushion blower speed right circuit - Short circuit to ground • Blower motor assembly - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_FAN_SPEED - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122A-12	Right Seat Cushion Blower Speed Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Seat cushion blower speed right circuit - Short circuit to power • Blower motor assembly - Short circuit to power • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_FAN_SPEED - For short circuit to power. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122B-11	Right Seat Back Blower Speed Sensor - Circuit short to ground	<ul style="list-style-type: none"> • Seat backrest blower speed right circuit - Short circuit to ground • Blower motor assembly - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_FAN_SPEED - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122B-12	Right Seat Back Blower Speed Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Seat backrest blower speed right circuit - Short circuit to power • Blower motor assembly - Short circuit to power • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_FAN_SPEED - For short circuit to power. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122C-11	Left Seat Cushion Blower Speed Sensor - Circuit short to ground	<ul style="list-style-type: none"> • Seat cushion blower speed left circuit - Short circuit to ground • Blower motor assembly - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_FAN_SPEED - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
B122C-12	Left Seat Cushion Blower Speed Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Seat cushion blower speed left circuit - Short circuit to power • Blower motor assembly - Short circuit to power • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_FAN_SPEED - For short circuit to power. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122D-11	Left Seat Back Blower Speed Sensor - Circuit short to ground	<ul style="list-style-type: none"> • Seat backrest blower speed left circuit - Short circuit to ground • Blower motor assembly - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_FAN_SPEED - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122D-12	Left Seat Back Blower Speed Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Seat backrest blower speed left circuit - Short circuit to power • Blower motor assembly - Short circuit to power • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_FAN_SPEED - For short circuit to power. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122E-98	Right Seat Cushion - Component or system over temperature	<ul style="list-style-type: none"> • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric device fan movement 	<ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device fan exhaust vent • Check for restricted thermal electric device fan movement • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122F-98	Right Seat Back - Component or system over temperature	<ul style="list-style-type: none"> • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric device fan movement 	<ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device fan exhaust vent • Check for restricted thermal electric device fan movement • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1230-98	Left Seat Back - Component or system over temperature	<ul style="list-style-type: none"> • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric device fan movement 	<ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device fan exhaust vent • Check for restricted thermal electric device fan movement • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
B1231-7A	Right Seat - Fluid leak or seal failure	<ul style="list-style-type: none"> • Seat backrest assembly - Air path leaking • Seat cushion assembly - Air path leaking • Seat assembly damaged 	<ul style="list-style-type: none"> • Check for blockage or restriction in seat backrest/seat cushion thermal electric device fan ducts • Check seat backrest/seat cushion thermal electric device fan exhaust vent is clear • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1232-7A	Left Seat - Fluid leak or seal failure	<ul style="list-style-type: none"> • Seat backrest assembly - Air path leaking • Seat cushion assembly - Air path leaking • Seat assembly damaged 	<ul style="list-style-type: none"> • Check for blockage or restriction in seat backrest/seat cushion thermal electric device fan ducts • Check seat backrest/seat cushion thermal electric device fan exhaust vent is clear • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1235-13	Left Seat Cushion Temperature Sensor - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat cushion temperature sensor left circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_SENSOR, Circuit reference LH_CUSHION_SENSOR_RTN - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U0010-88	Medium Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> • Medium speed CAN communication - Bus off 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0140-00	Lost Communication With Body Control Module - No sub type information	<ul style="list-style-type: none"> • Lost communication with central junction box 	 <p>NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a climate seat concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis</p> <ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Refer to the electrical circuit diagrams and check the CAN network between the front seat climate control module and central junction box • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0142-00	Lost Communication With Body Control Module "B" - No sub type information	<ul style="list-style-type: none"> • Lost communication with rear junction box 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Refer to the electrical circuit diagrams and check the CAN network between the front seat climate control module and rear junction box • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification

DTC	Description	Possible Causes	Action
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	<ul style="list-style-type: none"> • Lost communication with instrument cluster 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Refer to the electrical circuit diagrams and check the CAN network between the front seat climate control module and instrument cluster • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0156-00	Lost Communication With Information Center "A" - No sub type information	<ul style="list-style-type: none"> • Lost communication with rear seat entertainment control module 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the module • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Refer to the electrical circuit diagrams and check the CAN network between the front seat climate control module and rear seat entertainment control module • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> • Software stored in front seat climate control module is not compatible with master configuration 	<ul style="list-style-type: none"> • Check the front seat climate control module is configured correctly • Reconfigure the front seat climate control module using the manufacturer approved diagnostic system. Clear the DTC and retest the system • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0401-00	Invalid Data Received From ECM/PCM - No sub type information	<ul style="list-style-type: none"> • The engine control module has transmitted engine speed quality factor CAN signal at a specific value for a greater than expected time period 	<ul style="list-style-type: none"> • Check the engine control module for related DTCs and refer to the relevant DTC index • On software levels previous to 8X23-14B663-AE clear the DTC and take no further action if the system is operating correctly
U2101-00	Control module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> • Compatible central car configuration file not received by front seat climate control module 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check and update the car configuration file as required. Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Clear the DTC and retest
U3000-04	Control Module - System internal failures	<ul style="list-style-type: none"> • Front seat climate control module - Internal failure 	<ul style="list-style-type: none"> • Check and install new front seat climate control module as required. Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> • Wiring harness fault • Battery internal failure • Charging system fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the front seat climate control module and the central junction box • Refer to the battery care manual and verify that the vehicle battery is fully charged and serviceable before continuing with further diagnostic tests • Check the vehicle charging system

General Information - Diagnostic Trouble Code (DTC) Index DTC: Headlamp Control Module (HCM)

Description and Operation

Headlamp Leveling Control Module (HLCM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.









Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.


The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Headlamp Leveling Control Module (HLCM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual.

For additional information, refer to: [Headlamps](#) (417-01 Exterior Lighting, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1041-04	Leveling Control - System internal failures	<ul style="list-style-type: none"> Module internal failure 	<ul style="list-style-type: none"> Suspect Headlamp Leveling Module internal fault. Replace as required, refer to the new module/component installation note at the top of the DTC Index
B1041-54	Leveling Control - Missing calibration	<p>NOTE: This DTC will normally be logged when a new module has been installed.</p> <ul style="list-style-type: none"> Leveling sensor calibration routine not carried out 	<p>NOTE: Sensor calibration routine must be carried out with the vehicle unladen.</p> <ul style="list-style-type: none"> Calibrate the Headlamp Leveling Sensors using the manufacturer approved diagnostic system, carry the out routine 'Headlamp Control Module System Calibration' from the 'Module programming and configuration - Setup and Configuration - Lighting'
B10AE-11	Headlamp Leveling Motor - Circuit short to ground	<ul style="list-style-type: none"> Headlamp Leveling Motor Control Circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Headlamp Leveling Motor Control Circuit for short to ground
B10AE-12	Headlamp Leveling Motor - Circuit short to battery	<ul style="list-style-type: none"> Headlamp Leveling Motor Control Circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check Headlamp Leveling Motor Control Circuit for short to power

DTC	Description	Possible Causes	Action
B10AE-64	Headlamp Leveling Motor - Signal plausibility failure	<ul style="list-style-type: none"> Signal plausibility failure voltage out of range 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the Headlamp Leveling Motor circuits for failure. Disconnect one headlamp connector, clear DTC and re-test. If DTC cleared, suspect Headlamp Leveling Module or circuits to the disconnected side. If DTC remains, reconnect first headlamp and disconnect second, clear DTC and re-test. If DTC cleared, suspect Headlamp Leveling Module or circuits to the disconnected side. If DTC remains, suspect common circuits of the failure. Refer to the electrical circuit diagrams and check as required
B1A59-11	Sensor 5 Volt Supply - Circuit short to ground	<ul style="list-style-type: none"> Headlamp Leveling Sensor 5 volt supply circuit short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check Headlamp Leveling Sensor 5 volt supply circuit for short to ground
B1A59-12	Sensor 5 Volt Supply - General electrical failure	<ul style="list-style-type: none"> Headlamp Leveling Sensor 5 volt supply circuit short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check Headlamp Leveling Sensor 5 volt supply circuit for short to power
C1A04-11	Right Front Height Sensor - Circuit short to ground	<ul style="list-style-type: none"> Right front Height Sensor circuit short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams, and check Right Front Height Sensor circuit for short to ground
C1A04-15	Right Front Height Sensor - Circuit short to battery or open	<ul style="list-style-type: none"> Right front Height Sensor circuit short to power or open circuit 	<ul style="list-style-type: none"> Check Right Front Height Sensor connector for security. Refer to the electrical circuit diagrams, and check Right Front Height Sensor circuit for short to power or open circuit
C1A04-64	Right Front Height Sensor - Signal plausibility failure	<ul style="list-style-type: none"> Sensor (PWM) Signal out of range 	<p> NOTE: This DTC may be logged if the vehicles wheels have been raised from the floor</p> <ul style="list-style-type: none"> Check the location, security and mechanical operation of the Height Sensor. Refer to the electrical circuit diagrams, and check Right Front Height Sensor signal circuit for fault
C1A06-11	Right Rear Height Sensor - Circuit short to ground	<ul style="list-style-type: none"> Right rear Height Sensor circuit short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams, and check Right Rear Height Sensor circuit for short to ground
C1A06-15	Right Rear Height Sensor - Circuit short to battery or open	<ul style="list-style-type: none"> Right rear Height Sensor circuit short to power or open circuit 	<ul style="list-style-type: none"> Check Right Rear Height Sensor connector for security. Refer to the electrical circuit diagrams, and check Right Rear Height Sensor circuit for short to power or open circuit
C1A06-64	Right Rear Height Sensor - Signal plausibility failure	<ul style="list-style-type: none"> Sensor (PWM) Signal out of range 	<p> NOTE: This DTC may be logged if the vehicles wheels have been raised from the floor</p> <ul style="list-style-type: none"> Check the location, security and mechanical operation of the Height Sensor. Refer to the electrical circuit diagrams, and check Right Rear Height Sensor signal circuit for fault
U0001-88	High Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> CAN Bus Off CAN Bus Circuit fault 	<ul style="list-style-type: none"> Check other modules for stored DTCs. Carry out the CAN Network Integrity test using the manufacturer approved diagnostic system
U0101-00	Lost Communication with TCM - No sub type information	<ul style="list-style-type: none"> Lost communication with the Transmission Control Module CAN network fault 	<ul style="list-style-type: none"> Check the Transmission Control Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Headlamp Leveling Module and the Transmission Control Module
U0121-00	Lost Communication With Anti-Lock Brake System (ABS) Control Module - No sub type information	<ul style="list-style-type: none"> Lost communication with the Anti-lock Brake System Module CAN network fault 	<ul style="list-style-type: none"> Check the Anti-lock Brake System Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Headlamp Leveling Module and the Anti-lock Brake System Module

DTC	Description	Possible Causes	Action
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> Car Configuration File (CCF) information incompatible to Headlamp Leveling Module 	<ul style="list-style-type: none"> Check/amend the Car Configuration File (CCF) using the manufacturer approved diagnostic system. Confirm the latest Strategy and Calibration software is installed in the Headlamp Leveling Module, using the manufacturer approved diagnostic system update the Headlamp Leveling Module software as required. If DTC returns suspect an internal fault with the Headlamp Leveling Module Replace as required, refer to the new module/component installation note at the top of the DTC Index
U0415-00	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module - No sub type information	 NOTE: Steering angle sensor not calibrated <ul style="list-style-type: none"> Invalid data received from ABS module 	 NOTE: The steering wheel center (straight ahead) position is recalculated each ignition cycle <ul style="list-style-type: none"> Clear the DTC then cycle the ignition state to off then on. Carry out a short road test to calibrate the Steering Wheel Angle Sensor. If DTC returns, check the Anti-lock Brake System Module for related DTCs and refer to relevant DTC Index
U2100-00	Initial Configuration Not Complete - No sub type information	<ul style="list-style-type: none"> Car Configuration File (CCF) information not received completely 	 NOTE: The Car Configuration File (CCF) parameters required are (Vehicle type)(Headlamp type)(Gearbox type) and (Dayrunning light) <ul style="list-style-type: none"> Check/amend Car Configuration File (CCF) as required using the manufacturer approved diagnostic system. Using the manufacturer approved diagnostic system, clear the stored DTC then cycle the Ignition State to off, wait 30 seconds. Return the Ignition state to on and check for stored DTCs, if the DTC returns check other modules for related stored DTCs. If no other modules have related DTCs confirm the security and condition of the Headlamp Leveling Module circuit connections. If no other DTCs are stored and the circuit is correct suspect an internal fault with the Headlamp Leveling Module Replace as required, refer to the new module/component installation note at the top of the DTC Index
U2101-00	Control Module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> Car Configuration File (CCF) information incompatible to Headlamp Leveling Module 	 NOTE: The Car Configuration File (CCF) parameters required are (Vehicle type)(Headlamp type)(Gearbox type) and (Dayrunning light) <ul style="list-style-type: none"> Check/amend Car Configuration File (CCF) as required using the manufacturer approved diagnostic system
U3002-81	Vehicle Identification Number - Invalid serial data received	<ul style="list-style-type: none"> The stored Vehicle Identification Number is not the same as the Central Broadcast Vehicle Identification Number The Headlamp Leveling Module has previously been installed to another vehicle 	<ul style="list-style-type: none"> Check the correct Headlamp Leveling Module is installed to vehicle specification. Refit original or replace the module as required. Refer to the new module/component installation note at the top of the DTC Index
U3003-16	Battery Voltage - Circuit voltage below threshold	<ul style="list-style-type: none"> The power supply to the Module has been below 9 Volts for more than 1000 milliseconds 	<ul style="list-style-type: none"> Suspect Battery or Charging fault. Check the battery condition and state of charge. Check the vehicle charging system. Refer to the relevant workshop manual section. Clear the DTC, cycle ignition state to off then on, if DTC returns refer to the electrical circuit diagrams and check power and ground circuit to the Headlamp Leveling Module
U3003-17	Battery Voltage - Circuit voltage above threshold	<ul style="list-style-type: none"> The power supply to the Module has been above 16 Volts for more than 1000 milliseconds 	<ul style="list-style-type: none"> Suspect Charging fault. Check the battery condition and state of charge. Check the vehicle charging system. Refer to the relevant workshop manual section

DTC	Description	Possible Causes	Action
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> Difference in battery voltage, of 2 volts or more, between the central broadcast voltage (via CAN Bus) and Headlamp Leveling Module 	<ul style="list-style-type: none"> Check other modules for related stored DTCs. Refer to the electrical circuit diagrams and check power and ground voltages at the Headlamp Leveling Module
U0428-00	Invalid Data Received From Steering Angle Sensor Module - No sub type information	 <p>NOTE: Steering Angle Sensor not calibrated</p> <ul style="list-style-type: none"> Invalid Data Received from the Steering Angle Sensor Module 	<ul style="list-style-type: none"> Check the Steering Angle Sensor Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Headlamp Leveling Module and the Transmission Control Module
U0402-00	Invalid Data Received From Transmission Control Module - No sub type information	<ul style="list-style-type: none"> Invalid Data Received from the Transmission Control Module Transmission component fault 	<ul style="list-style-type: none"> Check the Transmission Control Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Headlamp Leveling Module and the Transmission Control Module
U0126-00	Lost Communication With Steering Angle Sensor Module - No sub type information	<ul style="list-style-type: none"> Lost communication with the Steering Angle Sensor Module CAN network fault 	<ul style="list-style-type: none"> Check the Steering Angle Sensor Module for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Headlamp Leveling Module and the Steering Angle Sensor
U0142-00	Lost Communication With Body Control Module "B" - No sub type information	<ul style="list-style-type: none"> Lost communication with the Auxiliary Junction Box CAN network fault 	<ul style="list-style-type: none"> Check the Auxiliary Junction Box for stored DTCs. Using the manufacturer approved diagnostic system, complete the CAN Network Integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Headlamp Leveling Module and the Auxiliary Junction Box

General Information - Diagnostic Trouble Code (DTC) Index DTC: Instrument Cluster (IPC)

Description and Operation

Instrument Cluster (IC)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Instrument Cluster (IC). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Instrument Cluster](#) (413-01 Instrument Cluster, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1008-11	Wiper Mode Switch - Circuit short to ground	<ul style="list-style-type: none"> Master wiper switch circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check master wiper switch circuit for short to ground
B1008-15	Wiper Mode Switch - Circuit short to battery or open	<ul style="list-style-type: none"> Master wiper switch circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check master wiper switch circuit for short to power, open circuit
B1009-51	Ignition Authorisation - Not programmed	<ul style="list-style-type: none"> Instrument cluster power and ground supply circuits - short, open circuit Target SID synchronization error following re-programming CAN fault 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check instrument cluster power and ground supply circuits for short, open circuit. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Check CAN communications between instrument cluster and tester
B1009-62	Ignition Authorisation - Signal compare failure	<ul style="list-style-type: none"> LS CAN fault CJB ignition, power and ground supply circuits - short, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between CJB and instrument cluster. Refer to the

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> • Instrument cluster power and ground supply circuits - short, open circuit • Incorrect CJB or instrument cluster installed • Target SID synchronization error following re-programming • Noise/EMC related error 	<p>electrical circuit diagrams and check CJB ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check correct CJB and instrument cluster installed. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Check CAN network for interference/EMC related issues</p>
B1009-87	Ignition Authorisation - Missing message	<ul style="list-style-type: none"> • CJB ignition, power and ground supply circuits - short, open circuit • LS CAN fault • Instrument cluster power and ground supply circuits - short, open circuit • Low battery voltage <9 volts 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CJB ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between CJB and instrument cluster. Check battery is in serviceable condition and fully charged
B100A-62	Fuel Pump Authorisation - Signal compare failure	<ul style="list-style-type: none"> • LS CAN fault • RJB power and ground supply circuits - short, open circuit • Instrument cluster power and ground supply circuits - short, open circuit • Incorrect RJB or instrument cluster installed • Target SID synchronization error following re-programming • Noise/EMC related error 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between RJB and instrument cluster. Refer to the electrical circuit diagrams and check RJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check correct RJB and instrument cluster installed. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Check CAN network for interference/EMC related issues
B100A-64	Fuel Pump Authorisation - Signal plausibility failure	<ul style="list-style-type: none"> • Target SID synchronization error following re-programming • RJB power and ground supply circuits - short, open circuit • LS CAN fault 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check RJB power and ground supply circuits for short, open circuit. Check CAN communications between RJB and instrument cluster
B100A-87	Fuel Pump Authorisation - Missing message	<ul style="list-style-type: none"> • RJB power and ground supply circuits - short, open circuit • LS CAN fault • Instrument cluster power and ground supply circuits - short, open circuit • Low battery voltage <9 volts 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check RJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between RJB and instrument cluster. Check battery is in serviceable condition and fully charged
B100B-67	Column Lock Ground Authorisation - Signal incorrect after event	<ul style="list-style-type: none"> • Algorithm based failure-signal is incorrect after the event • Instrument cluster power and ground supply circuits - short, open circuit • LS CAN fault • RJB power and ground supply circuits - short, open circuit • Vehicle speed present when attempting to power ESCL • Engine speed present when attempting to power ESCL • PowerMode status > 4 when attempting to perform lock action 	<ul style="list-style-type: none"> • If a non start issue has not been identified, clear the DTC and check vehicle starts correctly. If a non start issue has been identified run the manufacturers approved diagnostic system Start Authorisation Application. Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check RJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between RJB and instrument cluster. Check for invalid vehicle speed signal from ABS/instrument cluster gateway. Check for invalid engine speed signal from ECM/instrument cluster gateway. Check for invalid signal from CJB

DTC	Description	Possible Causes	Action
B100B-87	Column Lock Ground Authorisation - Missing message	<ul style="list-style-type: none"> Instrument cluster power and ground supply circuits - short, open circuit LS CAN fault RJB power and ground supply circuits - short, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check RJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between RJB and instrument cluster
B100C-67	Column Lock Supply Authorisation - Signal incorrect after event	<ul style="list-style-type: none"> Instrument cluster power and ground supply circuits - short, open circuit LS CAN fault CJB power and ground supply circuits - short, open circuit Vehicle speed present when attempting to power ESCL Engine speed present when attempting to power ESCL PowerMode status > 4 when attempting to perform lock action 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between CJB and instrument cluster. Check for invalid vehicle speed signal from ABS/instrument cluster gateway. Check for invalid engine speed signal from ECM/instrument cluster gateway. Check for invalid signal from CJB
B100C-87	Column Lock Supply Authorisation - Missing message	<ul style="list-style-type: none"> Instrument cluster power and ground supply circuits - short, open circuit LS CAN fault CJB power and ground supply circuits - short, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between CJB and instrument cluster
B100D-62	Column Lock Authorisation - Signal compare failure	<ul style="list-style-type: none"> CAN fault ESCL power and ground supply circuits - short, open circuit Instrument cluster power and ground supply circuits - short, open circuit Incorrect ESCL or instrument cluster installed Target SID synchronization error following re-programming Noise/EMC related error 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communication between Electronic Steering Column Lock and instrument cluster. Refer to the electrical circuit diagrams and check Electronic Steering Column Lock power and ground supply circuits for short, open circuit and Instrument cluster power and ground supply circuits for short, open circuit. Check correct Electronic Steering Column Lock and instrument cluster installed. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Check CAN network for interference/EMC related issues
B100D-64	Column Lock Authorisation - Signal plausibility failure	<ul style="list-style-type: none"> Algorithm based failure-signal plausibility failure CAN fault ESCL power and ground supply circuits - short, open circuit Instrument cluster power and ground supply circuits - short, open circuit 	<ul style="list-style-type: none"> If the customer has not reported a non start issue, clear the DTC and check vehicle starts correctly. If a non start issue has been reported run the manufacturers approved diagnostic system Start Authorisation Application and follow the actions required for this DTC. Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communication between Electronic Steering Column Lock and instrument cluster (check transmission out speed, vehicle speed, engine speed, gear position and powermode signals to Electronic Steering Column Lock). Refer to the electrical circuit diagrams and check Electronic Steering Column Lock power and ground supply circuits for short, open circuit and Instrument cluster power and ground supply circuits for short, open circuit
B100D-87	Column Lock Authorisation - Missing message - Missing message	<ul style="list-style-type: none"> Missing message CAN fault No response from electric steering column lock control module, instrument cluster, central junction box 	<ul style="list-style-type: none"> Clear DTC, repeatedly lock and unlock car using the key fob and retest. Check for related DTCs and refer to the relevant DTC index If the fault is cleared, notify the customer that the steering column lock may fail to unlock if the vehicle is parked with a high steering angle or

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> • Battery voltage at electric steering column lock control module too low • Electric steering column lock control module, instrument cluster, central junction box fault 	<p>with the road wheel against a curb. If the column lock is failing to disengage, the customer may be able to rectify this by rotating the steering wheel while pressing the engine start button</p> <ul style="list-style-type: none"> • If fault persists, complete a CAN network integrity test using the manufacturers approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits between the central junction box, the instrument cluster and the electronic steering column lock. Refer to the electrical circuit diagrams and check the central junction box, the instrument cluster and the electronic steering column lock power and ground supply circuits for short circuit to ground, short circuit to power, open circuit, high resistance. Repair circuit(s) as required. Clear DTC, perform an on demand self-test and retest • If fault persists, check that the vehicle battery supply voltage is between 9-16 volts. Rectify as required
B100D-96	Column Lock Authorisation - Component internal failure	<ul style="list-style-type: none"> • Battery voltage at electric steering column lock control module too low • Torque load on steering column • CAN fault • Electric steering column lock control module - Internal failure 	<ul style="list-style-type: none"> • Clear DTC, repeatedly lock and unlock car using the key fob and retest • If fault persists, check that the vehicle battery supply voltage is between 9-16 volts. Rectify as required • Ensure the column lock bolt movement is not obstructed or restricted (the parked position of the road wheels may be exerting a turning force through the steering column, preventing the lock from releasing. The steering wheel may need to be held against the force to allow the column lock to release). Clear DTC, repeatedly lock and unlock car using the key fob and retest • If fault persists, complete a CAN network integrity test using the manufacturers approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits between the central junction box, the instrument cluster and the electronic steering column lock. Refer to the electrical circuit diagrams and check the central junction box, the instrument cluster and the electronic steering column lock power and ground supply circuits for short circuit to ground, short circuit to power, open circuit, high resistance. Repair circuit(s) as required. Clear DTC, perform an on demand self-test and retest • If fault persists, check and install a new electric steering column lock control module as required
B1024-87	Start Control Unit - Missing message	<ul style="list-style-type: none"> • Smart card docking station failure - slave node not responding 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check the smart card docking station LIN circuit for short, open circuit. Suspect the smart card docking station, check and install a new docking station as required, refer to the new module/component installation note at the top of the DTC Index
B1046-11	Front Fog Lamp Control Switch - Circuit short to ground	<ul style="list-style-type: none"> • Fog lamp switch circuit - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check fog lamp switch circuit for short to ground
B1046-15	Front Fog Lamp Control Switch - Circuit short to battery or open	<ul style="list-style-type: none"> • Fog lamp switch circuit - short to power, open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check fog lamp switch circuit for short to power, open circuit
B1048-11	Brake Fluid Level Switch - Circuit short to ground	<ul style="list-style-type: none"> • Brake fluid level switch circuit - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check brake fluid level switch circuit for short to ground

DTC	Description	Possible Causes	Action
B10A0-11	Wiper/ Washer Switch - Circuit short to ground	<ul style="list-style-type: none"> Wash/wipe circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check wash/wipe circuit for short to ground
B10A0-15	Wiper/ Washer Switch - Circuit short to battery or open	<ul style="list-style-type: none"> Wash/wipe circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check wash/wipe circuit for short to power, open circuit
B10A6-11	Main Light Switch - Circuit short to ground	<ul style="list-style-type: none"> Master lighting switch circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check master lighting switch circuit for short to ground
B10A6-15	Main Light Switch - Circuit short to battery or open	<ul style="list-style-type: none"> Master lighting switch circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check master lighting switch circuit for short to power, open circuit
B112B-87	Steering Wheel Module - Missing message	<ul style="list-style-type: none"> Steering wheel module failure - slave node not responding 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check the clockspring LIN circuit for short, open circuit. Suspect the clockspring, check and install a new clockspring as required, refer to the new module/component installation note at the top of the DTC Index
B115C-7A	Transfer Fuel Pump - Fluid leak or seal failure	<ul style="list-style-type: none"> Fuel pump system fault 	<ul style="list-style-type: none"> Check for fuel system jet pump or jet pump fuel level sensor fault
B1A85-15	Ambient Light Sensor - Circuit short to battery or open	<ul style="list-style-type: none"> Autolamp sensor circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check autolamp sensor circuit for short to power, open circuit
B1B01-00	Key Transponder - No sub type information	<ul style="list-style-type: none"> Operator only cycles one key During transponder key programming the instrument cluster, smartcard docking station or key loses power/circuit failure Faulty key during key programming Unable to program transponder key due to noise/EMC related error 	<ul style="list-style-type: none"> Ensure all keys to be programmed are available. Refer to electrical circuit diagrams and check power and ground supply circuits to all relevant modules. Replace faulty key and repeat key programming. Check CAN network for interference/EMC related issues
B1B01-05	Key Transponder - System programming failures	<ul style="list-style-type: none"> Error following SCU replacement Smartcard docking station power and ground supply circuits - short, open circuit LIN fault Instrument cluster power and ground supply circuits - short, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check LIN communications between smartcard docking station and instrument cluster
B1B01-51	Key Transponder - Not programmed	<ul style="list-style-type: none"> LIN fault Instrument cluster power and ground supply circuits - short, open circuit Key fault Smartcard docking station power and ground supply circuits - short, open circuit Attempted to program a non 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check LIN communications between smartcard docking station and instrument cluster. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Confirm

DTC	Description	Possible Causes	Action
		default key	transponder key operation. Ensure new keys are from a known source
B1B01-55	Key Transponder - Not configured	<ul style="list-style-type: none"> • Un-programmed key inserted in SCU2 • A non default key inserted during key programming 	<ul style="list-style-type: none"> • Confirm the correct keys are used
B1B01-62	Key Transponder - Signal compare failure	<ul style="list-style-type: none"> • Instrument cluster power and ground supply circuits - short, open circuit • Smartcard docking station power and ground supply circuits - short, open circuit • Incorrect instrument cluster or smartcard docking station installed • Error during or following the Write Target SID routine • Noise/EMC related error 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check correct instrument cluster and smartcard docking station are installed. Perform the Immobilisation application from the Set-Up menu using the manufacturer approved diagnostic system. Check CAN network for interference/EMC related issues
B1B01-64	Key Transponder - Signal plausibility failure	<ul style="list-style-type: none"> • LIN fault • Instrument cluster power and ground supply circuits - short, open circuit • Transponder key fault • Smartcard docking station power and ground supply circuits - short, open circuit • Error occurred during transponder key programming 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check LIN communications between smartcard docking station and instrument cluster. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Confirm transponder key operation. Repeat transponder key programming
B1B01-67	Key Transponder - Signal incorrect after event	<ul style="list-style-type: none"> • LIN fault • Instrument cluster power and ground supply circuits - short, open circuit • Transponder key fault • Smartcard docking station power and ground supply circuits - short, open circuit • Another key in close proximity • Instrument cluster in incorrect programming state • Attempted to program a non default key • Instrument cluster Cold init whilst in Ignition On state, without key being present in the SCU • Race condition caused by closing driver door and pressing the start button within a small time window • Passive Key search function from last door closed and key inserted in the SCU 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check LIN communications between smartcard docking station and instrument cluster. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Confirm transponder key operation. Confirm single key operation. Ensure instrument cluster in correct mode i.e. Auto Enable, Key erase etc. Ensure new keys are from a known source. Check for intermittent power and ground to instrument cluster. Design condition - advise customer of starting sequence. Design condition - determine customer transponder key usage
B1B01-87	Key Transponder - Missing message	<ul style="list-style-type: none"> • LIN fault • Instrument cluster power and ground supply circuits - short, open circuit • Smartcard docking station power and ground supply circuits - short, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check LIN communications between smartcard docking station and instrument cluster. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit
B1B33-05	Target I.D. Transfer - System programming failures	<ul style="list-style-type: none"> • CAN fault • ECM ignition, power and ground supply circuits - short, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between ECM and instrument cluster. Refer to electrical

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> • Instrument cluster power and ground supply circuits - short, open circuit • ECM or instrument cluster incorrectly configured 	<p>circuit diagrams and check ECM ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system</p>
B1B33-62	Target I.D. Transfer - Signal compare failure	<ul style="list-style-type: none"> • CAN fault • ECM ignition, power and ground supply circuits - short, open circuit • Instrument cluster power and ground supply circuits - short, open circuit • Incorrect ECM or instrument cluster installed • Synchronisation error following re-programming • Noise/EMC related error 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between ECM and instrument cluster. Refer to electrical circuit diagrams and check ECM ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check correct ECM and instrument cluster installed. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Check CAN network for interference/EMC related issues
B1B33-64	Target identification transfer - Signal plausibility failure	<ul style="list-style-type: none"> • Algorithm based failure - signal plausibility failure • CAN fault • ECM ignition, power and ground supply circuits - short, open circuit • Instrument cluster power and ground supply circuits - short, open circuit • electronic steering column lock status incomplete • Race condition caused by closing driver door and pressing the start button within a small time window 	<ul style="list-style-type: none"> • If the customer has not reported a non start issue, clear the DTC and check vehicle starts correctly. If a non start has been reported run the manufacturers approved diagnostic system Start Authorisation Application and follow the actions required for this DTC. Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between ECM and instrument cluster. Refer to electrical circuit diagrams and check ECM ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check electronic steering column lock operation. Advise customer of starting sequence and to allow time to elapse between closing door and pressing start button
B1B33-87	Target I.D. Transfer - Missing message	<ul style="list-style-type: none"> • CAN fault • ECM ignition, power and ground supply circuits - short, open circuit • Instrument cluster power and ground supply circuits - short, open circuit • Low battery voltage 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between ECM and instrument cluster. Refer to electrical circuit diagrams and check ECM ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check battery is in serviceable condition and is fully charged, check terminals etc
B1C32-77	Steering Column Tilt Solenoid - Commanded position not reachable	<ul style="list-style-type: none"> • TILT axis fails to move minimum distance within allotted time period. Motion may have been prohibited due to motor jamming, stalling or solenoid pin not engaging 	<ul style="list-style-type: none"> • Check for restricted/jammed steering column motor mechanism. Refer to the electrical circuit diagrams and check steering column motor UP/IN, DOWN/OUT circuit for short, open circuit
B1C32-94	Steering Column Tilt Solenoid - Unexpected operation	<ul style="list-style-type: none"> • TELE axis moves when it has not been commanded to. Motion may have occurred due to solenoid pin not disengaging or mechanism has been jammed on, whilst REACH axis has been commanded to move 	<ul style="list-style-type: none"> • Check for stuck/jammed solenoid/switch. Refer to the electrical circuit diagrams and check steering column motor UP/IN, DOWN/OUT circuit for short, open circuit
B1C33-12	Steering Column Tilt Feedback Signal - Circuit short to battery	<ul style="list-style-type: none"> • Steering column tilt feedback signal circuit - short to power 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check steering column tilt feedback signal circuit for short to power

DTC	Description	Possible Causes	Action
B1C33-14	Steering Column Tilt Feedback Signal - Circuit short to ground or open	<ul style="list-style-type: none"> Steering column tilt feedback signal circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check steering column tilt feedback signal circuit for short to ground, open circuit
B1C34-77	Steering Column Telescope Solenoid - Commanded position not reachable	<ul style="list-style-type: none"> REACH axis fails to move minimum distance within allotted time period. Motion may have been prohibited due to motor jamming, stalling or solenoid pin not engaging 	<ul style="list-style-type: none"> Check for restricted/jammed steering column motor mechanism. Refer to the electrical circuit diagrams and check steering column motor UP/IN, DOWN/OUT circuit for short, open circuit
B1C34-94	Steering Column Telescope Solenoid - Unexpected operation	<ul style="list-style-type: none"> REACH axis moves when it has not been commanded to. Motion may have occurred due to solenoid pin not disengaging or mechanism has been jammed on, whilst TILT axis has been commanded to move 	<ul style="list-style-type: none"> Check for stuck/jammed solenoid/switch. Refer to the electrical circuit diagrams and check steering column motor UP/IN, DOWN/OUT circuit for short, open circuit
B1C35-12	Steering Column Telescope Feedback Signal - Circuit short to battery	<ul style="list-style-type: none"> Steering column TELE feedback signal circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check steering column TELE feedback signal circuit for short to power
B1C35-14	Steering Column Telescope Feedback Signal - Circuit short to ground or open	<ul style="list-style-type: none"> Steering column TELE feedback signal circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check steering column TELE feedback signal circuit for short to ground, open circuit
B1C36-11	Steering Column Tilt/Telescope Switch - Circuit short to ground	<ul style="list-style-type: none"> Steering column adjust switch circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check steering column adjust switch circuit for short to ground
B1C48-11	Flash to Pass Switch - Circuit short to ground	<ul style="list-style-type: none"> Main beam flash switch circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check main beam flash switch circuit for short to ground
B1C48-15	Flash to Pass Switch - Circuit short to battery or open	<ul style="list-style-type: none"> Main beam flash switch circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check main beam flash switch circuit for short to power, open circuit
B1C53-11	Front Wiper Intermittent Data - Circuit short to ground	<ul style="list-style-type: none"> Intermittent wipe switch circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check intermittent wipe switch circuit for short to ground
B1C53-15	Front Wiper Intermittent Data - Circuit short to battery or open	<ul style="list-style-type: none"> Intermittent wipe switch circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check intermittent wipe switch circuit for short to power, open circuit
B1D36-11	Turn Indicator Switch - Circuit short to ground	<ul style="list-style-type: none"> Direction indicator switch circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check direction indicator switch circuit for short to ground
B1D36-15	Turn Indicator Switch - Circuit short to battery or open	<ul style="list-style-type: none"> Direction indicator switch circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check direction indicator switch circuit for short to power, open circuit

DTC	Description	Possible Causes	Action
B1D37-11	Wiper Switch Connection Circuit - Circuit short to ground	<ul style="list-style-type: none"> Flick wipe switch circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check flick wipe switch circuit for short to ground
B1D37-15	Wiper Switch Connection Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> Flick wipe switch circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check flick wipe switch circuit for short to power, open circuit
C1110-64	Power steering Calibration Data - Signal plausibility failure	<ul style="list-style-type: none"> Invalid VAPS curve loaded 	<ul style="list-style-type: none"> Re-configure the instrument cluster as new to download VAPS curve data
P0635-11	Power Steering Control Circuit - Circuit short to ground	<ul style="list-style-type: none"> VAPS ignition supply circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check VAPS ignition supply circuit for short to ground
P0635-12	Power Steering Control Circuit - Circuit short to battery	<ul style="list-style-type: none"> VAPS ignition supply circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check VAPS ignition supply circuit for short to power
P0635-13	Power Steering Control Circuit - Circuit open	<ul style="list-style-type: none"> VAPS ignition supply circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check VAPS ignition supply circuit for open circuit
P0635-22	Power Steering Control Circuit - Signal amplitude > maximum	<ul style="list-style-type: none"> First valid received speed value above threshold 	<ul style="list-style-type: none"> Check ABS module for DTCs and refer to relevant DTC Index
P0635-44	Power Steering Control Circuit - Data memory failure	<ul style="list-style-type: none"> Data memory failure 	<ul style="list-style-type: none"> Re-configure the instrument cluster as new to download VAPS curve data
U0001-88	High Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> Bus Off 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check HS CAN network to instrument cluster
U0010-88	Medium Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> Bus Off 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check MS CAN network to instrument cluster
U0100-00	Lost Communication With ECM/PCM "A" - No sub type information	<ul style="list-style-type: none"> Loss of CAN communication with ECM 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check ECM for DTCs and refer to the relevant DTC Index
U0101-00	Lost Communication with TCM - No sub type information	<ul style="list-style-type: none"> Loss of CAN communication with TCM 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check TCM for DTCs and refer to the relevant DTC Index
U0103-00	Lost Communication With Gear Shift Module - No sub type information	<ul style="list-style-type: none"> Loss of CAN communication with transmission shift module 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check transmission shift module for DTCs and refer to the relevant DTC Index
U0104-00	Lost Communication With Cruise Control Module - No sub type information	<ul style="list-style-type: none"> Loss of CAN communication with speed control module 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check speed control module for DTCs and refer to the relevant DTC Index
U0121-00	Lost Communication With Anti-Lock Brake System (ABS) Control Module - No sub type information	<ul style="list-style-type: none"> Loss of CAN communication with ABS module 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check ABS module for DTCs and refer to the relevant DTC Index

General Information - Diagnostic Trouble Code (DTC) Index DTC: Integrated Audio Module (IAM)

Description and Operation

Integrated Audio Module (IAM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Integrated Audio Module (IAM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Information and Entertainment System](#) (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1B69-15	12 Volt supply circuit - Circuit short to battery or open	<ul style="list-style-type: none"> Antenna power supply circuit - short to battery, high resistance 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
B1B69-11	12 Volt supply circuit - Circuit short to ground	<ul style="list-style-type: none"> Antenna power supply circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. to the electrical circuit diagrams and test the antenna power supply circuit for short to ground
B1D19-16	Compact Disc Unit - Circuit voltage below threshold	<ul style="list-style-type: none"> Circuit voltage below threshold 	<ul style="list-style-type: none"> Suspect the integrated audio module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1D19-77	Compact Disc Unit - Commanded position not reachable	<ul style="list-style-type: none"> Commanded position not reachable 	<ul style="list-style-type: none"> Suspect the integrated audio module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index

DTC	Description	Possible Causes	Action
B1D19-93	Compact Disc Unit - No operation	<ul style="list-style-type: none"> No operation 	<ul style="list-style-type: none"> Suspect the integrated audio module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A01-11	Speaker #1 - Circuit short to ground	<ul style="list-style-type: none"> Front driver speaker circuits - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test front driver speaker circuits for short to ground
B1A01-12	Speaker #1 - Circuit short to battery	<ul style="list-style-type: none"> Front driver speaker circuits - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test front driver speaker circuits for short to power
B1A01-1A	Speaker #1 - Circuit resistance below threshold	<ul style="list-style-type: none"> Front driver speaker circuits - resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A01-1B	Speaker #1 - Circuit resistance above threshold	<ul style="list-style-type: none"> Front driver speaker circuits - resistance above threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A01-1C	Speaker #1 - Circuit voltage out of range	<ul style="list-style-type: none"> Front driver speaker circuits - voltage out of range. Power IC failure internal to the integrated audio 	<ul style="list-style-type: none"> Suspect the integrated audio module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A02-11	Speaker #2 - Circuit short to ground	<ul style="list-style-type: none"> Front passenger speaker circuits - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test front passenger speaker circuits for short to ground
B1A02-12	Speaker #2 - Circuit short to battery	<ul style="list-style-type: none"> Front passenger speaker circuits - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test front passenger speaker circuits for short to power
B1A02-1A	Speaker #2 - Circuit resistance below threshold	<ul style="list-style-type: none"> Front passenger speaker circuits - resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A02-1B	Speaker #2 - Circuit resistance above threshold	<ul style="list-style-type: none"> Front passenger speaker circuits - resistance above threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A02-1C	Speaker #2 - Circuit voltage out of range	<ul style="list-style-type: none"> Front passenger speaker circuits - voltage out of range. Power IC failure internal to the integrated audio 	<ul style="list-style-type: none"> Suspect the integrated audio module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A03-11	Speaker #3 - Circuit short to ground	<ul style="list-style-type: none"> Rear left speaker circuits - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test rear left speaker circuits for short to ground
B1A03-12	Speaker #3 - Circuit short to battery	<ul style="list-style-type: none"> Rear left speaker circuits - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test rear left speaker circuits for short to power

DTC	Description	Possible Causes	Action
B1A03-1A	Speaker #3 - Circuit resistance below threshold	<ul style="list-style-type: none"> Rear left speaker circuits - resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A03-1B	Speaker #3 - Circuit resistance above threshold	<ul style="list-style-type: none"> Rear left speaker circuits - resistance above threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A03-1C	Speaker #3 - Circuit voltage out of range	<ul style="list-style-type: none"> Rear left speaker circuits - voltage out of range. Power IC failure internal to the integrated audio 	<ul style="list-style-type: none"> Suspect the integrated audio module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A04-11	Speaker #4 - Circuit short to ground	<ul style="list-style-type: none"> Rear right speaker circuits - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test rear right speaker circuits for short to ground
B1A04-12	Speaker #4 - Circuit short to battery	<ul style="list-style-type: none"> Rear right speaker circuits - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test rear right speaker circuits for short to power
B1A04-1A	Speaker #4 - Circuit resistance below threshold	<ul style="list-style-type: none"> Rear right speaker circuits - resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A04-13	Speaker #4 - Circuit open	<ul style="list-style-type: none"> Rear right speaker circuits - resistance above threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1A04-1C	Speaker #4 - Circuit voltage out of range	<ul style="list-style-type: none"> Rear right speaker circuits - voltage out of range. Power IC failure internal to the integrated audio 	<ul style="list-style-type: none"> Suspect the integrated audio module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B1A56-13	Antenna - Circuit open	<ul style="list-style-type: none"> Antenna circuit - open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check antenna circuit for open circuit
B1D78-11	Auxiliary Input - Circuit short to ground	<ul style="list-style-type: none"> Auxiliary input circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test Auxiliary input circuits for short to ground
B1D78-12	Auxiliary Input - Circuit short to battery	<ul style="list-style-type: none"> Auxiliary input circuit - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test Auxiliary input circuits for short to power
B1D78-13	Auxiliary Input - Circuit open	<ul style="list-style-type: none"> Auxiliary input circuit - high resistance 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test Auxiliary input circuits for high resistance
B1D79-11	Microphone Input - Circuit short to ground	<ul style="list-style-type: none"> Microphone input circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test microphone input circuits for short to ground
B1D79-12	Microphone Input - Circuit short to battery	<ul style="list-style-type: none"> Microphone input circuit - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test microphone input circuits for short to power

DTC	Description	Possible Causes	Action
B1D79-13	Microphone Input - Circuit open	<ul style="list-style-type: none"> • Microphone input circuit - high resistance 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test microphone input circuits for high resistance
B1134-11	Phone Input - Circuit short to ground	<ul style="list-style-type: none"> • Phone input circuit - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test phone input circuits for short to ground
B1134-12	Phone Input - Circuit short to battery	<ul style="list-style-type: none"> • Phone input circuit - short to power 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test phone input circuits for short to power
B1134-13	Phone Input - Circuit open	<ul style="list-style-type: none"> • Phone input circuit - high resistance 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test phone input circuits for high resistance
U2100-00	Initial Configuration Not Complete - No sub type information	<ul style="list-style-type: none"> • Car configuration data not received 	<ul style="list-style-type: none"> • Check RJB for related DTCs and refer to the relevant DTC Index
U2101-00	Control Module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> • Incorrect car configuration data received 	<ul style="list-style-type: none"> • Check RJB for related DTCs and refer to the relevant DTC Index. Check/amend Car Configuration File using the manufacturer approved diagnostic system
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> • Internal electronic failure 	<ul style="list-style-type: none"> • Suspect the integrated audio module, install a new module as required, refer to the new module installation note at the top of the DTC Index
U3000-55	Control Module - Not configured	<ul style="list-style-type: none"> • Incorrect car configuration data received 	<ul style="list-style-type: none"> • Re-configure the RJB using the manufacturer approved diagnostic system. Clear DTC and re-test. If the DTC remains suspect the integrated audio module, refer to the new module installation note at the top of the DTC Index
U3000-87	Control Module - Missing message	<ul style="list-style-type: none"> • Missing message 	<ul style="list-style-type: none"> • Re-configure the RJB using the manufacturer approved diagnostic system. Check integrated audio module for DTCs and refer to the DTC Index. Check CAN network integrity using the manufacturer approved diagnostic system
U3000-98	Control Module - Component or system over temperature	<ul style="list-style-type: none"> • Component or system over temperature 	<ul style="list-style-type: none"> • Check for additional DTCs and refer to DTC Index. Clear DTC and re-test/monitor condition
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> • Mis-match in battery voltage, of 2 volts or more, between integrated audio module and RJB 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

General Information - Diagnostic Trouble Code (DTC) Index DTC: Integrated Control Panel (FCIMB)

Description and Operation

Integrated Control Panel (ICP)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Integrated Control Panel (ICP). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Information and Entertainment System](#) (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1012-23	Heated Windshield Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B1013-23	Heater Rear Defog Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B1014-23	Recirculation Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B1015-23	Screen On/Off Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required

DTC	Description	Possible Causes	Action
B1016-23	Status Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B1017-23	Left Temperature Decrease Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B1018-23	Right Temperature Decrease Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B1019-23	Left Temperature Increase Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B101A-23	Right Temperature Increase Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B101B-23	Defrost Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B101C-23	Seek Up Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B101D-23	Seek Down Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B101E-23	Air Conditioning Mode Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B101F-23	Eject Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B1020-23	Load Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B1021-23	Source Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B1022-23	Audio On/Off Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required

DTC	Description	Possible Causes	Action
B11A9-23	Tone Button - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
B121F-23	Climate Switch - Signal stuck low	<ul style="list-style-type: none"> • Button stuck down/jammed • Integrated control panel failure 	<ul style="list-style-type: none"> • Check for stuck down/jammed button. Check and install a new integrated control panel as required
U0010-88	Medium Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> • Bus off 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U0140-00	Lost Communication With Body Control Module - No sub type information	<ul style="list-style-type: none"> • Missing message from CJB 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U0142-00	Lost Communication With Body Control Module "B" - No sub type information	<ul style="list-style-type: none"> • Missing message from RJB 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	<ul style="list-style-type: none"> • Missing message from instrument cluster 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated to this DTC using the manufacturer approved diagnostic system
U0156-00	Lost Communication With Information Center "A" - No sub type information	<ul style="list-style-type: none"> • Missing message from information and entertainment control module 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> • Invalid car configuration data received 	<ul style="list-style-type: none"> • Re-configure the integrated control panel as new. Clear DTC and re-test, if DTC remains suspect the integrated control panel. Check and install a new integrated control panel as required, refer to the new module/component installation note at the top of the DTC Index
U3000-41	Control Module - General checksum failure	<ul style="list-style-type: none"> • Checksum error, internal module failure 	<ul style="list-style-type: none"> • Suspect the integrated control panel, check and install a new integrated control panel as required, refer to the new module/component installation note at the top of the DTC Index

General Information - Diagnostic Trouble Code (DTC) Index DTC: Occupant Classification System (OCS)

Description and Operation

Occupant Classification System (OCS)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



It is advisable not to use a cellular phone or to have a cellular phone in close proximity when working on the restraints control module or associated systems



Given the legal implications of a restraints system failure, harness repairs to Air Bag module circuits are not acceptable. Where the text refers to "REPAIR the circuit", this will normally mean the replacement of a harness.



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all diagnostic trouble codes (DTCs) that could be logged in the occupant classification system, for additional diagnosis and testing information refer to the relevant diagnosis and testing section.

For additional information, refer to: Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) (501-20 Supplemental Restraint System, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1193-53	Crash Event Storage Full and Locked - Deactivated	<ul style="list-style-type: none"> Crash event occurred 	<ul style="list-style-type: none"> Clear diagnostic trouble code and re-test
B1A54-01	Occupant Belt Tension Sensor - General Electrical Failure	<ul style="list-style-type: none"> General electrical failure 	<ul style="list-style-type: none"> Clear diagnostic trouble code and re-test. If the problem persists, check and install a new safety belt tension sensor as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B1A54-02	Occupant Belt Tension Sensor - General signal failure	<ul style="list-style-type: none"> General signal failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check safety belt tension and mat pressure sensor circuits for short to each other

DTC	Description	Possible Causes	Action
B1A54-11	Occupant Belt Tension Sensor - Circuit short to ground	<ul style="list-style-type: none"> Safety belt tension sensor voltage reference or signal circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check safety belt tension sensor voltage reference and signal circuits for short to ground
B1A54-12	Occupant Belt Tension Sensor - Circuit short to battery	<ul style="list-style-type: none"> Safety belt tension sensor voltage reference or signal circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check safety belt tension sensor voltage reference and signal circuits for short to power
B1A54-13	Occupant Belt Tension Sensor - Circuit open	<ul style="list-style-type: none"> Safety belt tension sensor voltage reference or signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check safety belt tension sensor voltage reference and signal circuits for open circuit
B1A62-02	Pressure Sensor - General signal failure	<ul style="list-style-type: none"> General signal failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check safety belt tension and mat pressure sensor circuits for short to each other
B1A62-11	Pressure Sensor - Circuit short to ground	<ul style="list-style-type: none"> Mat pressure sensor voltage reference or signal circuits - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check mat pressure sensor voltage reference and signal circuits for short to ground
B1A62-12	Pressure Sensor - Circuit short to battery	<ul style="list-style-type: none"> Mat pressure sensor voltage reference, ground or signal circuits - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check mat pressure sensor voltage reference, ground and signal circuits for short to power
B1A62-13	Pressure Sensor - Circuit open	<ul style="list-style-type: none"> Mat pressure sensor voltage reference or signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check mat pressure sensor voltage reference and signal circuits for open circuit
B1A62-7B	Pressure Sensor - Low fluid level	<ul style="list-style-type: none"> Low fluid level - bladder damaged 	<ul style="list-style-type: none"> Check and install new bladder as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
U0001-88	High Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> Bus off 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check CAN network for short, open circuit. Carry out the CAN network integrity test using the manufacturer approved diagnostic system
U0151-00	Lost Communication With Restraints Control Module - No sub type information	<ul style="list-style-type: none"> Restraints control module missing message 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check power and ground supplies to restraints control module. Carry out CAN network integrity test using the manufacturer approved diagnostic system
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> Master car configuration file ID does not correspond 	<ul style="list-style-type: none"> Check correct occupancy seat module is installed for vehicle specification. Check rear junction box for related diagnostic trouble codes and refer to relevant diagnostic trouble code index
U2016-51	Control Module Main Software - Not programmed	<ul style="list-style-type: none"> Main software not programmed 	<ul style="list-style-type: none"> Check and install a new occupancy seat module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
U201A-51	Control Module Main Calibration Data - Not programmed	<ul style="list-style-type: none"> Main calibration data not programmed 	<ul style="list-style-type: none"> Check and install a new occupancy seat module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

DTC	Description	Possible Causes	Action
U3000-04	Control Module - System Internal Failures	<ul style="list-style-type: none"> Occupancy seat module internal electronic failure 	<ul style="list-style-type: none"> Check and install a new occupancy seat module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
U3000-54	Control Module - Missing calibration	<ul style="list-style-type: none"> This diagnostic trouble code is set if a 'calibrate occupancy seat module empty seat offset' routine is requested and fails due to one of the pre-conditions to execute the routine 	<ul style="list-style-type: none"> Check the following criteria have all been achieved: Ignition status set to RUN/START. Verify seat is always empty after power-up before re-zero is requested. The occupancy seat module has gone through the seat assembly plant calibration. No collision event received from the restraints control module during the current ignition cycle. No faults present in the current ignition cycle. The trigger message for calibrate empty seat offset has been received from the diagnostic tool. Occupancy seat module has enough time to begin classification. Temperature is between 6C (42F) and 36C (97F)
U3003-16	Battery Voltage - Circuit voltage below threshold	<ul style="list-style-type: none"> Circuit voltage below threshold 	<ul style="list-style-type: none"> Check battery is in fully charged and serviceable condition. Check integrity of charging system
U3003-17	Battery Voltage - Circuit voltage above threshold	<ul style="list-style-type: none"> Circuit voltage above threshold 	<ul style="list-style-type: none"> Check battery is in fully charged and serviceable condition. Check integrity of charging system

General Information - Diagnostic Trouble Code (DTC) Index DTC: Parking Aid Module (PAM)

Description and Operation

Parking Aid Control Module (PACM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required



Physical damage to the sensor (impact damage or scratched sensor surface) must **NOT** be changed under warranty.

The table below lists all diagnostic trouble codes (DTCs) that could be logged in the Parking Aid Control Module (PACM). For additional diagnosis and testing information refer to the relevant diagnosis and testing section.

For additional information, refer to: [Parking Aid](#) (413-13 Parking Aid, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1B36-01	Front Right Outer Sensor - General Electrical Failure	<ul style="list-style-type: none"> Wiring harness fault Front right outer sensor - Component internal failure 	<ul style="list-style-type: none"> Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required Check the connector for integrity and damage, then re-connect sensor to confirm connection Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor

DTC	Description	Possible Causes	Action
B1B36-12	Front Right Outer Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Wiring harness fault 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B36-96	Front Right Outer Sensor - Component internal failure	<ul style="list-style-type: none"> • Wiring harness fault • Front right outer sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B38-01	Front Right Inner Sensor - General Electrical Failure	<ul style="list-style-type: none"> • Wiring harness fault • Front right inner sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B38-12	Front Right Inner Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Wiring harness fault 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B38-96	Front Right Inner Sensor - Component internal failure	<ul style="list-style-type: none"> • Wiring harness fault • Front right inner sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor


DTC	Description	Possible Causes	Action
B1B40-01	Front Left Outer Sensor - General electrical failure	<ul style="list-style-type: none"> • Wiring harness fault • Front left outer sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B40-12	Front Left Outer Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Wiring harness fault 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B40-96	Front Left Outer Sensor - Component internal failure	<ul style="list-style-type: none"> • Wiring harness fault • Front left outer sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B42-01	Front Left Inner Sensor - General electrical failure	<ul style="list-style-type: none"> • Wiring harness fault • Front left inner sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B42-12	Front Left Inner Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Wiring harness fault 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test

DTC	Description	Possible Causes	Action
B1B42-96	Front Left Inner Sensor - Component internal failure	<ul style="list-style-type: none"> • Wiring harness fault • Front left inner sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B44-01	Rear Right Outer Sensor - General electrical failure	<ul style="list-style-type: none"> • Wiring harness fault • Rear Right Outer Sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B44-12	Rear Right Outer Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Wiring harness fault 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the rear bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B44-96	Rear Right Outer Sensor - Component internal failure	<ul style="list-style-type: none"> • Wiring harness fault • Rear Right Outer Sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B46-01	Rear Right Inner Sensor - General electrical failure	<ul style="list-style-type: none"> • Wiring harness fault • Rear Right Inner Sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for

DTC	Description	Possible Causes	Action
			<p>signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor</p>
B1B46-12	Rear Right Inner Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Wiring harness fault 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the rear bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B46-96	Rear Right Inner Sensor - Component internal failure	<ul style="list-style-type: none"> • Wiring harness fault • Rear Right Inner Sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B48-01	Rear Left Outer Sensor - General electrical failure	<ul style="list-style-type: none"> • Wiring harness fault • Rear Left Outer Sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B48-12	Rear Left Outer Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Wiring harness fault 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the rear bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B48-96	Rear Left Outer Sensor - Component internal failure	<ul style="list-style-type: none"> • Wiring harness fault • Rear Left Outer Sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the

DTC	Description	Possible Causes	Action
			bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B50-01	Rear Left Inner Sensor - General electrical failure	<ul style="list-style-type: none"> Wiring harness fault Rear Left Inner Sensor - Component internal failure 	<ul style="list-style-type: none"> Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required Check the connector for integrity and damage, then re-connect sensor to confirm connection Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B50-12	Rear Left Inner Sensor - Circuit short to battery	<ul style="list-style-type: none"> Wiring harness fault 	<ul style="list-style-type: none"> Refer to electrical wiring diagrams and check the rear bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required Check the connector for integrity and damage, then re-connect sensor to confirm connection Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B50-96	Rear Left Inner Sensor - Component internal failure	<ul style="list-style-type: none"> Wiring harness fault Rear Left Inner Sensor - Component internal failure 	<ul style="list-style-type: none"> Refer to electrical wiring diagrams and check the rear bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required Check the connector for integrity and damage, then re-connect sensor to confirm connection Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B54-11	Function LED - Park Aid - Circuit short to ground	<ul style="list-style-type: none"> Wiring harness fault Switch/LED - Component internal failure 	<ul style="list-style-type: none"> Refer to electrical wiring diagrams and check the parking aid LED circuit for short circuit to ground. Repair or replace any wiring harness as required Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test. If the problem persists, suspect the switch/LED
B1B54-12	Function LED - Park Aid - Circuit short to battery	<ul style="list-style-type: none"> Wiring harness fault Switch/LED - Component internal failure Control Module - Component internal failure 	<ul style="list-style-type: none"> Refer to electrical wiring diagrams and check the parking aid LED circuit for short circuit to power. Repair or replace any wiring harness as required Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test. If the problem persists, suspect the switch/LED
B1B57-11	Front Sensors Power Circuit- Circuit short to ground	<ul style="list-style-type: none"> Wiring harness fault Control Module - Component internal failure 	<ul style="list-style-type: none"> Check front and rear bumper harness for signs of damage and security of connections Refer to electrical wiring diagrams and check the parking assist front sensor power circuit and rear sensor power circuit for short circuit to ground. Repair or replace any wiring harness as required Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test. If the problem persists, suspect the control module

DTC	Description	Possible Causes	Action
			<ul style="list-style-type: none"> • Cycle the ignition off, then on, to power up parking aid system and check corrective action
B1B58-11	Rear Sensors Power Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Wiring harness fault • Control Module - Component internal failure 	<ul style="list-style-type: none"> • Check rear and front (if front PDC fitted) bumper harness for signs of damage and security of connections • Refer to electrical wiring diagrams and check the parking assist rear sensor power circuit and front sensor power circuit (if front PDC fitted) for short circuit to ground. Repair or replace any wiring harness as required • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test. If the problem persists, suspect the control module • Cycle the ignition off, then on, to power up parking aid system and check corrective action
B1C30-73	Disable Switch - Actuator stuck closed	<ul style="list-style-type: none"> • Wiring harness fault • Control Switch - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the parking assist switch and switch circuit. Repair or replace any wiring harness as required • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test. If the problem persists, suspect the control switch • Check the switch function
U0010-00	Medium Speed CAN Communication Bus - No sub type information	<ul style="list-style-type: none"> • Medium speed CAN failure - bus off 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the parking aid control module medium speed CAN bus for short circuit to ground, short circuit to power, open circuit, high resistance, or short circuit between the paired CAN wires • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Cycle the ignition off, then on, and check if the DTC is still logged
U0073-00	Control Module Communication Bus "A" Off - No sub type information	<ul style="list-style-type: none"> • Control module communication Bus "A" failure - bus off 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the parking aid control module high speed CAN bus for short circuit to ground, short circuit to power, open circuit, high resistance, or short circuit between the paired CAN wires • Using the manufacturer approved diagnostic system, complete a CAN network integrity test • Cycle the ignition off, then on, and check if the DTC is still logged
U0140-00	Lost Communication With Body Control Module - No sub type information	<ul style="list-style-type: none"> • Loss of CAN communication with central junction box 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the central junction box. Clear DTC and retest • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the central junction box and the parking aid control module
U0142-00	Lost Communication With Body Control Module "B" - No sub type information	<ul style="list-style-type: none"> • Loss of CAN communication with auxiliary junction box 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the auxiliary junction box. Clear DTC and retest • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the central junction box and the parking aid control module
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	<ul style="list-style-type: none"> • Loss of CAN communication with instrument cluster 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the instrument cluster. Clear DTC and retest • Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the central junction box and the parking aid control module

DTC	Description	Possible Causes	Action
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> Car configuration file stored in parking aid control module does not match the master car configuration file Master car configuration file not being transmitted by master control module 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, check all other control modules, for related DTCs and refer to the relevant DTC index Check the components installed on the vehicle were installed by the factory or a dealer Install the original component or a new one as required
U0422-00	Invalid Data Received From Body Control Module - No sub type information	<ul style="list-style-type: none"> Invalid data received 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, check central junction box, for related DTCs and refer to the relevant DTC index Using the manufacturer approved diagnostic system, complete a CAN network integrity test Cycle the ignition off, then on, and check if the DTC is still logged Clear the DTC and re-test
U0423-00	Invalid Data Received From Instrument Panel Control Module - No sub type information	<ul style="list-style-type: none"> Invalid data received 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, check instrument cluster, for related DTCs and refer to the relevant DTC index Using the manufacturer approved diagnostic system, complete a CAN network integrity test Cycle the ignition off, then on, and check if the DTC is still logged Clear the DTC and re-test
U0443-00	Invalid Data Received From Body Control Module "B" - No sub type information	<ul style="list-style-type: none"> Invalid data received 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, check auxiliary junction box, for related DTCs and refer to the relevant DTC index Using the manufacturer approved diagnostic system, complete a CAN network integrity test Cycle the ignition off, then on, and check if the DTC is still logged Clear the DTC and re-test
U2100-00	Initial Configuration Not Complete - No sub type information	<ul style="list-style-type: none"> Car configuration file not the same as expected by the parking aid control module 	 <p>NOTE: After updating the car configuration file, set the ignition to on and wait 30 seconds before clearing the DTCs</p> <ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, check and update the car configuration file as required. Clear the DTC and retest
U2101-00	Control Module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> Parking aid control module configuration error 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check and up-date the car configuration file as required. Clear the DTC and re-test
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> Parking aid control module internal failure 	<ul style="list-style-type: none"> Using the manufacturers approved diagnostic system clear the DTC, cycle the ignition off, then on, and check if the DTC is still logged If the DTC is still logged suspect the parking aid control module
U3002-81	Vehicle Identification Number - Invalid serial data received	<ul style="list-style-type: none"> VIN Mismatch, stored VIN does not match broadcast VIN 	<ul style="list-style-type: none"> Using the manufacturers approved diagnostic system clear the DTC, cycle the ignition off, then on, and check if the DTC is still logged If the DTC is still logged replace the parking aid control module
U3003-16	Battery voltage - Circuit voltage below threshold	<ul style="list-style-type: none"> Circuit voltage below threshold 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, check central junction box, for related DTCs and refer to the relevant DTC index Check the vehicle charging system performance to ensure the voltage regulation is correct Refer to relevant section of workshop manual and battery care manual. Check battery state of charge and starting/charging system performance Refer to the electrical circuit diagrams and check parking aid control module power and ground circuits

DTC	Description	Possible Causes	Action
U3003-17	Battery Voltage - Circuit voltage above threshold	<ul style="list-style-type: none"> • Circuit voltage above threshold 	<p>for short circuit to ground, short circuit to power, open circuit</p> <ul style="list-style-type: none"> • Clear the DTC and retest <ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system, check central junction box, for related DTCs and refer to the relevant DTC index • Check the vehicle charging system performance to ensure the voltage regulation is correct • Refer to relevant section of workshop manual and battery care manual. Check battery state of charge and starting/charging system performance • Refer to the electrical circuit diagrams and check parking aid control module power and ground circuits for short circuit to ground, short circuit to power, open circuit • Clear the DTC and retest
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> • Signal compare failure in battery voltage, of 2 volts or more, between parking aid control module and central junction box 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system, check central junction box, for related DTCs and refer to the relevant DTC index • Check the vehicle charging system performance to ensure the voltage regulation is correct • Refer to relevant section of workshop manual and battery care manual. Check battery state of charge and starting/charging system performance • Refer to the electrical circuit diagrams and check parking aid control module power and ground circuits for short circuit to ground, short circuit to power, open circuit • Clear the DTC and retest

General Information - Diagnostic Trouble Code (DTC) Index DTC: Pedestrian Protection System Control Module (PPSCM)

Description and Operation

Pedestrian Protection System Control Module (PPSCM)



WARNING: TO AVOID ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY, THE BACKUP POWER SUPPLY MUST BE DEPLETED BEFORE REPAIRING OR REPLACING ANY PEDESTRIAN PROTECTION SYSTEM COMPONENTS. TO DEplete THE BACKUP POWER SUPPLY ENERGY, DISCONNECT THE BATTERY GROUND CABLE AND WAIT TWO MINUTES. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN PERSONAL INJURY.



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Pedestrian Protection System Control Module (PPSCM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual.

For additional information, refer to: [Pedestrian Protection System](#) (501-20C Pedestrian Protection System, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1001-11	Right Hood Deployment Control - Circuit short to ground	<ul style="list-style-type: none"> Right hood deployment control circuit short circuit to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the right hood deployment control circuit for short circuit to ground. Install a new wiring harness as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new right hood deployment control
B1001-12	Right Hood Deployment Control - Circuit short to battery	<ul style="list-style-type: none"> Right hood deployment control circuit short circuit to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the right hood deployment control circuit for short circuit to power. Install a new wiring harness as necessary. If no wiring harness fault exists, using the manufacturer approved diagnostic system, clear the DTCs and retest. If the fault persists, install a new right hood deployment control

General Information - Diagnostic Trouble Code (DTC) Index DTC: Rear Differential Control Module (RDCM)

Description and Operation

Rear Differential Control Module (RDCM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



If the rear differential control module, rear differential actuator or the rear differential are replaced, the on demand self test (ODST) must be carried out to calibrate the components



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as needed

The table below lists all diagnostic trouble codes (DTCs) that could be logged in the rear differential control module, for additional diagnosis and testing information refer to the relevant diagnosis and testing section.

For additional information, refer to: Rear Drive Axle and Differential (205-02 Rear Drive Axle/Differential, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
P0562-00	System Voltage Low - No sub type information	<ul style="list-style-type: none"> Rear differential control module voltage supply below 9 volts 	<ul style="list-style-type: none"> Check the battery charge condition, refer to the electrical circuit diagrams and check the wiring to the rear differential control module, repair as necessary
P0563-00	System Voltage High - No sub type information	<ul style="list-style-type: none"> System voltage high (supply voltage supply greater than 16 volts) 	<ul style="list-style-type: none"> Check engine control module for stored DTCs, suspect charging system fault. Refer to the electrical circuit diagrams and check, power and ground circuit for fault
P0604-00	Internal Control Module Random Access Memory (RAM) Error - No sub type information	<ul style="list-style-type: none"> Rear differential control module internal error 	<ul style="list-style-type: none"> Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0605-00	Internal Control Module Read Only Memory (ROM) Error - No sub type information	<ul style="list-style-type: none"> Rear differential control module internal error 	<ul style="list-style-type: none"> Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual, or determine if any

DTC	Description	Possible Causes	Action
			prior approval programme is in operation, prior to the installation of a new module/component
P0606-00	Control Module Processor - No sub type information	<ul style="list-style-type: none"> • Watchdog reset - internal control module failure 	<ul style="list-style-type: none"> • This is a control module internal check DTC. If no other DTCs are logged and no customer complaint exists, clear/ignore this DTC. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0607-00	Control Module Performance - No sub type information	<ul style="list-style-type: none"> • Rear differential control module internal error - charge pump voltage below threshold 	<ul style="list-style-type: none"> • Clear the DTC and retest. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0652-00	Sensor Reference Voltage B Circuit Low - No sub type information	<ul style="list-style-type: none"> • Position sensor supply below 5.7V • Sensor failure (within actuator) 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the differential actuator sensor position circuit, repair as necessary. Clear the DTC and retest • If no circuit problems exist, renew the differential actuator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0653-00	Sensor Reference Voltage B Circuit High - No sub type information	<ul style="list-style-type: none"> • Motor position sensor supply above 8.3 V • Internal control module failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the differential actuator hall sensor reference voltage at the control module or the actuator • If voltage is too high, then renew control module. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0666-00	PCM / ECM / TCM Internal Temperature Sensor A Circuit - No sub type information	<ul style="list-style-type: none"> • Internal electronic control unit temperature sensor value above 105°C 	<ul style="list-style-type: none"> • This is a control module internal check DTC. If no other DTCs are logged and no customer complaint exists, clear this DTC and retest. Check the security of control module fixings. Check the module ground connection. Consider environmental conditions before suspecting the control module. If the problem persists, renew the control module. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0702-64	Transmission Control System Electrical - Signal plausibility failure	<ul style="list-style-type: none"> • Implausibility of differential motor temperature sensor and oil temperature sensor readout detected • Motor or oil temperature sensor circuit - short circuit to ground or power 	<ul style="list-style-type: none"> • Check the rear differential oil quantity and specification. Refer to the relevant section of the workshop manual. Check both temperature sensor circuits and connectors for damage/water ingress, repair as necessary. Where available, after vehicle has been switched off for at least an hour, use the manufacturer approved diagnostic system to read motor temperature and oil temperature sensor values. Temperature difference should be less than 25°C. Clear the DTC and retest • Refer to the electrical circuit diagrams and check motor temperature sensor and oil sump temperature sensors and circuit for short circuit to ground, short circuit to power
P0712-00	Transmission Fluid Temperature Sensor A Circuit Low - No sub type information	<ul style="list-style-type: none"> • Differential actuator internal temperature sensor circuit - open circuit or short circuit to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check rear differential actuator motor temperature sensor circuit for short circuit to ground, open circuit, high resistance. Clear the DTC and retest. If no circuit problems exist, renew the differential actuator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

General Information - Diagnostic Trouble Code (DTC) Index DTC: Rear

Junction Box (RJB)

Description and Operation

Rear Junction Box (RJB)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Rear Junction Box (RJB). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Communications Network](#) (418-00 Module Communications Network, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
P0460-11	Fuel Level Sensor A Circuit - Circuit short to ground	<ul style="list-style-type: none"> Fuel level sensor A analogue input circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check fuel level sensor A analogue input circuit for short to ground
P0460-15	Fuel Level Sensor A Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> Fuel level sensor A analogue input circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check fuel level sensor A analogue input circuit for short to power, open circuit
P0571-12	Brake Switch A Circuit - Circuit short to battery	<ul style="list-style-type: none"> Footbrake switch digital input signal circuits - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check footbrake switch digital input signal circuits for short to power
P1230-12	Fuel Pump Low Speed Malfunction (VLCM) - Circuit short to battery	<ul style="list-style-type: none"> High Side output not driven - Diagnosis feedback indicates output is short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check fuel pump delivery module for short to power

DTC	Description	Possible Causes	Action
P1230-14	Fuel Pump Low Speed Malfunction (VLCM) - Circuit short to ground or open	<ul style="list-style-type: none"> High Side output not driven - Diagnosis feedback indicates output is short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check fuel pump delivery module for short to ground, open circuit
P1230-93	Fuel Pump Low Speed Malfunction (VLCM) - No operation	<ul style="list-style-type: none"> High Side output not driven - Diagnosis feedback indicates output is at open load or short to power 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check fuel pump delivery module for short to power, open circuit
P1346-11	Fuel Level Sensor B Circuit - Circuit short to ground	<ul style="list-style-type: none"> Fuel level sensor B analogue input circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check fuel level sensor B analogue input circuit for short to ground
P1346-15	Fuel Level Sensor B Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> Fuel level sensor B analogue input circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check fuel level sensor B analogue input circuit for short to power, open circuit
P1624-13	Anti-theft System - Circuit open	<ul style="list-style-type: none"> Anti-theft signal circuit from CJB - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check anti-theft signal circuit from CJB for open circuit
C111A-11	Right Stop Lamp - Circuit short to ground	<ul style="list-style-type: none"> Right stop lamp control circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right stop lamp control circuit for short to ground
C111A-12	Right Stop Lamp - Circuit short to battery	<ul style="list-style-type: none"> Right stop lamp control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right stop lamp control circuit for short to power
C111A-13	Right Stop Lamp - Circuit open	<ul style="list-style-type: none"> Right stop lamp control circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right stop lamp control circuit for open circuit
C111B-11	Left Stop Lamp - Circuit short to ground	<ul style="list-style-type: none"> Left stop lamp control circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left stop lamp control circuit for short to ground
C111B-13	Left Stop Lamp - Circuit open	<ul style="list-style-type: none"> Left stop lamp control circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left stop lamp control circuit for open circuit
C1120-11	Reversing lamp - Circuit short to ground	<ul style="list-style-type: none"> Reverse lamp control circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check reverse lamp control circuit for short to ground
C1120-12	Reversing lamp - Circuit short to battery	<ul style="list-style-type: none"> Reverse lamp control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check reverse lamp control circuit for short to power
C1120-13	Reversing lamp - Circuit open	<ul style="list-style-type: none"> Reverse lamp control circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check reverse lamp control circuit for open circuit
C1120-15	Reversing lamp - Circuit short to battery or open	<ul style="list-style-type: none"> Reverse lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check reverse lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest

DTC	Description	Possible Causes	Action
B100A-51	Fuel Pump Authorisation - Not programmed	<ul style="list-style-type: none"> • RJB fault • Low speed CAN fault • Instrument cluster fault 	<ul style="list-style-type: none"> • Check power and ground supplies to RJB. Check CAN communications between RJB and instrument cluster. Check power and ground supplies to instrument cluster
B100A-62	Fuel Pump Authorisation - Signal compare failure	<ul style="list-style-type: none"> • Low speed CAN fault • RJB fault • Instrument cluster fault • Incorrect module installed (RJB/Instrument cluster) • Write target SID synchronisation error following re-programming • Noise/EMC related error 	<ul style="list-style-type: none"> • Check CAN communications between RJB and instrument cluster. Check power and ground supplies to RJB and instrument cluster. Confirm correct module installed. Re-synchronise ID by re-configuring the RJB as a new module. Check CAN network for interference/EMC related issues
B100A-63	Fuel Pump Authorisation - Circuit/component protection time-out	<ul style="list-style-type: none"> • RJB fault • Low speed CAN fault • Instrument cluster fault • Low battery voltage <9V 	<ul style="list-style-type: none"> • Check power and ground supplies to RJB and instrument cluster. Check CAN communications between RJB and instrument cluster. Check battery is in fully charged and serviceable condition, refer to the battery care manual
B1026-12	Steering Column Lock - Circuit short to battery	<ul style="list-style-type: none"> • Steering column lock ground circuit - short to power 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check steering column lock ground circuit for short to power
B1087-83	LIN Bus "A" - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> • The checksum of the received LIN frame is incorrect 	<ul style="list-style-type: none"> • Check the battery monitoring system and rear parking aid system for DTCs and refer to relevant DTC Index
B1087-86	LIN Bus "A" - Signal invalid	<ul style="list-style-type: none"> • The header of the LIN message received is incorrect 	<ul style="list-style-type: none"> • Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Check the battery monitoring system and rear parking aid system for DTCs and refer to relevant DTC Index
B1087-88	LIN Bus "A" - Bus off	<ul style="list-style-type: none"> • Battery monitoring system LIN circuit - short to ground, power 	<ul style="list-style-type: none"> • Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check battery monitoring system LIN circuit for short to ground, power
B108A-23	Start Button - Signal stuck low	<ul style="list-style-type: none"> • Start/Stop switch digital input signal circuit - stuck low 	<ul style="list-style-type: none"> • Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check Start/Stop switch digital input signal circuit for short to ground
B10A1-11	Trailer Tow Detection - Circuit short to ground	<ul style="list-style-type: none"> • Trailer tow detection digital input circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check trailer tow detection digital input circuit for short to ground
B10AF-12	Blower Fan Relay - Circuit short to battery	<ul style="list-style-type: none"> • High Side output not driven - Diagnosis feedback indicates output is short to power 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check blower motor supply circuit for short to power
B10AF-14	Blower Fan Relay - Circuit short to ground or open	<ul style="list-style-type: none"> • High Side output not driven - Diagnosis feedback indicates output is short to ground, open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check blower motor supply circuit for short to ground, open circuit

DTC	Description	Possible Causes	Action
B10AF-93	Blower Fan Relay - No operation	<ul style="list-style-type: none"> High Side output not driven - Diagnosis feedback indicates output is at open load or short to power 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check blower motor supply circuit for short to power, open circuit
B10DD-11	Airbag Deployed - Circuit short to ground	<ul style="list-style-type: none"> Airbag deployed digital input signal circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check airbag deployed digital input signal circuit for short to ground
B10DD-15	Airbag Deployed - Circuit short to battery or open	<ul style="list-style-type: none"> Airbag deployed digital input signal circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check airbag deployed digital input signal circuit for short to power, open circuit
B10DD-38	Airbag Deployed - Signal frequency incorrect	<ul style="list-style-type: none"> Signal frequency incorrect 	<ul style="list-style-type: none"> Check the RCM for related DTCs and refer to the relevant DTC Index
B10DE-11	Low Fuel Warning Switch - Circuit short to ground	<ul style="list-style-type: none"> Diesel run-dry switch analogue input circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check diesel run-dry switch analogue input circuit for short to ground
B10DE-15	Low Fuel Warning Switch - Circuit short to battery or open	<ul style="list-style-type: none"> Diesel run-dry switch analogue input circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check diesel run-dry switch analogue input circuit for short to power, open circuit
B1112-11	Park Aid Ignition - Circuit short to ground	<ul style="list-style-type: none"> Parking aid ignition supply circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check parking aid ignition supply circuit for short to ground
B1112-12	Park Aid Ignition - Circuit short to battery	<ul style="list-style-type: none"> Parking aid ignition supply circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check parking aid ignition supply circuit for short to power
B1115-11	High Mounted Stop Lamp Control - Circuit short to ground	<ul style="list-style-type: none"> High mounted stop lamp control circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check high mounted stop lamp control circuit for short to ground
B1116-11	Left Tail Lamp - Circuit short to ground	<ul style="list-style-type: none"> Left hand tail lamp control circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left hand tail lamp control circuit for short to ground
B1117-11	Right Tail Lamp - Circuit short to ground	<ul style="list-style-type: none"> Right hand tail lamp control circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right hand tail lamp control circuit for short to ground
B111A-11	Number Plate Lamps - Circuit short to ground	<ul style="list-style-type: none"> Right hand or left hand number plate lamp control circuits - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right hand and left hand number plate lamp control circuits for short to ground

DTC	Description	Possible Causes	Action
B111A-12	Number Plate Lamps - Circuit short to battery	<ul style="list-style-type: none"> Right hand or left hand number plate lamp control circuits - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right hand and left hand number plate lamp control circuits for short to power
B111A-13	Number Plate Lamps - Circuit open	<ul style="list-style-type: none"> Right hand or left hand number plate lamp control circuits - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right hand and left hand number plate lamp control circuits for open circuit
B111A-15	Number Plate Lamps - Circuit short to battery or open	<ul style="list-style-type: none"> Right or left side licence plate lamp(s) inoperative Right or left side licence plate lamp control circuits - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right side and left side licence plate lamp control circuits for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B111D-12	Boot/Trunk Motor Open - Circuit short to battery	<ul style="list-style-type: none"> Luggage compartment lid latch actuator control circuit - short to power 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check luggage compartment lid latch actuator control circuit for short to power
B111D-14	Boot/Trunk Motor Open - Circuit short to ground or open	<ul style="list-style-type: none"> Luggage compartment lid latch actuator control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check luggage compartment lid latch actuator control circuit for short to ground, open circuit
B111E-11	Boot/Trunk Lamps - Circuit short to ground	<ul style="list-style-type: none"> Luggage compartment lamp control circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check luggage compartment lamp control circuit for short to ground
B111E-12	Boot/Trunk Lamps - Circuit short to battery	<ul style="list-style-type: none"> Luggage compartment lamp control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check luggage compartment lamp control circuit for short to power
B111E-13	Boot/Trunk Lamps - Circuit open	<ul style="list-style-type: none"> Luggage compartment lamp control circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check luggage compartment lamp control circuit for open circuit
B111E-15	Boot/Trunk Lamps - Circuit short to battery or open	<ul style="list-style-type: none"> Luggage compartment lamp inoperative Luggage compartment lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check luggage compartment lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B1123-12	Restraints Ignition Relay - Circuit short to battery	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is short to power 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check restraints ignition relay output for short to power
B1123-14	Restraints Ignition Relay - Circuit short to ground or open	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is short to ground, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check restraints ignition relay output for short to ground, open circuit
B1123-93	Restraints Ignition Relay - No operation	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is at open load 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check restraints ignition relay output for open load or

DTC	Description	Possible Causes	Action
		or short to power	short to power
B1124-11	Lamp Fade Control - Circuit short to ground	<ul style="list-style-type: none"> Interior lamp fade control circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check interior lamp fade control circuit for short to ground
B1124-12	Lamp Fade Control - Circuit short to battery	<ul style="list-style-type: none"> Interior lamp fade control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check interior lamp fade control circuit for short to power
B113C-12	Hazard Switch Illumination - Circuit short to battery	<ul style="list-style-type: none"> Hazard switch illumination control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check hazard switch illumination control circuit for short to power
B113C-14	Hazard Switch Illumination - Circuit short to ground or open	<ul style="list-style-type: none"> Hazard switch illumination control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check hazard switch illumination control circuit for short to ground, open circuit
B113E-12	External Boot/Trunk Release Switch - Circuit short to battery	<ul style="list-style-type: none"> External luggage compartment lid release switch digital input circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check external luggage compartment lid release switch digital input circuit for short to power
B113E-23	External Boot/Trunk Release Switch - Signal stuck low	<ul style="list-style-type: none"> External luggage compartment lid release switch digital input circuit - signal stuck low 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check external luggage compartment lid release switch digital input circuit for short to ground
B11D9-49	Vehicle Battery - Internal electronic failure	<ul style="list-style-type: none"> Vehicle battery damaged/worn out 	<ul style="list-style-type: none"> Check battery is in fully charged and serviceable condition using the Midtronics battery tester and the battery care manual
B11DB-49	Battery Monitoring Module - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the battery monitoring module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B11DB-87	Battery Monitoring Module - Missing message	<ul style="list-style-type: none"> Battery monitoring module connector dis-connected/poor connection Battery monitoring module to RJB LIN circuit - open circuit Battery monitoring module to battery positive monitor circuit - open circuit Battery monitoring module/RJB failure 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. If additional DTCs B108783, B108786, B108787 are logged, suspect the RJB. Check and install a new RJB as required, refer to the new module/component installation note at the top of the DTC Index. If additional DTCs B108783, B108786, B108787 are NOT logged, check for good/clean contact at battery monitoring module connector, refer to electrical circuit diagrams and check battery monitoring module to RJB LIN circuit and battery monitoring module to battery positive monitor circuit for open circuit. Clear DTC and repeat automated diagnostic procedure using manufacturer approved diagnostic system. If DTC remains suspect the battery monitoring module, check and install a new battery monitoring module as required, refer to the new module/component installation note at the top of the DTC Index
B123A-11	Left Front Turn Indicator - Circuit short to ground	<ul style="list-style-type: none"> Left front turn signal lamp control circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left front turn signal lamp control circuit for short to ground
B123A-12	Left Front Turn Indicator - Circuit short to battery	<ul style="list-style-type: none"> Left front turn signal lamp control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left front turn signal lamp control circuit for short to power

DTC	Description	Possible Causes	Action
B123A-13	Left Front Turn Indicator - Circuit open	<ul style="list-style-type: none"> Left front turn signal lamp control circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left front turn signal lamp control circuit for open circuit
B123A-15	Left Front Turn Indicator - Circuit short to battery or open	<ul style="list-style-type: none"> Left front turn signal lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check left front turn signal lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B123B-11	Right Front Turn Indicator - Circuit short to ground	<ul style="list-style-type: none"> Right front turn signal lamp control circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right front turn signal lamp control circuit for short to ground
B123B-12	Right Front Turn Indicator - Circuit short to battery	<ul style="list-style-type: none"> Right front turn signal lamp control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right front turn signal lamp control circuit for short to power
B123B-13	Right Front Turn Indicator - Circuit open	<ul style="list-style-type: none"> Right front turn signal lamp control circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right front turn signal lamp control circuit for open circuit
B123B-15	Right Front Turn Indicator - Circuit short to battery or open	<ul style="list-style-type: none"> Right front turn signal lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check right front turn signal lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B1247-11	Left Rear Turn Indicator - Circuit short to ground	<ul style="list-style-type: none"> Left rear turn signal lamp control circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left rear turn signal lamp control circuit for short to ground
B1247-12	Left Rear Turn Indicator - Circuit short to battery	<ul style="list-style-type: none"> Left rear turn signal lamp control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left rear turn signal lamp control circuit for short to power
B1247-13	Left Rear Turn Indicator - Circuit open	<ul style="list-style-type: none"> Left rear turn signal lamp control circuit - short to power, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left rear turn signal lamp control circuit for open circuit
B1247-15	Left Rear Turn Indicator - Circuit short to battery or open	<ul style="list-style-type: none"> Left rear turn signal lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check left rear turn signal lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B1248-11	Right Rear Turn Indicator - Circuit short to ground	<ul style="list-style-type: none"> Right rear turn signal lamp control circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right rear turn signal lamp control circuit for short to ground
B1248-12	Right Rear Turn Indicator - Circuit short to battery	<ul style="list-style-type: none"> Right rear turn signal lamp control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right rear turn signal lamp control circuit for short to power
B1248-13	Right Rear Turn Indicator - Circuit open	<ul style="list-style-type: none"> Right rear turn signal lamp control circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right rear turn signal lamp control circuit for open circuit
B1248-15	Right Rear Turn Indicator - Circuit short to battery or open	<ul style="list-style-type: none"> Right rear turn signal lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check right rear turn signal lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest

DTC	Description	Possible Causes	Action
B1261-13	Fuel Flap/Door Release Switch - Circuit open	<ul style="list-style-type: none"> Fuel filler flap digital input signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check fuel filler flap digital input signal circuit for open circuit
B1A79-11	Rear Fog Lamp - Circuit short to ground	<ul style="list-style-type: none"> Rear fog lamp control circuit - short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check rear fog lamp control circuit for short to ground
B1A79-12	Rear Fog Lamp - Circuit short to battery	<ul style="list-style-type: none"> Rear fog lamp control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check rear fog lamp control circuit for short to power
B1A79-13	Rear Fog Lamp - Circuit open	<ul style="list-style-type: none"> Rear fog lamp control circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check rear fog lamp control circuit for open circuit
B1C55-12	Horn Relay - Circuit short to battery	<ul style="list-style-type: none"> Horn control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check horn control circuit for short to power
B1C55-14	Horn Relay - Circuit short to ground or open	<ul style="list-style-type: none"> Horn control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check horn control circuit for short to ground, open circuit
B1C83-12	Rear Defog Relay - Circuit short to battery	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check heated rear window power supply circuit for short to power
B1C83-14	Rear Defog Relay - Circuit short to ground or open	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check heated rear window power supply circuit for short to ground, open circuit
B1C83-93	Rear Defog Relay - No operation	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is at open load or short to power 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check heated rear window power supply circuit for open load and short to power
B1C91-12	Fuel Flap/Door Lock Relay Coil Circuit - Circuit short to battery	<ul style="list-style-type: none"> Fuel filler flap locking motor control circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check fuel filler flap locking motor control circuit for short to power
B1C91-14	Fuel Flap/Door Lock Relay Coil Circuit - Circuit short to ground or open	<ul style="list-style-type: none"> Fuel filler flap locking motor control circuit - short to ground, open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check fuel filler flap locking motor control circuit for short to ground, open circuit
B1D35-12	Hazard Switch - Circuit short to battery	<ul style="list-style-type: none"> Hazard warning lamp switch digital input circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check hazard warning lamp switch digital input circuit for short to power
B1D35-23	Hazard Switch - Signal stuck low	<ul style="list-style-type: none"> Hazard warning lamp switch digital input circuit - signal stuck low 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check hazard warning lamp switch digital input circuit for short to ground
U0019-88	Low Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> Bus off 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U0140-00	Lost Communication With Body Control Module - No sub type information	<ul style="list-style-type: none"> No sub type information 	<ul style="list-style-type: none"> Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	<ul style="list-style-type: none"> • No sub type information 	<ul style="list-style-type: none"> • Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U0159-00	Lost Communication With Parking Assist Control Module "A" - No sub type information	<ul style="list-style-type: none"> • No sub type information 	<ul style="list-style-type: none"> • Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U0164-00	Lost Communication With HVAC Control Module - No sub type information	<ul style="list-style-type: none"> • No sub type information 	<ul style="list-style-type: none"> • Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U0214-00	Lost Communication With Remote Function Actuation - No sub type information	<ul style="list-style-type: none"> • No sub type information 	<ul style="list-style-type: none"> • Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U0300-46	Internal Control Module Software Incompatibility - Calibration/parameter memory failure	<ul style="list-style-type: none"> • Calibration/parameter memory failure 	<ul style="list-style-type: none"> • Suspect the RJB. Check and install a new RJB as required, refer to the new module/component installation note at the top of the DTC Index
U1000-00	Solid State Driver Protection Active -Driver Disabled - No sub type information	<ul style="list-style-type: none"> • No sub type information 	<ul style="list-style-type: none"> • Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U1A14-49	CAN Initialisation Failure - Internal electronic failure	<ul style="list-style-type: none"> • Internal electronic failure 	<ul style="list-style-type: none"> • Suspect the RJB. Check and install a new RJB as required, refer to the new module/component installation note at the top of the DTC Index
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> • Internal electronic failure 	<ul style="list-style-type: none"> • Suspect the RJB. Check and install a new RJB as required, refer to the new module/component installation note at the top of the DTC Index
U3000-55	Control Module - Not configured	<ul style="list-style-type: none"> • Not configured 	<ul style="list-style-type: none"> • Re-configure the RJB using the manufacturer approved diagnostic system

General Information - Diagnostic Trouble Code (DTC) Index DTC: Remote Keyless Entry Module (RFA)

Description and Operation

Remote Keyless Entry Module (RFA)

CAUTIONS:



Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle



When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system

The table below lists all diagnostic trouble codes (DTCs) that could be logged in the remote keyless entry module, for additional diagnosis and testing information refer to the relevant diagnosis and testing section.

For additional information, refer to: Remote Keyless Entry (RKE) Module (419-10 Multifunction Electronic Modules, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B102B-00	Passive Key - No sub type information	<ul style="list-style-type: none"> Response Error - general failure 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, clear all passive keys, re-learn all passive keys
B10C1-00	Left Front Unlock Pull Switch - No sub type information	<ul style="list-style-type: none"> No power supply to door handle Switch circuit open, or short circuit to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check the power supply to the door handle. Check the switch circuit is not open circuit or short to power. Repair wiring as required
B10C1-24	Left Front Unlock Pull Switch - Signal stuck high	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check for stuck left front unlock switch. Refer to the electrical circuit diagrams and check left front unlock switch circuit for short to ground

DTC	Description	Possible Causes	Action
B10C2-00	Left Rear Unlock Pull Switch - No sub type information	<ul style="list-style-type: none"> No power supply to door handle Switch circuit open, or short circuit to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check the power supply to the door handle. Check the switch circuit is not open circuit or short to power. Repair wiring as required
B10C2-24	Left Rear Unlock Pull Switch - Signal stuck high	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check for stuck left rear unlock switch. Refer to the electrical circuit diagrams and check left rear unlock switch circuit for short to ground
B10C3-00	Right Front Unlock Pull Switch - No sub type information	<ul style="list-style-type: none"> No power supply to door handle Switch circuit open, or short circuit to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check the power supply to the door handle. Check the switch circuit is not open circuit or short to power. Repair wiring as required
B10C3-24	Right Front Unlock Pull Switch - Signal stuck high	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check for stuck right front unlock switch. Refer to the electrical circuit diagrams and check right front unlock switch circuit for short to ground
B10C4-00	Right Rear Unlock Pull Switch - No sub type information	<ul style="list-style-type: none"> No power supply to door handle Switch circuit open, or short circuit to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check the power supply to the door handle. Check the switch circuit is not open circuit or short to power. Repair wiring as required
B10C4-24	Right Rear Unlock Pull Switch - Signal stuck high	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check for stuck right rear unlock switch. Refer to the electrical circuit diagrams and check right front unlock switch circuit for short to ground
B10C5-24	Trunk Unlock Pull Switch - Signal stuck high	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check for stuck luggage compartment lid unlock switch. Refer to the electrical circuit diagrams and check luggage compartment lid unlock switch circuit for short to ground
B10C6-1F	Exterior Trunk Antenna - Circuit intermittent	<ul style="list-style-type: none"> Circuit intermittent - general electrical error 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check exterior luggage compartment antenna circuits for short to ground, power, open circuit
B10C7-1F	Interior Trunk Antenna - Circuit intermittent	<ul style="list-style-type: none"> Circuit intermittent - general electrical error 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check interior luggage compartment antenna circuits for short to ground, power, open circuit
B10C8-1F	Interior Center Antenna - Circuit intermittent	<ul style="list-style-type: none"> Circuit intermittent - general electrical error 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check interior center antenna circuits for short to ground, power, open circuit
B10C9-1F	Interior Front Antenna - Circuit intermittent	<ul style="list-style-type: none"> Circuit intermittent - general electrical error 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check interior front antenna circuits for short to

DTC	Description	Possible Causes	Action
			ground, power, open circuit
B10CA-1F	Left Rear Door Handle Antenna - Circuit intermittent	<ul style="list-style-type: none"> • Circuit intermittent - general electrical error 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left rear door handle antenna circuits for short to ground, power, open circuit
B10CB-1F	Right Rear Door Handle Antenna - Circuit intermittent	<ul style="list-style-type: none"> • Circuit intermittent - general electrical error 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right rear door handle antenna circuits for short to ground, power, open circuit
B10CC-24	Left Front Latch Clutch Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> • Check for stuck left front door latch clutch switch. Refer to the electrical circuit diagrams and check left front door latch clutch switch circuit for short to ground
B10CD-24	Left Rear Latch Clutch Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> • Check for stuck left rear door latch clutch switch. Refer to the electrical circuit diagrams and check left front door latch clutch switch circuit for short to ground
B10CE-24	Right Front Latch Clutch Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> • Check for stuck right front door latch clutch switch. Refer to the electrical circuit diagrams and check left front door latch clutch switch circuit for short to ground
B10CF-24	Right Rear Latch Clutch Switch - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> • Check for stuck right rear door latch clutch switch. Refer to the electrical circuit diagrams and check left front door latch clutch switch circuit for short to ground
B10D1-24	Left Front Lock Button - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> • Check for stuck left front door handle lock switch. Refer to the electrical circuit diagrams and check left front door latch clutch switch circuit for short to ground
B10D2-24	Left Rear Lock Button - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> • Check for stuck left rear door handle lock switch. Refer to the electrical circuit diagrams and check left front door latch clutch switch circuit for short to ground
B10D3-24	Right Front Lock Button - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> • Check for stuck right front door handle lock switch. Refer to the electrical circuit diagrams and check left front door latch clutch switch circuit for short to ground
B10D4-24	Right Rear Lock Button - Signal stuck high	<ul style="list-style-type: none"> • Signal stuck high - button stuck in active position 	<ul style="list-style-type: none"> • Check for stuck right rear door handle lock switch. Refer to the electrical circuit diagrams and check left front door latch clutch switch circuit for short to ground
U0010-00	Medium Speed CAN Communication Bus - No subtype information	<ul style="list-style-type: none"> • No subtype information 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system
U0140-00	Lost Communication With Body Control Module - No subtype information	<ul style="list-style-type: none"> • Missing message from CJB 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check power and ground supplies to CJB

DTC	Description	Possible Causes	Action
U0142-00	Lost Communication With Body Control Module "B" - No subtype information	<ul style="list-style-type: none"> • Missing message from RJB 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check power and ground supplies to RJB
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No subtype information	<ul style="list-style-type: none"> • Missing message from instrument cluster 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check power and ground supplies to instrument cluster
U0300-00	Internal Control Module Software Incompatibility - No subtype information	<ul style="list-style-type: none"> • Invalid configuration message is received 	<ul style="list-style-type: none"> • Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC is still logged suspect the remote keyless entry module, refer to the new module installation note at the top of the DTC Index
U201F-00	External Receiver - No subtype information	<ul style="list-style-type: none"> • No subtype information - communication error 	<ul style="list-style-type: none"> • Suspect the RF receiver, check and install a new RF receiver as required, refer to the new module/component installation note at top of DTC Index
U201F-13	External Receiver - Circuit open	<ul style="list-style-type: none"> • Line open 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test RF receiver communication circuit to remote keyless entry module for short to ground or open circuit
U201F-87	External Receiver - Missing message	<ul style="list-style-type: none"> • Transmission error 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the data line between the RF receiver and the remote keyless entry module for short, open circuit. Suspect the RF receiver or remote keyless entry module, check and install a new RF receiver or remote keyless entry module as required, refer to the new module/component installation note at top of DTC Index
U2100-00	Initial Configuration Not Complete - No subtype information	<ul style="list-style-type: none"> • No subtype information 	<ul style="list-style-type: none"> • Configure the Remote Keyless Entry module using the manufacturer approved diagnostic system
U2101-00	Control Module Configuration Incompatible - No subtype information	<ul style="list-style-type: none"> • No subtype information 	<ul style="list-style-type: none"> • Re-configure the RJB using the manufacturer approved diagnostic system
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> • Internal electronic failure 	<ul style="list-style-type: none"> • Install a new remote keyless entry module, refer to the new module installation note at the top of the DTC Index
U3002-81	Vehicle Identification Number - Invalid serial data received	<ul style="list-style-type: none"> • Vehicle/component mis-match. Module previously installed to other vehicle 	<ul style="list-style-type: none"> • Install correct/new module to vehicle specification, refer to the new module/component installation note at the top of the DTC Index
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> • Mis-match in battery voltage, of 2 volts or more, between remote keyless entry module and RJB 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system • Refer to the relevant section of the workshop manual and test the battery and charging system

General Information - Diagnostic Trouble Code (DTC) Index DTC: Restraints Control Module (RCM)

Description and Operation

Restraints Control Module (RCM)

WARNINGS:



TO AVOID ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY, THE BACKUP POWER SUPPLY MUST BE DEPLETED BEFORE REPAIRING OR REPLACING ANY AIR BAG SUPPLEMENTAL RESTRAINT SYSTEM (SRS) COMPONENTS. TO DEplete THE BACKUP POWER SUPPLY ENERGY, DISCONNECT THE BATTERY GROUND CABLE AND WAIT ONE MINUTE. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN PERSONAL INJURY



Do not use a multimeter to probe the restraints control module. It is possible for the power from the meter battery to trigger the activation of the airbags. Failure to follow this instruction may result in personal injury



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.



It is advisable not to use a cellular phone or to have a cellular phone in close proximity when working on the restraints control module or associated systems.



Given the legal implications of a restraints system failure, harness repairs to air bag module circuits are not acceptable. Where the text refers to "REPAIR the circuit", this will normally mean the replacement of a harness.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Restraints Control Module (RCM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) (501-20B Supplemental Restraint System, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B0001-09	Driver Frontal Stage 1 Deployment Control - Component failures	<ul style="list-style-type: none"> Driver front stage 1 air bag - internal driver failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
B0001-11	Driver Frontal Stage 1 Deployment Control - Circuit short to ground	<ul style="list-style-type: none"> • Driver front stage 1 air bag circuit - short to ground 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test driver front stage 1 air bag circuit for short to ground
B0001-12	Driver Frontal Stage 1 Deployment Control - Circuit short to battery	<ul style="list-style-type: none"> • Driver front stage 1 air bag circuit - short to power 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test driver front stage 1 air bag circuit for short to power
B0001-1A	Driver Frontal Stage 1 Deployment Control - Circuit resistance below threshold	<ul style="list-style-type: none"> • Circuit resistance below threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0001-1B	Driver Frontal Stage 1 Deployment Control - Circuit resistance above threshold	<ul style="list-style-type: none"> • Circuit resistance above threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0001-1C	Driver Frontal Stage 1 Deployment Control - Circuit voltage out of range	<ul style="list-style-type: none"> • Driver front stage 1 air bag circuit - high resistance 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test driver front stage 1 air bag circuit for high resistance
B0001-56	Driver Frontal Stage 1 Deployment Control - Invalid/incomplete configuration	<ul style="list-style-type: none"> • Incompatible configuration 	<ul style="list-style-type: none"> • Re-configure the RCM using the manufacturer approved diagnostic system
B0001-95	Driver Frontal Stage 1 Deployment Control - Incorrect assembly	<ul style="list-style-type: none"> • Crosscoupling with other firing loop 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test driver front stage 1 air bag circuit for crosscoupling with other firing loop
B0002-09	Driver Frontal Stage 2 Deployment Control - Component failures	<ul style="list-style-type: none"> • Driver front stage 2 air bag - internal driver failure 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0002-11	Driver Frontal Stage 2 Deployment Control - Circuit short to ground	<ul style="list-style-type: none"> • Driver front stage 2 air bag circuit - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test driver front stage 2 air bag circuit for short to ground
B0002-12	Driver Frontal Stage 2 Deployment Control - Circuit short to battery	<ul style="list-style-type: none"> • Driver front stage 2 air bag circuit - short to power 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test driver front stage 2 air bag circuit for short to power
B0002-1A	Driver Frontal Stage 2 Deployment Control - Circuit resistance below threshold	<ul style="list-style-type: none"> • Circuit resistance below threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0002-1B	Driver Frontal Stage 2 Deployment Control - Circuit resistance above threshold	<ul style="list-style-type: none"> • Circuit resistance above threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0002-1C	Driver Frontal Stage 2 Deployment Control - Circuit voltage out of range	<ul style="list-style-type: none"> • Driver front stage 2 air bag circuit - high resistance 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test driver front stage 2 air bag circuit for high resistance
B0002-56	Driver Frontal Stage 2 Deployment Control - Invalid/incomplete configuration	<ul style="list-style-type: none"> • Incompatible configuration 	<ul style="list-style-type: none"> • Re-configure the RCM using the manufacturer approved diagnostic system
B0002-95	Driver Frontal Stage 2 Deployment Control - Incorrect assembly	<ul style="list-style-type: none"> • Crosscoupling with other firing loop 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test driver front stage 2 air bag circuit for crosscoupling with other firing loop
B0010-09	Passenger Frontal Stage 1 Deployment Control - Component failures	<ul style="list-style-type: none"> • Passenger front stage 1 air bag - internal driver failure 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
B0010-11	Passenger Frontal Stage 1 Deployment Control - Circuit short to ground	<ul style="list-style-type: none"> • Passenger front stage 1 air bag circuit - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test passenger front stage 1 air bag circuit for short to ground
B0010-12	Passenger Frontal Stage 1 Deployment Control - Circuit short to battery	<ul style="list-style-type: none"> • Passenger front stage 1 air bag circuit - short to power 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test passenger front stage 1 air bag circuit for short to power
B0010-1A	Passenger Frontal Stage 1 Deployment Control - Circuit resistance below threshold	<ul style="list-style-type: none"> • Circuit resistance below threshold 	<ul style="list-style-type: none"> • Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0010-1B	Passenger Frontal Stage 1 Deployment Control - Circuit resistance above threshold	<ul style="list-style-type: none"> • Circuit resistance above threshold 	<ul style="list-style-type: none"> • Carry out the pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0010-1C	Passenger Frontal Stage 1 Deployment Control - Circuit voltage out of range	<ul style="list-style-type: none"> • Passenger front stage 1 air bag circuit - high resistance 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test passenger front stage 1 air bag circuit for high resistance
B0010-56	Passenger Frontal Stage 1 Deployment Control - Invalid/incomplete configuration	<ul style="list-style-type: none"> • Incompatible configuration 	<ul style="list-style-type: none"> • Re-configure the RCM using the manufacturer approved diagnostic system
B0010-95	Passenger Frontal Stage 1 Deployment Control - Incorrect assembly	<ul style="list-style-type: none"> • Crosscoupling with other firing loop 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test passenger front stage 1 air bag circuit for crosscoupling with other firing loop
B0011-09	Passenger Frontal Stage 2 Deployment Control - Component failures	<ul style="list-style-type: none"> • Passenger front stage 2 air bag - internal driver failure 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0011-11	Passenger Frontal Stage 2 Deployment Control - Circuit short to ground	<ul style="list-style-type: none"> • Passenger front stage 2 air bag circuit - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test passenger front stage 2 air bag circuit for short to ground
B0011-12	Passenger Frontal Stage 2 Deployment Control - Circuit short to battery	<ul style="list-style-type: none"> • Passenger front stage 2 air bag circuit - short to power 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test passenger front stage 2 air bag circuit for short to power
B0011-1A	Passenger Frontal Stage 2 Deployment Control - Circuit resistance below threshold	<ul style="list-style-type: none"> • Circuit resistance below threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0011-1B	Passenger Frontal Stage 2 Deployment Control - Circuit resistance above threshold	<ul style="list-style-type: none"> • Circuit resistance above threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0011-1C	Passenger Frontal Stage 2 Deployment Control - Circuit voltage out of range	<ul style="list-style-type: none"> • Passenger front stage 2 air bag circuit - high resistance 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test passenger front stage 2 air bag circuit for high resistance
B0011-56	Passenger Frontal Stage 2 Deployment Control - Invalid/incomplete configuration	<ul style="list-style-type: none"> • Incompatible configuration 	<ul style="list-style-type: none"> • Re-configure the RCM using the manufacturer approved diagnostic system
B0011-95	Passenger Frontal Stage 2 Deployment Control - Incorrect assembly	<ul style="list-style-type: none"> • Crosscoupling with other firing loop 	<ul style="list-style-type: none"> • Refer to electrical circuit diagrams and test passenger front stage 2 air bag circuit for crosscoupling with other firing loop

DTC	Description	Possible Causes	Action
B0020-09	Left Side Air Bag Deployment Control - Component failures	<ul style="list-style-type: none"> Left side air bag circuit - internal driver failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0020-11	Left Side Air Bag Deployment Control - Circuit short to ground	<ul style="list-style-type: none"> Left side air bag circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test left side air bag circuit for short to ground
B0020-12	Left Side Air Bag Deployment Control - Circuit short to battery	<ul style="list-style-type: none"> Left side air bag circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test left side air bag circuit for short to power
B0020-1A	Left Side Air Bag Deployment Control - Circuit resistance below threshold	<ul style="list-style-type: none"> Circuit resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0020-1B	Left Side Air Bag Deployment Control - Circuit resistance above threshold	<ul style="list-style-type: none"> Circuit resistance above threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0020-1C	Left Side Air Bag Deployment Control - Circuit voltage out of range	<ul style="list-style-type: none"> Left side air bag circuit - high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and test left side air bag circuit for high resistance
B0020-56	Left Side Air Bag Deployment Control - Invalid/incomplete configuration	<ul style="list-style-type: none"> Incompatible configuration 	<ul style="list-style-type: none"> Re-configure the RCM using the manufacturer approved diagnostic system
B0020-95	Left Side Air Bag Deployment Control - Incorrect assembly	<ul style="list-style-type: none"> Crosscoupling with other firing loop 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and test left side air bag circuit for crosscoupling with other firing loop
B0028-09	Right Side Air Bag Deployment Control - Component failures	<ul style="list-style-type: none"> Right side air bag circuit - internal driver failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0028-11	Right Side Air Bag Deployment Control - Circuit short to ground	<ul style="list-style-type: none"> Right side air bag circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test right side air bag circuit for short to ground
B0028-12	Right Side Air Bag Deployment Control - Circuit short to battery	<ul style="list-style-type: none"> Right side air bag circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test right side air bag circuit for short to power
B0028-1A	Right Side Air Bag Deployment Control - Circuit resistance below threshold	<ul style="list-style-type: none"> Circuit resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0028-1B	Right Side Air Bag Deployment Control - Circuit resistance above threshold	<ul style="list-style-type: none"> Circuit resistance above threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0028-1C	Right Side Air Bag Deployment Control - Circuit voltage out of range	<ul style="list-style-type: none"> Right side air bag circuit - high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and test right side air bag circuit for high resistance
B0028-56	Right Side Air Bag Deployment Control - Invalid/incomplete configuration	<ul style="list-style-type: none"> Incompatible configuration 	<ul style="list-style-type: none"> Re-configure the RCM using the manufacturer approved diagnostic system
B0028-95	Right Side Air Bag Deployment Control - Incorrect assembly	<ul style="list-style-type: none"> Crosscoupling with other firing loop 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and test right side air bag circuit for crosscoupling with other firing loop

DTC	Description	Possible Causes	Action
B0029-09	Right Curtain Deployment Control 1 - Component failures	<ul style="list-style-type: none"> Right curtain deployment control 1 circuit - internal driver failure 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0029-11	Right Curtain Deployment Control 1 - Circuit short to ground	<ul style="list-style-type: none"> Right curtain deployment control 1 circuit - short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check right curtain deployment control 1 circuit for short to ground
B0029-12	Right Curtain Deployment Control 1 - Circuit short to battery	<ul style="list-style-type: none"> Right curtain deployment control 1 circuit - short to power 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check right curtain deployment control 1 circuit for short to power
B0029-1A	Right Curtain Deployment Control 1 - Circuit resistance below threshold	<ul style="list-style-type: none"> Circuit resistance below threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0029-1B	Right Curtain Deployment Control 1 - Circuit resistance above threshold	<ul style="list-style-type: none"> Circuit resistance above threshold 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0029-1C	Right Curtain Deployment Control 1 - Circuit voltage out of range	<ul style="list-style-type: none"> Right curtain deployment control 1 circuit - high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and test right curtain deployment control 1 circuit for high resistance
B0029-56	Right Curtain Deployment Control 1 - Invalid/incomplete configuration	<ul style="list-style-type: none"> Incompatible configuration 	<ul style="list-style-type: none"> Re-configure the RCM using the manufacturer approved diagnostic system
B0029-95	Right Curtain Deployment Control 1 - Incorrect assembly	<ul style="list-style-type: none"> Crosscoupling with other firing loop 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and test right curtain deployment control 1 circuit for crosscoupling with other firing loop
B0050-11	Driver Safety Belt Sensor - Circuit short to ground	<ul style="list-style-type: none"> Driver safety belt sensor circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test driver safety belt sensor circuit for short to ground
B0050-12	Driver Safety Belt Sensor - Circuit short to battery	<ul style="list-style-type: none"> Driver safety belt sensor circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test driver safety belt sensor circuit for short to power
B0050-13	Driver Safety Belt Sensor - Circuit open	<ul style="list-style-type: none"> Driver safety belt sensor circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test driver safety belt sensor circuit for open circuit
B0050-1E	Driver Safety Belt Sensor - Circuit resistance out of range	<ul style="list-style-type: none"> Driver safety belt sensor circuit - resistance out of range 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B0050-56	Driver Safety Belt Sensor - Invalid/incomplete configuration	<ul style="list-style-type: none"> Incompatible configuration 	<ul style="list-style-type: none"> Re-configure the RCM using the manufacturer approved diagnostic system
B0052-11	Passenger Safety Belt Sensor - Circuit short to ground	<ul style="list-style-type: none"> Passenger safety belt sensor circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test passenger safety belt sensor circuit for short to ground
B0052-12	Passenger Safety Belt Sensor - Circuit short to battery	<ul style="list-style-type: none"> Passenger safety belt sensor circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test passenger safety belt sensor circuit for short to power
B0052-13	Passenger Safety Belt Sensor - Circuit open	<ul style="list-style-type: none"> Passenger safety belt sensor circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test passenger safety belt sensor circuit for open circuit

General Information - Diagnostic Trouble Code (DTC) Index DTC: Satellite Digital Audio Radio System Module (SARM)

Description and Operation

Satellite Radio Module (SARM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as needed

The table below lists all diagnostic trouble codes (DTCs) that could be logged on the satellite radio module, for additional diagnosis and testing information refer to the relevant diagnosis and testing section.

For additional information, refer to: Information and Entertainment System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1A89-01	Satellite Antenna - General electrical failure	<ul style="list-style-type: none"> Wiring harness fault - Coaxial cable between satellite radio module and the satellite antenna Internal electronic failure - Satellite digital audio radio antenna Internal electronic failure - Satellite radio module 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check satellite digital audio radio antenna coaxial cable for short circuit to ground, short circuit to power, open circuit, high resistance. Repair wiring harness as required, clear DTC and retest If fault persists, check and install a new satellite digital audio radio antenna If fault persists, check and install a new satellite radio module Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
B1A89-11	Satellite Antenna - Circuit short to ground	<ul style="list-style-type: none"> Satellite antenna circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check satellite antenna circuit for short circuit to ground. Repair wiring harness as required. Clear DTC and retest

DTC	Description	Possible Causes	Action
B1A89-12	Satellite Antenna - Circuit short to battery	<ul style="list-style-type: none"> Satellite antenna circuit - short to power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check satellite antenna circuit for short circuit to power. Repair wiring harness as required. Clear DTC and retest
B1A89-13	Satellite Antenna - Circuit open	<ul style="list-style-type: none"> Satellite antenna circuit - open circuit, high resistance 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check satellite antenna circuit for open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
U3000-04	Control Module - System internal failures	<ul style="list-style-type: none"> System internal failure 	<ul style="list-style-type: none"> Check and install a new satellite radio module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
U3000-4A	Control Module - Incorrect component installed	<ul style="list-style-type: none"> Satellite radio module - Incorrect component installed Car configuration mismatch 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system select the vehicle configuration main menu>vehicle configuration>display and modify the vehicle configuration file data Check update as required
U3000-55	Control Module - Not configured	<ul style="list-style-type: none"> Satellite radio module - Incorrect component installed Incorrect car configuration file data received 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system select the vehicle configuration main menu>select configure existing modules menu and program the satellite radio module
U3000-87	Control Module - Missing message	<ul style="list-style-type: none"> The satellite radio module has not received the configuration file Master module not transmitting configuration file 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system check that the satellite radio module is configured correctly Check that the configuration file is being transmitted by the master module Using the manufacturer approved diagnostic system, complete a MOST network integrity test
U3000-98	Control Module - Component or system over temperature	<ul style="list-style-type: none"> Satellite radio module cooling vents obstructed Wiring harness fault Internal electronic failure 	<ul style="list-style-type: none"> Check for possible causes of the satellite radio module overheating. Check that the ventilation is not obstructed Check for short circuit related DTCs. Refer to the electrical circuit diagrams and check ground circuit for high resistance. Check antenna circuit for short to power or ground. Repair wiring harness as required. Clear DTC and retest Check for internal electronic failure related DTCs If fault persists, check and install a new satellite radio module. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> Signal compare failure Satellite radio module voltage differs more than $\pm 2V$ compared to rear junction box voltage 	<ul style="list-style-type: none"> Refer to relevant section of workshop manual and battery care manual. Check battery state of charge and starting/charging system performance. Check power supply circuit from rear junction box to satellite radio module Refer to electrical circuit diagrams and check the power and ground supply circuits to the module. Repair wiring harness as required. Clear DTC and retest

General Information - Diagnostic Trouble Code (DTC) Index DTC: Speed Control Module (CCM)

Description and Operation

Adaptive Speed Control Module (ASCM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Adaptive Speed Control Module (ASCM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Speed Control](#) (310-03C Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1A84-81	Car Configuration Data - Invalid serial data received	<ul style="list-style-type: none"> RJB reporting invalid data 	<ul style="list-style-type: none"> Re-configure the RJB using manufacturer approved diagnostic system
C1A67-54	Forward Looking Sensor - Missing calibration	<ul style="list-style-type: none"> Speed control sensor out of alignment 	<ul style="list-style-type: none"> Check speed control sensor for correct vertical alignment, and carry out speed control sensor alignment procedure using manufacturer approved diagnostic system
C1A67-81	Forward Looking Sensor - Invalid serial data received	<ul style="list-style-type: none"> Yaw voltage unreasonable for 0.5 seconds or unchanged for 1.2 seconds. Note: Yaw sensor internal to speed control sensor 	<ul style="list-style-type: none"> Clear DTC and re-test, if DTC remains suspect speed control sensor. Check and install a new sensor as required, refer to the new module/component installation note at the top of the DTC Index
C1A67-87	Forward Looking Sensor - Missing Message	<ul style="list-style-type: none"> Incorrect or missing data from speed control sensor 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check power and ground supplies for short, open circuit. Check private CAN network between speed control sensor and speed control module for failure, clear DTC and re-test. If DTC remains suspect the

DTC	Description	Possible Causes	Action
			speed control sensor, check and install a new sensor as required, refer to the new module/component installation note at the top of the DTC Index
C1A67-96	Forward Looking Sensor - Component internal Failure	<ul style="list-style-type: none"> Internal hardware failure 	<ul style="list-style-type: none"> Suspect the speed control sensor. Check and install a new sensor as required, refer to the new module/component installation note at the top of the DTC Index
C1A67-97	Forward Looking Sensor - Component or system operation obstructed or blocked	<ul style="list-style-type: none"> Sensor reduced visibility 	<ul style="list-style-type: none"> Check for blockage in front of radar. Note: This DTC will be cleared automatically when environmental conditions allow
C1A67-98	Forward Looking Sensor - Component or system over temperature	<ul style="list-style-type: none"> Speed control sensor internal temperature exceeded threshold 	<ul style="list-style-type: none"> Allow system to cool. Note: This DTC will be cleared automatically when environmental conditions allow
P174E-81	Output Shaft Speed/ABS Wheel Speed Correlation - Invalid serial data received	<ul style="list-style-type: none"> Follow speed is mis-calculated to too high a value 	<ul style="list-style-type: none"> Clear DTC and re-test
U0001-88	High Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> Vehicle CAN Bus off condition 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
U0100-00	Lost Communications With ECM/PCM "A" - No sub type information	<ul style="list-style-type: none"> ECM missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check ECM for related DTCs and refer to the relevant DTC Index
U0101-00	Lost Communications With TCM - No sub type information	<ul style="list-style-type: none"> TCM missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check TCM for related DTCs and refer to the relevant DTC Index
U0103-00	Lost Communication With Gear Shift Control Module A - No sub type information	<ul style="list-style-type: none"> No sub type information 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the Transmission Shift Module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Transmission Shift Module and Speed Control Module
U0103-87	Lost Communication With Gear Shift Module - Missing Message	<ul style="list-style-type: none"> Transmission shift module missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check transmission shift module for related DTCs and refer to the relevant DTC Index
U0121-00	Lost Communication With Anti-lock Brake System (ABS) Control Module - No sub type information	<ul style="list-style-type: none"> ABS missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check ABS for related DTCs and refer to the relevant DTC Index
U0128-00	Lost Communications With Park Brake Module - No sub type information	<ul style="list-style-type: none"> Parking brake missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check parking brake module for related DTCs and refer to the relevant DTC Index
U0155-00	Lost Communications With Instrument Panel Cluster (IPC) Control Module - No sub type information	<ul style="list-style-type: none"> Instrument cluster missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check instrument cluster for related DTCs and refer to the relevant DTC Index

DTC	Description	Possible Causes	Action
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> Invalid configuration message is received 	<ul style="list-style-type: none"> Re-configure the speed control module using the manufacturer approved diagnostic system. Clear DTCs and re-test. If DTC still logged, suspect incorrect speed control module installed. Check and install a new module as required, refer to new module/component installation note at top of DTC Index
U0300-55	Internal Control Module Software Incompatibility - Not configured	<ul style="list-style-type: none"> RJB - at least one of the car configuration parameters is not configured 	<ul style="list-style-type: none"> Re-configure the RJB using the manufacturer approved diagnostic system
U0401-00	Invalid Data Received From ECM/PCM A - No sub type information	<ul style="list-style-type: none"> ECM did not respond properly to speed control cancel or auto brake cancel request 	<ul style="list-style-type: none"> Check ECM for related DTCs and refer to relevant DTC Index
U0401-67	Invalid Data Received From ECM/PCM A - Signal incorrect after event	<ul style="list-style-type: none"> ECM did not respond properly to speed control resume request 	<ul style="list-style-type: none"> Check ECM for related DTCs and refer to relevant DTC Index
U0401-81	Invalid Data Received From ECM/PCM A - Invalid serial data received	<ul style="list-style-type: none"> Invalid data received from engine control module Bus signal/message failure Speed control inhibited by ECM 	<ul style="list-style-type: none"> Check the Engine Control Module for related DTCs and refer to relevant DTC Index. If U040181 is logged as historic but no other DTCs have logged in the engine control module at the same time and distance, it may be caused by cranking with low voltage conditions. Check battery and charging system according to instructions in the battery care manual. Install the latest Engine Control Module software using the manufacturer approved diagnostic system, contact Dealer Technical Support before replacing components
U0415-53	Invalid Data Received From Anti-Lock Braking System (ABS) Control Module - De-activated	<ul style="list-style-type: none"> Event information Deactivated 	<ul style="list-style-type: none"> Check the Anti-Lock Braking System Module for related DTCs and refer to the relevant DTC index
U0415-81	Invalid Data Received From Anti-lock Brake System (ABS) Control Module - Invalid serial data received	<ul style="list-style-type: none"> Stability assist fault 	<ul style="list-style-type: none"> Check ABS module for related DTCs and refer to relevant DTC Index
U0417-67	Invalid Data Received From Park Brake Control Module - Signal incorrect after event	<ul style="list-style-type: none"> Parking brake module did not respond properly to apply request 	<ul style="list-style-type: none"> Check parking brake module for related DTCs and refer to relevant DTC Index
U0417-81	Invalid Data Received From Park Brake Control Module - Invalid serial data received	<ul style="list-style-type: none"> Speed control inhibited by parking brake module 	<ul style="list-style-type: none"> Check parking brake module for related DTCs and refer to relevant DTC Index
U0418-68	Invalid Data Received From Brake System Control Module - Event information	<ul style="list-style-type: none"> Event information 	<ul style="list-style-type: none"> Check the Anti-Lock Braking System Module for related DTCs and refer to the relevant DTC index
U0421-81	Invalid Data Received From Suspension Control Module 'A' - Invalid serial data received	<ul style="list-style-type: none"> Invalid serial data received 	<ul style="list-style-type: none"> Check the Suspension Control Module for related DTCs and refer to the relevant DTC index
U0423-81	Invalid Data Received From Instrument Panel Control Module - Invalid serial data received	<ul style="list-style-type: none"> Speed control inhibited by instrument cluster 	<ul style="list-style-type: none"> Check instrument cluster, CJB and RJB for related DTCs and refer to relevant DTC Index
U1A00-88	Private Communication Network - Bus off	<ul style="list-style-type: none"> Bus off 	<ul style="list-style-type: none"> The module setting this code has disabled CAN transmission. Check for other bus off codes. Check the module and circuits. Refer to the electrical circuit diagrams. Clear all DTCs and road test the vehicle. If the concern reoccurs contact Dealer Technical

DTC	Description	Possible Causes	Action
			Support for further advice. Under no circumstance should any parts be replaced to overcome this issue
U1A14-49	CAN Initialisation Failure - Internal electronic failure	<ul style="list-style-type: none"> • Internal electronic failure 	<ul style="list-style-type: none"> • Suspect the speed control module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U2101-00	Control Module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> • Data sent from RJB is invalid 	<ul style="list-style-type: none"> • Check/amend Car Configuration File using the manufacturer approved diagnostic system, clear DTC and re-test. If DTC remains, re-configure RJB using manufacturer approved diagnostic system, clear DTC and re-test. If DTC remains check RJB for DTCs and refer to DTC Index
U3000-41	Control Module - General checksum failure	<ul style="list-style-type: none"> • Internal micro controller error • Checksum fault 	<ul style="list-style-type: none"> • Suspect the speed control module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-42	Control Module - General memory failure	<ul style="list-style-type: none"> • Internal RAM test fault 	<ul style="list-style-type: none"> • Suspect the speed control module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> • Internal control module failure 	<ul style="list-style-type: none"> • Suspect the speed control module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-63	Control Module - Circuit/component protection time-out	<ul style="list-style-type: none"> • Circuit/component protection time-out 	<ul style="list-style-type: none"> • The Control module internal protection has been activated. Check for other related DTCs that could lead to this event. Clear the DTC and retest. If the problem persists, renew the module. Refer to the warranty policy and procedures manual if a module is suspect
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> • Signal compare failure • Battery supply voltage below a recognized value 	<ul style="list-style-type: none"> • Check vehicle battery and charging system. Refer to the relevant section in the workshop manual. Refer to the electrical circuit diagrams and check the power and ground supply circuits to the modules

General Information - Diagnostic Trouble Code (DTC) Index DTC: Steering Column Lock Module (VIM)

Description and Operation

Steering Column Lock Module (VIM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.





Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Steering Column Lock Module, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section. For additional information, refer to: Steering Column Switches (211-05 Steering Column Switches, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B100D-51	Column Lock Authorisation - Not programmed	<ul style="list-style-type: none"> Module not programmed 	<ul style="list-style-type: none"> Configure the Steering Column Lock Module using the manufacturers approved diagnostic system
B100D-62	Column Lock Authorisation - Signal compare failure	<ul style="list-style-type: none"> Signal compare failure - This DTC will be logged if the encrypted data exchange does not match between Steering Column Lock and the Central Junction Box 	<ul style="list-style-type: none"> Configure the modules using the manufacturers approved diagnostic system. If the problem persists, complete a CAN network integrity test using the manufacturers approved diagnostic system. Perform an on demand self-test and retest
B100D-64	Column Lock Authorisation - Signal plausibility failure	<ul style="list-style-type: none"> Signal plausibility failure Steering Column Lock unable to perform lock action CAN Network fault Anti-lock Braking System, Engine Control Module, Central Junction Box fault 	 <p>NOTE: Prior to clearing this DTC, carry out the Vehicle Functional Reset application using the manufacturer approved diagnostic system</p> <ul style="list-style-type: none"> Check the serviceability of the steering column and lock. Clear the DTC and retest. If the problem persists, carry out CAN Network Integrity Test and Module Self Test using the manufacturer approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and

DTC	Description	Possible Causes	Action
			check CAN Network
B100D-87	Column Lock Authorisation - Missing message	<ul style="list-style-type: none"> • Missing message • CAN fault • No response from electric steering column lock control module, instrument cluster, central junction box • Battery voltage at electric steering column lock control module too low • Electric steering column lock control module, instrument cluster, central junction box fault 	 <p>NOTE: Prior to clearing this DTC, carry out the Vehicle Functional Reset application using the manufacturer approved diagnostic system</p> <ul style="list-style-type: none"> • Clear DTC, repeatedly lock and unlock car using the key fob and retest. Check for related DTCs and refer to the relevant DTC index • If the fault is cleared, notify the customer that the steering column lock may fail to unlock if the vehicle is parked with a high steering angle or with the road wheel against a curb. If the column lock is failing to disengage, the customer may be able to rectify this by rotating the steering wheel while pressing the engine start button • If fault persists, complete a CAN network integrity test using the manufacturers approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits between the central junction box, the instrument cluster and the electronic steering column lock. Refer to the electrical circuit diagrams and check the central junction box, the instrument cluster and the electronic steering column lock power and ground supply circuits for short circuit to ground, short circuit to power, open circuit, high resistance. Repair circuit(s) as required. Clear DTC, perform an on demand self-test and retest • If fault persists, check that the vehicle battery supply voltage is between 9-16 volts. Rectify as required
U0001-88	High Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> • Bus off 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> • No sub type information 	<ul style="list-style-type: none"> • Refer to network communication section of the workshop manual. Clear the DTC and ensure the vehicle battery supply voltage is between 9-16Volts. Using the manufacturers approved diagnostic system, complete a CAN integrity test. Perform an on demand self-test and retest
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> • Internal electronic failure detected during self test or lock/unlock operation 	<ul style="list-style-type: none"> • Refer to network communication section of the workshop manual. Clear the DTC and ensure the vehicle battery supply voltage is between 9-16Volts. Perform an on demand self-test and if the DTC returns suspect the electric steering column lock, refer to the warranty policy and procedures manual if a module/component is suspect
U3000-87	Control Module - Missing message	<ul style="list-style-type: none"> • Configuration message not received 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network. Check modules are configured correctly using the manufacturer approved diagnostic system
U3002-81	Vehicle Identification Number - Invalid serial data received	<ul style="list-style-type: none"> • Invalid vehicle identification number 	<ul style="list-style-type: none"> • Confirm the correct VIN details are stored in Steering Column Lock Module using the approved diagnostic system

General Information - Diagnostic Trouble Code (DTC) Index DTC: Television Module (TVM)

Description and Operation

Television Control Module (TVCM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Television Control Module (TVCM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Information and Entertainment System](#) (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1A56-11	Antenna - Circuit short to ground	<ul style="list-style-type: none"> Antenna circuit short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna circuit for short to ground
B1A56-12	Antenna - Circuit short to battery	<ul style="list-style-type: none"> Antenna circuit short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna circuit for short to power
B1A56-13	Antenna - Circuit open	<ul style="list-style-type: none"> Antenna circuit open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna circuit for open circuit
B1D55-11	Antenna#2 - Circuit short to ground	<ul style="list-style-type: none"> Antenna #2 circuit short to ground 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna #2 circuit for short to ground
B1D55-12	Antenna#2 - Circuit short to battery	<ul style="list-style-type: none"> Antenna #2 circuit short to power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna #2 circuit for short to power

DTC	Description	Possible Causes	Action
B1D55-13	Antenna#2 - Circuit open	<ul style="list-style-type: none"> • Antenna #2 circuit open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna #2 circuit for open circuit
B1D56-11	Antenna #3 Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Antenna #3 circuit short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna #3 circuit for short to ground
B1D56-12	Antenna #3 Circuit - Circuit short to battery	<ul style="list-style-type: none"> • Antenna #3 circuit short to power 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna #3 circuit for short to power
B1D56-13	Antenna #3 Circuit - Circuit open	<ul style="list-style-type: none"> • Antenna #3 circuit open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna #3 circuit for open circuit
B1D57-11	Antenna #4 Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Antenna #4 circuit short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna #4 circuit for short to ground
B1D57-12	Antenna #4 Circuit - Circuit short to battery	<ul style="list-style-type: none"> • Antenna #4 circuit short to power 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna #4 circuit for short to power
B1D57-13	Antenna #4 Circuit - Circuit open	<ul style="list-style-type: none"> • Antenna #4 circuit open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check antenna #4 circuit for open circuit
B1D58-11	Television Output - Circuit short to ground	<ul style="list-style-type: none"> • Television output circuit short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check television output circuit for short to ground
B1D58-12	Television Output - Circuit short to battery	<ul style="list-style-type: none"> • Television output circuit short to power 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check television output circuit for short to power
B1D58-13	Television Output - Circuit open	<ul style="list-style-type: none"> • Television output circuit open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check television output circuit for open circuit
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> • Internal electronic failure 	<ul style="list-style-type: none"> • Suspect the television module, check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3003-16	Battery Voltage - Circuit voltage below threshold	<ul style="list-style-type: none"> • Circuit voltage below threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U3003-17	Battery Voltage - Circuit voltage above threshold	<ul style="list-style-type: none"> • Circuit voltage above threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

General Information - Diagnostic Trouble Code (DTC) Index DTC: Tire Pressure Monitoring System Module (TPM)

Description and Operation

Tire Pressure Monitoring System (TPM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Where an 'on demand self-test' is referred to, this can be accessed via the 'DTC Monitor' tab on the manufacturers approved diagnostic system.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.


The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Tire Pressure Monitoring System, for additional Diagnosis and Testing information refer to the relevant Diagnosis and Testing Section. For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
C1A56-31	Left Front Tire Pressure Sensor and Transmitter Assembly - No signal	<ul style="list-style-type: none"> Missing, incompatible or defective tire pressure sensor or radio frequency receiver 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test F in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A56-68	Left Front Tire Pressure Sensor and Transmitter Assembly - Event information	<ul style="list-style-type: none"> Information only - vehicle exposed to extreme temperature environment and/or tire pressure sensor low battery voltage event 	<ul style="list-style-type: none"> No action required
C1A56-91	Left Front Tire Pressure Sensor and Transmitter Assembly - Parametric	<ul style="list-style-type: none"> Tire pressure sensor has reported out of range information for pressure, temperature or acceleration 	<ul style="list-style-type: none"> Replace defective tire pressure sensor. Refer to the relevant section of the workshop manual
C1A56-93	Left Front Tire Pressure Sensor and Transmitter Assembly - No operation	<ul style="list-style-type: none"> No tire pressure sensor can be localized at this position due to an initiator or tire pressure 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test G in section 204-04, Diagnosis and Testing, Wheels and Tires

DTC	Description	Possible Causes	Action
		sensor malfunction	
C1A57-11	Left Front Initiator - Circuit short to ground	<ul style="list-style-type: none"> Left front initiator circuit is short to ground 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test B1 in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A57-12	Left Front Initiator - Circuit short to battery	<ul style="list-style-type: none"> Left front initiator circuit is short to power 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test B2 in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A57-13	Left Front Initiator - Circuit open	<ul style="list-style-type: none"> Left front initiator circuit open 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test B9 in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A58-31	Right Front Tire Pressure Sensor and Transmitter Assembly - No signal	<ul style="list-style-type: none"> Missing, incompatible or defective tire pressure sensor or radio frequency receiver 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test F in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A58-68	Right Front Tire Pressure Sensor and Transmitter Assembly - Event information	<ul style="list-style-type: none"> Information only - vehicle exposed to extreme temperature environment and/or tire pressure sensor low battery voltage event 	<ul style="list-style-type: none"> No action required
C1A58-91	Right Front Tire Pressure Sensor and Transmitter Assembly - Parametric	<ul style="list-style-type: none"> Tire pressure sensor has reported out of range information for pressure, temperature or acceleration 	<ul style="list-style-type: none"> Replace defective tire pressure sensor. refer to the relevant section of the workshop manual
C1A58-93	Right Front Tire Pressure Sensor and Transmitter Assembly - No operation	<ul style="list-style-type: none"> No tire pressure sensor can be localized at this position due to an initiator or tire pressure sensor malfunction 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test G in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A59-11	Right Front Initiator - Circuit short to ground	<ul style="list-style-type: none"> Right front initiator circuit is short to ground 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test C1 in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A59-12	Right Front Initiator - Circuit short to battery	<ul style="list-style-type: none"> Right front initiator circuit is short to power 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test C2 in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A59-13	Right Front Initiator - Circuit open	<ul style="list-style-type: none"> Right front initiator circuit open 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test C9 in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A60-31	Left Rear Tire Pressure Sensor and Transmitter Assembly - No signal	<ul style="list-style-type: none"> Missing, incompatible or defective tire pressure sensor or radio frequency receiver 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test F in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A60-68	Left Rear Tire Pressure Sensor and Transmitter Assembly - Event information	<ul style="list-style-type: none"> Information only - Vehicle exposed to extreme temperature environment and/or tire pressure sensor low battery voltage event 	<ul style="list-style-type: none"> No action required

DTC	Description	Possible Causes	Action
C1A60-91	Left Rear Tire Pressure Sensor and Transmitter Assembly - Parametric	<ul style="list-style-type: none"> Tire pressure sensor has reported out of range information for pressure, temperature or acceleration 	<ul style="list-style-type: none"> Replace defective tire pressure sensor, refer to the relevant section of the workshop manual
C1A60-93	Left Rear Tire Pressure Sensor and Transmitter Assembly - No operation	<ul style="list-style-type: none"> No tire pressure sensor can be localized at this position due to an initiator or tire pressure sensor malfunction 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test G in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A61-11	Left Rear Initiator - Circuit short to ground	<ul style="list-style-type: none"> Left rear initiator circuit short to ground 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test D1 in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A61-12	Left Rear Initiator - Circuit short to battery	<ul style="list-style-type: none"> Left rear initiator circuit short to power 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test D2 in section 204-04,Diagnosis and Testing, Wheels and Tires
C1A61-13	Left Rear Initiator - Circuit open	<ul style="list-style-type: none"> Left rear initiator circuit open 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test D9 in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A62-31	Right Rear Tire Pressure Sensor and Transmitter Assembly - No signal	<ul style="list-style-type: none"> Missing, incompatible or defective tire pressure sensor or radio frequency receiver 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test F in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A62-68	Right Rear Tire Pressure Sensor and Transmitter Assembly - Event information	<ul style="list-style-type: none"> Information only - vehicle exposed to extreme temperature environment and/or tire pressure sensor low battery voltage event 	<ul style="list-style-type: none"> No action required
C1A62-91	Right Rear Tire Pressure Sensor and Transmitter Assembly - Parametric	<ul style="list-style-type: none"> Tire pressure sensor has reported out of range information for pressure, temperature or acceleration 	<ul style="list-style-type: none"> Replace defective tire pressure sensor, refer to the relevant section of the workshop manual
C1A62-93	Right Rear Tire Pressure Sensor and Transmitter Assembly - No operation	<ul style="list-style-type: none"> No tire pressure sensor can be localized at this position due to an initiator or tire pressure sensor malfunction 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test G in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A63-11	Right Rear Initiator - Circuit short to ground	<ul style="list-style-type: none"> Right rear initiator circuit short to ground 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test E1 in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A63-12	Right Rear Initiator - Circuit short to battery	<ul style="list-style-type: none"> Right rear initiator circuit short to power 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing). Go to pinpoint test E2 in section 204-04, Diagnosis and Testing, Wheels and Tires
C1A63-13	Right Rear Initiator - Circuit open	<ul style="list-style-type: none"> Right rear initiator circuit open 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test E9 in section 204-04, Diagnosis and Testing, Wheels and Tires

DTC	Description	Possible Causes	Action
C1A64-68	Spare Wheel Tire Pressure Sensor and Transmitter Assembly - Event information	<ul style="list-style-type: none"> Information only - vehicle exposed to extreme temperature environment and/or tire pressure sensor low battery voltage event 	<ul style="list-style-type: none"> No action required
C1A64-91	Spare Wheel Tire Pressure Sensor and Transmitter Assembly - Parametric	<ul style="list-style-type: none"> Tire pressure sensor has reported out of range information for pressure, temperature or acceleration 	<ul style="list-style-type: none"> Replace defective tire pressure sensor, refer to the relevant section of the workshop manual
C1A64-93	Spare Wheel Tire Pressure Sensor and Transmitter Assembly - No operation	<ul style="list-style-type: none"> Missing, incompatible or defective tire pressure sensor or radio frequency receiver 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test H in section 204-04, Diagnosis and Testing, Wheels and Tires
C1D19-11	External Receiver Data Line - Circuit short to ground	<ul style="list-style-type: none"> Tire pressure monitoring system radio frequency receiver or data line circuit is short to ground 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test A in section 204-04,Diagnosis and Testing, Wheels and Tires
C1D19-12	External Receiver Data Line - Circuit short to battery	<ul style="list-style-type: none"> Tire pressure monitoring system radio frequency receiver or data line circuit is short to power 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test I in section 204-04, diagnosis and testing
C1D19-87	External Receiver Data Line - Missing message	<ul style="list-style-type: none"> Radio Frequency reception blocked Tire pressure monitoring system radio frequency receiver faulty Tire pressure monitoring system radio frequency receiver or data line circuits open circuit Missing, incompatible or defective tire pressure sensors 	<ul style="list-style-type: none"> For additional information, refer to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).Go to pinpoint test J in section 204-04, Diagnosis and Testing, Wheels and Tires
U0010-88	Medium Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> CAN bus fault 	<ul style="list-style-type: none"> Carry out CAN network integrity tests. Refer to the electrical wiring diagrams and check CAN network for short, open circuit
U0140-00	Lost communication with body control module - No sub type information	<ul style="list-style-type: none"> CAN bus fault Central junction box fault 	<ul style="list-style-type: none"> Refer to the electrical wiring diagrams and check central junction box power and ground supplies for short, open circuit. Carry out CAN network integrity tests
U0142-00	Lost Communication With Body Control Module "B" - No sub type information	<ul style="list-style-type: none"> CAN bus fault Rear junction box fault 	<ul style="list-style-type: none"> Refer to the electrical wiring diagrams and check rear junction box power and ground supplies for short, open circuit. Carry out CAN network integrity tests
U0155-00	Lost Communications With Instrument Panel Cluster (IPC) Control Module - No sub type information	<ul style="list-style-type: none"> CAN bus fault Instrument cluster fault 	<ul style="list-style-type: none"> Refer to the electrical wiring diagrams and check instrument cluster power and ground supplies for short, open circuit. Carry out CAN network integrity tests
U0164-00	Lost Communication With HVAC Control Module - No sub type information	<ul style="list-style-type: none"> CAN bus fault Climate control module fault 	<ul style="list-style-type: none"> Refer to the electrical wiring diagrams and check climate control module power and ground supplies for short, open circuit. Carry out CAN network integrity tests

DTC	Description	Possible Causes	Action
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> Incompatible tire pressure monitoring system module for vehicle CAN network 	<ul style="list-style-type: none"> Check correct tire pressure monitoring system module is installed to vehicle specification, otherwise suspect the rear junction box
U0415-00	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module - No sub type information	<ul style="list-style-type: none"> Invalid data received from the anti-lock braking system control module CAN bus fault Anti-lock braking system fault 	<ul style="list-style-type: none"> Check anti-lock braking system control module and Instrument Cluster for related DTCs and refer to the relevant DTC index. Carry out CAN network integrity tests
U0424-00	Invalid Data Received From HVAC Control Module - No sub type information	<ul style="list-style-type: none"> HVAC control module fault 	<ul style="list-style-type: none"> Check climate control module for related DTCs and refer to relevant DTC index
U1A14-49	CAN Initialisation Failure - Internal electronic failure	<ul style="list-style-type: none"> Tire pressure monitoring system module fault 	<ul style="list-style-type: none"> Install a new tire pressure monitoring module. Refer to the new module/component installation note at the top of the DTC index
U3000-55	Control Module - Not configured	<ul style="list-style-type: none"> Tire pressure monitoring system configuration data is invalid 	<ul style="list-style-type: none"> Check and amend the car configuration file
U3000-87	Control Module - Missing message	<ul style="list-style-type: none"> Tire pressure monitoring system configuration data not received 	<ul style="list-style-type: none"> Check the rear junction box for related DTCs and refer to the relevant DTC index. Carry out CAN network integrity test
U3002-81	Vehicle Identification Number - Invalid serial data received	<ul style="list-style-type: none"> Tire pressure monitoring system module and vehicle VIN mismatch 	<div style="display: flex; align-items: flex-start;">  <p style="color: blue; font-size: small;">NOTE: This DTC indicates that the tire pressure monitoring system module is not the original part installed to the vehicle at the factory/dealer and could have been substituted. Refer to the note above the DTC index about replacing components which may remain under manufacturer warranty.</p> </div> <ul style="list-style-type: none"> Re-install the original or a new tire pressure monitoring system control module

General Information - Diagnostic Trouble Code (DTC) Index DTC: Touch Screen Display (FCDIM)

Description and Operation

Touch Screen (TS)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Touch Screen (TS). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Information and Entertainment System](#) (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B100E-25	Video Input 'A' - Signal shape/waveform failure	<ul style="list-style-type: none"> ODST Only - TV video synch mis-match 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B100F-25	Video Input 'B' - Signal shape/waveform failure	<ul style="list-style-type: none"> ODST Only - Reverse Camera video synch mis-match 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U1A01-01	Communication Link - General electrical failure	<ul style="list-style-type: none"> ODST Only - cable from navigation module not correctly installed 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check electrical harness from navigation module is correctly installed
U1A01-15	Communication Link - Circuit short to battery or open	<ul style="list-style-type: none"> TSD to navigation module circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check TSD to navigation module circuit for short to power, open circuit
U1A4B-48	Control Module Processor B - Supervision software failure	<ul style="list-style-type: none"> Supervision software failure 	<ul style="list-style-type: none"> Re-configure the TSD using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
U3000-44	Control Module - Data memory failure	<ul style="list-style-type: none"> • EEPROM, External RAM access failure 	<ul style="list-style-type: none"> • Suspect the TSD, check and install a new TSD as required, refer to the new module/component installation note at the top of the DTC Index
U3000-48	Control Module - Supervision software failure	<ul style="list-style-type: none"> • Supervision software failure 	<ul style="list-style-type: none"> • Re-configure the TSD using the manufacturer approved diagnostic system
U3000-4B	Control Module - Over temperature	<ul style="list-style-type: none"> • Touch panel backlight - high temperature detected 	<ul style="list-style-type: none"> • Allow the system to cool, clear the DTC and check/monitor system for re-occurrence. If DTC re-occurs suspect the TSD. Check and install a new TSD as required, refer to the new module/component installation note at the top of the DTC Index
U3000-55	Control Module - Not configured	<ul style="list-style-type: none"> • Incorrect Car Configuration Parameters received 	<ul style="list-style-type: none"> • Check/amend Car Configuration File using the manufacturer approved diagnostic system
U3000-87	Control Module - Missing message	<ul style="list-style-type: none"> • Car Configuration File not received 	<ul style="list-style-type: none"> • Check RJB for related DTCs and refer to relevant DTC Index. Check CAN and MOST networks, carry out the CAN and MOST network tests using the manufacturer approved diagnostic system
U3000-98	Control Module - Component or system over temperature	<ul style="list-style-type: none"> • TSD internal temperature over limit 	<ul style="list-style-type: none"> • Allow the system to cool, clear the DTC and check/monitor system for re-occurrence. If DTC re-occurs suspect the TSD. Check and install a new TSD as required, refer to the new module/component installation note at the top of the DTC Index
U3003-16	Battery Voltage - Circuit voltage below threshold	<ul style="list-style-type: none"> • Circuit voltage below threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U3003-17	Battery Voltage - Circuit voltage above threshold	<ul style="list-style-type: none"> • Circuit voltage above threshold 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

General Information - Diagnostic Trouble Code (DTC) Index Vehicles With: 6HP28 6-Speed Automatic Transmission, DTC: Transmission Control Module (TCM)

Description and Operation

Transmission Control Module (TCM) 6 speed (6HP28 Applications)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as needed

The table below lists all diagnostic trouble codes (DTCs) that could be logged in the transmission control module, for additional diagnosis and testing information refer to the relevant diagnosis and testing section
For additional information, refer to: Diagnostics (307-01 Automatic Transmission/Transaxle - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
P0121-86	Throttle/Pedal Position Sensor A Circuit Range/Performance - Signal invalid	<ul style="list-style-type: none"> Throttle/Pedal Position Sensor Fault (Data received over CAN Bus) 	<ul style="list-style-type: none"> Check Engine Control Module for stored DTCs
P0219-86	Engine Overspeed Condition - Signal invalid	<ul style="list-style-type: none"> Engine speed too low or too high (Data received over CAN Bus) 	<ul style="list-style-type: none"> Check Engine Control Module for stored DTCs
P0500-81	Vehicle Speed Sensor A - Invalid serial data received	<ul style="list-style-type: none"> Vehicle Speed Sensor fault (Data received over CAN Bus) 	<ul style="list-style-type: none"> Check Dynamic Stability Control module for stored DTCs
P0501-81	Vehicle Speed Sensor A Range/Performance - Invalid serial data received	<ul style="list-style-type: none"> Vehicle Speed receive over CAN Bus does not match Transmission Output-Shaft speed 	<ul style="list-style-type: none"> Check Dynamic Stability Control module for stored DTCs. Check correct Differential is installed to the vehicle

DTC	Description	Possible Causes	Action
P0561-1C	System Voltage Unstable - Circuit voltage out of range	<ul style="list-style-type: none"> Power supply voltage out of range when engine running 	<ul style="list-style-type: none"> Check Engine Control Module for stored DTCs. Check Charging System and Battery condition
P0562-21	System Voltage Low - Signal amplitude < minimum	<ul style="list-style-type: none"> Circuit low voltage. Battery supply voltage to Transmission Control Module 	<ul style="list-style-type: none"> Refer to Circuit diagrams and check Power and Ground Circuit for fault. Check Engine Control Module for stored DTCs. Check Charging System and Battery condition
P0563-22	System Voltage High - Signal amplitude > maximum	<ul style="list-style-type: none"> High Battery charge, alternator fault 	<ul style="list-style-type: none"> Check Engine Control Module for stored DTCs. Check Charging System and Battery condition
P0601-41	Internal Control Module Memory Check Sum Error - General checksum failure	<ul style="list-style-type: none"> Software error Transmission Control Module failure 	<ul style="list-style-type: none"> Re-configure the Transmission Control Module using the manufacturer approved diagnostic system, clear DTC and re-test. If DTC remains, Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0604-00	Internal Control Module Random Access Memory (RAM) Error - No sub type information	<ul style="list-style-type: none"> Shift-by-Wire fault 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0605-41	Internal Control Module Read Only Memory (ROM) Error - General checksum failure	<ul style="list-style-type: none"> General checksum failure 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0606-04	TCM Processor - System Internal Failures	<ul style="list-style-type: none"> Micro controller component faults 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0606-26	TCM Processor - Signal rate of change below threshold	<ul style="list-style-type: none"> Micro controller component faults 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0606-49	TCM Processor - Internal electronic failure	<ul style="list-style-type: none"> Micro controller component faults 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-04	TCM Processor - System Internal Failures	<ul style="list-style-type: none"> Micro controller component faults 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-06	TCM Processor - Algorithm Based Failures	<ul style="list-style-type: none"> Micro controller component faults 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-11	TCM Processor - Circuit Short to Ground	<ul style="list-style-type: none"> Watchdog fault 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-12	TCM Processor - Circuit Short to Battery	<ul style="list-style-type: none"> Watchdog fault 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P0613-13	TCM Processor - Circuit Open	<ul style="list-style-type: none"> • Watchdog fault 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-14	TCM Processor - Circuit Short to Ground or Open	<ul style="list-style-type: none"> • Watchdog fault 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-21	TCM Processor - Signal amplitude < minimum	<ul style="list-style-type: none"> • Watchdog fault 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-22	TCM Processor - Signal amplitude > maximum	<ul style="list-style-type: none"> • Watchdog fault 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-47	TCM Processor - Watchdog / safety Micro controller failure	<ul style="list-style-type: none"> • Watchdog fault 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-49	TCM Processor - Internal electronic failure	<ul style="list-style-type: none"> • Micro controller component faults 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0613-68	TCM Processor - Event Information	<ul style="list-style-type: none"> • Watchdog fault 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P061B-02	Internal Control Module Torque Calculation Performance - General signal failure	<ul style="list-style-type: none"> • Transmission Control Module - positive torque signal not valid 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P061B-26	Internal Control Module Torque Calculation Performance - Signal rate of change below threshold	<ul style="list-style-type: none"> • Transmission Control Module positive torque signal not valid 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P062F-04	Internal Control Module EEPROM Error - System Internal Failures	<ul style="list-style-type: none"> • EEPROM communication error 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0642-21	Sensor Reference Voltage A Circuit Low - Signal amplitude < minimum	<ul style="list-style-type: none"> • Sensor supply voltage fault low 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0643-22	Sensor Reference Voltage A Circuit High - Signal amplitude > maximum	<ul style="list-style-type: none"> • Sensor supply voltage fault high 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0657-13	Actuator Supply Voltage A Circuit / Open - Circuit Open	<ul style="list-style-type: none"> • Actuator supply (pressure control valves etc) Open Circuit 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P0657-1C	Actuator Supply Voltage A Circuit / Open - Circuit voltage out of range	<ul style="list-style-type: none"> Actuator supply (pressure control valves etc) voltage plausibility fault 	<ul style="list-style-type: none"> Refer to electrical Circuit diagrams and check Transmission Control Module connector for signs of water ingress or damage, check pin 7 for Short to Power or Ground (should NOT be connected and harness terminal should have a bung installed). If no fault identified, suspect the Transmission Control Module. Check and install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0658-11	Actuator Supply Voltage A Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Actuator supply (pressure control valves etc) voltage Short to Ground 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0659-12	Actuator Supply Voltage A Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Actuator supply (pressure control valves etc) voltage Short to Power 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0667-01	PCM / ECM / TCM Internal Temperature Sensor A Range/Performance - General Electrical Failure	<ul style="list-style-type: none"> General electrical failure 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0667-04	PCM / ECM / TCM Internal Temperature Sensor A Range/Performance - System Internal Failures	<ul style="list-style-type: none"> Internal Electronic Failure 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0667-49	PCM / ECM / TCM Internal Temperature Sensor A Range/Performance - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0700-02	Transmission Control System (MIL Request) - General signal failure	<ul style="list-style-type: none"> General Signal failure 	<ul style="list-style-type: none"> Clear DTC, Road test and re-test, Read DTCs and Investigate as required
P0700-22	Transmission Control System (MIL Request) - Signal amplitude > maximum	<ul style="list-style-type: none"> Double fault from monitoring of internal power supply and pressure regulator/solenoid control software 	<ul style="list-style-type: none"> If any of the following DTCs are also present; P074013, P096712, P273912, P273012, P272112, P096312, P276312, P097112, suspect the Transmission Control Module, check and install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0700-75	Transmission Control System (MIL Request) - Emergency Position Not Reachable	<ul style="list-style-type: none"> Emergency Position Not Reachable 	<ul style="list-style-type: none"> Clear DTC, Road test and re-test, Read DTCs and investigate as required
P0710-13	Transmission Fluid Temperature Sensor A Circuit - Circuit Open	<ul style="list-style-type: none"> Transmission fluid temperature sensor Circuit Open Circuit 	<ul style="list-style-type: none"> Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0711-01	Transmission Fluid Temperature Sensor A Circuit Range/Performance - General Electrical Failure	<ul style="list-style-type: none"> General electrical failure 	<ul style="list-style-type: none"> Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0711-22	Transmission Fluid Temperature Sensor A Circuit Range/Performance - Signal amplitude > maximum	<ul style="list-style-type: none"> Signal amplitude > maximum. Excessive jump in temperature 	<ul style="list-style-type: none"> Clear DTC. Carry out cold start road test, continue driving vehicle until normal operating temperature is achieved. Reads DTCs, if DTC returns, suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to

DTC	Description	Possible Causes	Action
			the warranty policy and procedures manual if a module/component is suspect.
P0712-11	Transmission Fluid Temperature Sensor A Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Transmission fluid temperature sensor Circuit Short to Ground 	<ul style="list-style-type: none"> Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0713-01	Transmission Fluid Temperature Sensor A Circuit High - General Electrical Failure	<ul style="list-style-type: none"> General electrical failure 	<ul style="list-style-type: none"> Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0713-12	Transmission Fluid Temperature Sensor A Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Transmission fluid temperature sensor Circuit Short to Power 	<ul style="list-style-type: none"> Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0716-14	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Turbine/Input Shaft Speed Sensor Circuit Short to Ground or Open Circuit 	<ul style="list-style-type: none"> Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0716-21	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance - Signal amplitude < minimum	<ul style="list-style-type: none"> Turbine/Input Shaft Speed Sensor signal too small 	<ul style="list-style-type: none"> Clear DTC and road test, if DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0716-22	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance - Signal amplitude > maximum	<ul style="list-style-type: none"> Turbine/Input Shaft Speed Sensor signal above maximum 	<ul style="list-style-type: none"> Clear DTC and road test, if DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0717-12	Turbine/Input Shaft Speed Sensor A Circuit No Signal - Circuit Short to Battery	<ul style="list-style-type: none"> Turbine/input shaft speed sensor A Circuit Short to Power 	<ul style="list-style-type: none"> Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0720-12	Output Shaft Speed Sensor Circuit - Circuit Short to Battery	<ul style="list-style-type: none"> Transmission output shaft speed sensor Circuit Short to Power 	<ul style="list-style-type: none"> Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0720-14	Output Shaft Speed Sensor Circuit - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Transmission output shaft speed sensor Circuit Short to Ground or Open Circuit 	<ul style="list-style-type: none"> Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0721-22	Output Shaft Speed Sensor Circuit Range/Performance - Signal amplitude > maximum	<ul style="list-style-type: none"> Transmission output shaft speed sensor signal above maximum 	<ul style="list-style-type: none"> Clear DTC and road test, if DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0721-27	Output Shaft Speed Sensor Circuit Range/Performance - Signal rate of change above threshold	<ul style="list-style-type: none"> Output shaft speed negative gradient too high 	<ul style="list-style-type: none"> Clear DTC and road test, if DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P0721-64	Output Shaft Speed Sensor Circuit Range/Performance - Signal plausibility failure	<ul style="list-style-type: none"> • Signal plausibility failure 	<ul style="list-style-type: none"> • Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0729-07	Gear 6 Incorrect Ratio - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0731-07	Gear 1 Incorrect Ratio - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0732-07	Gear 2 Incorrect Ratio - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0733-07	Gear 3 Incorrect Ratio - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0734-07	Gear 4 Incorrect Ratio - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0735-07	Gear 5 Incorrect Ratio - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0736-07	Reverse Incorrect Ratio - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0740-13	Torque Converter Clutch Solenoid Circuit / Open - Circuit Open	<ul style="list-style-type: none"> • Pressure control solenoid 2 Circuit Open Circuit 	<ul style="list-style-type: none"> • Clear DTC and test. If code re-detects suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0741-07	Torque Converter Clutch Solenoid Circuit Performance/Stuck Off - Mechanical Failures	<ul style="list-style-type: none"> • Too high slip at torque converter clutch. Mechanical Failures 	<ul style="list-style-type: none"> • Suspect torque converter lockup clutch. Install a new torque converter, refer to the warranty policy and procedures manual if a module/component is suspect. If transmission fluid is in very poor condition and dirty, install a new transmission, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P0745-04	Pressure Control Solenoid A - System Internal Failures	<ul style="list-style-type: none"> • System Internal Failures 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0745-48	Pressure Control Solenoid A - Supervision Software Failure	<ul style="list-style-type: none"> • Supervision Software Failure 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0758-12	Shift Solenoid B Electrical - Circuit Short to Battery	<ul style="list-style-type: none"> • Circuit Short to Power 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0758-13	Shift Solenoid B Electrical - Circuit Open	<ul style="list-style-type: none"> • Solenoid valve 1 or Pressure control Solenoid G Circuit Open Circuit 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0771-71	Shift Solenoid E Performance/Stuck Off - Actuator stuck	<ul style="list-style-type: none"> • Actuator stuck 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0775-04	Pressure Control Solenoid B - System Internal Failures	<ul style="list-style-type: none"> • System Internal Failures 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0775-48	Pressure Control Solenoid B - Supervision Software Failure	<ul style="list-style-type: none"> • Supervision Software Failure 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0781-07	1-2 Shift - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0781-77	2-1 Shift - Commanded position not reachable	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0782-07	2-3 Shift - Commanded position not reachable	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0782-77	3-2 Shift - Commanded position not reachable	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0783-07	3-4 Shift - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
			suspect.
P0783-77	3-4 Shift - Commanded position not reachable	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0784-07	4-5 Shift - Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0784-77	4-5 Shift - Commanded position not reachable	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0798-1A	Pressure Control Solenoid C Electrical - Circuit Resistance Below Threshold	<ul style="list-style-type: none"> Pressure control solenoid C Circuit resistance below threshold 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0798-1E	Pressure Control Solenoid C Electrical - Circuit Short to Ground	<ul style="list-style-type: none"> Pressure control solenoid C electrical circuit short to ground 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0798-21	Pressure Control Solenoid C Electrical - Signal amplitude < minimum	<ul style="list-style-type: none"> Pressure Control Solenoid C Electrical signal amplitude < minimum 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0814-62	Transmission Range Display Circuit - Signal compare failure	<ul style="list-style-type: none"> Transmission Range Display Circuit signal compare failure 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0826-08	Up and Down Switch circuit - Bus Signal Message Failures	<ul style="list-style-type: none"> Invalid CAN signal from Central Junction Box/Instrument Cluster Stuck Sprintronic switch CAN bus circuit fault 	<ul style="list-style-type: none"> Check Central Junction Box and Instrument Cluster for stored DTCs. Check gear change switches for correct operation. Refer to circuit diagrams and check CAN bus for a circuit fault
P0826-81	Up and Down Switch Circuit - Invalid serial data received	<ul style="list-style-type: none"> Invalid Can signal from Central Junction Box / Instrument Cluster Stuck Sprintronic switch CAN Bus Circuit fault 	<ul style="list-style-type: none"> Check Central Junction Box and Instrument Cluster for stored DTCs. Check Gear Change Switches for correct operation. Refer to Circuit diagrams and check CAN Bus for Circuit fault
P0826-88	Up and Down Switch Circuit - Bus off	<ul style="list-style-type: none"> Steering Wheel Module to Central Junction Box / Instrument Cluster LIN Bus failure 	<ul style="list-style-type: none"> Check Central Junction Box and Steering Wheel Ice Switches for stored DTCs. Refer to Circuit diagrams and check LIN Bus for Circuit fault
P0829-07	5-6 Shift - Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P0829-77	6-5 Shift - Commanded Position Not Reachable	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P084F-01	Park / Neutral Switch Input Circuit - General Electrical Failure	<ul style="list-style-type: none"> • Wrong voltage level detected on Park/No Park signal 	<ul style="list-style-type: none"> • Check for correct output at Transmission Control Module park signal pin (check in all positions) 12 volts in Park, 0 volts in all other positions. If fault identified, suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect. If no fault identified, check Park signal circuit to Transmission Shift Module for short, open circuit
P0850-01	Park / Neutral Switch Input Circuit - General Electrical Failure	<ul style="list-style-type: none"> • General electrical failure 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0850-02	Park / Neutral Switch Input Circuit - General signal failure	<ul style="list-style-type: none"> • General signal failure 	<ul style="list-style-type: none"> • Check Parklock mechanism, If Parklock operation correct suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0850-29	Park / Neutral Switch Input Circuit - Signal invalid	<ul style="list-style-type: none"> • Signal Invalid 	<ul style="list-style-type: none"> • Check Parklock mechanism, If Parklock operation correct suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0850-1C	Park / Neutral Switch Input Circuit - Circuit voltage out of range	<ul style="list-style-type: none"> • Circuit voltage out of range 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0919-93	Gear Shift Position Control Error - No operation	<ul style="list-style-type: none"> • No shifting despite driver request 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0919-94	Gear Shift Position Control Error - Unexpected operation	<ul style="list-style-type: none"> • Shifting without driver request 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0938-29	Hydraulic Oil Temperature Sensor Range/Performance - Signal invalid	<ul style="list-style-type: none"> • Transmission fluid temperature compared with module temperature fault 	<ul style="list-style-type: none"> • Clear DTC. Carry out cold start road test, continue driving vehicle until normal operating temperature is achieved. Read DTCs, if DTC returns, suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0963-12	Pressure Control Solenoid A Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> • Pressure control solenoid 1 Circuit Short to Power 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0964-13	Pressure Control Solenoid B Control Circuit / Open - Circuit Open	<ul style="list-style-type: none"> • Pressure Control Solenoid B Control Circuit Open 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual


DTC	Description	Possible Causes	Action
			if a module/component is suspect.
P0964-14	Pressure Control Solenoid B Control Circuit / Open - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Pressure Control Solenoid B Control Circuit Short to Ground or Open 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0966-11	Pressure Control Solenoid B Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Pressure control solenoid 2 Circuit Short to Ground 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0967-12	Pressure Control Solenoid B Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Pressure control solenoid 2 Circuit Short to Power 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0968-14	Pressure Control Solenoid C Control Circuit / Open - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Pressure control solenoid 3 Circuit Short to Ground or Open Circuit 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0970-11	Pressure Control Solenoid C Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Pressure control solenoid 3 Circuit Short to Ground 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0971-12	Pressure Control Solenoid C Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Pressure control solenoid 3 Circuit Short to Power 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0972-22	Shift Solenoid A Control Circuit Range/Performance - Signal amplitude > maximum	<ul style="list-style-type: none"> Pressure control solenoid 1 current too large 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0973-11	Shift Solenoid A Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Shift solenoid A control Circuit Short to Ground 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0973-14	Shift Solenoid A Control Circuit Low - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Pressure control solenoid 1 Circuit Short to Ground or Open Circuit 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0973-1A	Shift Solenoid A Control Circuit Low - Circuit Resistance Below Threshold	<ul style="list-style-type: none"> Shift Solenoid A control circuit resistance below threshold 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0973-1E	Shift Solenoid A Control Circuit Low - Circuit Resistance Out Of Range	<ul style="list-style-type: none"> Shift Solenoid A control circuit resistance out of range 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0976-11	Shift Solenoid B Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Solenoid valve 2 Circuit Short to Ground 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P0976-14	Shift Solenoid B Control Circuit Low - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Solenoid valve 2 Circuit Short to Ground or Open Circuit 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P1674-04	Control Module Software Corrupted - System Internal Failures	<ul style="list-style-type: none"> • System internal failures 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P1674-48	Control Module Software Corrupted - Supervision Software Failure	<ul style="list-style-type: none"> • Supervision software failure 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P1707-07	Transfer Case Neutral or Park/Neutral Indication Circuit - Commanded position not reachable	<ul style="list-style-type: none"> • Transfer case neutral or park/neutral indication circuit - mechanical failures 	<ul style="list-style-type: none"> • Clear the DTC. Test drive the Vehicle, engaging and disengaging the parking lock several times. If the DTC recurs, check parking lock components and replace as required. If no faulty parklock component is found Clear DTC and the DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P1707-72	Transfer Case Neutral or Park/Neutral Indication Circuit - Actuator Stuck Open	<ul style="list-style-type: none"> • Transfer case neutral or park/neutral indication circuit - Actuator stuck open 	<ul style="list-style-type: none"> • Clear the DTC. Test drive the Vehicle, engaging and disengaging the parking lock several times. If the DTC recurs, check parking lock components and replace as required. If no faulty parklock component is found Clear DTC and the DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P1707-77	Transfer Case Neutral or Park/Neutral Indication Circuit - Commanded position not reachable	<ul style="list-style-type: none"> • Commanded position not reachable 	<ul style="list-style-type: none"> • Clear the DTC. Test drive the Vehicle, engaging and disengaging the parking lock several times. If the DTC recurs, check parking lock components and replace as required. If no faulty parklock component is found Clear DTC and the DTC returns suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2700-07	Transmission Friction Element A Apply Time Range/Performance - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2701-07	Transmission Friction Element B Apply Time Range/Performance - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2702-07	Transmission Friction Element C Apply Time Range/Performance - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2703-07	Transmission Friction Element D Apply Time Range/Performance - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P2704-07	Transmission Friction Element E Apply Time Range/Performance - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	<ul style="list-style-type: none"> • Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (mechanical) internal fault. Install a new Transmission as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2713-04	Pressure Control Solenoid D - System Internal Failures	<ul style="list-style-type: none"> • System internal failures 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2713-48	Pressure Control Solenoid D - Supervision Software Failure	<ul style="list-style-type: none"> • Supervision software failure 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2716-22	Pressure Control Solenoid D Electrical - Signal amplitude > maximum	<ul style="list-style-type: none"> • Pressure Control Solenoid D Electrical signal amplitude > maximum 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2716-1A	Pressure Control Solenoid D Electrical - Circuit Resistance Below Threshold	<ul style="list-style-type: none"> • Pressure control solenoid D circuit resistance below threshold 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2716-1E	Pressure Control Solenoid D Electrical - Circuit Resistance Out Of Range	<ul style="list-style-type: none"> • Pressure control solenoid D circuit resistance out of range 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2718-14	Pressure Control Solenoid D Control Circuit / Open - Circuit Short to Ground or Open	<ul style="list-style-type: none"> • Pressure control solenoid D Circuit Short to Ground or Open Circuit 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2720-11	Pressure Control Solenoid D Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> • Pressure control solenoid D Circuit Short to Ground 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2721-12	Pressure Control Solenoid D Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> • Pressure control solenoid D Circuit Short to Power 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2722-04	Pressure Control Solenoid E - System Internal Failures	<ul style="list-style-type: none"> • Pressure Control Solenoid E system internal failures 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2722-48	Pressure Control Solenoid E - Supervision Software Failure	<ul style="list-style-type: none"> • Pressure Control Solenoid E supervision control software failure 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2725-22	Pressure Control Solenoid E Electrical - Signal amplitude > maximum	<ul style="list-style-type: none"> • Pressure Control Solenoid E Electrical signal amplitude > maximum 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2725-1A	Pressure Control Solenoid E Electrical - Circuit Resistance Below Threshold	<ul style="list-style-type: none"> • Pressure control solenoid E electrical resistance below threshold 	<ul style="list-style-type: none"> • Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P2725-1E	Pressure Control Solenoid E Electrical - Circuit Resistance Out Of Range	<ul style="list-style-type: none"> Pressure control solenoid E circuit resistance out of range 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2727-14	Pressure Control Solenoid E Control Circuit / Open - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Pressure Control Solenoid E Control Circuit Short to Ground or Open Circuit 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2729-11	Pressure Control Solenoid E Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Pressure control solenoid E Circuit Short to Ground 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2730-12	Pressure Control Solenoid E Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Pressure control solenoid E Circuit Short to Power 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2731-04	Pressure Control Solenoid F - System Internal Failures	<ul style="list-style-type: none"> Pressure Control Solenoid F no sub type information 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2731-48	Pressure Control Solenoid F - Supervision Software Failure	<ul style="list-style-type: none"> Pressure Control Solenoid F supervision software failure 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2734-22	Pressure Control Solenoid F Electrical - Signal amplitude > maximum	<ul style="list-style-type: none"> Pressure Control Solenoid F Electrical signal amplitude > maximum 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2734-1A	Pressure Control Solenoid F Electrical-Circuit Resistance Below Threshold	<ul style="list-style-type: none"> Pressure control solenoid F electrical circuit resistance below threshold 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2734-1E	Pressure Control Solenoid F Electrical-Circuit Resistance Out Of Range	<ul style="list-style-type: none"> Pressure control solenoid F electrical circuit resistance out of range 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2736-14	Pressure Control Solenoid F Control Circuit / Open - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Pressure Control Solenoid F Control Circuit Short to Ground or Open 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2738-11	Pressure Control Solenoid F Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Pressure Control Solenoid F Control Circuit Short to Ground 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2739-12	Pressure Control Solenoid F Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Pressure Control Solenoid F Control Circuit Short to Power 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2763-12	Torque Converter Clutch Pressure Control Solenoid Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Pressure control solenoid F Circuit Short to Power 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

DTC	Description	Possible Causes	Action
P2764-11	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Torque converter clutch pressure control solenoid control Circuit Short to Ground 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2764-1A	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low - Circuit Resistance Below Threshold	<ul style="list-style-type: none"> Torque converter clutch pressure control solenoid control circuit resistance below threshold 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2764-1E	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low - Circuit Resistance Out Of Range	<ul style="list-style-type: none"> Torque converter clutch pressure control solenoid control circuit resistance out of range 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2807-11	Pressure Control Solenoid G - Circuit Short to Ground	<ul style="list-style-type: none"> Park solenoid Circuit Short to Ground 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2807-12	Pressure Control Solenoid G - Circuit Short to Battery	<ul style="list-style-type: none"> Park solenoid Circuit Short to Power 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2807-13	Pressure Control Solenoid G - Circuit Open	<ul style="list-style-type: none"> Park solenoid Circuit Open Circuit 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
P2807-14	Pressure Control Solenoid G - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Park solenoid Circuit Short to Ground or Open Circuit 	<ul style="list-style-type: none"> Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
B1087-82	LIN Bus "A" - Alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> Alive counter fault 	<ul style="list-style-type: none"> Check Transmission Shift Module for stored DTCs. Refer to the electrical Circuit diagrams and check Transmission Control Module to Transmission Shift Module for Short to Ground or Open Circuit (LIN Bus)
B1087-83	LIN Bus "A" - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> Checksum error 	<ul style="list-style-type: none"> Check Transmission Shift Module for stored DTCs Refer to the electrical Circuit diagrams and check Transmission Control Module to Transmission Shift Module for Short to Ground or Open Circuit (LIN Bus)
B1087-87	LIN Bus "A" - Missing message	<ul style="list-style-type: none"> Transmission Shift Module is NOT visible to the Transmission Control Module on the LIN Bus 	<ul style="list-style-type: none"> Check Transmission Shift Module for stored DTCs Refer to the electrical Circuit diagrams and check Transmission Control Module to Transmission Shift Module for Short or Open Circuit (LIN Bus)
B1087-88	LIN Bus "A" - Bus off	<ul style="list-style-type: none"> LIN Bus Circuit fault. Check hardware of LIN connection between transmission and Transmission Shift Module 	<ul style="list-style-type: none"> Refer to the electrical Circuit diagrams and check Transmission Control Module to Transmission Shift Module LIN bus circuit for Short, Open Circuit. Check Transmission Shift Module for related DTCs
U0001-88	High Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> CAN Bus off 	<ul style="list-style-type: none"> Refer to the electrical Circuit diagrams and check CAN Bus for Circuit fault

DTC	Description	Possible Causes	Action
U0100-82	Lost Communication With ECM/PCM "A" - Alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> • Alive counter fault 	<ul style="list-style-type: none"> • Check Engine Control Module for stored DTCs
U0100-83	Lost Communication With ECM/PCM "A" - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Checksum fault 	<ul style="list-style-type: none"> • Check Engine Control Module for stored DTCs
U0100-87	Lost Communication With ECM/PCM "A" - Missing message	<ul style="list-style-type: none"> • CAN Timeout 	 <p>NOTE: Do NOT install a new Engine Control Module if an Engine Control Module Timeout DTC is only logged in the Transmission Control Module, the failure is NOT with the Engine Control Module</p> <ul style="list-style-type: none"> • Check Engine Control Module for stored DTCs. Check CAN Bus Circuit for fault
U0103-82	Lost Communication With Gear Shift Control Module A - Alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> • Alive counter fault 	<ul style="list-style-type: none"> • Check Transmission Shift Module for stored DTCs. Check CAN Bus Circuit for fault
U0103-83	Lost Communication With Gear Shift Control Module A - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Checksum fault 	<ul style="list-style-type: none"> • Check Transmission Shift Module for stored DTCs. Check CAN Bus Circuit for fault
U0103-87	Lost Communication With Gear Shift Control Module A - Missing message	<ul style="list-style-type: none"> • CAN Timeout 	<ul style="list-style-type: none"> • Check Transmission Shift Module for stored DTCs. Check CAN Bus Circuit for fault
U0122-82	Lost Communication With Vehicle Dynamics Control Module - Alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> • Alive counter fault 	<ul style="list-style-type: none"> • Check Dynamic Stability Control (ABS) for stored DTCs. Check CAN Bus Circuit for fault
U0122-83	Lost Communication With Vehicle Dynamics Control Module - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Checksum fault 	<ul style="list-style-type: none"> • Check Dynamic Stability Control (ABS) for stored DTCs. Check CAN Bus Circuit for fault
U0122-87	Lost Communication With Vehicle Dynamics Control Module - Missing message	<ul style="list-style-type: none"> • CAN Timeout 	<ul style="list-style-type: none"> • Check Dynamic Stability Control (ABS) for stored DTCs. Check CAN Bus Circuit for fault
U0126-00	Lost Communication With Steering Angle Sensor Module - No sub type information	<ul style="list-style-type: none"> • Lost Communication With Steering Angle Sensor Module 	<ul style="list-style-type: none"> • Check SAS for stored DTCs. Check CAN Bus Circuit for fault
U0128-87	Lost Communication With Park Brake Control Module - Missing message	<ul style="list-style-type: none"> • CAN timeout electronic parking brake module 	<ul style="list-style-type: none"> • Check Electronic Parking Brake Module (EPB) for stored DTCs. Check CAN Bus Circuit for fault
U0140-82	Lost Communication With Body Control Module - Alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> • Alive counter fault 	<ul style="list-style-type: none"> • Check Central Junction Box for stored DTCs. Check CAN Bus Circuit for fault
U0140-83	Lost Communication With Body Control Module - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Checksum fault 	<ul style="list-style-type: none"> • Check Central Junction Box for stored DTCs. Check CAN Bus Circuit for fault
U0140-87	Lost Communication With Body Control Module - Missing message	<ul style="list-style-type: none"> • CAN Timeout 	<ul style="list-style-type: none"> • Check Central Junction Box for stored DTCs. Check CAN Bus Circuit for fault
U0155-87	Lost Communication With Instrument Panel Cluster (IPC) Control Module - Missing message	<ul style="list-style-type: none"> • CAN timeout instrument cluster 	<ul style="list-style-type: none"> • Check Instrument Cluster for stored DTCs. Check CAN Bus Circuit for fault
U0300-68	Control Module - Event information	<ul style="list-style-type: none"> • Transmission software does not match vehicle network 	<ul style="list-style-type: none"> • Check Central Junction Box software level, Check Transmission Control Module Software level, Update software as required using the manufacturer approved process

DTC	Description	Possible Causes	Action
U0401-08	Invalid Data Received From ECM/PCM A - Bus Signal Message Failures	<ul style="list-style-type: none"> Inaccurate engine speed, torque information 	<ul style="list-style-type: none"> Check Engine Control Module for stored DTCs, Check CAN Bus circuit for faults
U0401-68	Invalid Data Received from ECM/PCM A - Event information	<ul style="list-style-type: none"> Inaccurate engine speed, torque information 	<ul style="list-style-type: none"> Check Engine Control Module for stored DTCs. Check CAN Bus Circuit for fault
U0401-86	Invalid Data Received from ECM/PCM A - Signal Invalid	<ul style="list-style-type: none"> Inaccurate engine speed, torque information 	<ul style="list-style-type: none"> Check Engine Control Module for stored DTCs. Check CAN Bus Circuit for fault
U0404-68	Invalid Data Received from Gear Shift Control Module A - Event information	<ul style="list-style-type: none"> Incorrect CAN data received from Transmission Shift Module 	<ul style="list-style-type: none"> Check Transmission Shift Module for stored DTCs. Refer to Circuit diagrams and check CAN and LIN Bus for Circuit fault
U0404-81	Invalid Data Received from Gear Shift Control Module A - Invalid Serial Data Received	<ul style="list-style-type: none"> Incorrect LIN data received from Transmission Shift Module 	<ul style="list-style-type: none"> Check Transmission Shift Module for stored DTCs. Refer to Circuit diagrams and check CAN and LIN Bus for Circuit fault
U0416-68	Invalid Data Received From Vehicle Dynamics Control Module - Event information	<ul style="list-style-type: none"> Event information brake information 	<ul style="list-style-type: none"> Check Engine Control Module for stored DTCs. Check CAN Bus Circuit for fault
U0422-68	Invalid Data Received From Body Control Module - Event information	<ul style="list-style-type: none"> Event information invalid Power mode information 	<ul style="list-style-type: none"> Check Central Junction Box for stored DTCs. Check CAN Bus Circuit for fault
U101B-87	Lost Communication With GSM - Multiple Bus - Missing message	<ul style="list-style-type: none"> Missing message lost communication with Transmission Shift Module (multiple Bus) 	<ul style="list-style-type: none"> Check Transmission Shift Module for stored DTCs. Refer to Circuit diagrams and check CAN and LIN Bus for Circuit fault
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
U3000-4B	Control Module - Circuit resistance above threshold	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Check and correct oil level. Check hydraulic flow through oil cooler and pipe circuit for restriction or blockage. If no restrictions found, suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.
U3000-81	Control Module - Invalid serial data received	<ul style="list-style-type: none"> Vehicle or Engine type signal incorrect from Central Junction Box or incorrect Transmission Control Module software installed 	<ul style="list-style-type: none"> Reflash the Transmission Control Module using the manufacturer approved process
U3001-94	Control Module Improper Shutdown - Unexpected operation	<ul style="list-style-type: none"> Control Module Improper Shutdown (voltage related) 	<ul style="list-style-type: none"> Check Engine Control Module For Power (alternator) faults. Check Power and Ground Circuit and Battery for fault. Clear DTCs. Road Test. If DTC reoccurs suspect the Transmission Control Module. Install a new Transmission Control Module as required, refer to the warranty policy and procedures manual if a module/component is suspect.

General Information - Diagnostic Trouble Code (DTC) Index DTC: Transmission Shift Module (GSM)

Description and Operation

Gear Shift Module (GSM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as needed

The table below lists all diagnostic trouble codes (DTCs) that could be logged in the gear shift module, for additional diagnosis and testing information refer to the relevant diagnosis and testing section.

For additional information, refer to: External Controls (307-05 Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1087-08	LIN Bus "A" - Bus Signal / Message Failures	<ul style="list-style-type: none"> LIN bus 'A' Error 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check LIN input signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance
B1087-81	LIN Bus "A" - Invalid serial data received	<ul style="list-style-type: none"> Transmission control module LIN message error - LIN/CAN signal mismatch (complement fault) 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check LIN input signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Check transmission control module for related DTCs and refer to relevant DTC index
B1087-82	LIN Bus "A" - Alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> Transmission control module LIN message error - Alive counter fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check LIN input signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Check transmission control module for related DTCs and refer to relevant DTC index

DTC	Description	Possible Causes	Action
B1087-83	LIN Bus "A" - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> Transmission control module LIN message error - checksum fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check LIN input signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Check transmission control module for related DTCs and refer to relevant DTC index
B1087-87	LIN Bus "A" - Missing message	<ul style="list-style-type: none"> Transmission control module LIN message error - Missing message 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check LIN input signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Check transmission control module for related DTCs and refer to relevant DTC index
B1142-62	Ignition Status 1 - Signal compare failure	<ul style="list-style-type: none"> Hardwired ignition and CAN powermode signals differ 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check ignition supply circuit for short circuit to ground, short circuit to power, open circuit, high resistance
B123C-01	Dynamic Stability Control Status Indicator - General Electrical Failure	<ul style="list-style-type: none"> Dynamic stability control LED failure 	<ul style="list-style-type: none"> Check transmission shift module, check operation of the dynamic stability control button status illumination, check and install new transmission shift module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module
B123D-64	Dynamic Stability Control Button - Signal plausibility failure	<ul style="list-style-type: none"> Dynamic stability control button may be stuck, may be due to a faulty button or to the user holding the button for a prolonged period (dynamic stability control button detected as pressed for 30 seconds) (S1) 	<ul style="list-style-type: none"> Check for normal dynamic stability control button functionality. If it operates normally then no further action required. If the dynamic stability control button fails to operate normally then may be due to an internal fault, check and install new transmission shift module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module
B123F-01	Adaptive Speed Limiter Mode Indicator - General Electrical Failure	<ul style="list-style-type: none"> Adaptive speed limiter LED failure 	<ul style="list-style-type: none"> Check transmission shift module, check operation of the active speed limiter button status illumination, check and install new transmission shift module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module
B1241-64	Adaptive Speed Limiter Button - Signal plausibility failure	<ul style="list-style-type: none"> May be due to a faulty button or to the user holding the button for a prolonged period (adaptive speed limiter button detected as pressed for 30 seconds) 	<ul style="list-style-type: none"> Check for normal adaptive speed limiter button functionality. If it operates normally then no further action required. If the adaptive speed limiter button fails to operate normally then may be due to an internal fault, check and install new transmission shift module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module
B1242-64	Winter Button - Signal plausibility failure	<ul style="list-style-type: none"> May be due to a faulty button or to the user holding the button for a prolonged period (winter button detected as pressed for 30 seconds) 	<ul style="list-style-type: none"> Check for normal winter button functionality. If it operates normally then no further action required. If the winter button fails to operate normally then may be due to an internal fault, check and install new transmission shift module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module

General Information - Diagnostic Trouble Code (DTC) Index DTC: Portable Audio Interface Control Module (PAICM)

Description and Operation

Portable Audio Interface Control Module (PAICM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Portable Audio Interface Control Module (PAICM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual.

For additional information, refer to: [Information and Entertainment System](#) (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
U3000-13	Control Module - Circuit open	<ul style="list-style-type: none"> Universal serial bus (USB) harness between portable audio interface panel and user interface panel is not properly connected Connection - detect circuit between portable audio interface panel and user interface panel is not grounded Universal serial bus (USB) harness between portable audio interface panel and user interface panel is open circuit 	<ul style="list-style-type: none"> Check for correct connection of universal serial bus (USB) harness between portable audio interface panel and user interface panel. Refer to the electrical circuit diagrams and check portable audio interface module connection detect circuit between portable audio interface panel and user interface panel is grounded. Install universal serial bus (USB) harness between portable audio interface panel and user interface panel as required, refer to the new module/component installation note at the top of the DTC Index
U3000-44	Control Module - Data memory failure	<ul style="list-style-type: none"> Portable audio interface module internal RAM memory 	<ul style="list-style-type: none"> Suspect the portable audio interface module. Check and install a new module as required. Refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
		failure	
U3000-45	Control Module - Program memory failure	<ul style="list-style-type: none"> Portable audio interface module internal flash memory failure 	<ul style="list-style-type: none"> Suspect the portable audio interface module. Check and install a new module as required. Refer to the warranty policy and procedures manual if a module is suspect
U3000-55	Control Module - Not configured	<ul style="list-style-type: none"> Portable audio interface module not configured correctly 	<ul style="list-style-type: none"> Re-program the portable audio interface module, clear DTC and re-test. If DTC remains carry out MOST tests and test USB cable for open, short circuit, clear DTC and re-test. If DTC remains suspect the portable audio interface module, check and install a new module as required. Refer to the warranty policy and procedures manual if a module is suspect
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> Portable audio interface module voltage differs more than $\pm 2V$ compared to central electronics module voltage 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the fuses, power and ground connections to both modules

General Information - Diagnostic Trouble Code (DTC) Index DTC: Hybrid Digital Radio Control Module (HDRCM)

Description and Operation

Hybrid Digital Radio Control Module (HDRCM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Hybrid Digital Radio Control Module (HDRCM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual.

For additional information, refer to: [Information and Entertainment System](#) (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1A56-02	Antenna - General signal failure	<ul style="list-style-type: none"> Antenna general signal failure 	<ul style="list-style-type: none"> Renew the diversity antenna amplifier
B1A56-11	Antenna - Circuit short to ground	<ul style="list-style-type: none"> Diversity antenna amplifier circuit short to ground 	<ul style="list-style-type: none"> Refer to the electrical guides and check the diversity antenna amplifier circuit and the antenna for short circuit to ground
B1A56-12	Antenna - Circuit short to battery	<ul style="list-style-type: none"> Diversity antenna amplifier circuit short to power 	<ul style="list-style-type: none"> Refer to the electrical guides and check the diversity antenna amplifier circuit and the antenna for short circuit to power
B1A56-13	Antenna - Circuit open	<ul style="list-style-type: none"> Diversity antenna amplifier circuit open circuit 	<ul style="list-style-type: none"> Refer to the electrical guides and check the diversity antenna amplifier circuit and the antenna for open circuit
U200D-14	Control Module Output Power A - Circuit short to ground or open	<ul style="list-style-type: none"> Diversity antenna amplifier power supply circuit short to ground or open circuit 	<ul style="list-style-type: none"> Refer to the electrical guides and check the diversity antenna amplifier power circuit

DTC	Description	Possible Causes	Action
U3000-04	Control Module - System internal failures	<ul style="list-style-type: none"> Diversity antenna amplifier internal failure 	<ul style="list-style-type: none"> Renew the amplifier module
U3000-4A	Control Module - Incorrect component installed	<ul style="list-style-type: none"> Diversity antenna amplifier internal incorrect component installed <ul style="list-style-type: none"> The module has been installed to a vehicle not configured to accept it 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure existing modules menu and program the module
U3000-55	Control Module - Not configured	<ul style="list-style-type: none"> Diversity antenna amplifier not configured correctly 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure existing modules menu and program the module
U3000-87	Control Module - Missing message	<ul style="list-style-type: none"> Missing message 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system select the vehicle configuration main menu, select configure existing modules menu and program the module
U3000-98	Control Module - Component or system over temperature	<ul style="list-style-type: none"> Diversity antenna amplifier component or system over temperature 	<ul style="list-style-type: none"> Consider moving the amplifier mounting position to prevent unit overheating. Cool the vehicle interior down by ensuring it is in the shade and have the A/C on cool. When cool, clear the DTC and retest. If the problem persists, renew the amplifier module
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> Mismatch in battery voltage of 2 volts or more for longer than 1 minute, between the measured battery voltage at the Digital Audio Control Module C and the battery voltage signal sent from the Rear Junction Box. 	<ul style="list-style-type: none"> Refer to the electrical guides and check that power supply voltage at Digital Audio Control Module C and Rear Junction Box is not different by more than 2 volts. Rectify as required

General Information - Diagnostic Trouble Code (DTC) Index DTC: Infotainment Control Module (ICM)

Description and Operation

Infotainment Control Module (ICM)



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Infotainment Control Module (ICM). For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Information and Entertainment System](#) (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1D21-11	Remote control switch - Circuit short to ground	<ul style="list-style-type: none"> The information and entertainment module has detected a ground measurement for a period longer than expected or has detected a ground measurement when another value was expected Front remote circuit short circuit to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check front remote circuit for short to ground
U0010-00	Medium speed CAN communication bus - No sub type information	<ul style="list-style-type: none"> General failure Open circuit medium speed CAN negative circuit Short circuit to power medium speed CAN negative circuit Short circuit to ground medium speed CAN negative circuit Open circuit medium speed CAN positive circuit Short circuit to power medium speed CAN positive 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Clear DTC and re-test, if DTC remains, refer to electrical circuit diagrams and check for open circuit, short to power, short to ground on medium speed CAN negative circuit. Check for open circuit, short to power, short to ground on medium speed CAN positive circuit. Check for short circuit between medium speed CAN positive circuit and medium speed CAN negative circuit

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> circuit • Short circuit to ground medium speed CAN positive circuit • Short circuit between medium speed CAN positive circuit and medium speed CAN negative circuit 	
U0156-4A	Lost communication with information center "A" - Incorrect component installed	<ul style="list-style-type: none"> • The information and entertainment module has detected a mismatch between the hardware connected and the expected hardware • Module has incorrect serial number 	<ul style="list-style-type: none"> • Suspect incorrect instrument cluster installed. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0159-00	Lost communication with parking assist control module "A" - No sub type information	<ul style="list-style-type: none"> • General failure • Parking aid module, battery supply circuit, open circuit • Parking aid module, ground supply circuit, open circuit • Parking aid module medium speed CAN negative circuit, open circuit • parking aid module medium speed CAN positive circuit, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check parking aid module for DTCs and refer to the relevant DTC Index. Refer to electrical circuit diagrams, check battery and ground supplies, to parking aid module for open circuit. Check medium speed CAN negative and positive harness to parking aid module, repair as necessary
U0163-00	Lost communication with navigation control module - No sub type information	<ul style="list-style-type: none"> • General failure • Navigation system module, battery supply circuit, open circuit • Navigation system module ground supply circuit, open circuit • Navigation system module, MOST network, open circuit • Navigation system module not configured • Navigation system module failure 	<ul style="list-style-type: none"> • Check the navigation system module for DTCs and refer to the relevant DTC index. Using the manufacturing approved diagnostic system carry out MOST ring test. Using the manufacturers approved diagnostic system re-configure the navigation system module. Refer to electrical circuit diagrams check battery and ground supplies to navigation system module for open circuit. Repair as necessary. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0163-4A	Lost communication with navigation control module - Incorrect component installed	<ul style="list-style-type: none"> • The information and entertainment module has detected a mismatch between the hardware connected and the expected hardware • Module has incorrect serial number 	<ul style="list-style-type: none"> • Suspect incorrect navigation module installed. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0184-00	Lost communication with radio - No sub type information	<ul style="list-style-type: none"> • General failure • Integrated audio module battery supply circuit, open circuit • Integrated audio module ground supply circuit, open circuit • Integrated audio module MOST network, open circuit • Integrated audio module not configured • Integrated audio module failure 	<ul style="list-style-type: none"> • Check the integrated audio module for DTCs and refer to the relevant DTC index. Using the manufacturing approved diagnostic system carry out MOST ring test. Using the manufacturers approved diagnostic system re-configure the integrated audio module. Refer to electrical circuit diagrams check battery and ground supplies to integrated audio module for open circuit. Repair as necessary. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0184-4A	Lost communication with radio - Incorrect component installed	<ul style="list-style-type: none"> • The information and entertainment module has detected a mismatch between the hardware connected and the expected hardware 	<ul style="list-style-type: none"> • Suspect incorrect integrated audio module installed. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs

DTC	Description	Possible Causes	Action
U0186-00	Lost communication with audio amplifier "A" - No sub type information	<ul style="list-style-type: none"> • Module has incorrect serial number 	
U0186-00	Lost communication with audio amplifier "A" - No sub type information	<ul style="list-style-type: none"> • General failure • Amplifier audio module battery supply circuit, open circuit • Amplifier audio module ground supply circuit, open circuit • Amplifier audio module MOST network, open circuit • Amplifier audio module not configured • Amplifier audio module failure 	<ul style="list-style-type: none"> • Check the amplifier audio module for DTCs and refer to the relevant DTC index. Using the manufacturing approved diagnostic system carry out MOST ring test. Using the manufacturers approved diagnostic system re-configure the amplifier audio module. Refer to electrical circuit diagrams check battery and ground supplies to amplifier audio module for open circuit. Repair as necessary. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0186-4A	Lost communication with audio amplifier "A" - Incorrect component installed	<ul style="list-style-type: none"> • The information and entertainment module has detected a mismatch between the hardware connected and the expected hardware • Module has incorrect serial number 	<ul style="list-style-type: none"> • Suspect incorrect amplifier audio module installed. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0191-00	Lost communication with television - No sub type information	<ul style="list-style-type: none"> • General failure • Television receiver module battery supply, open circuit • Television receiver module ground supply circuit, open circuit • Television receiver module MOST network, open circuit • Television receiver module not configured • Television receiver module failure 	<ul style="list-style-type: none"> • Check the television receiver module for DTCs and refer to the relevant DTC index. Using the manufacturing approved diagnostic system carry out MOST ring test. Using the manufacturers approved diagnostic system re-configure the television receiver module. Refer to electrical circuit diagrams check battery and ground supplies to television receiver module for open circuit. Repair as necessary. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0191-4A	Lost communication with television - Incorrect component installed	<ul style="list-style-type: none"> • The information and entertainment module has detected a mismatch between the hardware connected and the expected hardware • Module has incorrect serial number 	<ul style="list-style-type: none"> • Suspect incorrect television receiver module installed. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0193-00	Lost communication with digital audio control module A - No sub type information	<ul style="list-style-type: none"> • General failure • Digital audio broadcast module/satellite radio module battery supply circuit, open circuit • Digital audio broadcast module/satellite radio module ground supply circuit, open circuit • Digital audio broadcast module/satellite radio module MOST network, open circuit • Digital audio broadcast module/satellite radio module not configured • Digital audio broadcast module/satellite radio module failure 	<ul style="list-style-type: none"> • Check the digital audio broadcast module/satellite radio module for DTCs and refer to the relevant DTC index. Using the manufacturing approved diagnostic system carry out MOST ring test. Using the manufacturers approved diagnostic system re-configure the digital audio broadcast module/satellite radio module. Refer to electrical circuit diagrams check battery and ground supplies to digital audio broadcast module/satellite radio module for open circuit. Repair as necessary. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0193-4A	Lost communication with digital audio control module A - Incorrect component installed	<ul style="list-style-type: none"> • The information and entertainment module has detected a mismatch between the hardware connected and the expected 	<ul style="list-style-type: none"> • Suspect incorrect digital audio broadcast module/satellite radio module installed. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> hardware • Module has incorrect serial number 	
U0197-00	Lost communication with telephone control module - No sub type information	<ul style="list-style-type: none"> • General failure • Telephone control module battery supply circuit, open circuit • Telephone control module ground supply circuit, open circuit • Telephone control module MOST network open circuit • Telephone control module not configured • Telephone control module failure 	<ul style="list-style-type: none"> • Check the telephone control module for DTCs and refer to the relevant DTC index. Using the manufacturing approved diagnostic system carry out most ring test. Using the manufacturers approved diagnostic system re-configure the telephone control module. Refer to electrical circuit diagrams check battery and ground supplies to telephone control module for open circuit. Repair as necessary. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0197-4A	Lost communication with telephone control module - Incorrect component installed	<ul style="list-style-type: none"> • The information and entertainment module has detected a mismatch between the hardware connected and the expected hardware • Module has incorrect serial number 	<ul style="list-style-type: none"> • Suspect incorrect telephone module installed. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0237-00	Lost communication with digital audio control module C - No sub type information	<ul style="list-style-type: none"> • General failure • High definition radio module battery supply circuit, open circuit • High definition radio module ground supply circuit, open circuit • High definition radio module MOST network, open circuit • High definition radio module not configured • High definition radio module failure 	<ul style="list-style-type: none"> • Check the module for DTCs and refer to the relevant DTC index. Using the manufacturing approved diagnostic system carry out MOST ring test. Using the manufacturers approved diagnostic system re-configure the high definition radio module . Refer to electrical circuit diagrams check battery and ground supplies to high definition radio module for open circuit. Repair as necessary. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0237-4A	Lost communication with digital audio control module C - Incorrect component installed	<ul style="list-style-type: none"> • The information and entertainment module has detected a mismatch between the hardware connected and the expected hardware • Module has incorrect serial number 	<ul style="list-style-type: none"> • Suspect incorrect high definition radio module installed, Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0253-00	Lost communication with accessory protocol interface module - No sub type information	<ul style="list-style-type: none"> • General failure • Portable audio interface console battery supply circuit, open circuit • Portable audio interface console ground supply circuit, open circuit • Portable audio interface console MOST network, open circuit • Portable audio interface console not configured • Portable audio interface console failure 	<ul style="list-style-type: none"> • Check the portable audio interface console for DTCs and refer to the relevant DTC index. Using the manufacturing approved diagnostic system carry out MOST ring test. Using the manufacturers approved diagnostic system re-configure the portable audio interface console. Refer to electrical circuit diagrams check battery and ground supplies to portable audio interface console for open circuit. Repair as necessary. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs
U0253-4A	Lost communication with accessory protocol interface module - Incorrect component installed	<ul style="list-style-type: none"> • The information and entertainment module has detected a mismatch between the hardware connected and the expected hardware • Module has incorrect serial number 	<ul style="list-style-type: none"> • Suspect incorrect portable audio interface console installed. Refer to the warranty policy and procedures manual if module is suspect. Check the system is operating correctly and there are no DTCs

General Information - Diagnostic Trouble Code (DTC) Index DTC: Telephone Module (TEL)

Description and Operation

Telephone Module



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

The table below lists all Diagnostic Trouble Codes (DTCs) that could be logged in the Telephone Module. For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual. For additional information, refer to: [Cellular Phone](#) (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).

DTC	Description	Possible Causes	Action
B1A56-13	Antenna - Circuit open	<ul style="list-style-type: none"> Bluetooth antenna circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check blue tooth antenna circuit for open circuit
B1D79-84	Microphone Input - Signal below allowable range	<ul style="list-style-type: none"> Signal amplitude < minimum 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test microphone input circuit for short/open circuit. Check integrated audio module for related DTCs and refer to relevant DTC Index
U1A00-88	Private Communication Network - Bus off	<ul style="list-style-type: none"> Bluetooth phone module internal communications failure 	<ul style="list-style-type: none"> Suspect the module. Check and install a new telephone module as required, refer to the new module/component installation note at the top of the DTC Index
U2100-00	Initial Configuration Not Complete - No sub type information	<ul style="list-style-type: none"> Initial configuration not complete 	<ul style="list-style-type: none"> Re-configure the RJB using the manufacturer approved diagnostic system. If DTC remains, carry out CAN network integrity tests using the manufacturer approved diagnostic system
U2101-00	Control Module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> Configuration incompatible 	<ul style="list-style-type: none"> Re-configure the RJB using the manufacturer approved diagnostic system. If DTC remains, suspect the telephone module. Check and install a new telephone

DTC	Description	Possible Causes	Action
			module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-44	Control Module - Data memory failure	<ul style="list-style-type: none"> • Data memory failure 	<ul style="list-style-type: none"> • Re-configure the telephone module. If the DTC remains, suspect the telephone module. Check and install a new telephone module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-45	Control Module - Program memory failure	<ul style="list-style-type: none"> • Program memory failure 	<ul style="list-style-type: none"> • Re-configure the telephone module. If the DTC remains, suspect the telephone module. Check and install a new telephone module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-55	Control Module - Not configured	<ul style="list-style-type: none"> • Incorrect car configuration data received 	<ul style="list-style-type: none"> • Re-configure the RJB using the manufacturer approved diagnostic system. Clear DTC and re-test. If the DTC remains suspect the telephone module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-98	Control Module - Component or system over temperature	<ul style="list-style-type: none"> • Component or system over temperature 	<ul style="list-style-type: none"> • Check for additional DTCs and refer to DTC Index. Clear DTC and re-test/monitor condition for re-occurrence
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> • Mis-match in battery voltage, of 2 volts or more, between telephone module and RJB 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

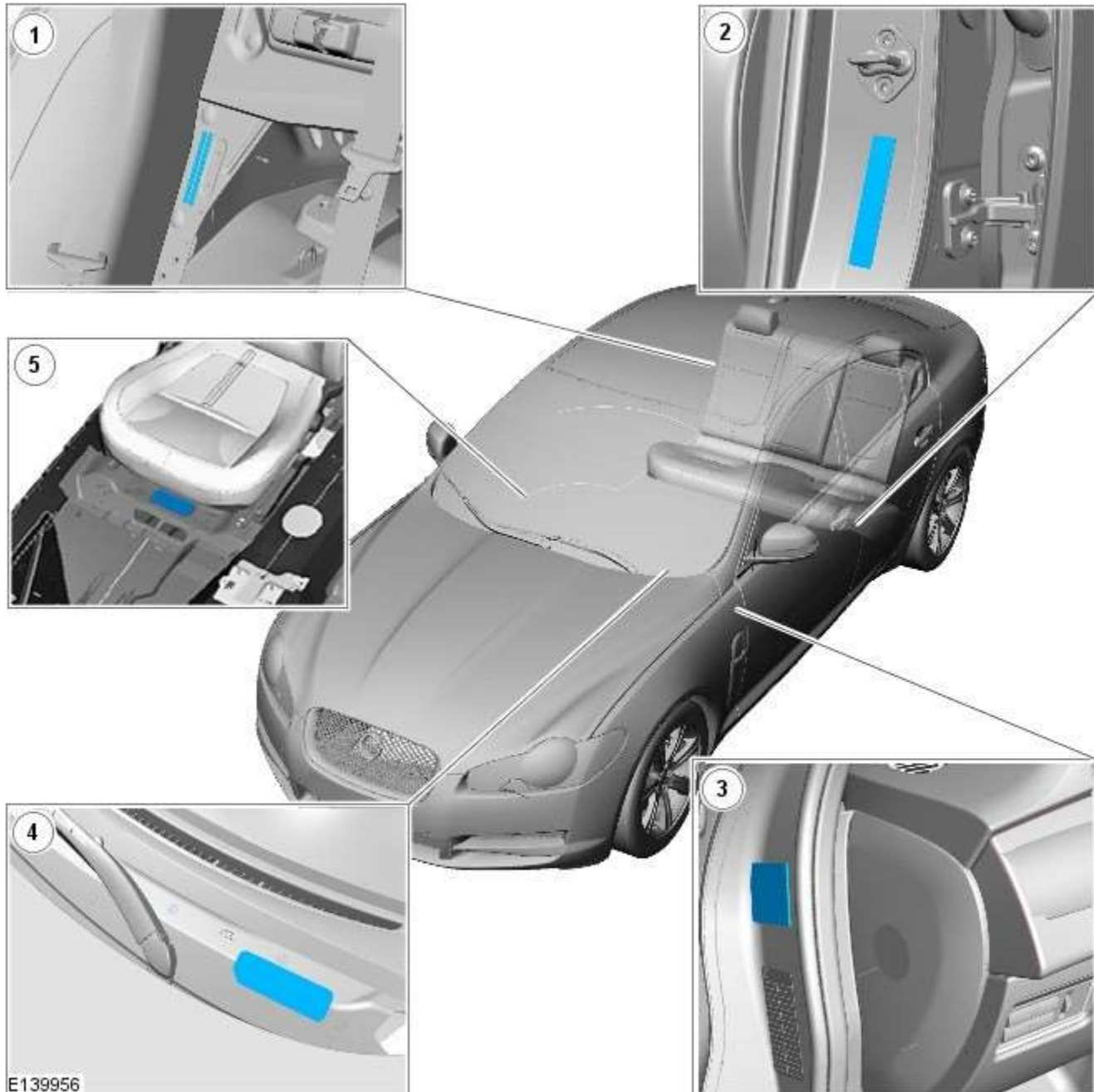
Identification Codes - Identification Codes

Description and Operation

Vehicle Identification Number (VIN)

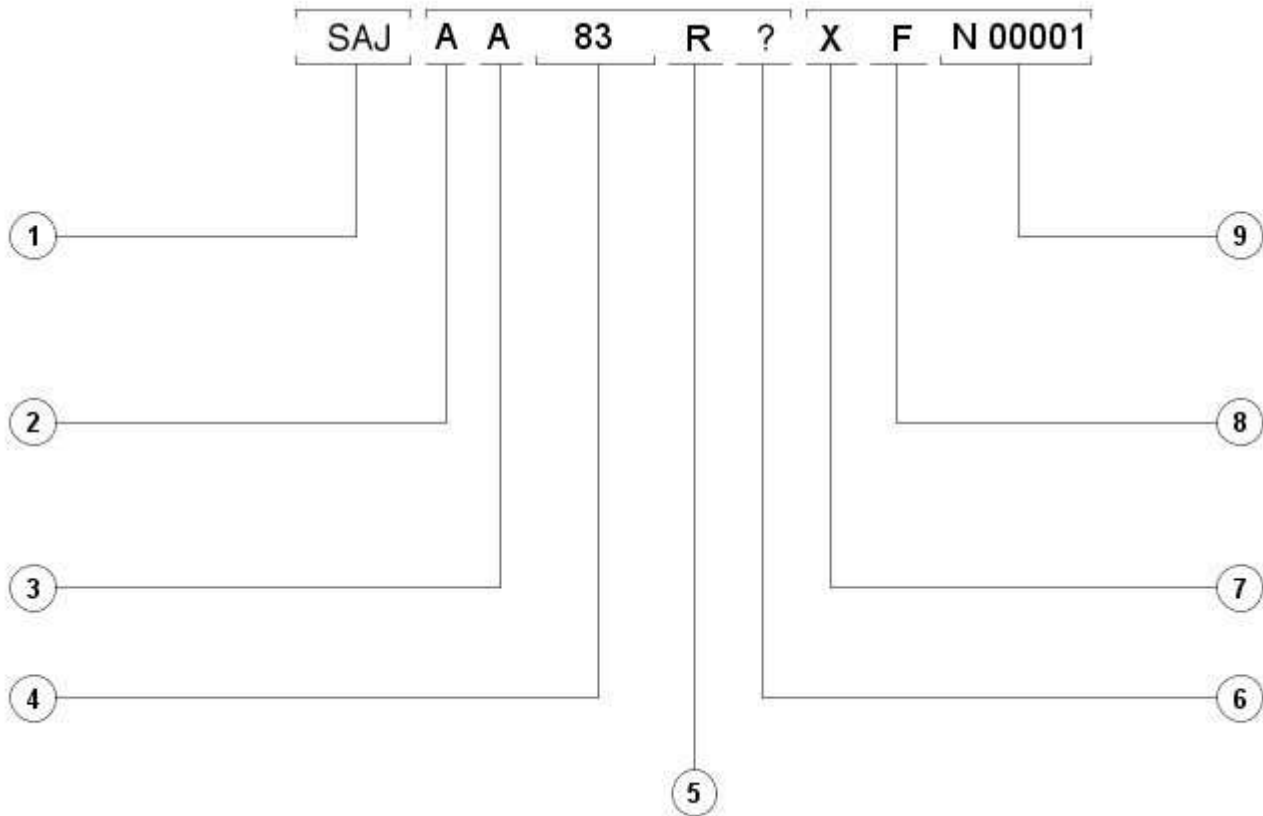
The official Vehicle Identification Number (VIN) for title and registration purposes is stamped on a metal plate and fastened to the instrument panel. It is positioned close on the left-hand side of the vehicle and is visible from the outside.

The VIN is also located on the vehicle certification label.



Item	Part Number	Description
1	—	VIN (stamped) To the end of 11MY
2	—	Bar code label (USA)
3	—	VIN label (Europe/Rest of World shown)
4	—	VIN plate
5	—	VIN (stamped) From 12MY onwards

Vehicle Identification Number (Typical)



E63050

Item	Description
1	World manufacturer identifier
2	Market, air bag specification
3	Transmission and steering code
4	Body code
5	Emission control system
6	Check digit
7	Model year
8	Assembly plant, model line
9	Production sequence number

World Manufacturer Identifier

VIN Positions 1

Codes	Manufacturer	Make	Type
SAJ	Jaguar Cars Limited, England	Jaguar	Passenger Car

Market, Air Bag Specification

VIN position 2

VIN code	Description
A	Rest of World with twin air bags, side air bags and curtain air bags
K	Japan with twin air bags, side air bags and curtain air bags
W	USA with twin air bags, side air bags and curtain air bags
X	Canada with twin air bags, side air bags and curtain air bags
Y	Mexico with twin air bags, side air bags and curtain air bags

Transmission, Steering Code

VIN Position 3

VIN Code	Description
A	Automatic LHS
C	Automatic RHS

Body Code - All except USA and Canada - 2010 and 2011 model years

VIN Position 4

VIN Code	Description
05	Luxury
06	Premium luxury
07	Sport luxury/Portfolio/SV8
08	'R'

Body Code (USA and Canada) 2010 and 2011 model years

VIN Position 4

VIN Code	Description
0F	Luxury
0G	Premium luxury
0H	Portfolio/SV8
0J	'R'

Body Code - All except USA and Canada - 2012 model year

VIN Position 4

VIN Code	Description
04	Entry
05	Luxury
06	Premium luxury
07	Sport luxury/Portfolio/SV8
08	'R'
85	Luxury+speedpack
86	Premium luxury+speedpack
87	Sport luxury/Portfolio/SV8+speedpack
88	'R' + speedpack

Body Code (USA and Canada) 2012 model year

VIN Position 4

VIN Code	Description
0F	Luxury
0G	Premium luxury
0H	Portfolio/SV8
0J	'R'
8E	Luxury+speedpack
8F	Premium luxury+speedpack
8G	Sport luxury/Portfolio/SV8+speedpack
8H	'R' + speedpack

Engine Emission System - 2009 model year

VIN Position 5

NOTES:



*1 EU. Includes the following markets; Austria, Belgium, Bulgaria, Cyprus, Czech Rep, Denmark, Eire, Estonia, Finland, France, Germany, Greece, Holland, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovenia, Slovakia, Spain (incl. Canary Islands), Sweden and UK.



*2 East Europe. Includes the following markets; Albania, Bosnia, Croatia, Former Yugoslav Republic of Macedonia, Kosovo, Montenegro and Serbia.



*3 Russia. Includes the following markets; Belarus, Kazakhstan, Ukraine and Uzbekistan.



*4 Middle East. Includes the following markets; Abu Dhabi, Bahrain, Dubai, Jordan, Kuwait, Lebanon, Oman, Qatar and Saudi Arabia.



*5 Caribbean. Includes the following markets; Bahamas, Barbados, Grand Cayman, Grenada and Trinidad and Tobago.

VIN Code	Engine	Market
D	3.0L	*5 Caribbean, Chile, Dominican Rep, Guatemala, Indonesia, Malaysia, *4 Middle East, Morocco,
F	4.2L	Panama, Phillipines, Singapore, Sri Lanka and Uruguay

VIN Code	Engine	Market
G	4.2L Supercharged	China
N/A	2.7L Diesel	
M	3.0L	
N/A	4.2L	
N/A	4.2L Supercharged	
N/A	2.7L Diesel	*2 East Europe, *1 EU, Israel, Norway, *3 Russia, Switzerland and Turkey
M	3.0L	
P	4.2L	
R	4.2L Supercharged	
1	2.7L Diesel	
W	3.0L	Brazil
X	4.2L	
Y	4.2L Supercharged	
N/A	2.7L Diesel	
S	3.0L	
U	4.2L	
V	4.2L Supercharged	
N/A	2.7L Diesel	
H	3.0L	Japan
K	4.2L	
L	4.2L Supercharged	
N/A	2.7L Diesel	
N/A	3.0L	
B	4.2L	
C	4.2L Supercharged	
N/A	2.7L Diesel	
N/A	3.0L	Canada
B	4.2L	
C	4.2L Supercharged	
N/A	2.7L Diesel	
N/A	3.0L	
K	4.2L	
L	4.2L Supercharged	
N/A	2.7L Diesel	
N/A	3.0L	South Korea
B	4.2L	
C	4.2L Supercharged	
1	2.7L Diesel	
D	3.0L	
F	4.2L	
G	4.2L Supercharged	
1	2.7L Diesel	
M	3.0L	Argentina, Australia, Cyprus, Hong Kong, Malta, New Zealand, Taiwan, Thailand and UK (and Eire)
P	4.2L	
R	4.2L Supercharged	
1	2.7L Diesel	

Engine Emission System - 2010 model year

VIN Position 5

NOTES:



*1 EU. Includes the following markets; Austria, Belgium, Bulgaria, Cyprus, Czech Rep, Denmark, Eire, Estonia, Finland, France, Germany, Greece, Holland, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovenia, Slovakia, Spain (incl. Canary Islands), Sweden and UK.



*2 East Europe. Includes the following markets; Albania, Bosnia, Croatia, Former Yugoslav Republic of Macedonia,

Kosovo, Montenegro and Serbia.



*3 Russia. Includes the following markets; Belarus, Kazakhstan, Ukraine and Uzbekistan.



*4 Middle East. Includes the following markets; Abu Dhabi, Bahrain, Dubai, Jordan, Kuwait, Lebanon, Oman, Qatar and Saudi Arabia.



*5 Caribbean. Includes the following markets; Bahamas, Barbados, Grand Cayman, Grenada and Trinidad and Tobago.

VIN Code	Engine	Market
D	3.0L	Algeria, Brunei, *5 Caribbean, Dominican Rep, Guatemala, Indonesia, Libya, *4 Middle East, Morocco, Pakistan, Panama, Phillipines, Sri Lanka, Tunisia and Uruguay
F	5.0L	
G	5.0L Supercharged	
H	3.0L	China
P	5.0L	
R	5.0L Supercharged	
H	3.0L	Chile
P	5.0L	
R	5.0L Supercharged	
H	3.0L	Argentina
P	5.0L	
R	5.0L Supercharged	
H	3.0L	*1 EU, *2 East Europe, Israel, Norway, Switzerland and Turkey
P	5.0L	
R	5.0L Supercharged	
2	3.0L Diesel	
W	3.0L	Brazil
X	5.0L	
Y	5.0L Supercharged	
S	3.0L - Egypt only	Egypt and Syria
F	5.0L	
G	5.0L Supercharged	
H	3.0L	Japan
P	5.0L	
R	5.0L Supercharged	
A	4.2L	USA
B	5.0L	
C	5.0L Supercharged	
A	4.2L	Canada
B	5.0L	
C	5.0L Supercharged	
A	4.2L	Mexico
B	5.0L	
C	5.0L Supercharged	
B	5.0L	South Korea
C	5.0L Supercharged	
2	3.0L Diesel	
H	3.0L	Malaysia
P	5.0L	
R	5.0L Supercharged	
D	3.0L	South Africa
F	5.0L	
G	5.0L Supercharged	
2	3.0L Diesel	

VIN Code	Engine	Market
H	3.0L	Taiwan
P	5.0L	
R	5.0L Supercharged	
2	3.0L Diesel	
D	3.0L	Thailand
F	5.0L	
G	5.0L Supercharged	
D	3.0L	Singapore
F	5.0L	
G	5.0L Supercharged	
H	3.0L	Australia, Cyprus, Hong Kong, Malta, New Zealand and UK (and Eire)
P	5.0L	
R	5.0L Supercharged	
2	3.0L Diesel	

Engine Emission System - 2011 model year

VIN Position 5

NOTES:



*1 EU. Includes the following markets; Andorra, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, India (gasoline only), Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Monaco, Netherlands, Norway, Poland, Portugal, Romania, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK; (Canary Islands, Azores, Madeira, Martinique, Guadeloupe, Reunion are included as remote parts of sovereign states).



*2 With Diesel Particulate Filter (DPF), includes the following markets; Australia, Belarus, Gibraltar, Hong Kong, Iceland, Israel, Korea (diesel), Macau, Morocco, New Zealand, Palestine, Singapore (diesel only), South Africa (Diesel), Taiwan, Tunisia.



*3 With-out DPF, includes the following markets; Argentina, Bermuda, Chile, China, Guadeloupe, India (diesel only), Kazakhstan, Morocco, Ukraine, Russia.



*4 Rest Of World (ROW), includes the following markets; Barbados, Benin, Botswana, Burkina Faso, Burundi, Brunei, Cameroon, Central African Republic, Chad, Congo, Costa Rica, Democratic Republic of Congo, Dominican Republic, Equatorial Guinea, Ethiopia, Falklands, Fiji, Gabon, Gambia, Ghana, Guatemala, Guinea, Guinea Bissau, Guyana, Haiti, Honduras, Ivory Coast, Lesotho, Liberia, Madagascar, Malawi, Mali, Mozambique, Mauritania, Namibia, New Caledonia, Niger, Panama, Papua New Guinea, Rwanda, Sierra Leone, Singapore (gasoline only), Somalia, Swaziland, Tahiti, Tanzania, Togo, Trinidad & Tobago, Uganda, Western Sahara, Zambia, Zimbabwe.



*5 Emergent World, With-out OBD, includes the following markets; Albania, Angola, Bolivia, Colombia, Ecuador, Georgia, Indonesia, Jamaica, Kenya, Kyrgyzstan, Macedonia, Malaysia, Mauritius, Nigeria, Paraguay, Peru, Philippines, South Africa (gasoline only), Sri Lanka, Turkmenistan, Uruguay, Uzbekistan, Venezuela, Vietnam.



*6 Hot Climate, With-out OBD, includes the following markets; Algeria, Azerbaijan, Bahrain, Bangladesh for gasoline, Bhutan, Dubai, Egypt, Iraq, Jordan, Kuwait, Lebanon (gasoline only), Libya, Oman, Pakistan, Qatar, Saudi Arabia, Sudan, Syria (gasoline only), Thailand, Tunisia, United Arab Emirates, Yemen.

B	5.0L	USA, Canada, Mexico and Korea
C	5.0L Supercharged	USA, Canada, Mexico and Korea
D	3.0L	*4 ROW, *5 Emergent World and *6 Hot Climate
E	5.0L Supercharged	USA, Canada, Mexico and Korea
F	5.0L	*4 ROW, *5 Emergent World and *6 Hot Climate
G	5.0L Supercharged	*4 ROW, *5 Emergent World and *6 Hot Climate
H	3.0L	*(*2 With DPF, *3 With-out DPF), * Japan and *1 EU
J	5.0L Supercharged	*1 EU, *2 With DPF, *3 With-out DPF and Japan
K	5.0L Supercharged	Brazil
L	5.0L Supercharged	*4 ROW, *5 Emergent World and *6 Hot Climate
P	5.0L	*1 EU, *2 With DPF, *3 With-out DPF and Japan
R	5.0L Supercharged	*1 EU, *2 With DPF, *3 With-out DPF and Japan
W	3.0L	Brazil
X	5.0L	Brazil

Y	5.0L Supercharged	Brazil
2	3.0L Diesel	*1 EU and *2 With DPF
3	3.0L Diesel	*1 EU
4	3.0L Diesel	*1 EU and *2 With DPF
5	3.0L Diesel	*4 ROW, *5 Emergent World, *3 With-out DPF, Japan and *6 Hot Climate

#() 3.0L Gasoline EU4 is compliant with european emission requirements until December 2010.

Engine Emission System - 2012 model year

VIN Position 5

NOTES:



*1 EU. Includes the following markets; Andorra, Austria, Belgium, Bulgaria, Chile(diesel only), Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, India (gasoline only), Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Moldova, Monaco, Netherlands, Norway, Poland, Portugal, Romania, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK; (Canary Islands, Azores, Madeira, Martinique, Guadeloupe, Reunion are included as remote parts of sovereign states).



*2 With DPF, Australia, Belarus, Gibraltar, Hong Kong, Iceland, Israel, Korea (diesel only), Macau, Morocco, New Zealand, Palestine, Singapore (diesel only), South Africa (Diesel), Taiwan, Tunisia



*3 With-out DPF, Argentina, Bermuda, Chile (gasoline only), China, Guadeloupe, India (diesel only), Kazakhstan, Mexico (diesel only), Morocco, Ukraine, Russia.



*4 Rest Of World (ROW), includes the following markets; Barbados, Benin, Botswana, Burkina Faso, Burundi, Brunei, Cameroon, Central African Republic, Chad, Congo, Costa Rica, Democratic Republic of Congo, Dominican Republic, Equatorial Guinea, Ethiopia, Falklands, Fiji, Gabon, Gambia, Ghana, Guatemala, Guinea, Guinea Bissau, Guyana, Haiti, Honduras, Ivory Coast, Lesotho, Liberia, Madagascar, Malawi, Mali, Mozambique, Mauritania, Namibia, New Caledonia, Niger, Panama, Papua New Guinea, Rwanda, Sierra Leone, Singapore (gasoline only), Somalia, Swaziland, Tahiti, Tanzania, Togo, Trinidad & Tobago, Uganda, Western Sahara, Zambia, Zimbabwe.



*5 Emergent World, With-out OBD, includes the following markets; Albania, Angola, Bolivia, Colombia, Ecuador, Georgia, Indonesia, Jamaica, Kenya, Kyrgystan, Macedonia, Malaysia, Mauritius, Nigeria, Paraguay, Peru, Philippines, South Africa (gasoline only), Sri Lanka, Turkmenistan, Uruguay, Uzbekistan, Venezuela, Vietnam.



*6 Hot Climate, With-out OBD, includes the following markets; Algeria, Azerbaijan, Bahrain, Bangladesh for gasoline, Bhutan, Dubai, Egypt, Iraq, Jordan, Kuwait, Lebanon (gasoline only), Libya, Oman, Pakistan, Qatar, Saudi Arabia, Sudan, Syria (gasoline only), Thailand, Tunisia, United Arab Emirates, Yemen.

B	5.0L	USA, Canada, Mexico and Korea
C	5.0L Supercharged	USA, Canada, Mexico and Korea
D	3.0L	*4 ROW, *5 Emergent World and *6 Hot Climate
E	5.0L Supercharged	USA, Canada, Mexico and Korea
F	5.0L	*4 ROW, *5 Emergent World and *6 Hot Climate
G	5.0L Supercharged	*4 ROW, *5 Emergent World and *6 Hot Climate
H	3.0L	*2 With DPF, *3 With-out DPF and Japan
J	5.0L Supercharged	*1 EU, *2 With DPF, *3 With-out DPF and Japan
K	5.0L Supercharged	Brazil
L	5.0L Supercharged	*4 ROW, *5 Emergent World and *6 Hot Climate
P	5.0L	*1 EU, *2 With DPF, *3 With-out DPF and Japan
R	5.0L Supercharged	*1 EU, *2 With DPF, *3 With-out DPF and Japan
T	2.2L Diesel	*1 EU and *2 With DPF
W	3.0L	Brazil
X	5.0L	Brazil
Y	5.0L Supercharged	Brazil
2	3.0L Diesel	*1 EU and *2 With DPF
4	3.0L Diesel	*1 EU and *2 With DPF
5	3.0L Diesel	*4 ROW, *5 Emergent World, *3 With-out DPF, Japan and *6 Hot Climate
6	2.2L Diesel	*1 EU and *2 With DPF

Check Digit

VIN Position 6

VIN Code	Description
0 - 9 or X	Calculated in accordance with American standard CFR part 565

Model Year

VIN Position 7

VIN Code	Description
9	2009 model year
A	2010 model year
B	2011 model year
C	2012 model year

Assembly Plant and Model Line

VIN Position 8

VIN Code	Description
D	Castle Bromwich 2.2L Diesel
F	Castle Bromwich 3.0L Petrol
H	Castle Bromwich 4.2L Normally aspirated Petrol
L	Castle Bromwich 5.0L Normally aspirated Petrol
M	Castle Bromwich 5.0L Supercharged Petrol
N	Castle Bromwich 3.0L Diesel
1	Castle Bromwich 4.2L Supercharged Petrol
7	Castle Bromwich 2.7L Diesel

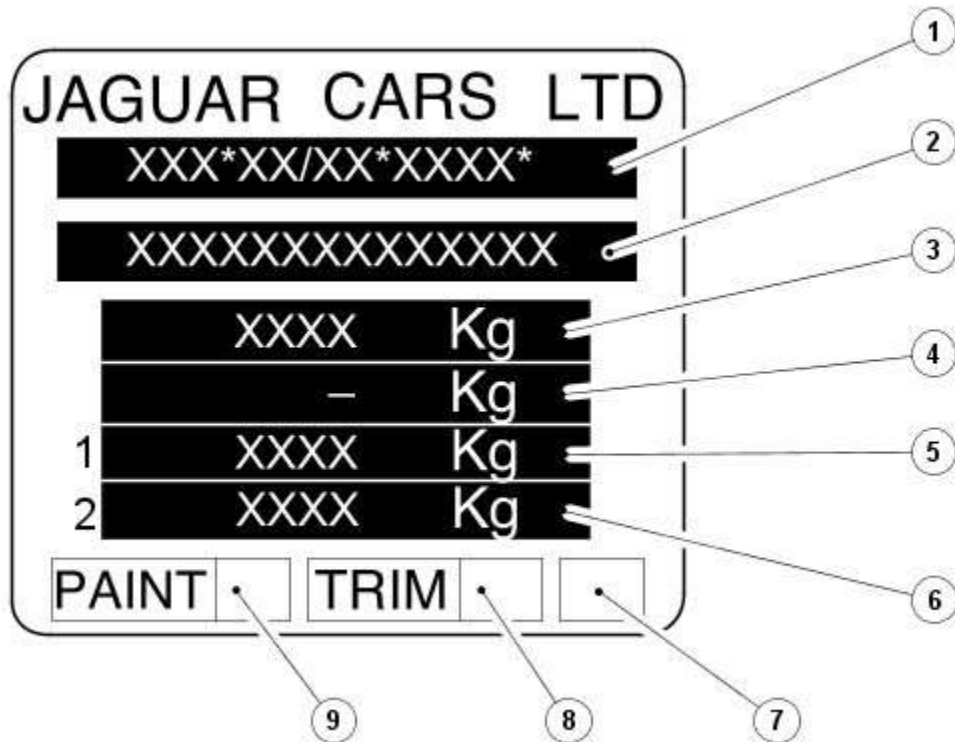
Production Sequence Number

VIN Position 9

Sequence Number
R00001 - R99999
S00001 - S99999
T00001 - T99999

VIN Label

VIN Label (Europe and Rest of world)

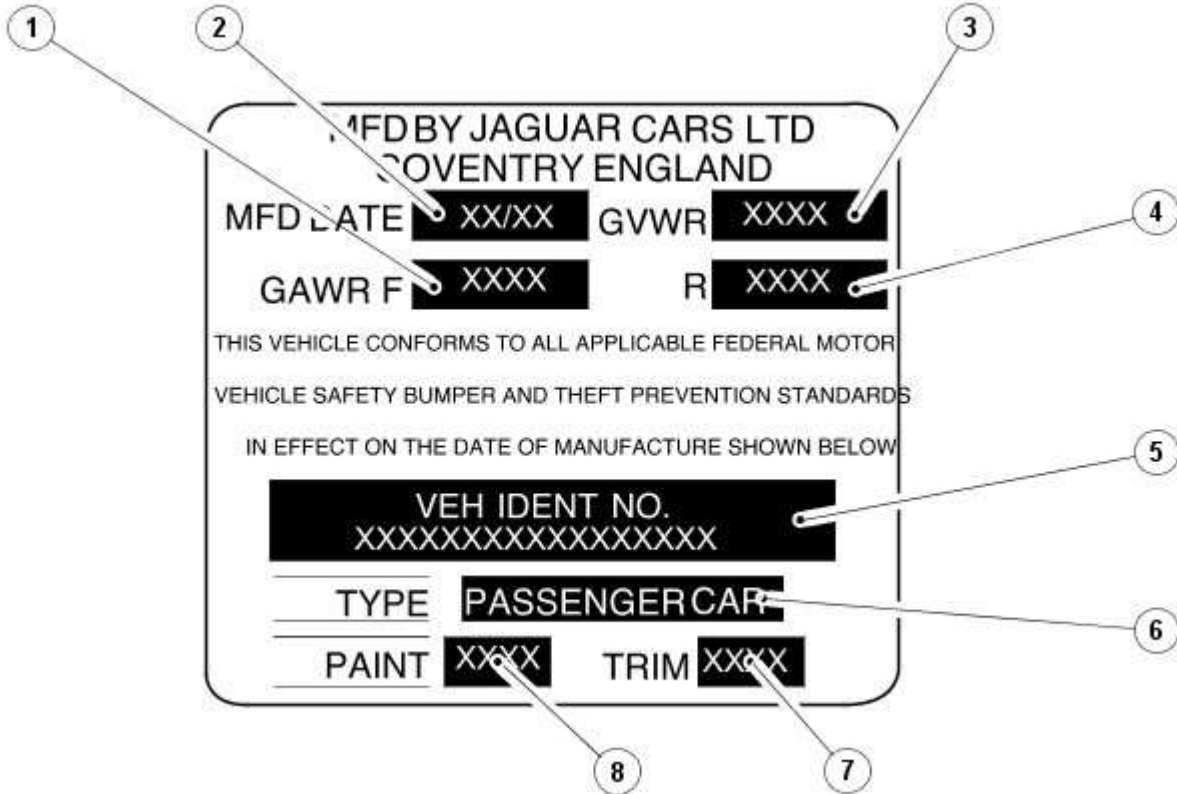


E 36533

Item	Description
1	Whole Vehicle Type Approval (WVTA) - Only shown for certain markets
2	VIN
3	Gross vehicle weight

4		Gross train weight
5		Maximum permitted front axle loading
6		Maximum permitted rear axle loading
7		Date of manufacture
8		Interior trim code
9		Paint code

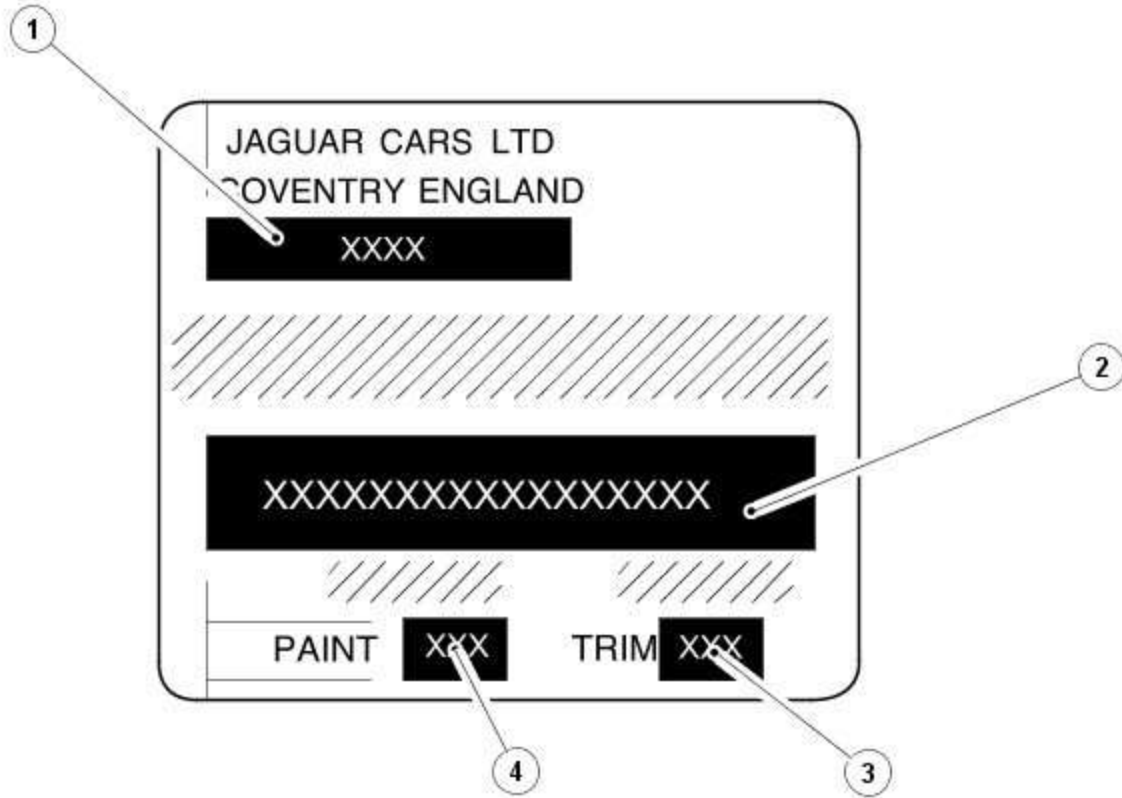
VIN Label (North America)



E36534

Item		Description
1		Maximum permitted front axle loading
2		Date of manufacture
3		Gross vehicle weight
4		Maximum permitted rear axle loading
5		VIN
6		Type
7		Interior trim code
8		Paint code

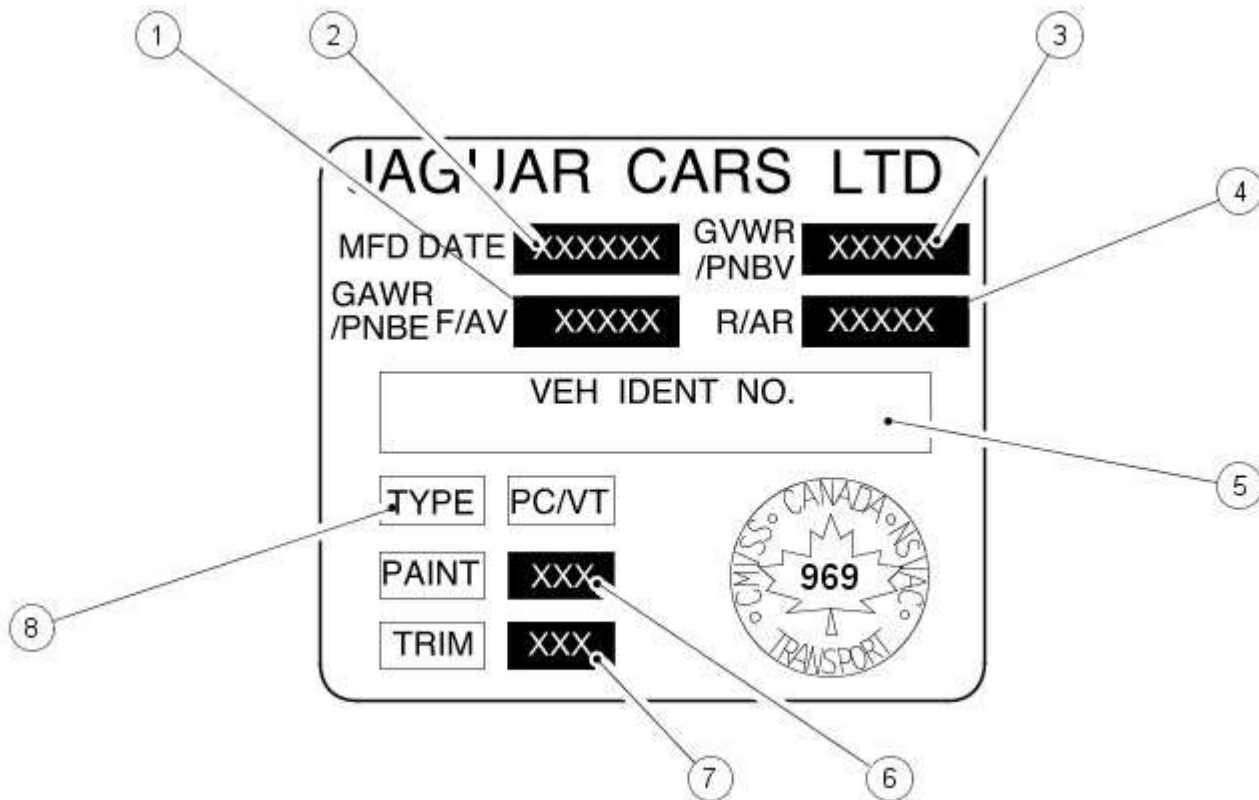
VIN Label (Saudi Arabia and Gulf States)



E36535

Item	Description
1	Date of manufacture
2	VIN
3	Interior trim code
4	Paint code

VIN Label (Canada)



E36536

Item	Description
1	Maximum permitted front axle loading
2	Date of manufacture
3	Gross vehicle weight
4	Maximum permitted rear axle loading
5	VIN
6	Paint code
7	Interior trim code
8	Type

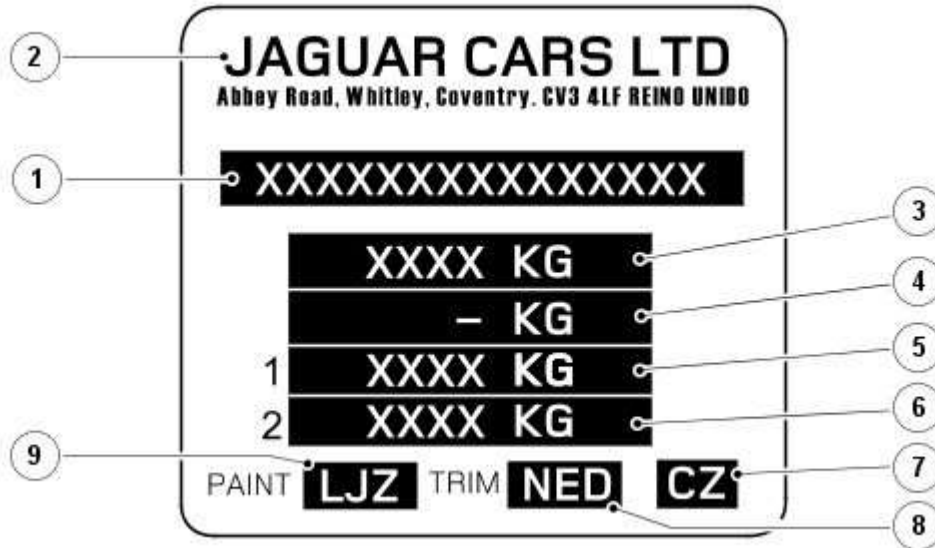
VIN Label (China)



E99220

Item	Description
1	Occupant number
2	Engine specification (Type/Capacity/Power)
3	VIN
4	Trade mark
5	Vehicle type
6	Gross vehicle weight
7	Date of manufacture
8	Manufacturer name

VIN Label (Argentina)



E99221

Item	Description
1	VIN
2	Trade mark and manufacturer address (in Spanish)
3	Gross vehicle weight
4	Gross train weight
5	Maximum permitted front axle loading
6	Maximum permitted rear axle loading
7	Date of manufacture
8	Interior trim code
9	Paint code

Automatic Transmission Number

The serial number of the transmission unit is displayed on a metal label or bar code (if equipped) attached to the transmission casing.

Engine Number(s)

Engine Number - 2.2L Diesel

The serial number is stamped on an engine web on the right-hand side of the cylinder block behind the engine mounting.

Engine Number - 2.7L Diesel

The serial number is stamped on an engine web on the right-hand side of the cylinder block behind the engine mounting.

Engine Number - 3.0L Diesel

The serial number is stamped on an engine web on the right-hand side of the cylinder block behind the engine mounting.

Engine Number - 3.0L

The engine number is contained on a bar code label on the front cover and is also stamped in the cylinder block casting on the

left-hand side of the engine below the engine mounting.

Engine Number - 4.2L and 4.2L Supercharged

The serial number is stamped on an engine web on the left-hand side of the cylinder block behind the engine mounting. The emission code is also located here, on the transmission flange.

Engine Number - 5.0L and 5.0L Supercharged

The serial number is stamped on an engine web on the left-hand side of the cylinder block behind the engine mounting.

Jacking and Lifting - Jacking

Description and Operation

Safety Precautions



WARNING: The jack provided with the vehicle is intended to be used in an emergency for changing a deflated tire. To avoid damage to the vehicle, never use the jack to raise the vehicle for any other purpose. Refer to the Driver Handbook when using the jack supplied with the vehicle. Failure to follow these instructions may result in personal injury.

The following safety precautions must be observed when raising the vehicle to carry out service operations:

- Never rely on a jack alone to support a vehicle. Always use suitable vehicle stands to provide rigid support.
- When working beneath a vehicle, whenever possible use a vehicle hoist instead of a jack and vehicle stands.
- Make sure that the vehicle is standing on firm, level ground before using a jack.
- Do not rely on the parking brake alone; chock the wheels and put the automatic transmission into Park if possible.
- Check that any lifting equipment used has adequate capacity for the load being lifted and is in correct working order.

Jacking and Lifting - Lifting

Description and Operation

Lifting Points—Twin-Post Hoist and Floor Jack

CAUTIONS:



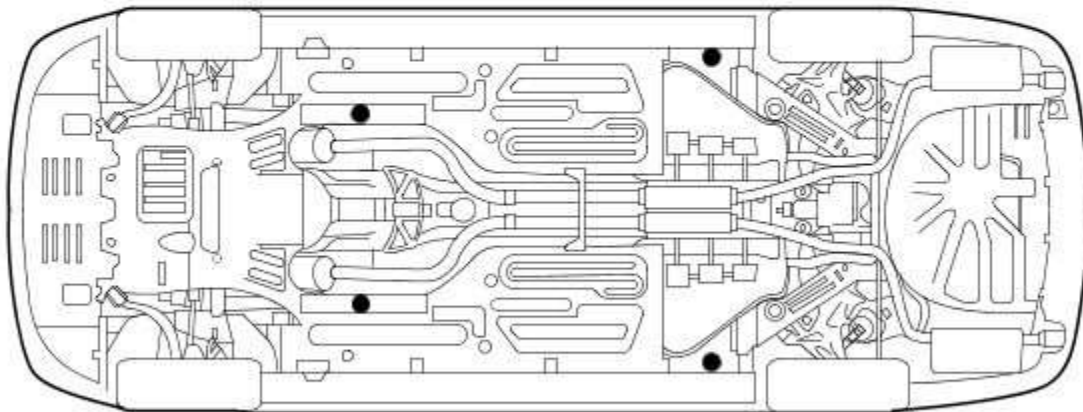
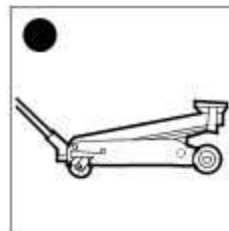
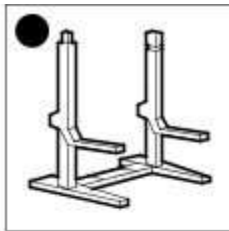
Do not allow the hoist adapters to contact the steering linkage, suspension arms, stabilizer bar, rear subframe stabilizer brackets or to compress the lower suspension arm stabilizer bar insulator. Damage to the suspension, exhaust and steering linkage components may occur if care is not exercised when positioning the hoist adapters of two-post hoists prior to lifting the vehicle.



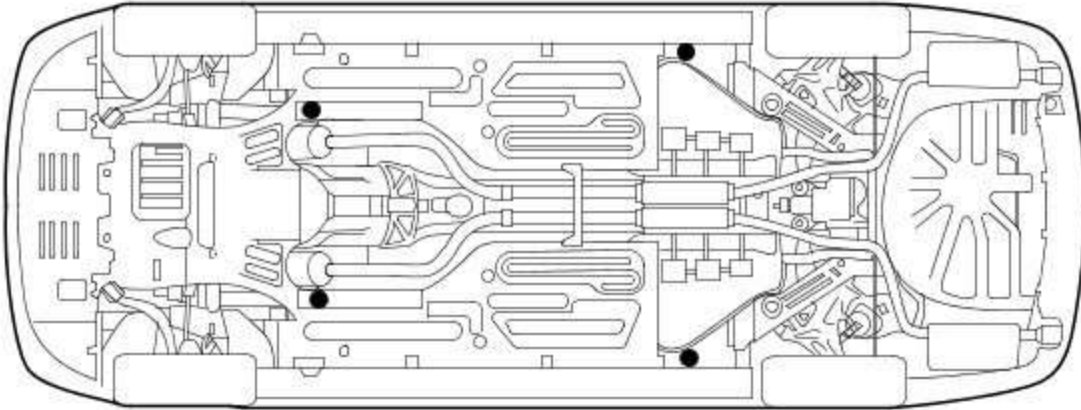
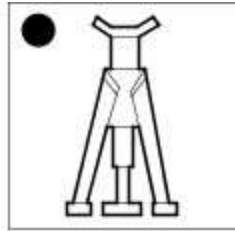
Never use the differential housing as a lift point. Damage to the differential housing and cover may occur.



When using a floor jack, a cushioned pad must be utilized to avoid body damage.



Vehicle Support Points



E30332

Vehicle Recovery

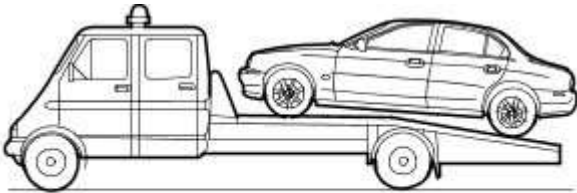


NOTE: Prior to vehicle recovery, make sure the vehicle keys are available and the security system is disarmed.

Vehicle recovery methods are:

- By flat-bed transporter.
- By rear suspended tow.
- By rear suspended tow.

Transporter or Trailer Recovery

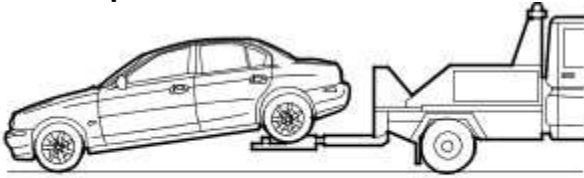


VUJ0001116

When the vehicle is being recovered by transporter or trailer:

- The parking brake must be applied and the wheels chocked.
- The gear selector lever must be in Neutral. Do not select Park on automatic transmission vehicles, as the parking lock mechanism may be damaged by the forward and backward rocking motion of the vehicle.
- The vehicle must be securely tied down to the transporter or trailer.

Rear Suspended Tow



VJJ0001117

When the vehicle is being recovered by rear suspended tow:

- The ignition key must be removed from the ignition switch to lock the steering.
- The rear wheels must be correctly positioned in the lifting cradle and securely tied down.

Emergency Towing



WARNING: If the engine is not running, the steering will become heavy and the force necessary to effectively apply the brakes will be greatly increased.



CAUTION: A vehicle with a defective transmission must be towed by rear suspended tow.

When the vehicle is being towed on its own wheels:

- Local regulations for the towing of vehicles must be followed. In some countries the registration number of the towing vehicle and an 'On Tow' sign or warning triangle must be displayed at the rear of the towed vehicle.
- The gear selector lever must be in Neutral.
- The ignition switch must be in position II to release the steering lock and make the direction indicators, horn and stop lamps operate.
- A distance of 0,8 km (0.5 mile) must not be exceeded.
- A speed of 48 km/h (30 mph) must not be exceeded.
- The tow rope must be attached to the front towing eye.

Noise, Vibration and Harshness - Noise, Vibration and Harshness (NVH)

Description and Operation

Noise, vibration and harshness (NVH) is becoming more important as vehicles become more sophisticated and passenger comfort levels increase. This section is designed to aid in the diagnosis, testing and repair of NVH concerns.

- Noise is defined as sounds not associated with the operation of passenger compartment equipment that interface with customer satisfaction.
- Vibration is defined as impulses felt by the customer that are not caused by road surface changes.
- Harshness is a ride quality issue where the customer feels that the vehicle response to the road surface is sharply transmitted to the customer.

Diagnostic Theory

Diagnosis is more than just following a series of interrelated steps in order to find the solution to the specific condition. It is a way of looking at systems that are not functioning the way they should and finding out why. Also it is knowing how the system should work and whether it is working correctly.

There are basic rules for diagnosis. If these rules are followed, the cause of the condition is usually found the first time through the system.

Know the System

- Know how the parts go together.
- Know how the system operates as well as its limits and what happens when the system goes wrong.
- Sometimes this means checking the system against one that is known to be working correctly.

Know the History of the System

A clue in any one of these areas may save time:

- How old or new is the system?
- What kind of treatment has it had?
- Has it been repaired in the past in such a manner that might relate to the present condition?
- What is the repair history?

Know the History of the Condition

- Did it start suddenly or appear gradually?
- Was it related to some other occurrence such as a collision or previous part renewal?
- Know how the condition made itself known; it may be an important clue to the cause.

Know the Probability of Certain Conditions Developing

- Look for the simple rather than the complex.
- For example:
 - Electrical conditions usually occur at connections rather than components.
 - An engine no-start is more likely to be caused by a loose wire or small adjustment rather than a sheared-off camshaft.
- Know the difference between impossible and improbable. Certain failures in a system can be improbable but still happen.
- New parts are just that, new. It does not mean they are always good functioning parts.

Do Not Cure the Symptom and Leave the Cause

Lowering the pressure in a front tire may correct the condition of a vehicle leaning to one side, but it does not correct the original condition.

Be Positive the Cause is Found

- Double check the findings.
- What caused a worn component?
- A loose transmission or engine mount could indicate that other mounts are also loose.

Diagnostic Charts

Charts are a simple way of expressing the relationship between basic logic and a physical system of components. They help discover the cause of a condition in the least time. Diagnostic charts combine many areas of diagnosis into one visual display:

- probability of certain things occurring in a system
- speed of checking certain components or functions before others
- simplicity of carrying out certain tests before others
- elimination of checking huge portions of a system by carrying out simple tests
- certainty of narrowing down the search to a small portion before carrying out in-depth testing

The fastest way to find a condition is to work with the tools that are available. This means working with proven diagnostic charts and the correct special equipment for the system.

Noise, Vibration and Harshness - Noise, Vibration and Harshness (NVH)

Diagnosis and Testing

Principle of Operation

For a detailed description of Noise, Vibration and Harshness issues, refer to the Description and Operation section of the workshop manual.

REFER to: [Noise, Vibration and Harshness \(NVH\)](#) (100-04 Noise, Vibration and Harshness, Description and Operation).

Inspection and Verification

1. Verify the customer's concerns by operating the vehicle to duplicate the condition.
2. Visually inspect the vehicle to determine any obvious cause(s) of the concern(s).
3. If the inspection reveals obvious causes that can be readily identified, repair as necessary.
4. If the concern(s) remains after the inspection, determine the symptom(s) and refer to the Symptom Chart.

How To Use This Diagnostic Procedure Section

- Noise, vibration and harshness (NVH) concerns have become more important as vehicles have become more sensitive to these vibrations. This section is designed as an aid to identifying these situations
- The section provides diagnostic procedures based on symptoms. If the condition occurs at high speed, for instance, the most likely place to start is under High Speed Shake
- The road test procedure will tell how to sort the conditions into categories and how to tell a vibration from a shake
- A series of Road Test Quick Checks is provided to make sure that a cause is either pinpointed or eliminated
- Name the condition, proceed to the appropriate section and locate the correct diagnosis. When the condition is identified, the job is partly done
- Follow the diagnostic procedure as outlined
- Quick Checks are described within the step, while more involved tests and adjustments are outlined in General Procedures
- Always follow each step exactly and make notes to recall important findings later

Customer Interview

The road test and customer interview (if available) provide information that will help identify the concerns and will provide direction to the correct starting point for diagnosis.

Identify the Condition

NVH problems usually occur in a number of areas:

- tires
- engine accessories
- suspension
- driveline
- air leakage (wind noise)
- squeaks and rattles
- heating ventilation and air conditioning (HVAC)
- electrical (e.g. motor noise)
- transmission
- engine

It is important, therefore, that an NVH concern be isolated into its specific area(s) as soon as possible. The easiest and quickest way to do this is to carry out the Road Test as outlined.

Noise Diagnostic Procedure

Non-Axle Noise

The five most important sources of non-axle noise are exhaust, tires, roof racks, trim and mouldings, and transmission.

Therefore, make sure that none of the following conditions are the cause of the noise before proceeding with a driveline tear down and diagnosis.

- Under certain conditions, the pitch of the exhaust may sound very much like gear noise. At other times, it can be mistaken for a wheel bearing rumble
- Tires, especially snow tires, can have a high pitched tread whine or roar, similar to gear noise. Radial tires, to some degree, have this characteristic. Also, any non-standard tire with an unusual tread construction may emit a roar or whine type noise
- Trim and mouldings can also cause whistling or a whining noise
- Clunk may be a metallic noise heard when the automatic transmission is engaged in reverse or drive, or it may occur when the throttle is applied or released. It is caused by backlash somewhere in the driveline
- Bearing rumble sounds like marbles being tumbled. This condition is usually caused by a damaged wheel bearing

Noise Conditions

- Gear noise is typically a howling or whining due to gear damage or incorrect bearing preload. It can occur at various speeds and driving conditions, or it can be continuous
- Chuckle is a particular rattling noise that sounds like a stick against the spokes of a spinning bicycle wheel. It occurs while decelerating from approximately 64 km/h (40 miles/h) and can usually be heard all the way to a stop. The frequency varies with vehicle speed
- Knock is very similar to chuckle, though it may be louder and occurs on acceleration or deceleration. The tear down will disclose what has to be corrected

Check and rule out tires, exhaust and trim items before disassembling the transmission to diagnose and correct gear noise.

The noises described under Road Test usually have specific causes that can be diagnosed by observation as the unit is disassembled. The initial clues are the type of noise heard on the road test and the driving conditions.

Vibration Conditions



NOTE: New Constant Velocity (CV) joints should not be installed unless disassembly and inspection revealed unusual wear.

Clicking, popping or grinding noises may be caused by the following:

- Cut or damaged CV joint boots resulting in inadequate or contaminated lubricant in the outboard or inboard CV joint bearing housings
- Loose CV joint boot clamps
- Another component contacting the rear drive half shaft
- Worn, damaged or incorrectly installed wheel bearing, suspension or brake component

Vibration at highway speeds may be caused by the following:

- Out-of-balance front or rear wheels
- Out-of-round tires
- Driveline imbalance
- Driveline run-out (alignment)



NOTE: Rear drive half shafts are not balanced and are not likely to contribute to rotational vibration disturbance.

Shudder or vibration during acceleration (including from rest) may be caused by the following:

- Driveline alignment
- Excessively worn or damaged outboard or inboard CV joint bearing housing
- Excessively high CV joint operating angles caused by incorrect ride height. Check ride height, verify correct spring rate and check items under Inoperative Conditions
- Excessively worn driveshaft components

Leakage Conditions

1. Inspect the CV joint boots for evidence of cracks, tears or splits.
2. Inspect the underbody for any indication of grease splatter in the vicinity of the rear drive half shaft, outboard and inboard CV joint boot locations, which is an indication of CV joint boot or CV joint boot clamp damage.
3. Inspect the inboard CV joint bearing housing seal for leakage.

Inoperative Conditions

If a CV joint or rear drive half shaft pull-out occurs, check the following:

- suspension components for correct location, damage or wear
- bushings for wear
- subframe for damage
- bent or worn components
 - Stabilizer bar link
 - Left-hand rear suspension lower arm and bushing
 - Right-hand rear suspension lower arm and bushing
 - Rear wheel hub and rear drive half shaft

Road Test

A gear-driven unit will produce a certain amount of noise. Some noise is acceptable and may be audible at certain speeds or under various driving conditions as on a newly paved blacktop road. The slight noise is in no way detrimental and must be considered normal.

The road test and customer interview (if available) provide information needed to identify the condition and give direction to the correct starting point for diagnosis.

1. Make notes throughout the diagnosis routine. Make sure to write down even the smallest piece of information, because

it may turn out to be the most important.

2. Do not touch anything until a road test and a thorough visual inspection of the vehicle have been carried out. Leave the tire pressures and vehicle load just where they were when the condition was first observed. Adjusting tire pressures, vehicle load or making other adjustments may reduce the conditions intensity to a point where it cannot be identified clearly. It may also inject something new into the system, preventing correct diagnosis.
3. Make a visual inspection as part of the preliminary diagnosis routine, writing down anything that does not look right. Note tire pressures, but do not adjust them yet. Note leaking fluids, loose nuts and bolts, or bright spots where components may be rubbing against each other. Check the luggage compartment for unusual loads.
4. Road test the vehicle and define the condition by reproducing it several times during the road test.
5. Carry out the Road Test Quick Checks as soon as the condition is reproduced. This will identify the correct diagnostic procedure. Carry out the Road Test Quick Checks more than once to verify they are providing a valid result. Remember, the Road Test Quick Checks may not tell where the concern is, but they will tell where it is not.

Road Test Quick Checks

1. 24-80 km/h (15-50 miles/h): With light acceleration, a moaning noise is heard and possibly a vibration is felt in the front floor pan. It is usually worse at a particular engine speed and at a particular throttle setting during acceleration at that speed. It may also produce a moaning sound, depending on what component is causing it. Refer to Tip-In Moan in the Symptom Chart.
2. Acceleration/deceleration: With slow acceleration and deceleration, a shake is sometimes noticed in the steering wheel/column, seats, front floor pan, front door trim panel or front end sheet metal. It is a low frequency vibration (around 9-15 cycles per second). It may or may not be increased by applying brakes lightly. Refer to Idle Boom/Shake /Vibration in the Symptom Chart.
3. High speed: A vibration is felt in the front floor pan or seats with no visible shake, but with an accompanying sound or rumble, buzz, hum, drone or booming noise. Coast with the clutch pedal depressed or shift control selector lever in neutral and engine idling. If vibration is still evident, it may be related to wheels, tires, front brake discs, wheel hubs or front wheel bearings. Refer to High Speed Shake in the Symptom Chart.
4. Engine rpm sensitive: A vibration is felt whenever the engine reaches a particular rpm. It will disappear in neutral coasts. The vibration can be duplicated by operating the engine at the problem rpm while the vehicle is stationary. It can be caused by any component, from the accessory drive belt to the torque converter which turns at engine speed when the vehicle is stopped. Refer to High Speed Shake in the Symptom Chart.
5. Noise/vibration while turning: Clicking, popping, or grinding noises may be due to a worn, damaged, or incorrectly installed front wheel bearing, rear drive half shaft or CV joint.
6. Noise/vibration that is road speed relative: This noise/vibration can be diagnosed independent of engine speed or gear selected (engine speed varies but torque and road speed remain constant). The cause may be a rear drive axle/differential whine.

Road Conditions

An experienced technician will always establish a route that will be used for all NVH diagnosis road tests. The road selected should be reasonably smooth, level and free of undulations (unless a particular condition needs to be identified). A smooth asphalt road that allows driving over a range of speeds is best. Gravel or bumpy roads are unsuitable because of the additional road noise produced. Once the route is established and consistently used, the road noise variable is eliminated from the test results.



NOTE: Some concerns may be apparent only on smooth asphalt roads.

If a customer complains of a noise or vibration on a particular road and only on a particular road, the source of the concern may be the road surface. If possible, try to test the vehicle on the same type of road.

Vehicle Preparation

Carry out a thorough visual inspection of the vehicle before carrying out the road test. Note anything which is unusual. Do not repair or adjust any condition until the road test is carried out, unless the vehicle is inoperative or the condition could pose a hazard to the technician.

After verifying the condition has been corrected, make sure all components removed have been installed.

Lift Test

After a road test, it is sometimes useful to do a similar test on a lift.

When carrying out the high-speed shake diagnosis or engine accessory vibration diagnosis on a lift, observe the following precautions:



WARNING: If only one drive wheel is allowed to rotate, speed must be limited to 55 km/h (35 miles/h) indicated on the speedometer since actual wheel speed will be twice that indicated on the speedometer. Speed exceeding 55 km/h (35 miles/h) or allowing the drive wheel to hang unsupported could result in tire disintegration, differential failure, constant velocity joint

and drive half shaft failure, which could cause serious personal injury and extensive vehicle damage. Failure to follow these instructions may result in personal injury.



CAUTION: The suspension should not be allowed to hang free. When the CV joint is run at a very high angle, extra vibration as well as damage to the seals and joints can occur.

The rear suspension lower arm should be supported as far outboard as possible. To bring the vehicle to its correct ride height, the full weight of the vehicle should be supported in the rear by floor jacks. REFER to: (100-02 Jacking and Lifting)

[Jacking](#) (Description and Operation),
[Lifting](#) (Description and Operation).

1. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting)
[Jacking](#) (Description and Operation),
[Lifting](#) (Description and Operation).
2. Explore the speed range of interest using the Road Test Quick Checks as previously described.
3. Carry out a coast down in neutral. If the vehicle is free of vibration when operating at a steady indicated speed and behaves very differently in drive and coast, a transmission concern is likely.

Note, however, that a test on the lift may produce different vibrations and noises than a road test because of the effect of the lift. It is not unusual to find vibrations on the lift that were not found in the road test. If the condition found on the road can be duplicated on the lift, carrying out experiments on the lift may save a great deal of time.

Exhaust Neutralization Procedure

1. Raise vehicle on lift and slacken all exhaust fixings.
2. With all fixings loose, neutralize the exhaust system.
3. Tighten all fixings to correct torque, starting at the rear-most point working towards the front of the vehicle.

Symptom Chart

Symptom	Possible Cause	Action
High-speed shake	<ul style="list-style-type: none"> • Wheel end vibration • Engine/transmission • Driveline 	GO to Pinpoint Test A.
Tip-in moan	<ul style="list-style-type: none"> • Air cleaner • Power steering • Powertrain • Engine mounts • Exhaust system 	GO to Pinpoint Test B.
Idle boom/shake/vibration, or shudder	<ul style="list-style-type: none"> • Cable(s)/hoses(s) • Intake air distribution and filtering system • Engine mounts • Exhaust system • Belt/pulleys 	GO to Pinpoint Test C.
Wheel end vibration analysis	<ul style="list-style-type: none"> • Suspension/rear drive halfshaft and CV joints • Tires/wheels • Wheel bearings • CV joint boots 	GO to Pinpoint Test D.
Non-axle noise	<ul style="list-style-type: none"> • Trim/mouldings • A/C system • Accessories 	GO to Pinpoint Test E.

Pinpoint Tests



NOTE: These Pinpoint Tests are designed to take the technician through a step-by-step diagnosis procedure to determine the cause of a condition. It may not always be necessary to follow the chart to its conclusion. Carry out only the Pinpoint Test steps necessary to correct the condition. Then check operation of the system to make sure the condition is corrected.

After verifying that the condition has been corrected, make sure all components removed have been installed.

PINPOINT TEST A : HIGH-SPEED SHAKE	
TEST	DETAILS/RESULTS/ACTIONS

PINPOINT TEST B : TIP-IN MOAN	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK THE AIR CLEANER	
	1 Check the air cleaner. <ul style="list-style-type: none"> Check the air cleaner, inlet tube, outlet tube, resonators and all other components associated with the air induction system for correct installation and tightness of all connections.
	Are the components OK? Yes GO to B2. No Correct the condition. Repeat the Road Test as outlined.
B2: CHECK THE EXHAUST SYSTEM	
	1 Carry out the exhaust system neutralizing procedure in this section.
	Is the exhaust system OK? Yes GO to B3. No Repair as necessary. Restore vehicle. Repeat the Road Test as outlined.
B3: CHECK THE POWER STEERING	
	1 Remove the auxiliary drive belt and test for tip-in moan.
	Is the tip-in moan OK? Yes Repair the power steering as necessary. For additional information, refer to Section 211-00. No Check and install new engine/transmission mounts as necessary. Repeat Road Test as outlined.

PINPOINT TEST C : IDLE BOOM/SHAKE/VIBRATION/SHUDDER	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK CABLE/HOSES	
	1 Check the engine compartment for any component that may be grounding between the engine and body or chassis. Example: air conditioning (A/C) hoses.
	Are the components OK? Yes GO to C2. No Correct the condition. Repeat the Road Test as outlined.
C2: CHECK THE COOLING RADIATOR	
	1 Check the engine cooling radiator mountings and bushings for security and condition. Check the radiator installation for any component that may have a touch condition.
	Are the installation and bushings OK? Yes GO to C3. No Correct the condition. Repeat the Road Test as outlined.
C3: CHECK THE EXHAUST SYSTEM	
	1 Carry out the exhaust system neutralizing procedure in this section.
	Is the exhaust system OK? Yes Check and install new engine/transmission mounts as necessary. Repeat Road Test as outlined. No Repair as necessary. Repeat Road Test.

PINPOINT TEST D : WHEEL END VIBRATION ANALYSIS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: INSPECT THE TIRES	
	1 Inspect the tires. <ul style="list-style-type: none"> Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting) Jacking (Description and Operation), Lifting (Description and Operation). Inspect the tires for: <ul style="list-style-type: none"> Correct tire size Tire/wheel compatibility Wear or damage

	<ul style="list-style-type: none"> • Tire beads correctly seated
	<p>Are the tires OK?</p> <p>Yes GO to D2.</p> <p>No Inspect the wheels. For additional information, refer to Section 204-00.</p>
D2: INSPECT WHEEL BEARINGS	
	<p>1 Inspect the wheel bearings. For additional information, refer to Section 204-00.</p>
	<p>Are the wheel bearings OK?</p> <p>Yes GO to D3.</p> <p>No Repair as necessary. Repeat the Road Test as outlined.</p>
D3: INSPECT THE CONSTANT VELOCITY (CV) JOINT BOOTS	
	<p>1 Inspect the CV joint boots.</p> <ul style="list-style-type: none"> • Spin the rear tire by hand • Inspect for evidence of cracks, tears, splits or splattered grease
	<p>Are the CV joint boots OK?</p> <p>Yes GO to D4.</p> <p>No Repair as necessary. Repeat the Road Test as outlined.</p>
D4: INSPECT WHEEL AND TIRE RUNOUT	
	<p>1 Inspect the wheel and tire runout.</p> <ul style="list-style-type: none"> • Carry out the Wheel and Tire Check procedure. REFER to: Lifting (100-02 Jacking and Lifting, Description and Operation).
	<p>Is the wheel and tire runout OK?</p> <p>Yes Balance the wheels and tires. Refer to the wheel balance equipment manufacturers instructions.</p> <p>No Repair as necessary. REFER to: Lifting (100-02 Jacking and Lifting, Description and Operation). Repeat the Road Test as outlined.</p>

PINPOINT TEST E : NON-AXLE NOISE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: INSPECT VEHICLE TRIM	
	<p>1 Check the grille and trim mouldings to see if they are the source of the noise.</p>
	<p>Are the vehicle trim components causing the noise?</p> <p>Yes Install new trim or repair as necessary. For additional information, refer to Section 501-08.</p> <p>No GO to E2.</p>
E2: CHECK THE A/C SYSTEM FOR NOISE	
	<p>1 Check the A/C system components for noise by turning the A/C system on and off.</p>
	<p>Is the A/C system causing the noise?</p> <p>Yes Diagnose the A/C system. REFER to: Lifting (100-02 Jacking and Lifting, Description and Operation).</p> <p>No GO to E3.</p>
E3: CHECK NON-FACTORY ACCESSORIES	
	<p>1 Inspect any accessories for being the source of the noise. Example: grounding body-to-frame, antennas, visors, bug deflectors and fog lights?</p>
	<p>Are the accessories the cause of the noise?</p> <p>Yes Adjust, repair or install new accessories or fasteners as required.</p> <p>No Verify the customer concern.</p>

Noise, Vibration and Harshness - Exhaust System Neutralizing

General Procedures

1. Loosen the muffler inlet pipe and resonator pipe to exhaust manifold fasteners at the flanges and the muffler inlet connection.
2. Place a stand to support the muffler parallel to the vehicle frame with the muffler pipe bracket free of stress.
3. Tighten the muffler connection.
4. Position the exhaust pipes to the manifolds and tighten. Make sure that the catalytic converter and heat shield do not contact the frame rails.
5. With the complete exhaust system tight (and cooled) the rear hanger insulator should be angled forward, to allow the system to expand rearward when heated during normal running

Suspension System - General Information -

Vehicle Ride Height



NOTE: All figures are at "Kerb" height - For additional information, refer to Vehicle Ride Height below.

Description		Measurement	
Description	Front/Rear	Kerb mm (inch)	Tolerance mm (inch)
Vehicles without supercharger	Front	388 (15.28)	±12 (0.5)
	Rear	391 (15.39)	±12 (0.5)
Vehicles with supercharger	Front	385 (15.16)	±12 (0.5)
	Rear	384 (15.12)	±12 (0.5)
Vehicles with All wheel drive	Front	404 (15.90)	±12 (0.5)
	Rear	391 (15.39)	±12 (0.5)

- Ride height is measured from the centre of the wheel to the apex of the wheel arch, through the wheel centre line.
- Kerb - with all fluids at full and a full tank of fuel, no occupants/luggage.
- Tires must be inflated to normal pressure -
For additional information, refer to: [Specifications](#) (204-04 Wheels and Tires, Specifications).

Wheel Alignment - Front Camber



NOTE: *1 Camber Balance = left-hand camber - right-hand camber.

Description	Degrees/Minutes	Left-hand		Right-hand		Balance*1	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
All right-hand drive and Japan	Degrees/Minutes	-0° 36'	±45'	-0° 12'	±45'	-0° 24'	±45'
	Decimal Degrees	-0.6°	±0.75°	-0.2°	±0.75°	-0.4°	±0.75°
USA, Canada, Mexico and Dominican Republic (Federal)	Degrees/Minutes	-0° 12'	±45'	-0° 33'	±45'	0° 21'	±45'
	Decimal Degrees	-0.2°	±0.75°	-0.55°	±0.75°	0.35°	±0.75°
Rest of world	Degrees/Minutes	-0° 12'	±45'	-0° 24'	±45'	0° 12'	±45'
	Decimal Degrees	-0.2°	±0.75°	-0.4°	±0.75°	0.2°	±0.75°
Vehicles with All wheel drive	Degrees/Minutes	-0° 11'	±45'	-0° 32'	±0.45'	21'	±45'
	Decimal Degrees	-0.19°	±0.75°	-0.54°	±0.75°	0.35°	±0.75°

Wheel Alignment - Front Caster



NOTE: *2 Caster Balance = left-hand caster - right-hand caster.

Description	Degrees/Minutes	Left-hand		Right-hand		Balance*2	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
All right-hand drive and Japan	Degrees/Minutes	6° 53'	±45'	6° 20'	±45'	0° 33'	±45'
	Decimal Degrees	6.88°	±0.75°	6.33°	±0.75°	0.55°	±0.75°
USA, Canada, Mexico and Dominican Republic (Federal)	Degrees/Minutes	6° 36'	±45'	6° 45'	±45'	-0° 8'	±45'
	Decimal Degrees	6.61°	±0.75°	6.74°	±0.75°	-0.14°	±0.75°
Rest of world	Degrees/Minutes	6° 36'	±45'	6° 36'	±45'	0° 0'	±45'
	Decimal Degrees	6.61°	±0.75°	6.61°	±0.75°	0°	±0.75°
Vehicles with All wheel drive	Degrees/Minutes	6° 2'	± 45'	6° 11'	± 45'	- 9'	± 45'
	Decimal Degrees	6.04°	±0.75°	6.19°	± 0.75°	-0.15°	± 0.75°

Wheel Alignment - Front Toe

Description	Degrees/Minutes	Total Toe	
		Nominal	Tolerance
All right-hand drive and Japan	Degrees/Minutes	0° 13'	±12'
	Decimal Degrees	0.22°	±0.20°
USA, Canada, Mexico and Dominican Republic (Federal)	Degrees/Minutes	0° 13'	±12'
	Decimal Degrees	0.22°	±0.20°
Rest of world	Degrees/Minutes	0° 13'	±12'
	Decimal Degrees	0.22°	±0.20°
Vehicles with All wheel drive	Degrees/Minutes	16'	± 12'
	Decimal Degrees	0.27°	± 0.20°

Wheel Alignment - Rear Camber (Vehicles without supercharger)

Description	Degrees/Minutes	Left-hand		Right-hand	
		Nominal	Tolerance	Nominal	Tolerance
All Markets	Degrees/Minutes	-0° 47'	±45'	-0° 47'	±45'
	Decimal Degrees	-0.78°	±0.75°	-0.78°	±0.75°

Wheel Alignment - Rear Camber (Vehicles with supercharger)

Description	Degrees/Minutes	Left-hand		Right-hand	
		Nominal	Tolerance	Nominal	Tolerance
All Markets	Degrees/Minutes	-0° 59'	±45'	-0° 59'	±45'

Description		Left-hand		Right-hand	
Markets	Degrees/Minutes	Nominal	Tolerance	Nominal	Tolerance
Vehicles with All wheel drive	Decimal Degrees	-0.98°	±0.75°	-0.98°	±0.75°
	Degrees/Minutes	- 53'	± 45'	- 53'	± 45'
	Decimal Degrees	-0.89°	± 0.75°	-0.89°	± 0.75°

Wheel Alignment - Rear Toe

Description		Left-hand		Right-hand		Total Toe	
Markets	Degrees/Minutes	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
All Markets	Degrees/Minutes	0° 5'	±8'	0° 5'	±8'	0° 10'	±12'
	Decimal Degrees	0.083°	±0.14°	0.083°	±0.14°	0.17°	±0.20°
Vehicles with All wheel drive	Degrees/Minutes	5'	± 8'	5'	± 8'	9'	± 12'
	Decimal Degrees	0.08°	± 0.14°	0.08°	± 0.14°	0.15°	± 0.20°

Wheel Alignment - Rear Thrust Angle



NOTE: *5 Rear Thrust Angle = (left-hand toe - right-hand toe) ÷ 2.

Markets		Rear Thrust Angle*5	
Markets	Degrees/Minutes	Nominal	Tolerance
All Markets	Degrees/Minutes	0° 0'	±8'
	Decimal Degrees	0°	±0.14°
Vehicles with All wheel drive	Degrees/Minutes	0° 0'	±8'
	Decimal Degrees	0°	±0.14°

General Specifications

Item	Specification
Clear Vision	
Clear vision (negative value is counterclockwise)	0° ± 3°
Ball Joint Radial Play	
Lower ball joint — maximum	0.8 mm (1/32 in)
Upper ball joint — maximum	0.8 mm (1/32 in)

Suspension System - General Information - Suspension System

Diagnosis and Testing

Principle of Operation

For a detailed description of the suspension system, refer to the relevant Description and Operation section of the workshop manual. REFER to:

[Front Suspension](#) (204-01 Front Suspension, Description and Operation),
[Front Suspension](#) (204-01 Front Suspension, Description and Operation),
[Front Suspension](#) (204-01 Front Suspension, Description and Operation),
[Rear Suspension](#) (204-02 Rear Suspension, Description and Operation),
[Rear Suspension](#) (204-02 Rear Suspension, Description and Operation),
[Rear Suspension](#) (204-02 Rear Suspension, Description and Operation).

Inspection and Verification

1. Verify the customer concern by carrying out a road test on a smooth road. If any vibrations are apparent, refer to section 100-04 Noise, Vibration and Harshness.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection Chart

Mechanical
<ul style="list-style-type: none"> • Damaged tires • Wheel bearing(s) • Loose or damaged front or rear suspension components • Loose, damaged or missing suspension fastener(s) • Incorrect spring usage • Damaged or sagging spring(s) • Damaged or leaking shock absorber(s) • Damaged or leaking strut(s) • Worn or damaged suspension bushing(s) • Loose, worn or damaged steering system components • Damaged axle components

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the next step.
4. If the fault is not visually evident, verify the symptom and refer to the following Symptom Chart.

Symptom Chart

Symptom	Possible Sources	Action
Crabbing	* Incorrect rear thrust angle.	* Check the rear toe adjustment. REFER to: Rear Toe Adjustment (204-00 Suspension System - General Information, General Procedures).
	* Front or rear suspension components.	* Inspect the front and rear suspension systems. Repair or install new suspension components as necessary.
	* Drive axle damaged.	* Install a new rear drive axle/differential. REFER to: Axle Assembly - V6 3.0L Petrol (205-02 Rear Drive Axle/Differential, Removal and Installation).
Drift/Pull	* Unequal tire pressure.	* Check and adjust the tire pressures. Inspect the tire for excessive wear. REFER to: Specifications (204-04 Wheels and Tires, Specifications).
	* Incorrect wheel alignment.	* Check and adjust the wheel alignment. REFER to: (204-00 Suspension System - General Information) Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures), Camber and Caster Adjustment (General Procedures).
	* Tires.	* Check and adjust the tire pressures. Inspect the tire for excessive wear. REFER to: Specifications (204-04 Wheels and Tires, Specifications).
	* Unevenly loaded or overloaded vehicle.	* Notify the customer of incorrect vehicle loading.
	* Damaged steering components.	* Check the steering system.
	* Brake drag.	* Check the brakes. REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).

Front Bottoming or Riding Low	* Coil springs.	* Check the ride height. Install new springs as necessary. REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation), Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
Incorrect Tire Wear	* Incorrect tire pressure (rapid center rib or inner and outer edge wear).	* Check and adjust the tire pressure. Inspect the tire for excessive wear. REFER to: Specifications (204-04 Wheels and Tires, Specifications).
	* Excessive front or rear toe (rapid inner or outer edge wear).	* Check and adjust the wheel alignment. REFER to: (204-00 Suspension System - General Information) Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures), Camber and Caster Adjustment (General Procedures).
	* Excessive negative or positive camber (rapid inner or outer edge wear).	* Check and adjust the wheel alignment. REFER to: (204-00 Suspension System - General Information) Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures), Camber and Caster Adjustment (General Procedures).
	* Tires out of balance (tires cupped or dished).	* Balance the tires.
Rough ride	* Spring(s)	* Check and install new spring(s) as necessary. REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation), Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
Shimmy or Wheel Tramp	* Loose wheel nut(s).	* Check and tighten the wheel nuts to specification. REFER to: Specifications (204-04 Wheels and Tires, Specifications).
	* Loose front suspension fasteners.	* Check and tighten the suspension fasteners to specification. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
	* Front wheel bearing(s).	* Check the wheel bearings.
	* Worn or damaged suspension component bushing.	* Check and install new components as necessary.
	* Wheel/tires.	* Check the wheels/tires. Balance or install new wheel/tires as necessary. REFER to: Wheels and Tires (204-04 Wheels and Tires, Diagnosis and Testing).
	* Loose, worn or damaged ball joint(s).	* Check the Ball Joint(s).
	* Loose, worn or damaged steering components.	* Check and install new components as necessary.
	* Front wheel alignment.	* Check and adjust the wheel alignment. REFER to: (204-00 Suspension System - General Information) Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures), Camber and Caster Adjustment (General Procedures).
	* Shock absorber(s).	* Check and install new shock absorber(s) as necessary. REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation), Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
	* Spring(s).	* Check and install new springs as necessary. REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation), Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
Poor self center action of the steering	* Ball joints.	* Check the Ball Joints.
	* Steering components.	* Check and install new components as necessary.
Steering wheel off-center	* Unequal front or rear toe settings.	* Check and adjust the wheel alignment. REFER to: (204-00 Suspension System - General Information) Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures), Camber and Caster Adjustment (General Procedures).
	* Steering components.	* Check and install new components as necessary.
Sway or roll	* Overloaded, unevenly or incorrectly loaded vehicle.	* Notify the customer of incorrect vehicle loading.
	* Loose wheel nut(s).	* Check and tighten the wheel nut(s) to specification. REFER to: Specifications (204-04 Wheels and Tires, Specifications).
	* Coil spring(s).	* Check and install new coil springs as necessary. REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation),

		Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
	* Loose front stabilizer bar or rear stabilizer bar.	* Check and tighten the stabilizer bar to specification. REFER to: Specifications (204-01 Front Suspension, Specifications), Specifications (204-02 Rear Suspension, Specifications).
	* Worn lower suspension arm stabilizer bar insulators.	* Install new lower suspension arm stabilizer bar as necessary. REFER to: Front Stabilizer Bar - 2.7L Diesel (204-01, Removal and Installation), Front Stabilizer Bar - V6 3.0L Petrol (204-01 Front Suspension, Removal and Installation), Front Stabilizer Bar - 4.2L (204-01, Removal and Installation), Rear Stabilizer Bar (204-02 Rear Suspension, Removal and Installation).
	* Shock absorber(s).	* Check and install new shock absorber(s) as necessary. REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation), Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
Vehicle Leans to One Side	* Unevenly loaded or overloaded vehicle.	* Notify the customer of incorrect vehicle loading.
	* Front or rear suspension components.	* Inspect the front and rear suspension systems. Repair or install new suspension components as necessary.
	* Shock absorber(s).	* Check and install new shock absorber(s) as necessary. REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation), Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
	* Coil spring(s).	* Check and install new spring(s) as necessary. REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation), Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
	* Incorrect ride height. Lateral tilt out of specification.	* Check the ride height. Install new spring(s) as necessary. REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation), Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
Vibration/Noise	* Tires/wheels. * Wheel bearings. * Wheel hubs. * Brake components. * Suspension components. * Steering components.	* Check and install new components as necessary.
Wander	* Unevenly loaded or overloaded vehicle.	* Notify the customer of incorrect vehicle loading.
	* Ball joint(s).	* Check the Ball Joint(s).
	* Front wheel bearing(s).	* Check the wheel bearings.
	* Loose, worn or damaged suspension components.	* Check and install new suspension components as necessary.
	* Loose suspension fasteners.	* Check and tighten the suspension fasteners to specification. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
	* Steering components.	* Check and install new steering components.
	* Wheel alignment (excessive total front toe-out).	* Check and adjust the wheel alignment. REFER to: (204-00 Suspension System - General Information) Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures), Camber and Caster Adjustment (General Procedures).

Component Tests

Ball Joint Inspection

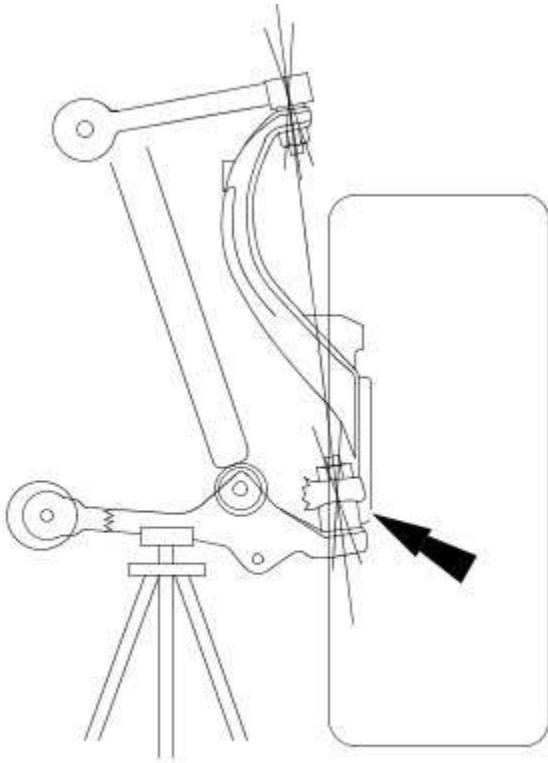


NOTE: The front suspension is shown in the following procedures. The inspection of the rear suspension upper ball joint is similar.

1. Raise and support the vehicle. REFER to: (100-02 Jacking and Lifting) [Jacking](#) (Description and Operation), [Lifting](#) (Description and Operation).
2. Prior to carrying out any inspection of the ball joints, inspect the front wheel bearings.

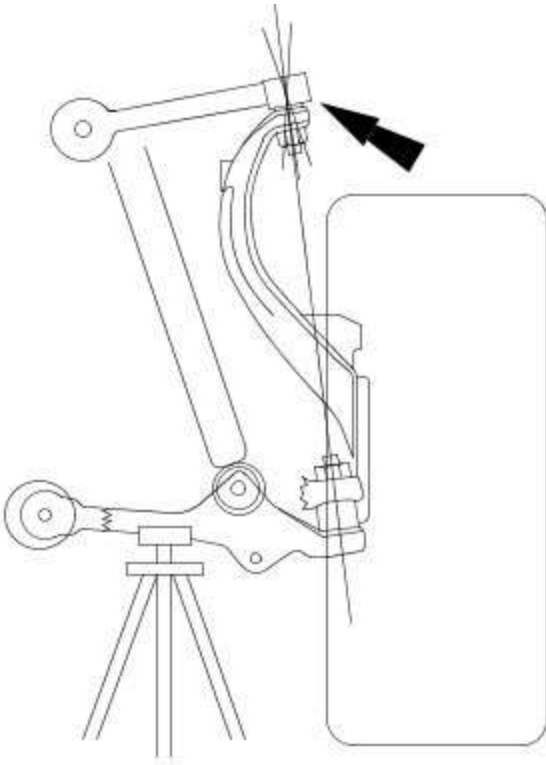
3. CAUTION: The safety stand beneath the suspension lower arm must only support the weight of the suspension and not the full weight of the vehicle. Failure to follow this instruction may result in damage to the components.

Position a safety stand beneath the front suspension lower arm or rear suspension lower arm to be tested.



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4. While an assistant pulls and pushes the top and bottom of the tire, observe the relative movement between the ball joint and the front suspension lower arm. Any movement at or exceeding the specification indicates a worn or damaged ball joint. Install a new wheel knuckle as necessary.
REFER to: [Wheel Knuckle](#) (204-01 Front Suspension, Removal and Installation).



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5. While an assistant pulls and pushes the top and bottom of the tire, observe the relative movement between the ball joint and the front suspension upper arm or rear suspension upper arm. Any movement at or exceeding the specification indicates a worn or damaged ball joint. Install a new upper arm as necessary. REFER to: (204-01 Front Suspension) [Upper Arm LH](#) (Removal and Installation), [Upper Arm RH](#) (Removal and Installation).
6. Remove the safety stand.
7. Lower the vehicle.

Suspension System - General Information - Camber and Caster Adjustment

General Procedures

NOTES:



The camber and caster adjustment for the left-hand side is shown, the procedure for adjusting the right-hand side is similar.



This procedure must be carried out using a 4-post ramp.



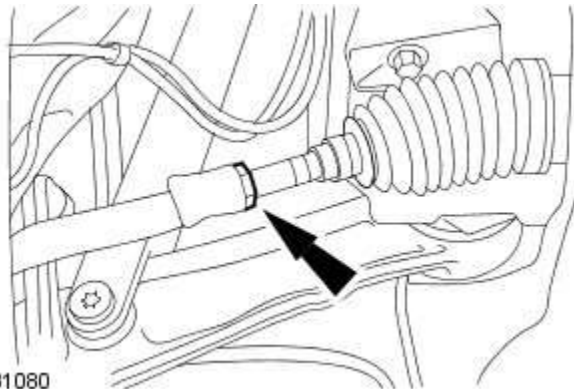
Adjustments to the camber will affect the toe settings. Therefore, the camber and toe may need to be adjusted at the same time to achieve the correct settings.



Adjustments to the camber may affect the caster settings. Therefore, the caster will need to be checked, and adjusted as necessary.

All vehicles

1. Vehicles with air suspension.
For additional information, refer to: [Air Suspension Manual Tight Tolerance Setting Mode \(204-05, General Procedures\)](#).
2. Check the rear toe adjustment.
For additional information, refer to: [Rear Toe Adjustment \(204-00 Suspension System - General Information, General Procedures\)](#).
Adjust as necessary.
3. Check the front toe adjustment.
For additional information, refer to: [Front Toe Adjustment \(204-00 Suspension System - General Information, General Procedures\)](#).
Adjust as necessary.
4. Check the camber and caster settings. Follow the equipment manufacturer's instructions.



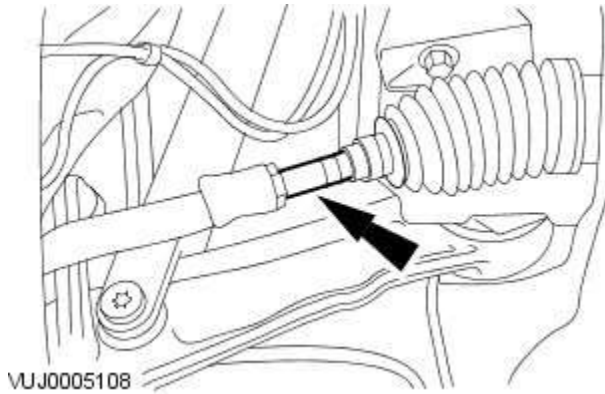
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5. **NOTE:** Left-hand shown, right-hand similar.

Loosen the tie-rod end lock nut.

- Clean and lubricate the lock nut and tie-rod threads.



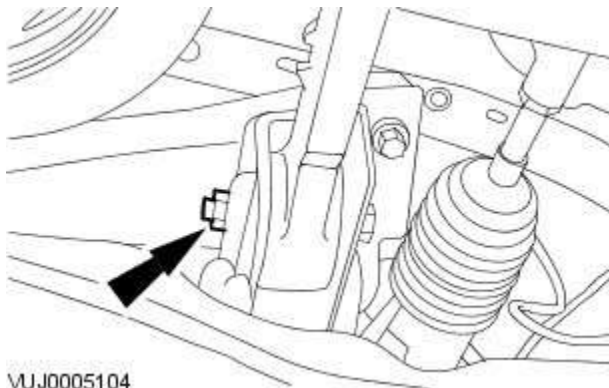
6. NOTES:

⚠ Do not allow the tie-rod end or steering gear boot to twist when the tie-rod is rotated.

⚠ Left-hand, shown right-hand similar.

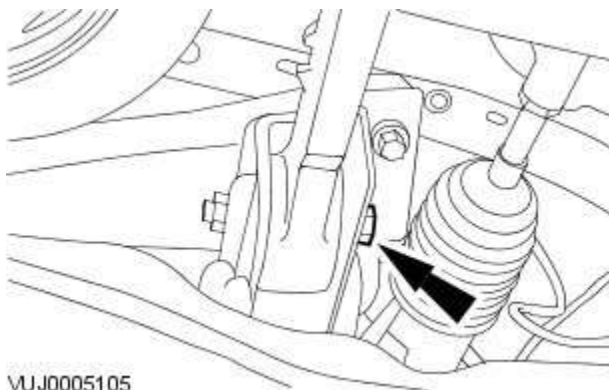
Rotate the tie-rod to adjust the toe.

Vehicles requiring camber adjustment



7. NOTE: Left-hand shown, right-hand similar.

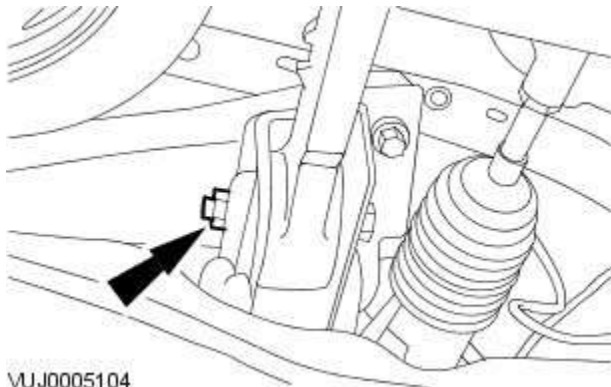
Loosen the rear lower arm lock nut.



8. ⚠ NOTE: Left-hand shown, right-hand similar.

Rotate the camber adjustment cam bolt to adjust the camber.

9. Check the camber and toe settings. Follow the equipment manufacturer's instructions. Adjust as necessary.



VUJ0005104

10. NOTES:

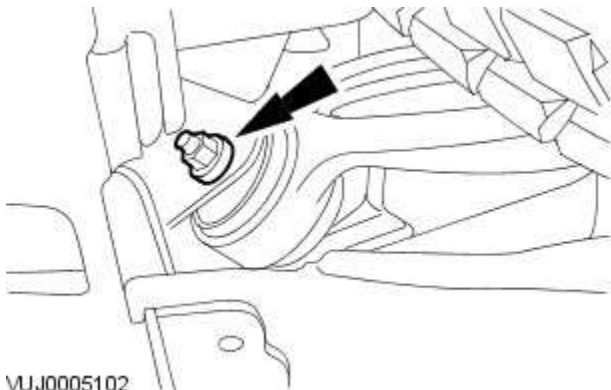
 Make sure the camber adjustment cam bolt does not rotate.

 Left-hand shown, right-hand similar.

Tighten the rear lower arm lock nut.

- Tighten to 175 Nm.

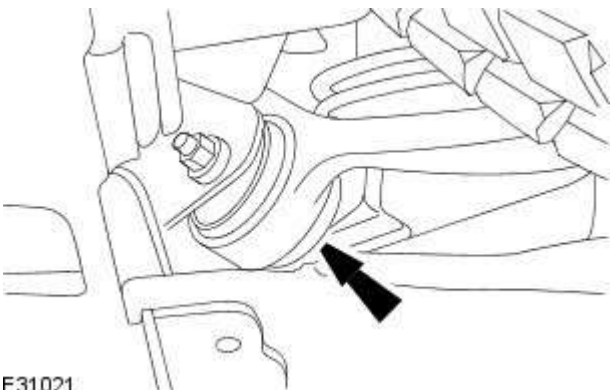
Vehicles requiring caster adjustment



VUJ0005102


11.  NOTE: Left-hand shown, right-hand similar.

Loosen the front lower arm lock nut.



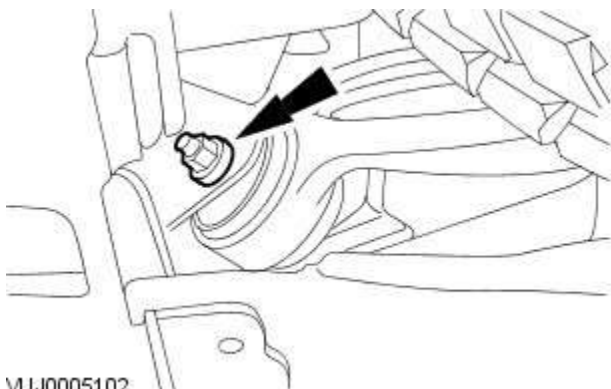
E31021

12. NOTES:

 Adjustments to the caster will affect the toe settings. Therefore, the caster and toe may need to be adjusted at the same time to achieve the correct settings.


 Left-hand shown, right-hand similar.


Rotate the caster adjustment cam bolt to adjust the caster.



VUJ0005102

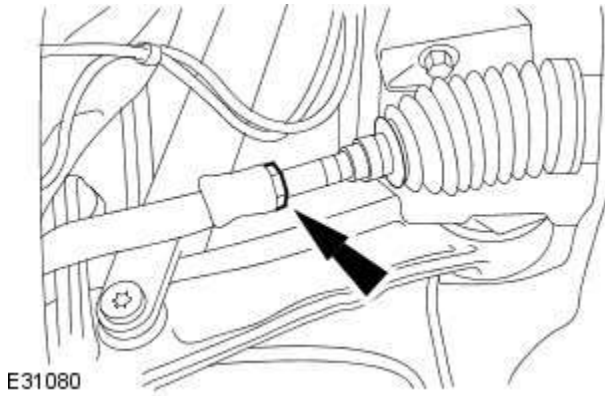
13. NOTES:

 Make sure the caster adjustment cam bolt does not rotate.


 Left-hand shown, right-hand similar.


Tighten the caster adjustment cam bolt lock nut.

- Tighten to 175 Nm.



14. NOTES:

 Make sure the tie-rod or tie-rod end does not rotate.

 Left-hand shown, right-hand similar.

Tighten the tie-rod end lock nut

- Tighten to 55 Nm.

15.  NOTE: Make sure that all fixings are torqued to the correct specification.

Check the caster and toe settings. Follow the equipment manufacturer's instructions. Adjust as necessary.

Suspension System - General Information - Four-Wheel Alignment

General Procedures

CAUTIONS:



Make sure the vehicle is on a flat level surface.



Make sure the tire pressures are within specification.

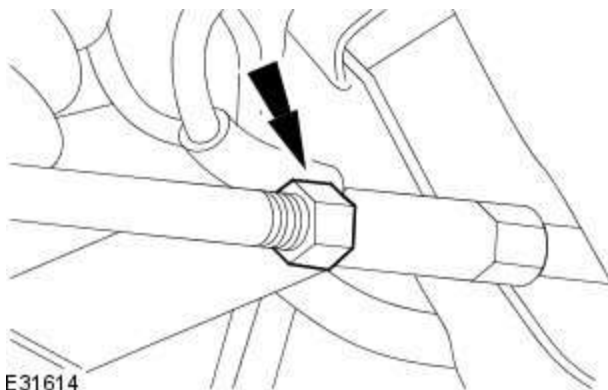


Make sure that only the manufacturers' recommended four wheel alignment equipment is used.



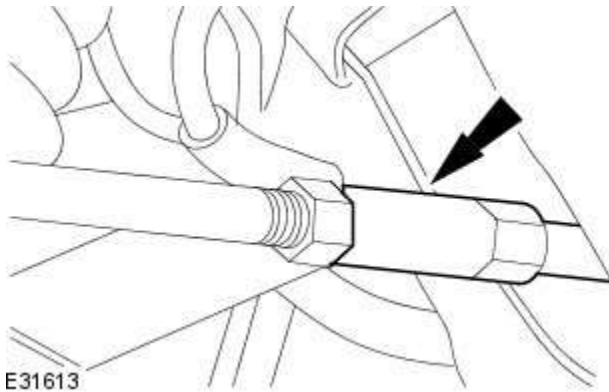
Make sure the steering is in the straight ahead position.

1. For wheel alignment information, refer to the suspension specification section.
For additional information, refer to: [Specifications](#) (204-00 Suspension System - General Information, Specifications).
2. Check the tie rod ends, suspension joints, wheel bearings and wheels and tires for damage, wear and free play.
 - Adjust or repair any worn, damaged or incorrectly adjusted components.
3. Check and adjust tire pressures.
4. Position the vehicle on a calibrated, level, vehicle lift.
5. Vehicles with air suspension.
For additional information, refer to: Air Suspension Manual Tight Tolerance Setting Mode (204-05, General Procedures).
6. Release the vehicle parking brake.
7. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.



E31614

8. **NOTE:** LH illustration shown, RH is similar. To adjust, loosen the toe link locknuts.



9. CAUTION: Do not allow the gaiter to twist.

NOTES:



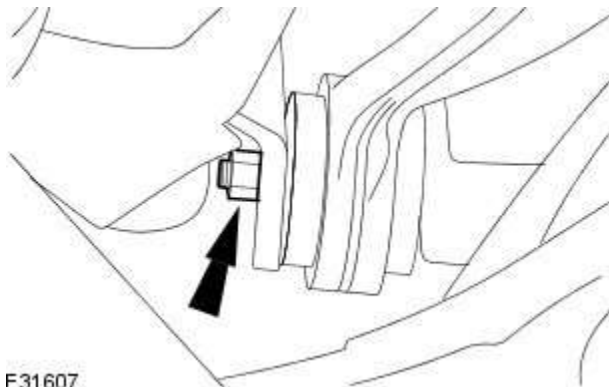
Both tie rods must be rotated by an equal amount.



LH illustration shown, RH is similar.

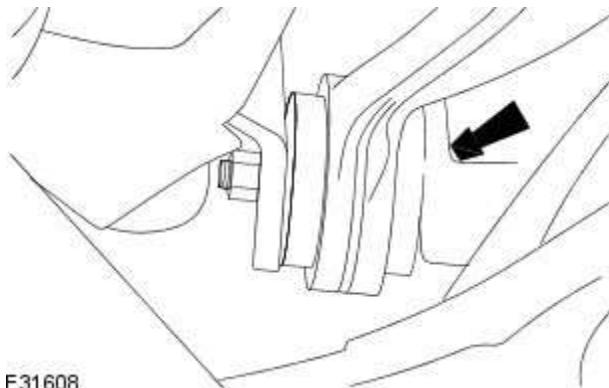
Adjust the rear toe.

10. Tighten the toe link locknuts to 55 Nm (40 lb.ft).



11.  NOTE: LH illustration shown, RH is similar.

To adjust the caster, loosen the front lower arm lock nuts.



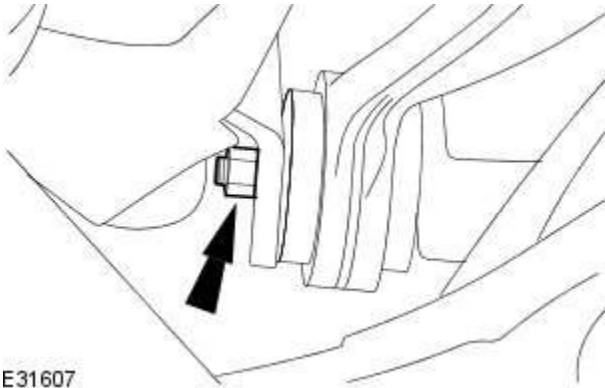
12.  NOTE: LH illustration shown, RH is similar.

Rotate the caster adjustment cam bolt.


13.  CAUTION: Make sure the caster adjustment bolt does not rotate while the lock nut is being tightened.

Tighten the caster adjustment cam bolt nut.

- Tighten the nut and bolt to 175 Nm (129 lb.ft).



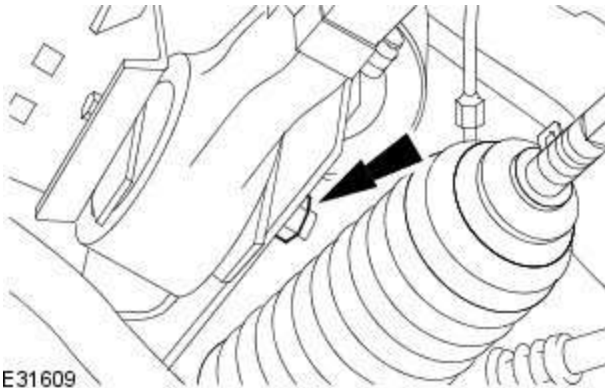
E31607

14.  **CAUTION:** Adjustments made to the camber setting will affect the front toe setting. Therefore, the camber and toe may need to be adjusted at the same time.



NOTE: LH illustration shown, RH is similar.


To adjust the camber, loosen the rear lower arm lock nuts.



E31609

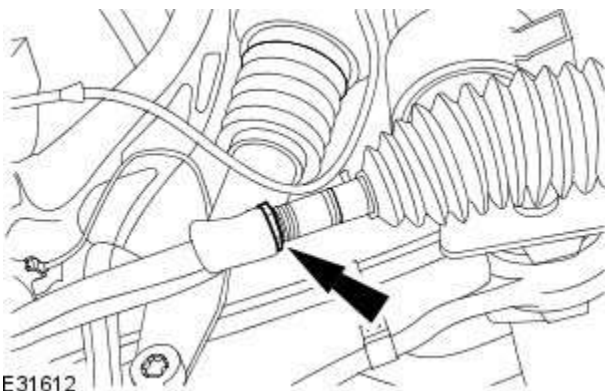
15.  **NOTE:** LH illustration shown, RH is similar.

Rotate the camber adjustment cam bolt.

16.  **CAUTION:** Make sure the camber adjustment bolt does not rotate while the lock nut is being tightened.

Tighten the camber adjustment cam bolt nut.

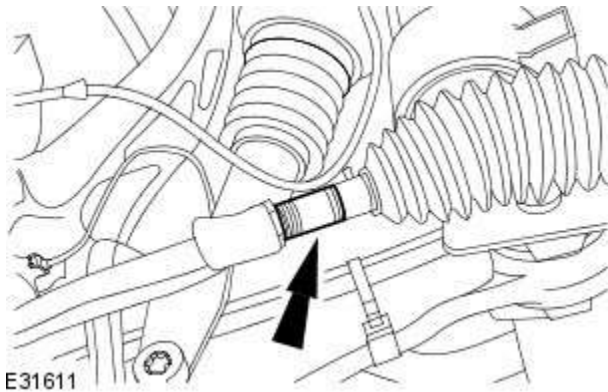
- Tighten the nut and bolt to 175 Nm (129 lb.ft).




E31612

17.  **NOTE:** LH illustration shown, RH is similar.

To adjust, loosen the tie rod end lock nuts.



18.  CAUTION: Do not allow the gaiter to twist.

NOTES:



Both tie rods must be rotated by an equal amount.



LH illustration shown, RH is similar.

Adjust the front toe.

19. Tighten the tie rod end lock nuts to 55 Nm (40 lb.ft).

20. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.

Suspension System - General Information - Front Toe Adjustment

General Procedures

CAUTIONS:



Make sure the vehicle is on a flat level surface.



Make sure the tire pressures are within specification.

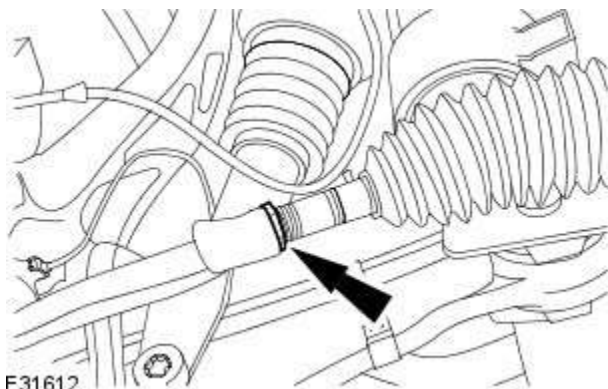


Make sure that only the manufacturers' recommended four wheel alignment equipment is used.



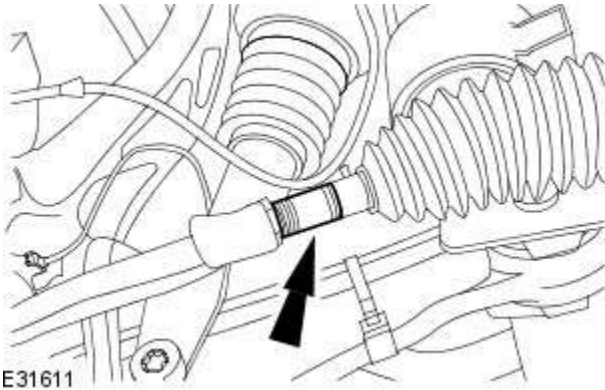
Make sure the steering is in the straight ahead position.


1. For wheel alignment information, refer to the suspension specification section.
For additional information, refer to: [Specifications](#) (204-00 Suspension System - General Information, Specifications).
2. Check the tie rod ends, suspension joints, wheel bearings and wheels and tires for damage, wear and free play.
 - Adjust or repair any worn, damaged or incorrectly adjusted components.
3. Check and adjust tire pressures.
4. Position the vehicle on a 4 post lift.
5. Release the vehicle parking brake.
6. Vehicles with air suspension.
For additional information, refer to: Air Suspension Manual Tight Tolerance Setting Mode (204-05, General Procedures).
7. For additional information, refer to: Air Suspension Manual Tight Tolerance Setting Mode (204-05, General Procedures).
8. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.



E31612

9. **NOTE:** LH illustration shown, RH is similar. To adjust, loosen the tie rod end lock nuts.



10.  CAUTION: Do not allow the gaiter to twist.

NOTES:

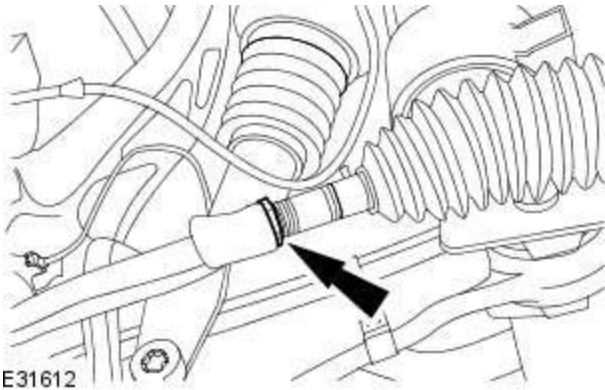


Both tie rods must be rotated by an equal amount.



LH illustration shown, RH is similar.

Adjust the front toe.



11.  NOTE: LH illustration shown, RH is similar.

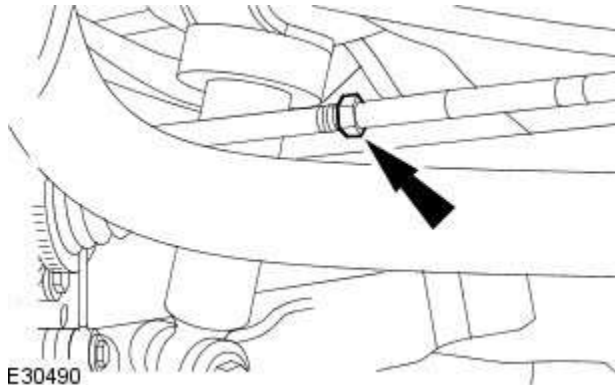
Tighten the tie rod end lock nuts to 55 Nm.

12. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment.


Suspension System - General Information - Rear Toe Adjustment

General Procedures

1. Vehicles with air suspension.
For additional information, refer to: Air Suspension Manual Tight Tolerance Setting Mode (204-05, General Procedures).
2. Check the toe settings. Follow the equipment manufacturer's instructions.

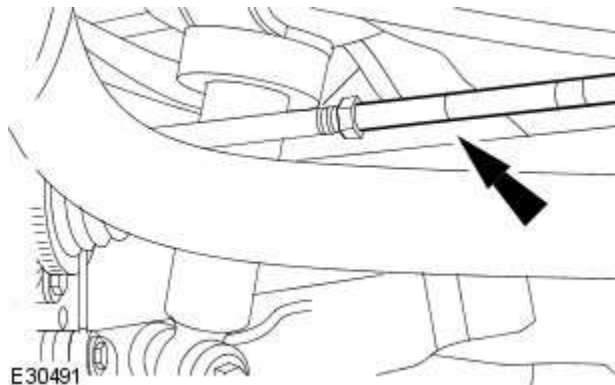


E30490

3.  **NOTE:** Left-hand, shown right-hand similar.

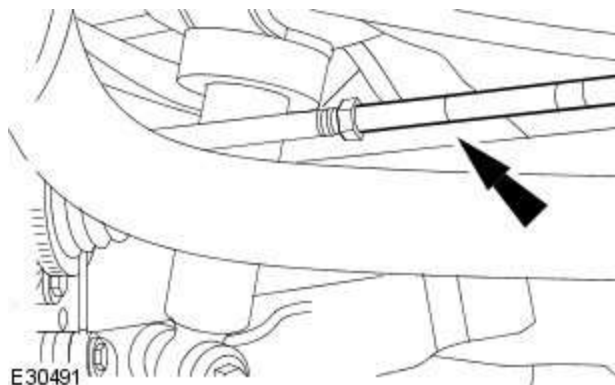
Loosen the lock nut.

- Clean and lubricate the lock nut and toe link threads.



E30491

4. Rotate the toe link to adjust the toe settings.



E30491

5. Tighten the lock nut.

6. Check the toe settings. Follow the equipment manufacturer's instructions.

Suspension System - General Information - Front Wheel Bearing and Wheel Hub Runout

Check Vehicles With: High Performance Brakes

General Procedures

NOTES:



Some variation in the illustrations may occur, but the essential information is always correct.

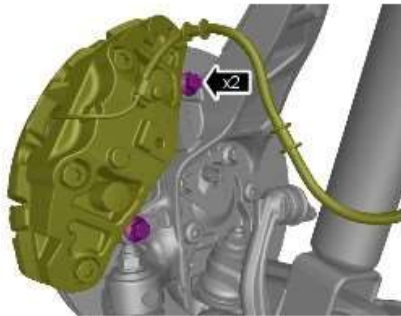


RH illustration shown, LH similar.

-  **WARNING:** Make sure to support the vehicle with axle stands.

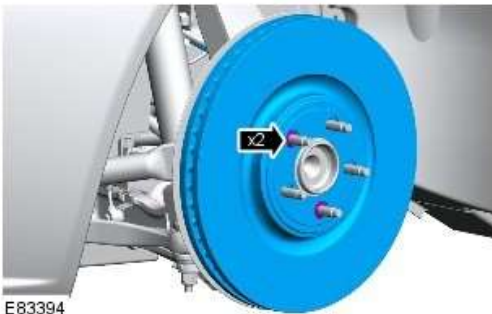
Raise the front of the vehicle.

- Remove the front wheel.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).



E117071

- Remove the 2 brake caliper support bolts.
 - Push the brake caliper pistons back to release the pads from the disc.
 - Detach the brake caliper and position to one side with suitable tie strap.



E83394

- Remove the disc.
 - Remove the 2 clips.



E142472

- Mount special tool 100-053 on the lower caliper support bracket as shown.
 - A spacer washer may be required under the tool.
 - Use the brake caliper support bolt and suitable nut.



E142472

- Position the [Dial Test Indicator \(DTI\) gauge](#) probe on the hub flange as shown.

- Zero DTI and rotate the hub one complete revolution to measure hub runout. hub runout must not exceed 0.015 mm.

- If the hub runout exceeds the limit, install a new hub and bearing. For additional information, refer to:

(204-01 Front Suspension)

[Front Wheel Bearing and Wheel Hub - V6 3.0L Petrol](#) (Removal and Installation),
[Front Wheel Bearing and Wheel Hub - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (Removal and Installation).

9. If the hub runout is within the limit install the removed components.
10. tighten the brake caliper bolts to 115 Nm.

Suspension System - General Information - Rear Wheel Bearing and Wheel Hub Runout Check

General Procedures

NOTES:




RH illustration shown, LH similar.



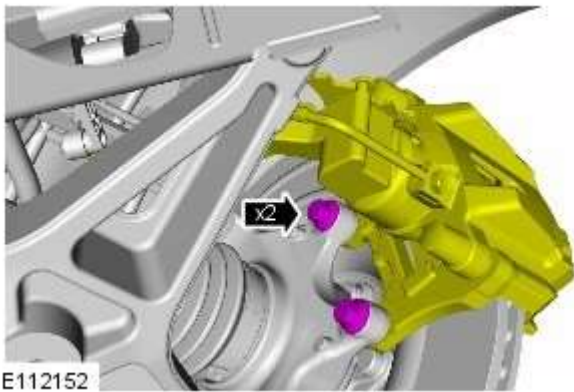
Some variation in the illustrations may occur, but the essential information is always correct.



It is recommended that the DTI is capable of measurements of 0.005 mm.

1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise the rear of the vehicle.

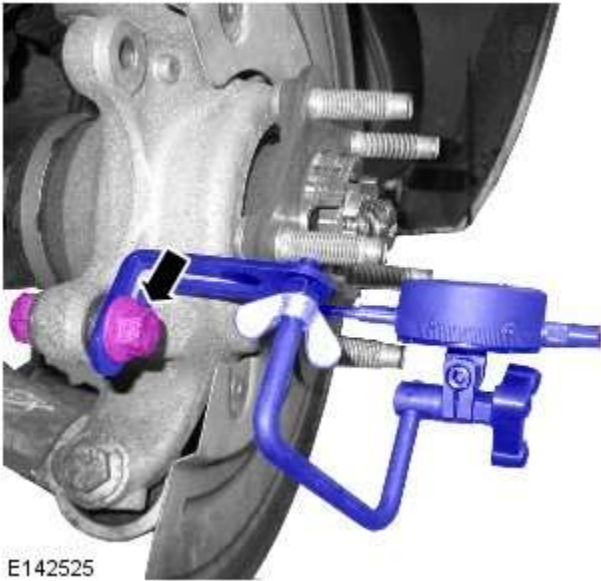
2. Remove the rear wheel.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).



3. Remove the 2 brake caliper support bolts.
 - Push the brake pads back to release the brake caliper from the disc.
 - Detach the brake caliper and position to one side with suitable tie strap.

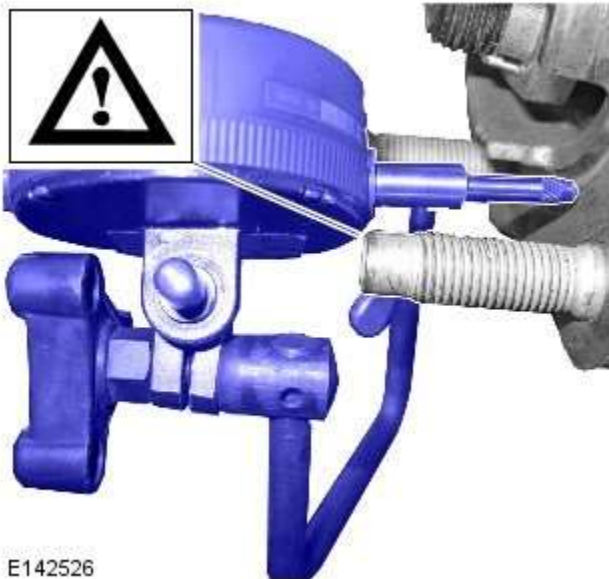


4. Remove the disc.
 - Remove the 2 clips.




E142525

5. Mount special tool 100-053 on the lower caliper support bracket as shown.
 - A spacer washer may be required under the tool.
 - Use the brake caliper support bolt and suitable nut.



E142526

6.  CAUTION: Take care not to contact the studs.
Position the [Dial Test Indicator \(DTI\) gauge](#) probe on the hub flange as shown.

7. Zero DTI and rotate the hub one complete revolution to measure hub runout. Hub runout must not exceed 0.025 mm.
8. If the hub runout exceeds the limit, install a new hub and bearing. For additional information, refer to: [Rear Wheel Bearing](#) (204-02 Rear Suspension, Removal and Installation).
9. If the hub runout is within the limit install the removed components.
10. Tighten the brake support caliper bolts to 103 Nm.

Front Suspension -

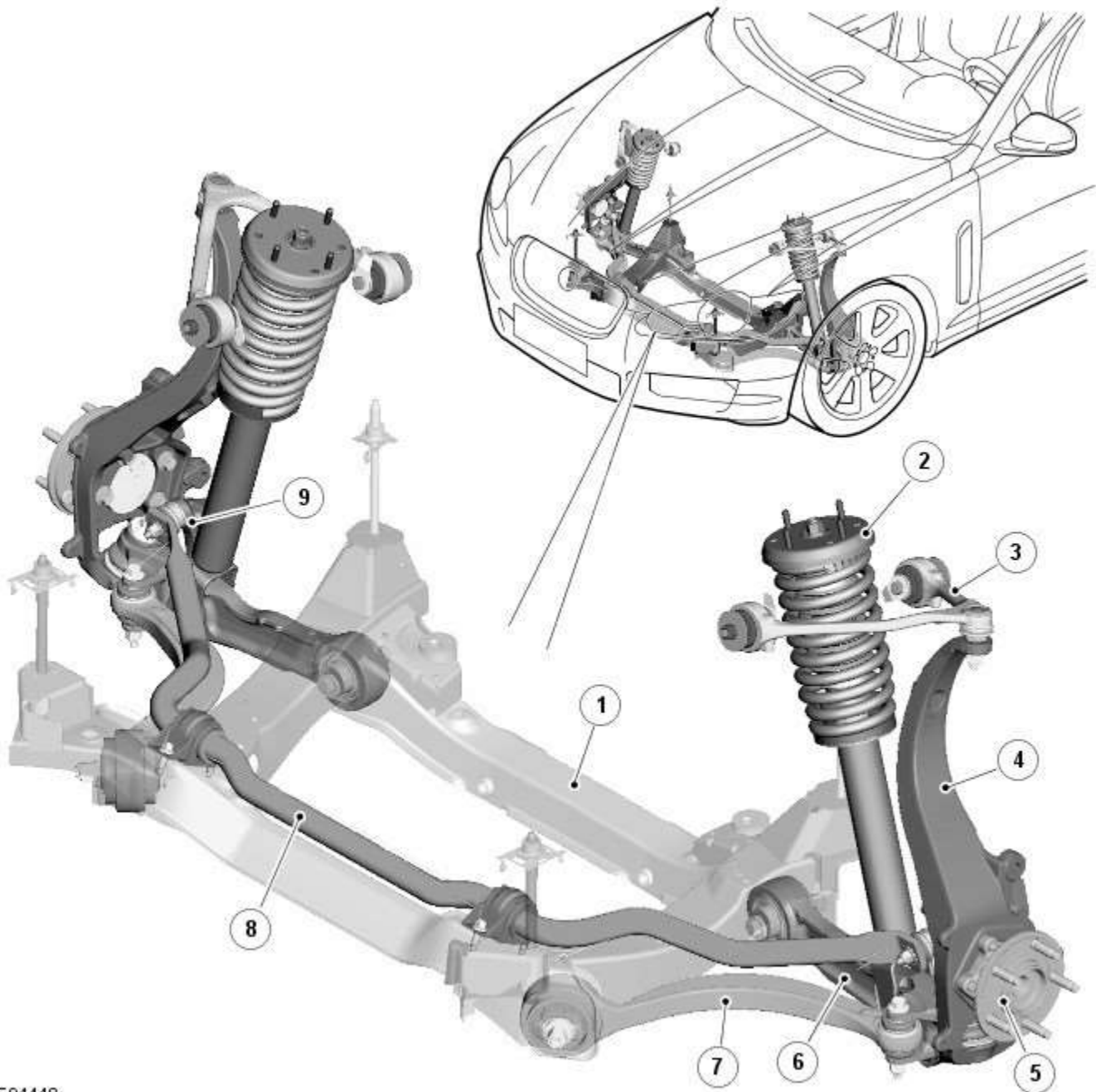
Torque Specification

Description	Nm	lb-ft	lb-in
Steering gear to subframe retaining bolts	100	74	-
Toe link ball joint to wheel knuckle retaining nut	133	98	-
Stabilizer bar link to stabilizer bar retaining nut	43	32	-
Stabilizer bar link to lower arm retaining nut and bolt	70	52	-
Stabilizer bar clamp to subframe retaining bolts	55	41	-
Rear lower arm to wheel knuckle ball joint retaining nut	75	55	-
Rear lower arm to subframe retaining nut and bolt	175	129	-
Front lower arm to subframe retaining nut and bolt	175	129	-
Front lower arm to rear lower arm retaining nut and bolt	Stage 1 - 60 Stage 2 - 135 degrees	Stage 1 - 44 Stage 2 - 135 degrees	-
Upper arm ball joint to wheel knuckle retaining nut	90	66	-
Upper arm to body retaining nuts and bolts	47	35	-
Shock absorber and spring assembly upper mounting to body retaining nuts	28	20	-
Shock absorber and spring assembly to lower arm retaining nut and bolt	175	129	-
Shock absorber and spring assembly upper mounting retaining nut (without adaptive damping)	50	37	-
Shock absorber and spring assembly upper mounting retaining nut (with adaptive damping)	27	20	-
Wheel hub and bearing assembly to wheel knuckle retaining bolt	90	66	-
Wheel and tire to wheel hub retaining nuts	125	92	-

Front Suspension - Front Suspension - Component Location

Description and Operation

COMPONENT LOCATION



E94448

Item	Description
1	Subframe
2	Spring and damper assembly
3	Upper control arm
4	Wheel knuckle
5	Wheel hub and bearing assembly
6	Lower lateral control arm
7	Lower forward control arm
8	Stabilizer bar
9	Stabilizer bar link

Front Suspension - Front Suspension - Overview

Description and Operation

OVERVIEW

The front suspension is a fully independent design assembled on a non-isolated subframe. The wheel knuckle attaches to the wishbone type upper and lower control arms.

The stabilizer bar attaches to the front of the subframe and varies in shape depending on the engine variant.

The spring and damper assemblies are located between the lower control arm and the front suspension housing in the inner wing. Dependant on vehicle model there are three types of coil spring and damper available:

- a standard oil passive damper (All models except supercharged),
- an adaptive damper, also known as Computer Active Technology Suspension (CATS) on 4.2L supercharged vehicles up to 2010MY,
Refer to: [Vehicle Dynamic Suspension - 4.2L \(204-05, Description and Operation\)](#).
- a continuously variable adaptive damper, also known as Adaptive Dynamics System on 5.0L supercharged vehicles from 2010MY.
Refer to: [Vehicle Dynamic Suspension - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (204-05 Vehicle Dynamic Suspension, Description and Operation).

Front Suspension - Front Suspension - System Operation and Component Description

Description and Operation

System Operation

The front suspension is a fully independent design assembled on a non-isolated subframe mounted by four bolts to the vehicle body. This rigid mounting arrangement provides the driver with optimum steering feel and facilitates towards the vehicle's sporty dynamic suspension.

The suspension arrangement is a double-wishbone type with the length ratio between the upper and lower wish-bone control arms calculated to minimize track and camber changes.

An adaptive damping system is available on specified models. For additional information refer to Vehicle Dynamic Suspension 4.2L or 5.0L.

Component Description

COMPONENTS



Item	Description
1	Subframe
2	Spring and damper assembly
3	Upper control arm
4	Wheel knuckle
5	Stabilizer bar link
6	Wheel hub and bearing assembly
7	Lower lateral control arm
8	Lower forward control arm
9	Stabilizer bar

Upper Control Arm

The forged-aluminum upper control arm is a wishbone design and connects to the vehicle body through two plain bushes, and links to the swan neck wheel knuckle by an integral ball joint. The upper control arm is inclined to provide anti-dive characteristics under heavy braking, while also controlling geometry for vehicle straight-line stability.

Lower Control Arm

The forged aluminum lower control arms are of the wishbone design; the arms separate to allow for optimum bush tuning:

- The rear lateral control arm is fitted with a bush at its inner end which locates between brackets on the subframe. The arm is secured with an eccentric bolt which provides the adjustment of the suspension camber geometry. The outer end of the control arm has a tapered hole which locates on a ball joint fitted to the wheel knuckle. An integral clevis bracket on the forward face of the lateral control arm allows for the attachment of the forward control arm. A bush is fitted below the clevis bracket to provide for the attachment of the stabilizer bar link. A cross-axis joint is fitted to a cross-hole in the control arm to provide the location for the clevis attachment of the spring and damper assembly.
- The forward control arm is fitted with a fluid-block rubber bush at its inner end which locates between brackets on the subframe. The arm is secured with an eccentric bolt which provides adjustment of the caster and camber geometry. The outer end of the control arm is fitted with a cross-axis joint and locates in the integral clevis bracket on the lateral control arm.

Wheel Knuckle

The cast aluminum wheel knuckle is a swan neck design and attaches to the upper control arm and lower lateral control arm. The lower lateral control arm locates on a non serviceable ball-joint integral with the wheel knuckle. The lower boss on the rear of the knuckle provides for the attachment of the steering gear tie-rod ball joint.

The wheel knuckle also provides the mounting locations for the:

- wheel hub and bearing assembly
- the wheel speed sensor (integral to the wheel hub and bearing assembly)
- brake caliper and disc shield.

Stabilizer Bar

The stabilizer bar is attached to the front of the subframe with bushes and mounting brackets. The pressed steel mounting brackets locate over the bushes and are attached to the cross member with bolts screwed into threaded locations in the subframe. The stabilizer bar has crimped, 'anti-shuffle' collars pressed in position on the inside edges of the bushes. The collars prevent sideways movement of the stabilizer bar.

The stabilizer bar is manufactured from 32mm diameter tubular steel on supercharged models and 31mm diameter tubular steel on diesel and normally aspirated models and has been designed to provide particular characteristics in maintaining roll rates, specifically in primary ride comfort.

Each end of the stabilizer bar curves rearwards to attach to a ball joint on a stabilizer link. Each stabilizer link is secured to a bush in the lower lateral arm with a bolt and locknut. The links allow the stabilizer bar to move with the wheel travel providing maximum effectiveness.

The only difference between the front stabilizer bars, in addition to the diameter, is in the shape to accommodate engine variant:

- a slightly curved bar, between bush centers, for V6 diesel (31 mm dia) and V8 gasoline supercharged (32 mm dia),
- a straight bar, between bush centers, for V6 and V8 normally aspirated gasoline engines (31 mm dia).

Spring and Damper Assembly

The spring and damper assemblies are located between the lower lateral arm and the front suspension housing in the inner wing. Dependant on vehicle model there are three types of coil spring and damper available:

- a standard oil passive damper (All models except supercharged),
- an adaptive damper, also known as Computer Active Technology Suspension (CATS) on 4.2L supercharged vehicles up to 2010MY. For additional information refer to Vehicle Dynamic Suspension 4.2L.
- a continuously variable adaptive damper, also known as Adaptive Dynamics System on 5.0L supercharged vehicles from 2010MY. For additional information refer to Vehicle Dynamic Suspension 5.0L.

The dampers are a monotube design with a spring seat secured by a circlip onto the damper tube. The damper's lower spherical joint is an integral part of the lateral lower control-arm, and the damper takes the form of a clevis-end, which straddles the spherical joint.

The damper piston is connected to a damper rod which is sealed at its exit point from the damper body. The threaded outer end of the damper rod locates through a hole in the top mount. A self locking nut secures the top mount to the damper rod. The damper rod on the adaptive damper has an electrical connector on the outer end of the damper rod.

Supercharged 4.2L vehicles up to 2010MY: The adaptive damper functions by restricting the flow of hydraulic fluid through internal galleries in the damper's piston. The adaptive damper has a solenoid operated valve, which when switched allows a greater flow of hydraulic fluid through the damper's piston. This provides a softer damping characteristic from the damper. The adaptive damper defaults to a firmer setting when not activated. The solenoid is computer controlled and can switch between soft and hard damping settings depending on road wheel inputs and vehicle speed.

Supercharged 5.0L vehicles from 2010MY: The variable damper functions by adjustment of a solenoid operated variable orifice, which opens up an alternative path for oil flow within the damper. When de-energized the bypass is closed and all the oil flows

through the main (firm) piston. When energized the solenoid moves an armature and control blade, which work against a spring. The control blade incorporates an orifice which slides inside a sintered housing to open up the bypass as required. In compression, oil flows from the lower portion of the damper through a hollow piston rod, a separate soft (comfort) valve, the slider housing and orifice and into the upper portion of the damper, thereby bypassing the main (firm) valve. In rebound the oil flows in the opposite direction

The damper rod is fitted with a spring aid which prevents the top mount making contact with the top of the damper body during full suspension compression and also assists with the suspension tune.

The spring rate of the coil springs can differ between models and are color coded for identification. The coil spring locates on a spring packer and a lower spring seat which is located on the damper body. The spring locates in an upper spring seat which is located on the underside of the top mount. The majority of the roll stiffness is provided by the springs rather than the stabilizer bar as this arrangement allows for a natural frequency of roll and consequently a consistent suspension ride.

India-Specific Spring and Damper Assembly Spacers



E137439

Front and rear spring and damper assemblies are fitted with spacers to raise ride height in India-specific vehicles. The front and the rear spacers are the same, their color is black.

Front Suspension - Front Suspension

Diagnosis and Testing

Principle of Operation

For a detailed description of the suspension system, refer to the relevant Description and Operation section of the workshop manual. REFER to: (204-01 Front Suspension)

[Front Suspension](#) (Description and Operation),
[Front Suspension](#) (Description and Operation),
[Front Suspension](#) (Description and Operation).

Inspection and Verification

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection



Mechanical
<ul style="list-style-type: none"> • Damaged suspension dampers

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the next step
4. If the fault is not visually evident, verify the symptom and refer to the following Symptom Chart

Symptom Chart

Symptom	Possible Cause	Action
Evidence of fluid on suspension damper	<ul style="list-style-type: none"> • Fluid on damper from an external source • Fluid leaking from damper 	<ul style="list-style-type: none"> • Damper not faulty, do not renew • GO to Pinpoint Test A.

PINPOINT TEST A : DAMPER FLUID LEAK DIAGNOSIS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: ASSESS LEAK	
NOTES:	
 Residual oil left over from the damper assembly process may create oil staining on the damper tube. This will not affect the function of the damper.	
 Slight seepage is considered normal.	
	1 Assess the extent of the oil leakage Is the leakage serious enough to indicate that the damper seal has failed? Yes GO to Pinpoint Test B . No Damper not faulty, do not renew.

PINPOINT TEST B : CONFIRM LEAK

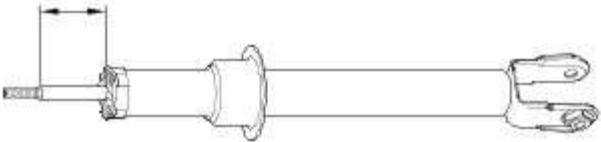
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: ROAD TEST	
	1 Clean all traces of oil from the damper 2 Drive the vehicle over a speed bump or similar ten times
	Is any fluid visible on the outside of the damper? Yes GO to Pinpoint Test C . No Damper not faulty, do not renew.

PINPOINT TEST C : DAMPER STICKOUT TEST

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: DAMPER STICKOUT TEST	



NOTE: If a significant quantity of fluid has leaked out of the damper, the dividing piston will be displaced upwards in the tube by the pressure of the gas below it. This will limit the downward travel of the piston.

	1 Remove the suspension strut assembly REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation).
	2 Remove the spring
	3 Remove the bump stop
	4 Push the damper piston fully into the damper tube
 E144894	5 Measure and record the stickout dimension (the distance between the damper tube cap and the piston rod shoulder)
	Is the stickout dimension greater than 12.0mm? Yes Damper unserviceable. Install a new suspension damper. Enclose a record of the stickout dimension with the returned part. No Damper serviceable. Re-assemble and re-install the suspension strut REFER to: Front Shock Absorber (204-01 Front Suspension, Removal and Installation).

Front Suspension - Front Shock Absorber

Removal and Installation

Removal

NOTES:




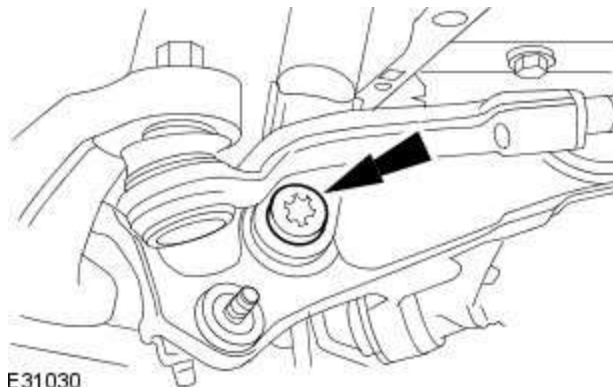
Fuse box release only required on removal of the RH front shock absorber.



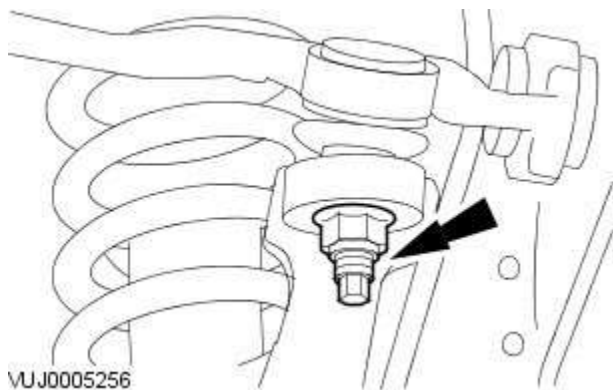
Expansion tank release only required for supercharged variant removal of the LH front shock absorber.

All vehicles

-  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
 Raise and support the vehicle.
- Remove the front wheel and tire.
 For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
- Remove the front stabilizer bar link.
 For additional information, refer to: [Front Stabilizer Bar Link](#) (204-01 Front Suspension, Removal and Installation).



- Release the front shock absorber from the lower arm.



- CAUTIONS:



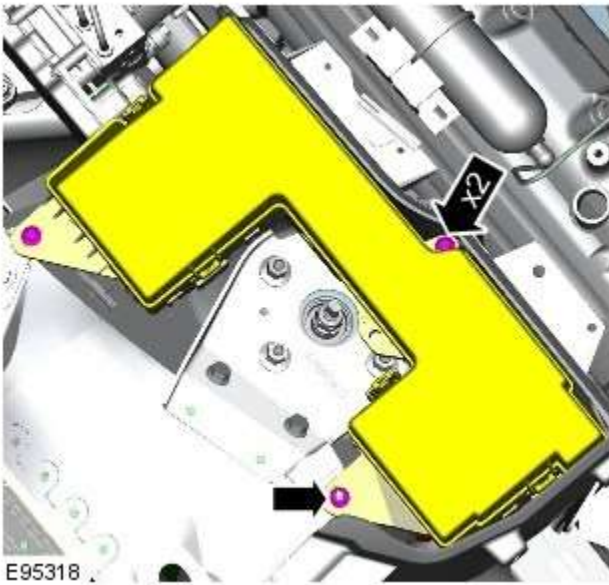
Make sure the wheel knuckle is supported. Failure to follow these instructions may result in damage to the vehicle.



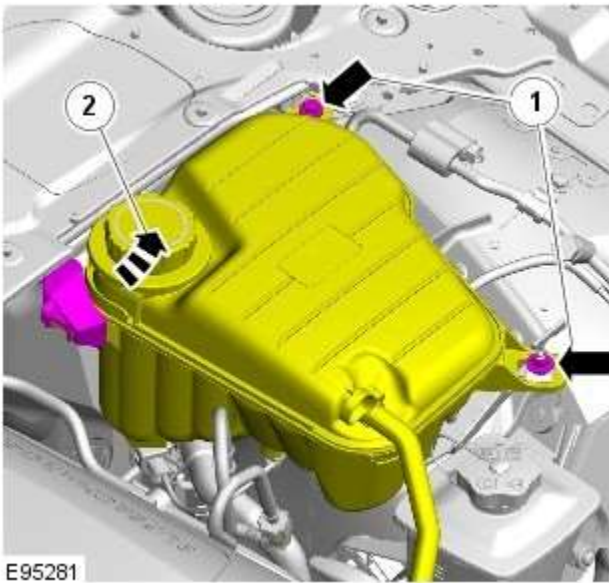
Use an Allen key to prevent the ball joint rotating whilst removing the nut.

Disconnect the upper arm from the wheel knuckle.

- Lower the vehicle.

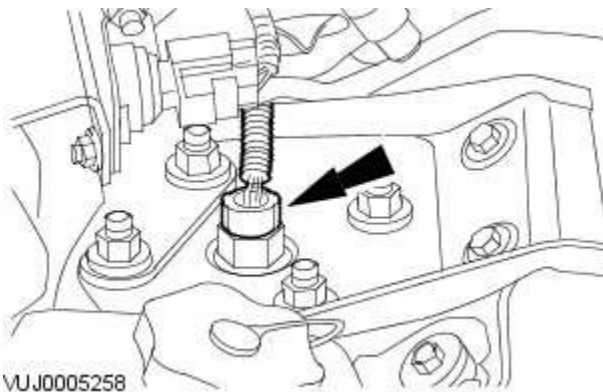


7. Release the fuse box.
 - Remove the 2 bolts and 1 nut.
 - Position the fuse box aside for access to the inboard retaining nut.



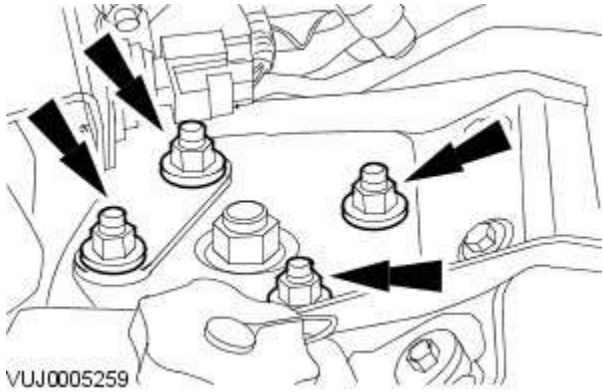
8. Release the coolant expansion tank for access.


Vehicles with supercharger




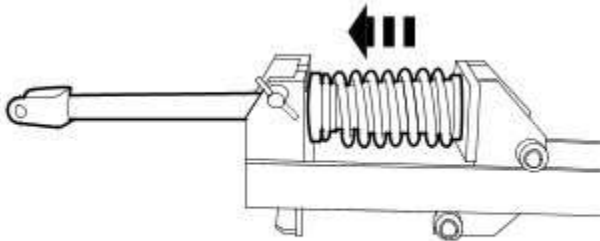
9. Disconnect the front shock absorber electrical connector.


All vehicles



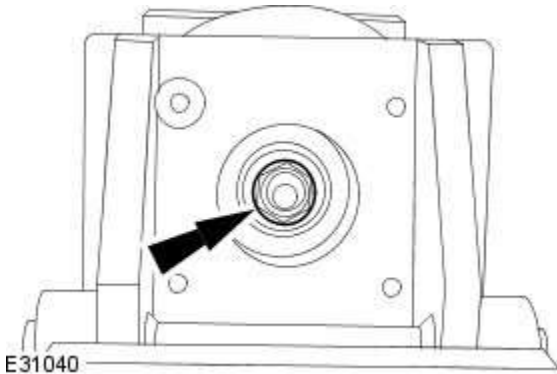
10.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.
- Remove the front shock absorber and spring assembly.

11.  NOTE: Do not disassemble further if the component is removed for access only.
- Install the front shock absorber and spring assembly in the spring compressor.



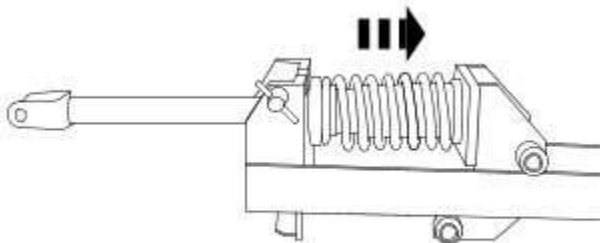
12.  WARNING: The spring is under extreme tension, care must be taken at all times. Failure to follow these instructions may result in personal injury.
- Compress the spring.

E31041



13. Remove the front shock absorber retaining nut

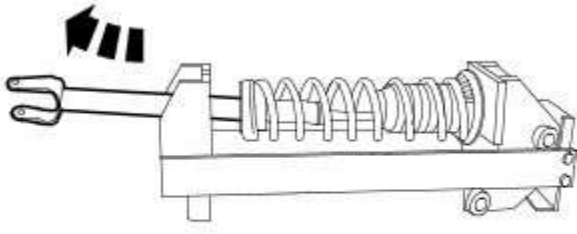
E31040



14. Carefully release the spring tension.

E31039

15. Remove the front shock absorber.

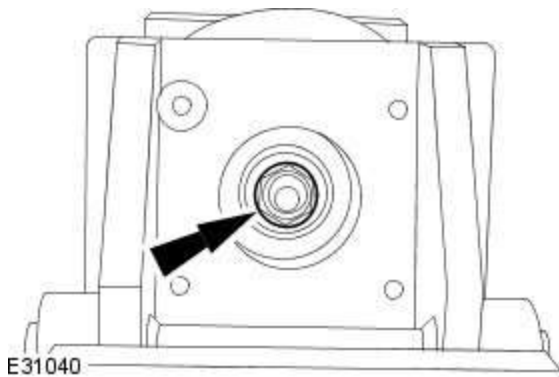


E31042

Installation

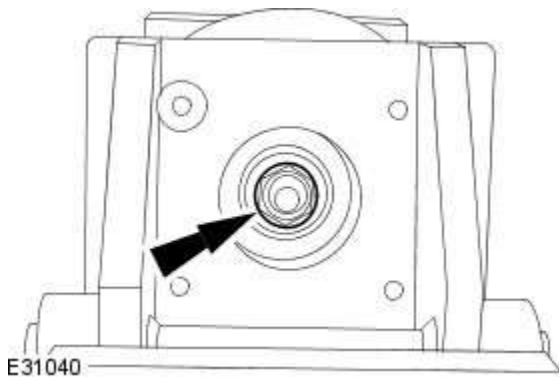
All vehicles

1. Vehicles without adaptive damping: Tighten the nut to 50 Nm.



E31040

2. Vehicles with adaptive damping: Tighten the nut to 27 Nm.

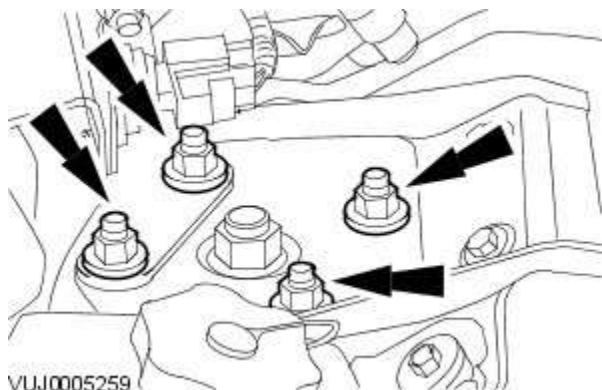


E31040

3. **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.

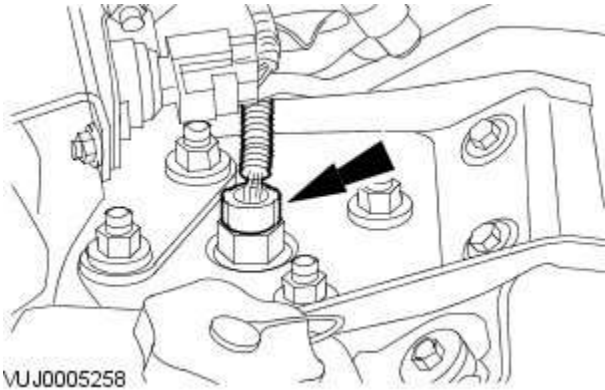
Install the front shock absorber and spring assembly.

- Tighten the nuts to 27 Nm.



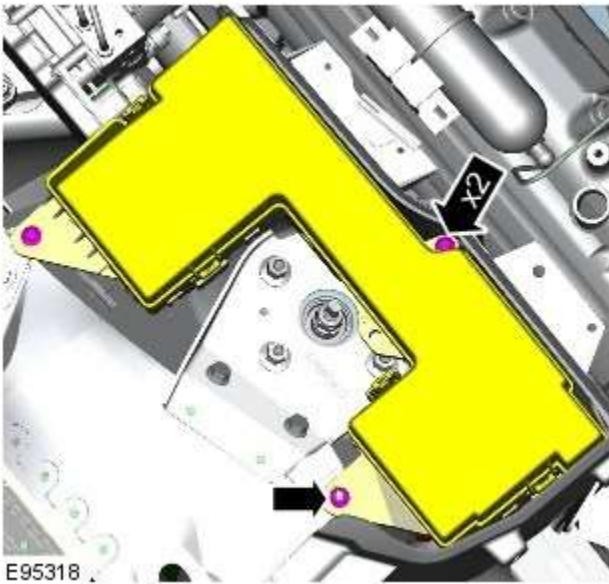
VUJ0005259

Vehicles with supercharger

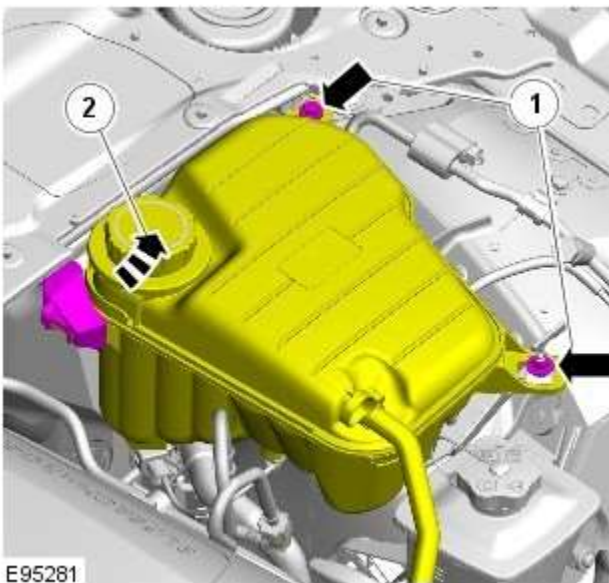


4. Connect the front shock absorber electrical connector.

All vehicles

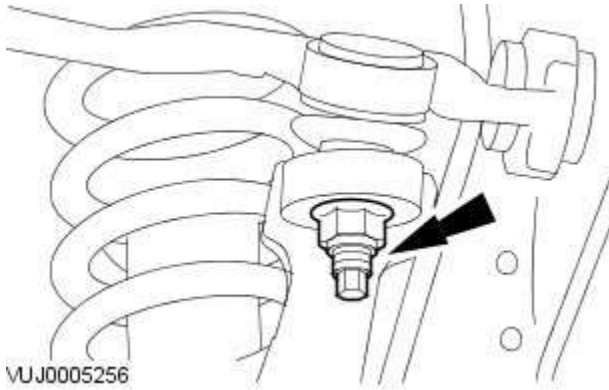


5. Secure the fuse box.




6. Secure the coolant expansion tank.
• Tighten to 10 Nm.

7. Raise the vehicle.



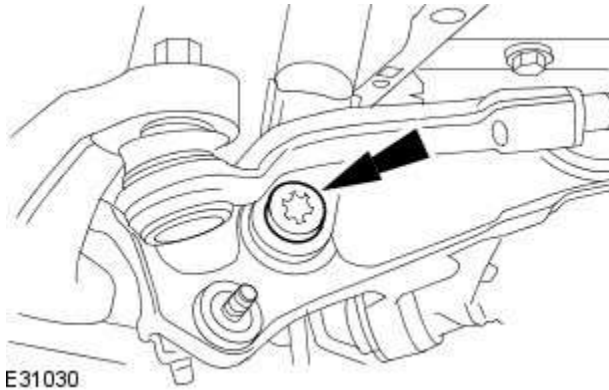
8. CAUTIONS:

 Use an Allen key to prevent the ball joint rotating whilst installing the nut.

 Make sure the wheel knuckle is supported. Failure to follow these instructions may result in damage to the vehicle.

Secure the upper arm to the wheel knuckle.

- Tighten the nut to 90 Nm.



9. Connect the front shock absorber and spring assembly to the lower arm.

- Tighten the bolt to 175 Nm.

10. Install the front stabilizer bar link.

For additional information, refer to: [Front Stabilizer Bar Link](#) (204-01 Front Suspension, Removal and Installation).

11. Install the front wheel and tire.


For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

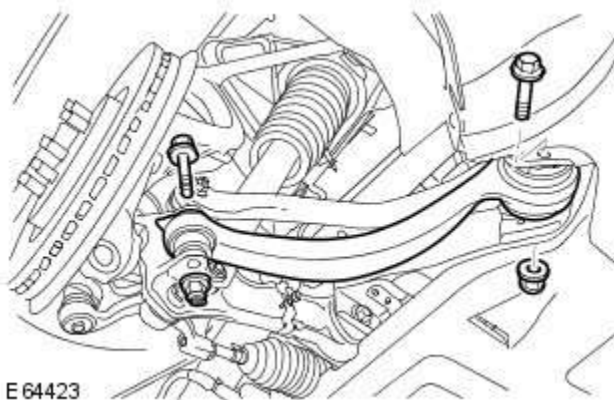
12. Lower the vehicle.

Front Suspension - Front Lower Arm

Removal and Installation

Removal

-  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
 Raise and support the vehicle.
- Remove the air deflector.
 For additional information, refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
- Remove the front wheel and tire.
 For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).



4. NOTES:



Note the fitted position.

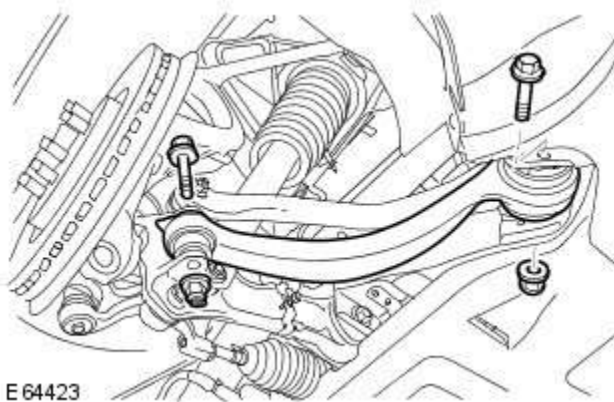


RH illustration shown, LH is similar

Release the front lower arm.

- Remove the 2 bolts and discard the nuts.

Installation

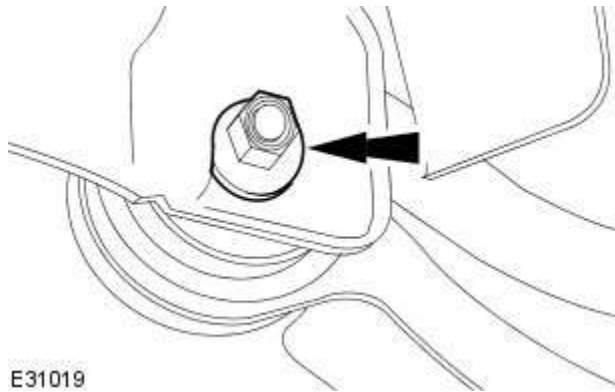


-  **NOTE:** RH illustration shown, LH is similar

Install the front lower arm.

- Install the bolt and tighten the new nut to 60 Nm + 135 degrees.
- Install the front lower arm inner retaining nut and bolt, but do not fully tighten at this stage.

- Install the front wheel and tire.
 For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
- Lower the vehicle.



E31019

4. **CAUTION:** The final tightening of the front lower arm inner retaining nut and bolt must be carried out with the vehicle on its wheels

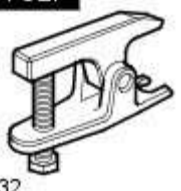
Tighten the 14mm bolt to 175 Nm.

5. Install the air deflector.
For additional information, refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
6. Lower the vehicle.
7. Using only four-wheel alignment equipment approved by Jaguar, check the wheel alignment, and adjust if required.


Front Suspension - Rear Lower Arm

Removal and Installation

Special Tool(s)

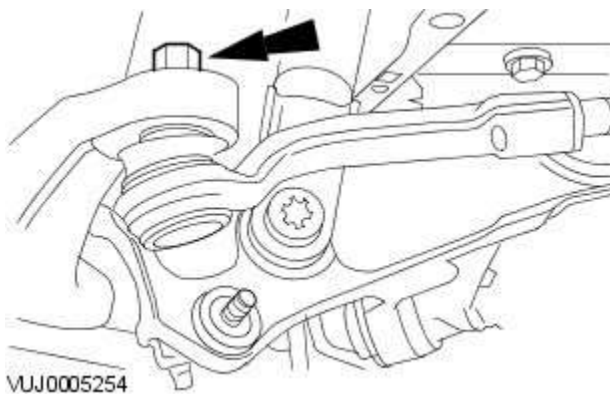
 <p>204-327</p> <p>E63732</p>	<p>Ball joint splitter</p> <p>204-327</p>
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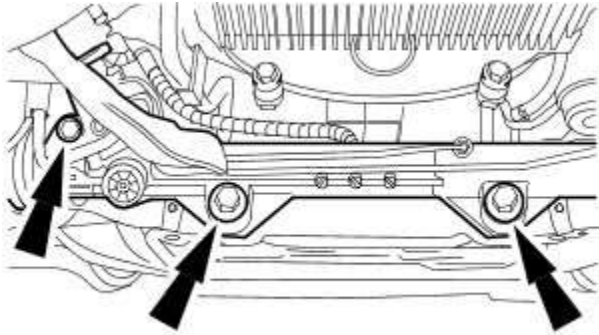
Removal

-  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise the vehicle on a 4 post lift.
- Remove the engine undertray.
For additional information, refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
- WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

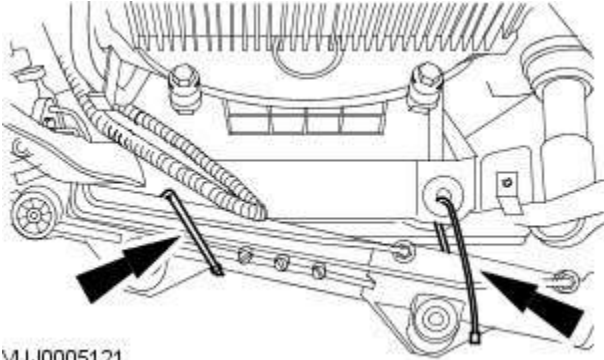
Raise and support the body.
- Remove the wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
- Remove the stabilizer bar link.
For additional information, refer to: [Front Stabilizer Bar Link](#) (204-01 Front Suspension, Removal and Installation).
- Release the tie rod.





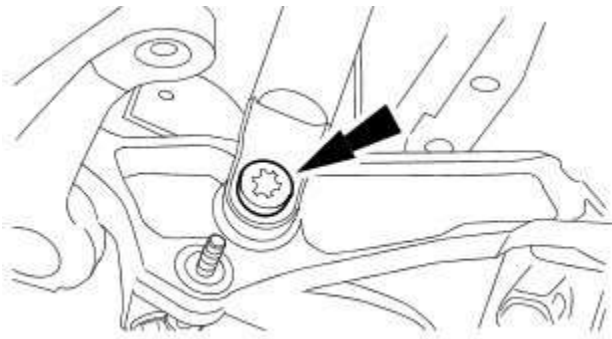
VUJ0005142

7. Release the steering gear.



VUJ0005121

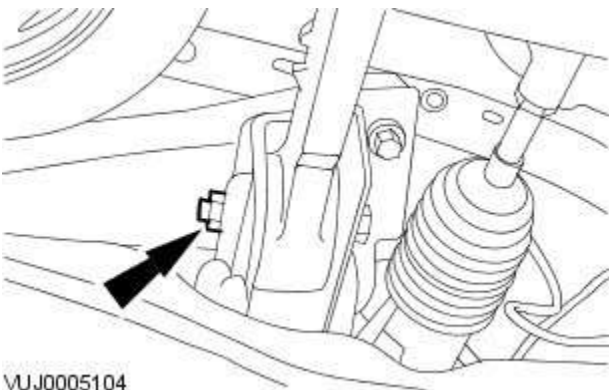
8. Secure the steering gear.



VUJ0005255

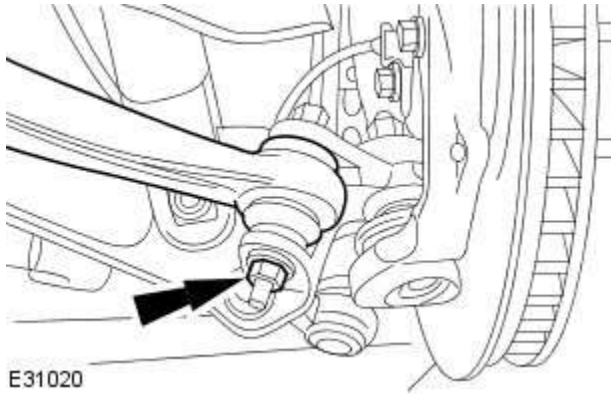
Release the shock absorber and spring assembly.

9.



VUJ0005104

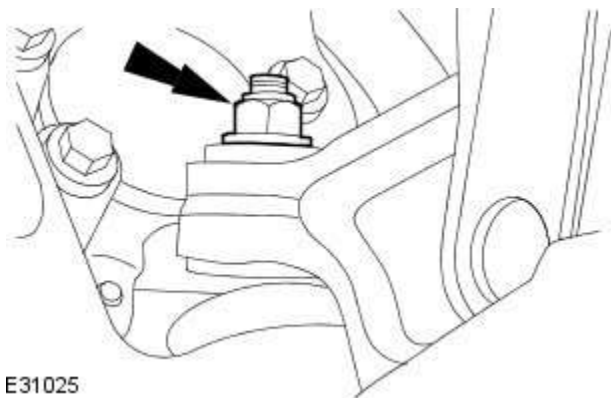
10. Remove the rear lower arm inner bolt.




E31020
11.

Release the front lower arm.

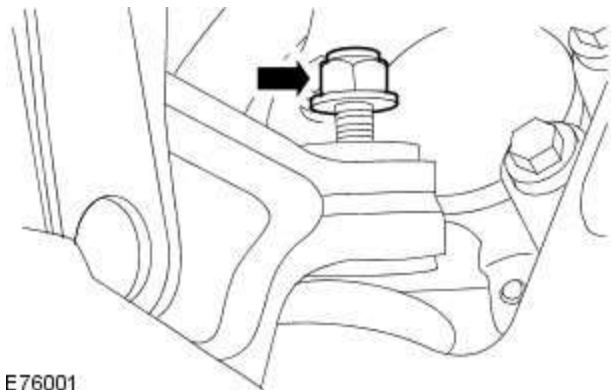
- Remove and discard the nut and bolt.




E31025

12.  CAUTION: Prevent the rear lower arm ball joint ball pin hexagon from rotating. Failure to follow this instruction may result in damage to the lower ball joint boot.

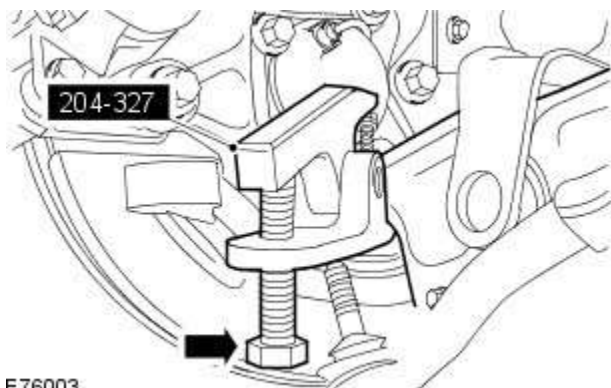
Loosen the rear lower arm ball joint retaining nut.




E76001
13.

-  CAUTION: Prevent the rear lower arm ball joint ball pin hexagon from rotating. Failure to follow this instruction may result in damage to the lower ball joint boot.


Adjust the rear lower arm ball joint retaining nut until the ball joint thread cannot be seen.




E76003

14.  WARNING: Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in personal injury.

CAUTIONS:

-  Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in damage to the special tool.

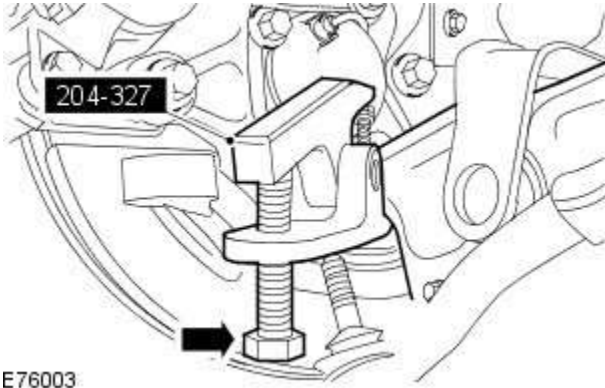
-  Make sure the special tool is correctly located and the lower ball joint boot is not damaged while carrying out the operation. Failure to follow this instruction may result in damage to the component.


Using the special tool, release the rear lower arm ball joint from the wheel knuckle lower pivot.

- Tighten the special tool adjusting bolt to a maximum of


60 Nm.


- If the rear lower arm ball joint releases from the wheel knuckle lower pivot, using no more than 60 Nm on the special tool adjusting bolt, proceed to step 13.
- If the rear lower arm ball joint does not release from the wheel knuckle lower pivot, using no more than 60 Nm on the special tool adjusting bolt, proceed to step 12.




15.  **WARNING:** Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in personal injury.

CAUTIONS:

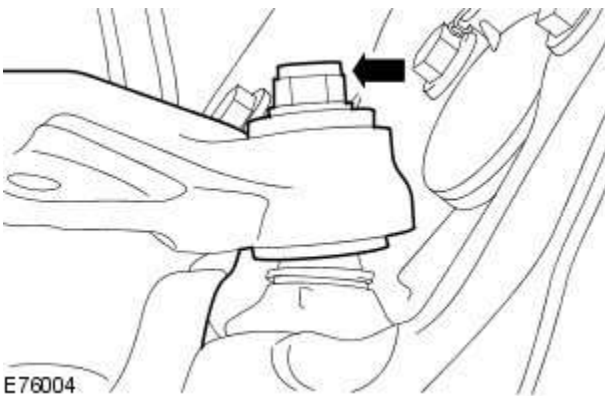
 Make sure the special tool is supported while carrying out the operation. Failure to follow this instruction may result in damage to the special tool.


 Make sure the special tool is correctly located and the lower ball joint boot is not damaged while carrying out the operation. Failure to follow this instruction may result in damage to the component.

 **NOTE:** Do not carry out this step if the rear lower arm ball joint released from the wheel knuckle lower pivot in step 12.

Using the special tool, release the rear lower arm ball joint from the wheel knuckle lower pivot.

- Tighten the special tool adjusting bolt to a maximum of 60 Nm.
- Strike the top surface of the special tool directly above the rear lower arm ball joint at the point indicated using a copper mallet.

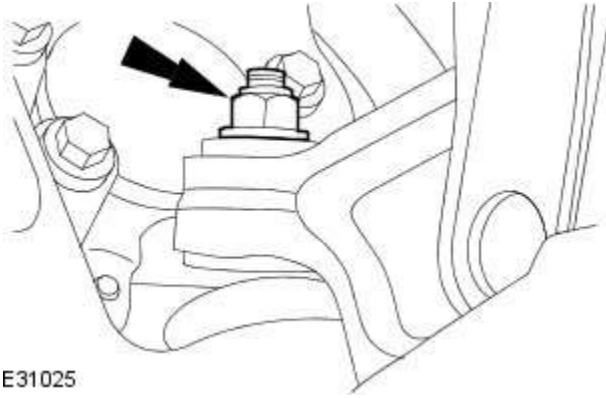


16.  **CAUTION:** Prevent the rear lower arm ball joint ball pin hexagon from rotating. Failure to follow this instruction may result in damage to the lower ball joint boot.


Remove the rear lower arm.

- Remove and discard the retaining nut.

Installation



E31025

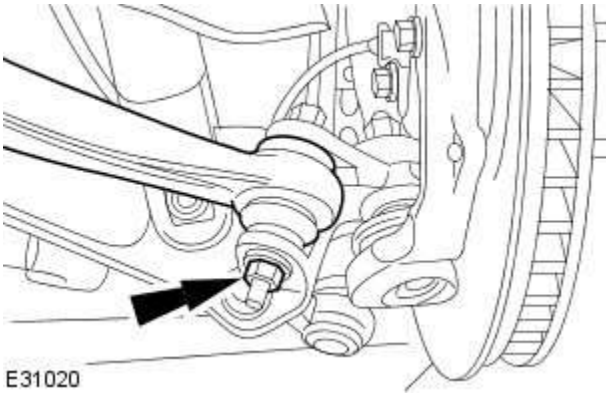
1.  **WARNING:** Make sure that a new lower arm ball joint nut is installed.



CAUTION: Prevent the rear lower arm ball joint ball pin hexagon from rotating. Failure to follow this instruction may result in damage to the lower ball joint boot.

Install the rear lower arm.

- Tighten the nut to 92 Nm.

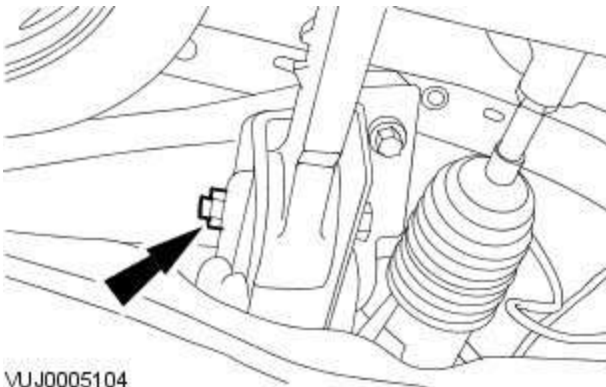


E31020

2.  **NOTE:** Install a new retaining nut and bolt.

Secure the front lower arm.

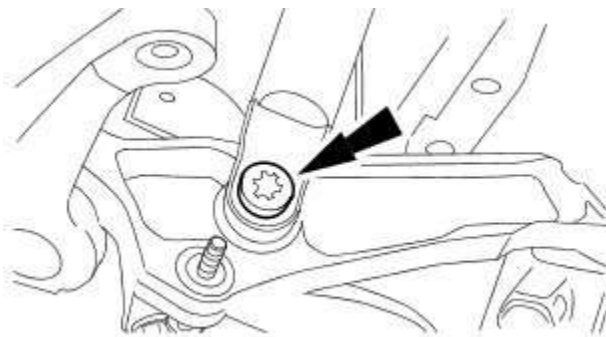
- Stage 1: Tighten to 60 Nm.
- Stage 2: Tighten to a further 135 degrees.



VUJ0005104

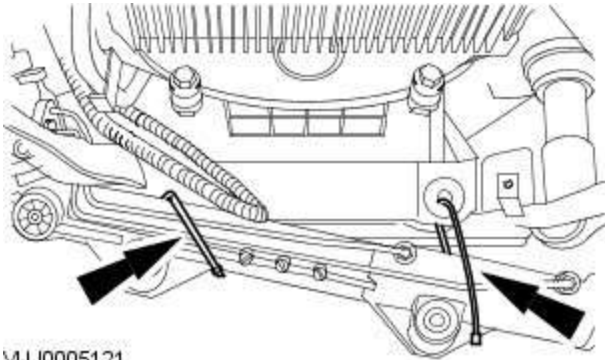
3. Secure the rear lower arm.

- Install the rear lower arm inner retaining nut, but do not tighten fully at this stage.



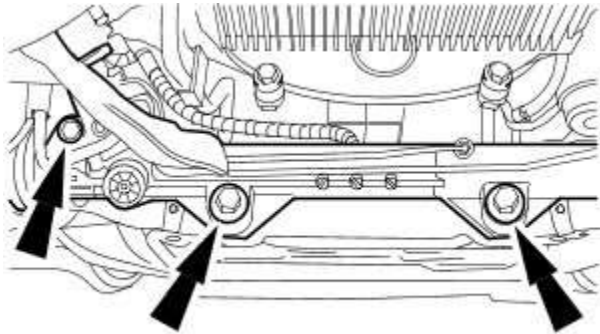
VUJ0005255

4. Install the shock absorber and spring assembly.
- Tighten the bolt to 175 Nm.



VUJ0005121

5. Remove and discard the retaining straps.



VUJ0005142

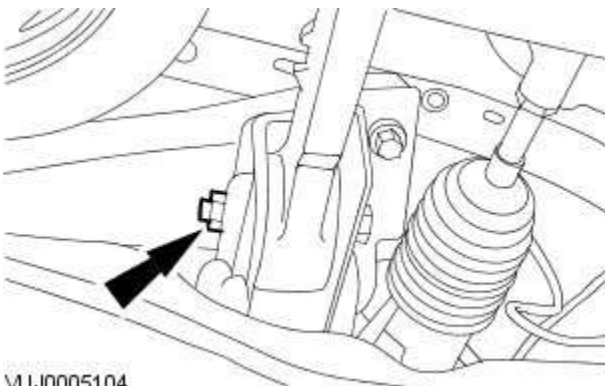
6. Install the steering gear.
 - Tighten the bolts to 100 Nm.

7. Secure the tie rod end.
 - Tighten the nut to 55 Nm.


8. Install the stabilizer bar link.
For additional information, refer to: [Front Stabilizer Bar Link](#) (204-01 Front Suspension, Removal and Installation).

9. Install the wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

10. Lower the body.



VUJ0005104

11.  **CAUTION:** The final tightening of the upper arm must be carried out with the vehicle on it's wheels.

Tighten to 175 Nm.

12. Install the engine undertray.
For additional information, refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

13. Using only four-wheel alignment equipment approved by Jaguar, check

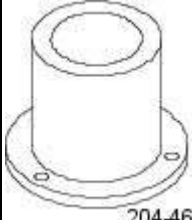
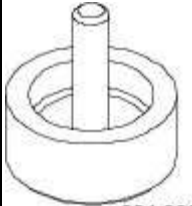
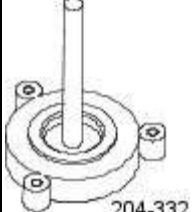
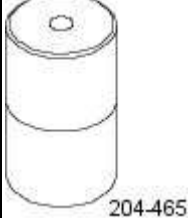
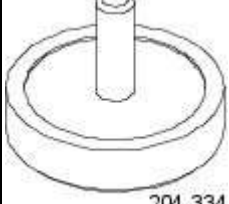
and adjust the wheel alignment.

For additional information, refer to: [Camber and Caster Adjustment](#)
(204-00 Suspension System - General Information, General Procedures).

Front Suspension - Rear Lower Arm Bushing

Removal and Installation

Special Tool(s)

 <p>204-464</p>	<p>Rear lower arm bushing remover and installer 204-464</p>
 <p>204-333</p>	<p>Rear lower arm bushing remover 204-333</p>
 <p>204-332</p>	<p>Rear lower arm bushing installer 204-332</p>
 <p>204-465</p>	<p>Rear lower arm bushing installer 204-465</p>
 <p>204-334</p>	<p>Rear lower arm bushing installer 204-334</p>

Removal

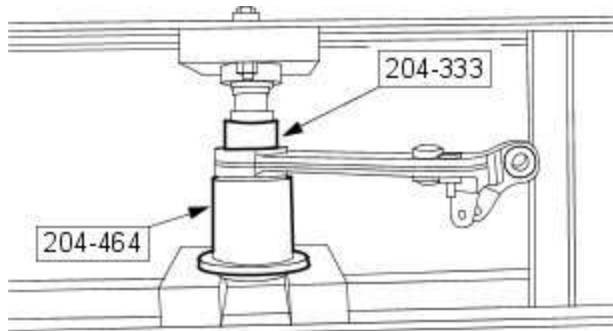


CAUTION: Nuts and bolts must be tightened with the weight of the vehicle on the suspension.


1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the rear lower arm.
For additional information, refer to: [Rear Lower Arm](#) (204-01 Front Suspension, Removal and Installation).

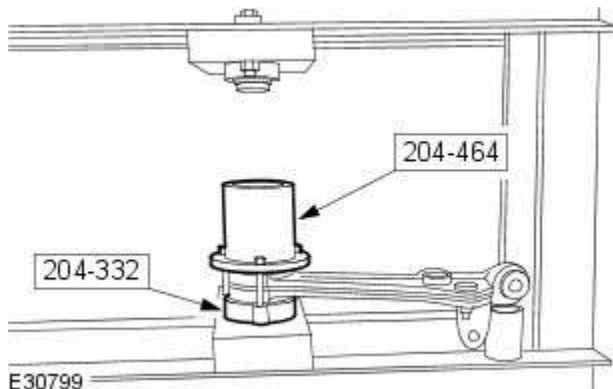


E30796

3.  NOTE: Note the fitted position.

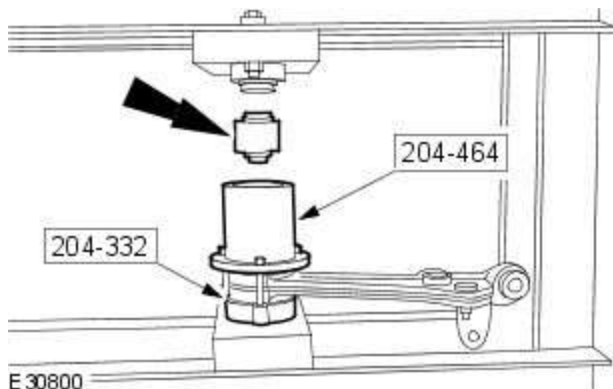
Using the special tools, remove and discard the lower arm rear bushings.

Installation




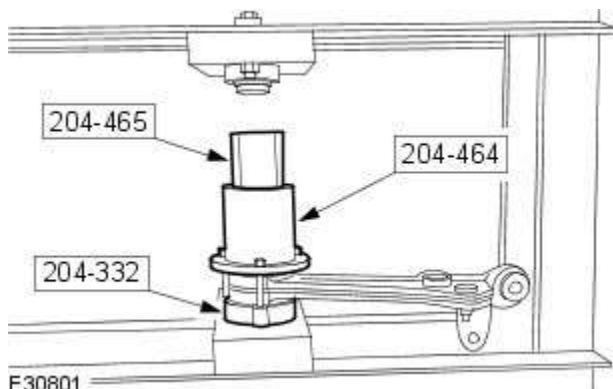
E30799

1. Install the special tools to the rear lower arm.
 • Tighten the bolts.



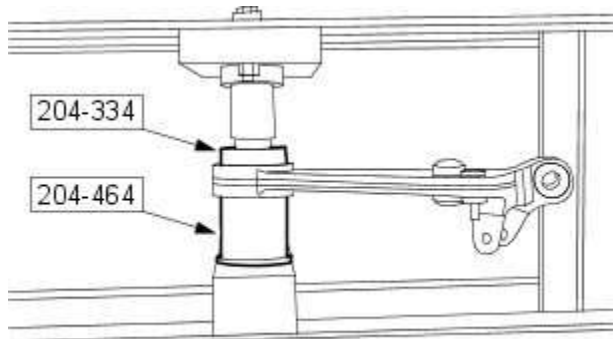
E30800

2.  NOTE: Align to the position noted on removal.
 Position the bushing in the special tool.



E30801

3. Using the special tools, partially install the lower arm bushing.



E30802





4. Change the special tools, then complete installation of the bushing.

5. Install the rear lower arm.
For additional information, refer to: [Rear Lower Arm](#) (204-01 Front Suspension, Removal and Installation).

Front Suspension - Shock Absorber Bushing

Removal and Installation

Special Tool(s)

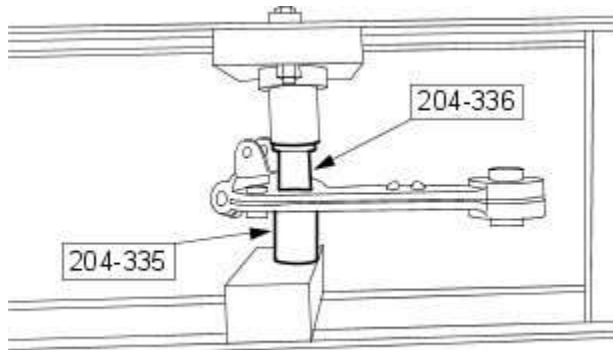
 <p>204-337</p>	<p>Replacer support-bush 204-337</p>
 <p>204-338</p>	<p>Replacer-bush 204-338</p>
 <p>204-336</p>	<p>Remover-bush 204-336</p>
 <p>204-335</p>	<p>Remover support-bush 204-335</p>

Removal



CAUTION: Nuts and bolts must be tightened with the weight of the vehicle on the suspension.

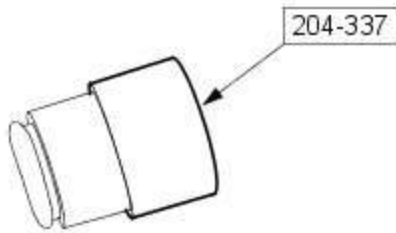
1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
Raise the vehicle on a 4 post lift.
2. Remove the rear lower arm.
For additional information, refer to: [Rear Lower Arm](#) (204-01 Front Suspension, Removal and Installation).



E30779

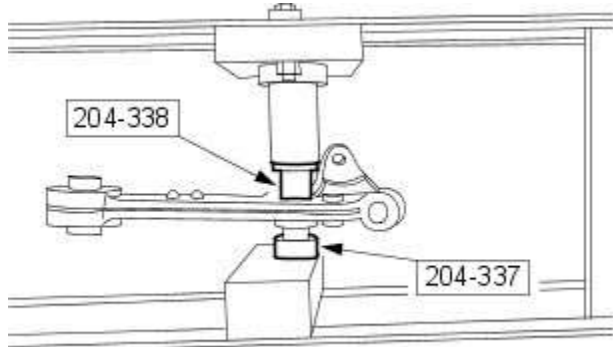
3. **NOTE:** Take note of the fitted position of the bush. Using the special tools, remove the shock absorber bushing.

Installation




E30781

1. **NOTE:** Make sure the shock absorber bushing boot is correctly located into the special tool.
Install the bushing into the special tool.



E30782

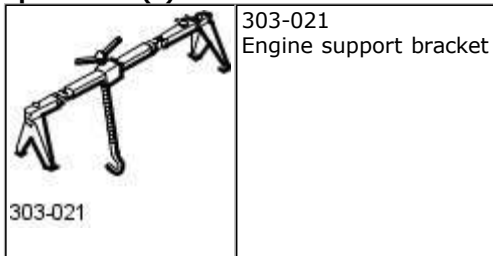
2.  **NOTE:** Align to the position noted on removal.
Using the special tools, install the shock absorber bushing.

3. Install the rear lower arm.
For additional information, refer to: [Rear Lower Arm](#) (204-01 Front Suspension, Removal and Installation).

Front Suspension - Front Stabilizer Bar V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Special Tool(s)



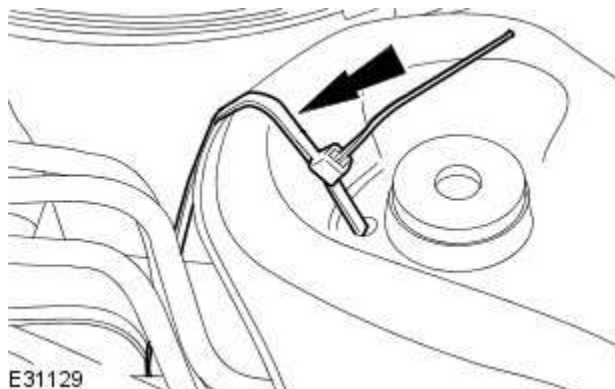
Removal



NOTE: Removal steps in this procedure may contain installation details.

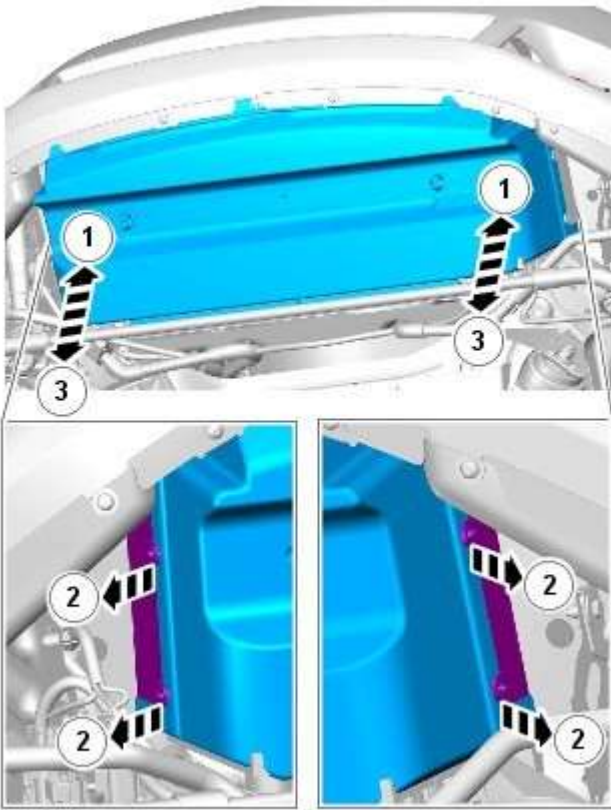
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.
3. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
4. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).
5. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
6. Refer to: [Front Wheel Bearing and Wheel Hub - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (204-01 Front Suspension, Removal and Installation).
7. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



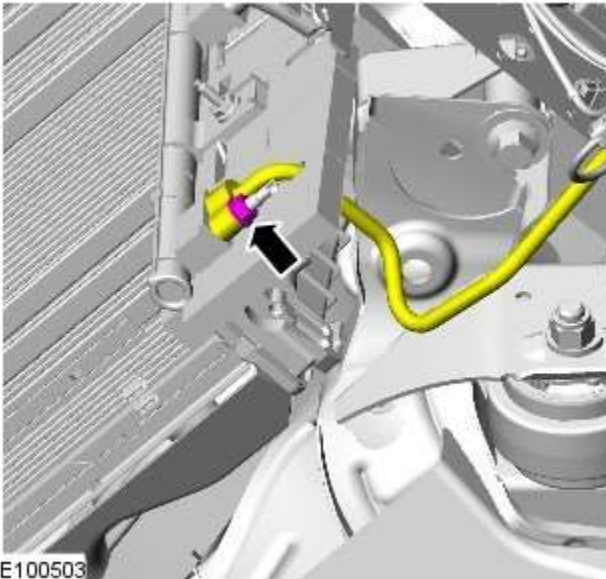
8.
 - Secure the radiator assembly.

- 9.
- Raise and support the vehicle.

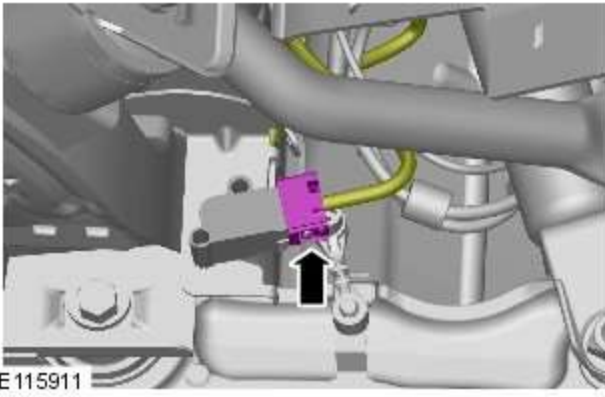


E97870

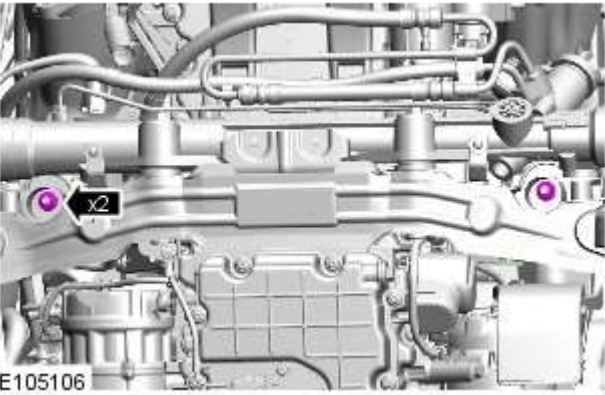
10. Torque: 8 Nm




E100503

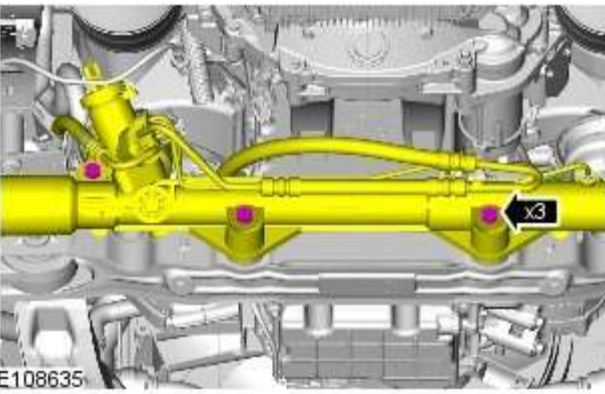



11.  NOTE: LH illustration shown, RH is similar.



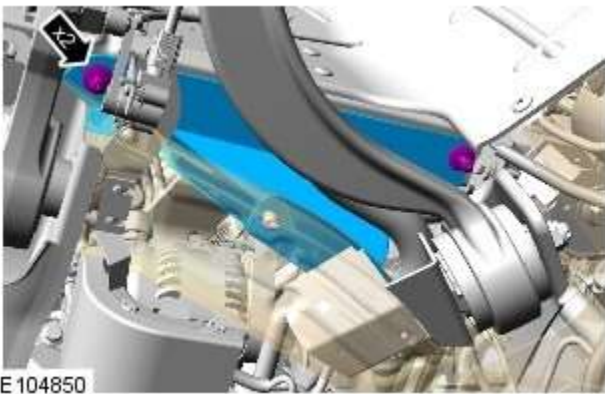
12.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 45 Nm



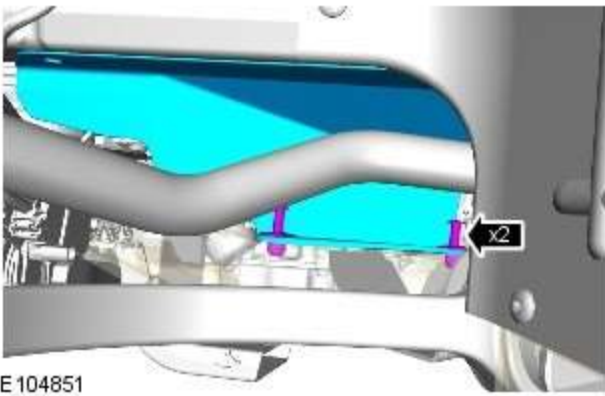
13.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 100 Nm



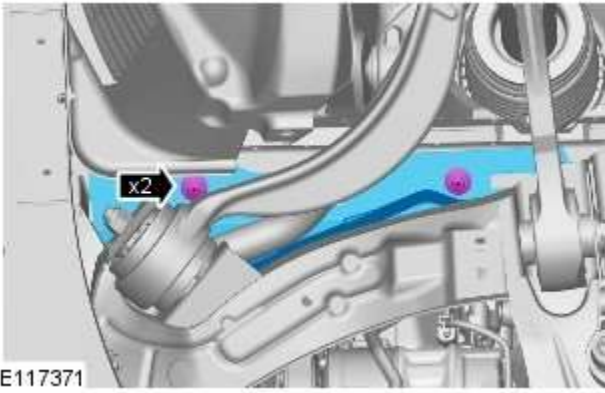
14.

15.



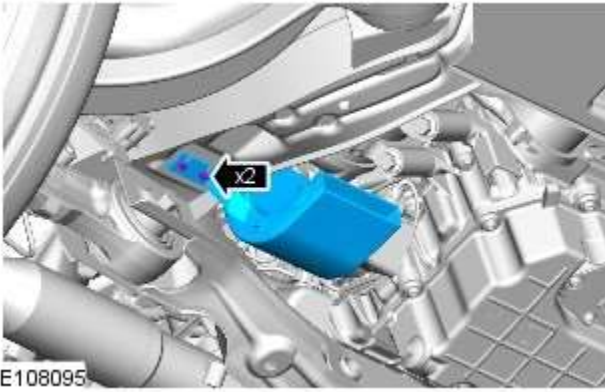
E104851

16.



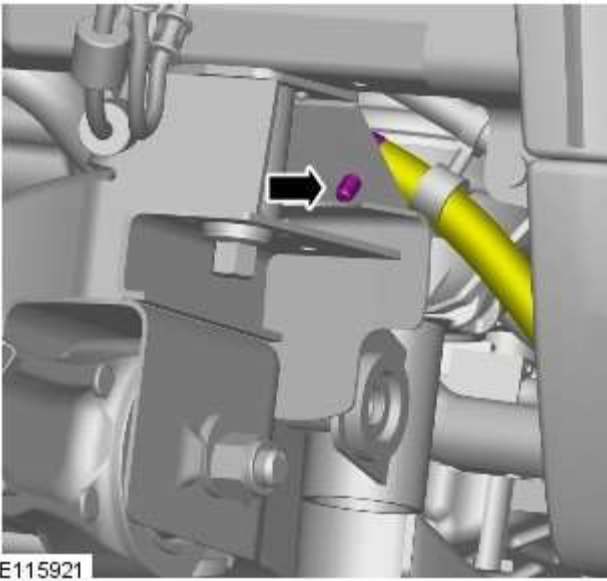
E117371


17.

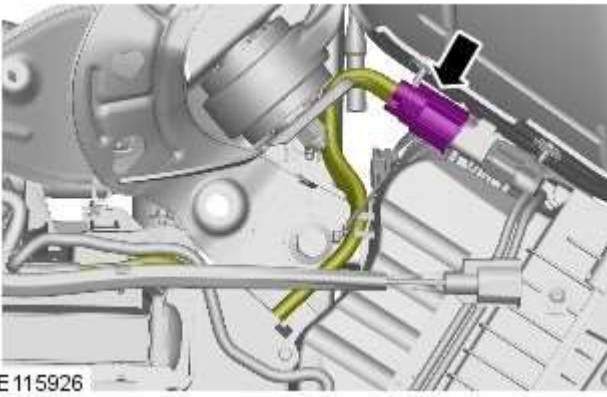


E108095

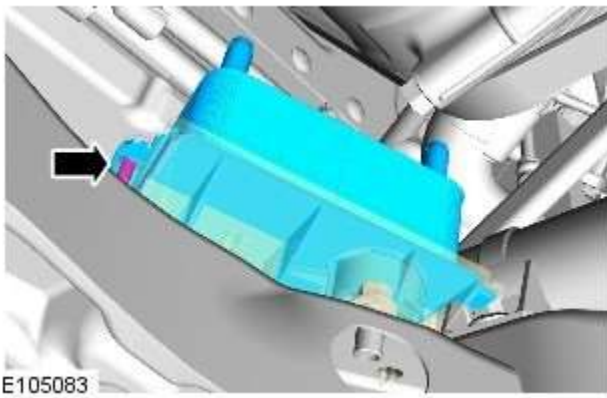
18.



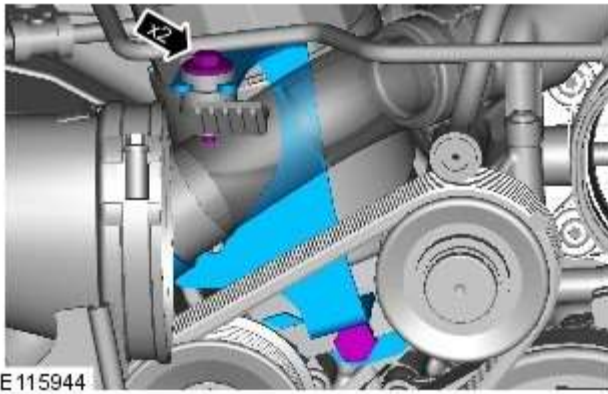
19.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



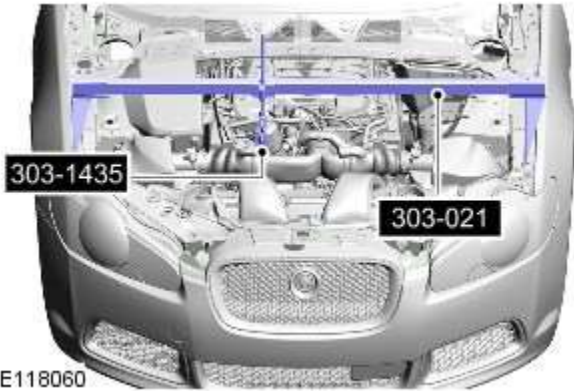
20. Torque: 5 Nm



21. Lower the vehicle.




22. Torque:
M6 9 Nm
M10 40 Nm




23. CAUTIONS:

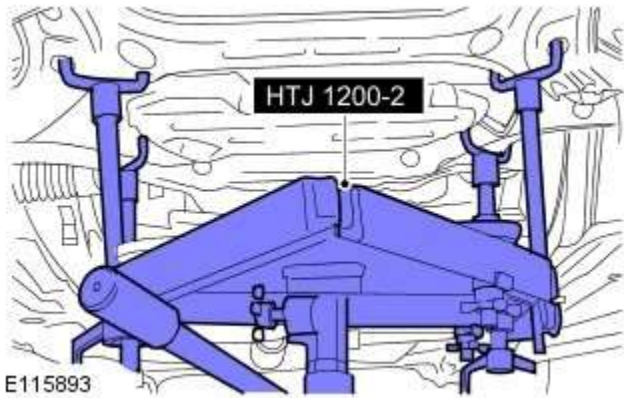
 Support the engine on a jack. The angle may need to be adjusted during this procedure.

 Make sure to protect the paintwork.

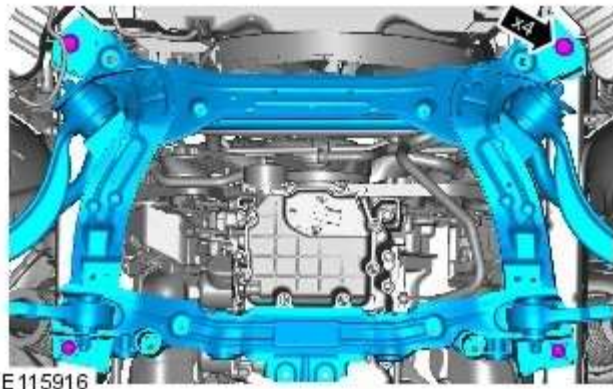
Special Tool(s): [303-021](#)

24.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

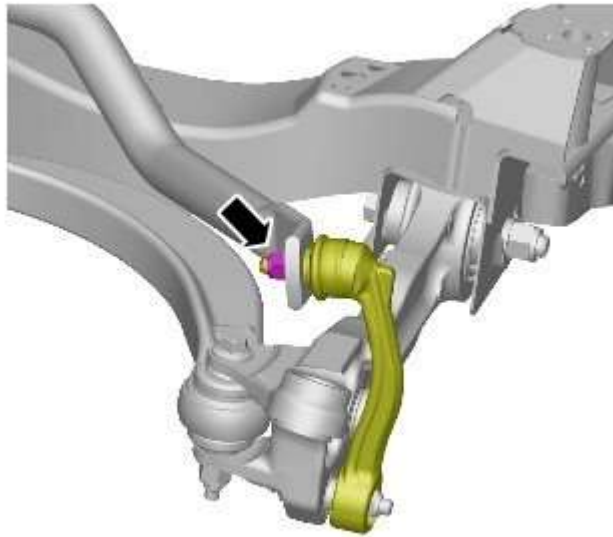


25.



E115916

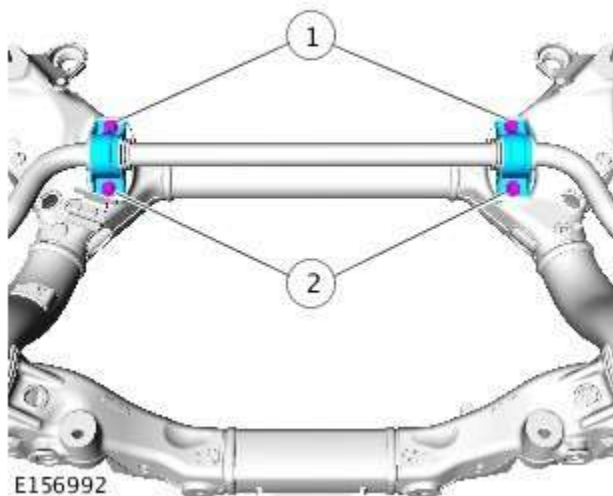
26.



E118885

27.  NOTE: LH illustration shown, RH is similar.

Torque: 43 Nm



E156992

28. During installation tighten the bolts in the following sequence.

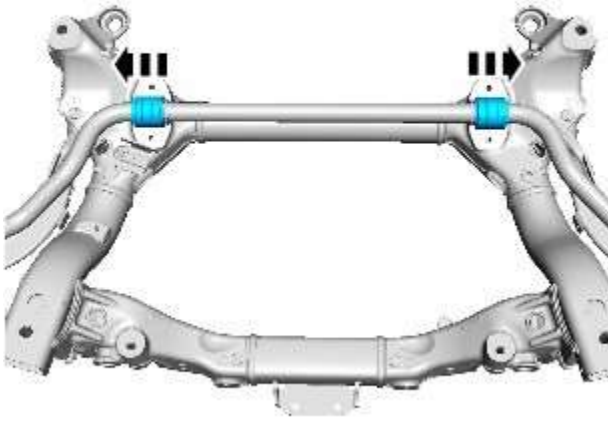
Torque:

Bolt 1 55 Nm

Bolt 2 55 Nm

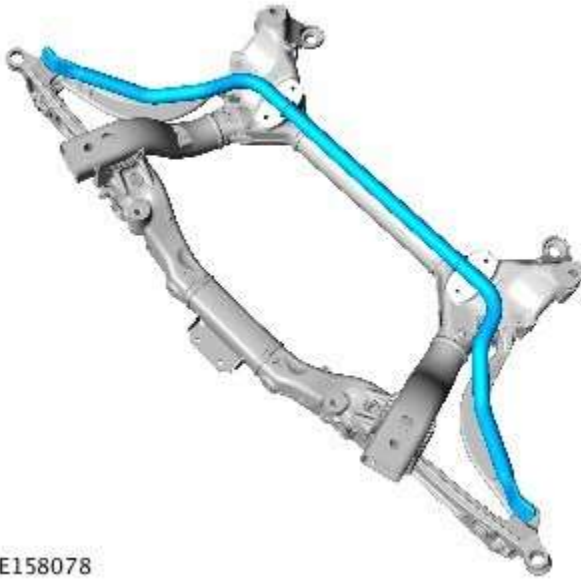
Bolt 1 55 Nm

29.



E154239

30.



E158078


Installation

1. To install, reverse the removal procedure.
2. Refer to: [Camber and Caster Adjustment](#) (204-00 Suspension System - General Information, General Procedures).

Front Suspension - Front Stabilizer Bar Link

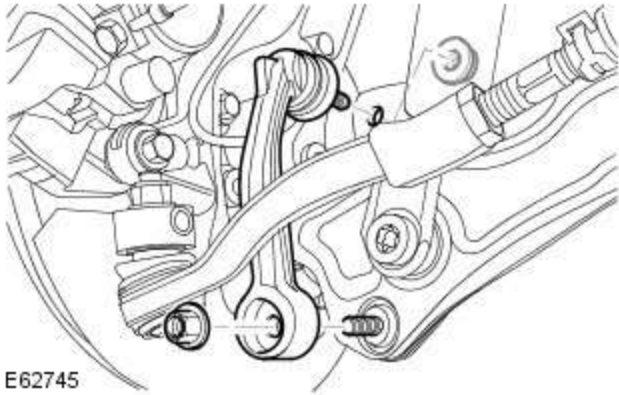
Removal and Installation

Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Remove the front wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

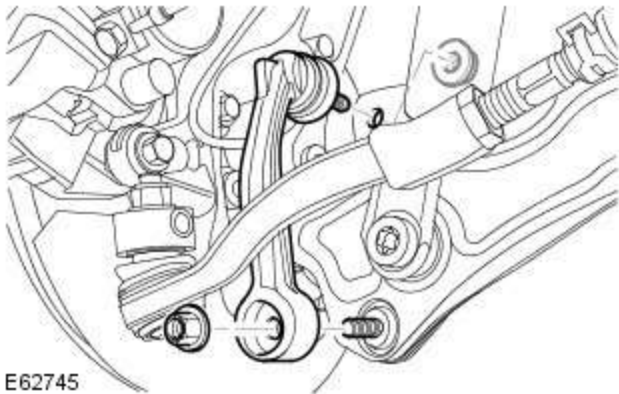


3. **NOTE:** Use an additional wrench to prevent the ball joint rotating.

Remove the front stabilizer bar link.

- Remove and discard the 2 nuts.

Installation



1. **NOTE:** Use an additional wrench to prevent the ball joint rotating.

Install the front stabilizer bar link.

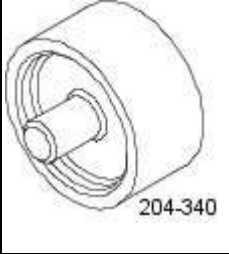
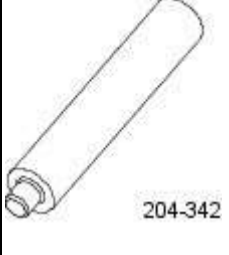
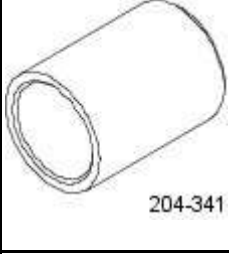
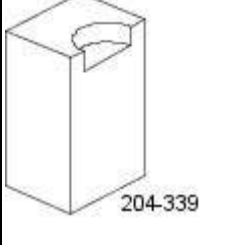
- Tighten the upper nut to 47 Nm.
- Tighten the lower nut to 70 Nm.

2. Install the wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

Front Suspension - Stabilizer Bar Link Bushing

Removal and Installation

Special Tool(s)

 <p>204-340</p>	<p>Bush installer 204-340</p>
 <p>204-342</p>	<p>Bush remove 204-342</p>
 <p>204-341</p>	<p>Support 204-341</p>
 <p>204-339</p>	<p>Support 204-339</p>

Removal

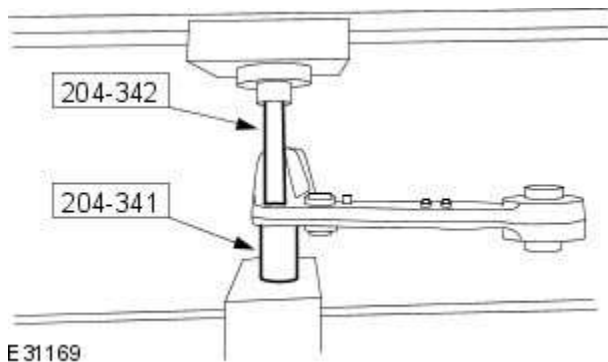


CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise the vehicle on a 4 post lift.

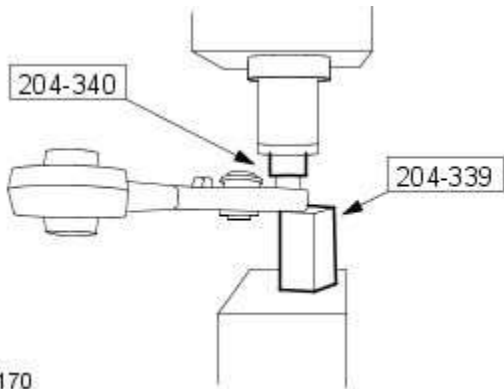
2. Remove the rear lower arm.
For additional information, refer to: [Rear Lower Arm](#) (204-01 Front Suspension, Removal and Installation).




E31169

3. Using the special tools, remove and discard the stabilizer bar link bushing.

Installation



E31170


1.  NOTE: Apply water to lubricate the bushing.
Using the special tools, install the stabilizer bar link bushing.

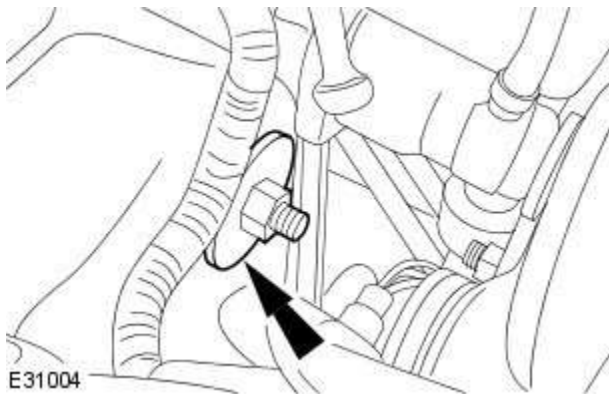
2. Install the rear lower arm.
For additional information, refer to: [Rear Lower Arm](#) (204-01 Front Suspension, Removal and Installation).

Front Suspension - Upper Arm LH

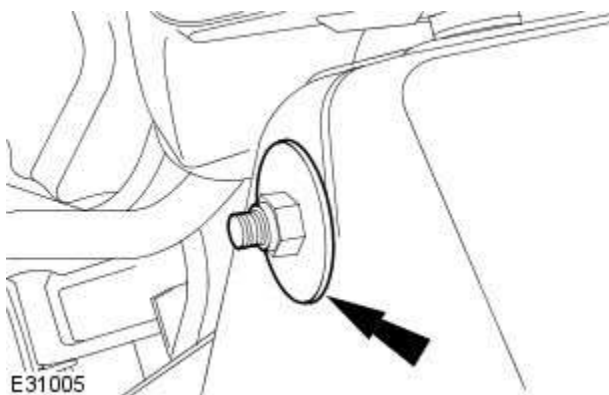
Removal and Installation


Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
Raise and support the vehicle.
2. Remove the front shock absorber.
For additional information, refer to: [Front Shock Absorber](#) (204-01 Front Suspension, Removal and Installation).
3. Remove the secondary bulkhead panel LH.
For additional information, refer to: [Secondary Bulkhead Panel LH - 3.0L NA V6 - AJ27](#) (501-02 Front End Body Panels, Removal and Installation).
4. Remove the air cleaner.
For additional information, refer to: Air Cleaner (303-12A, Removal and Installation) / [Air Cleaner](#) (303-12B Intake Air Distribution and Filtering - V6 3.0L Petrol, Removal and Installation) / Air Cleaner (303-12C, Removal and Installation) / Air Cleaner LH (303-12D, Removal and Installation).



5. **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.
Remove the upper arm retaining nut.

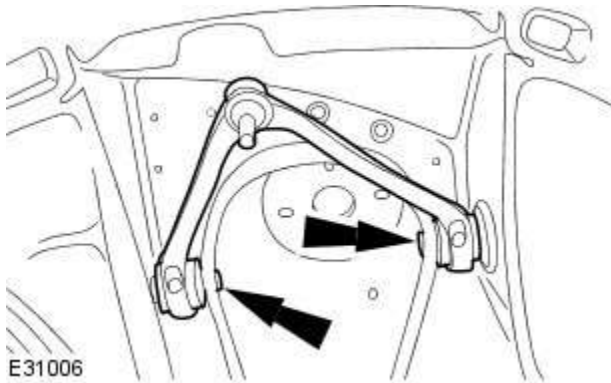


6.  **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.
Remove the upper arm retaining nut.

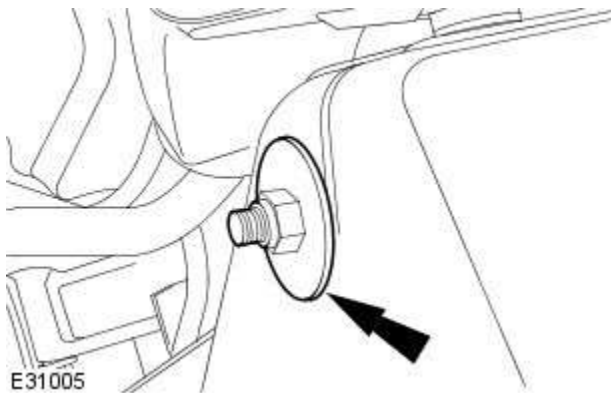



7. Remove the upper arm.

Installation

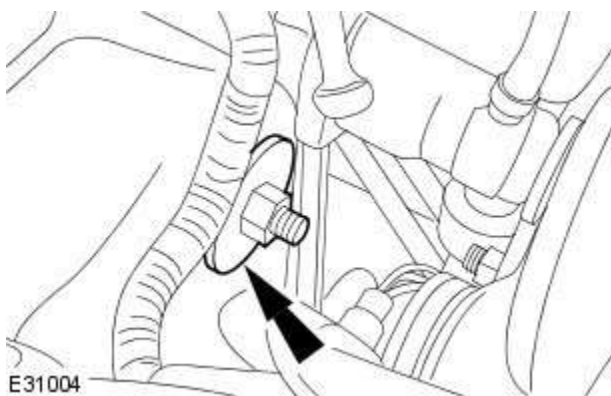



1. Install the upper arm.



2.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Install the upper arm retaining nut, but do not tighten fully at this stage.

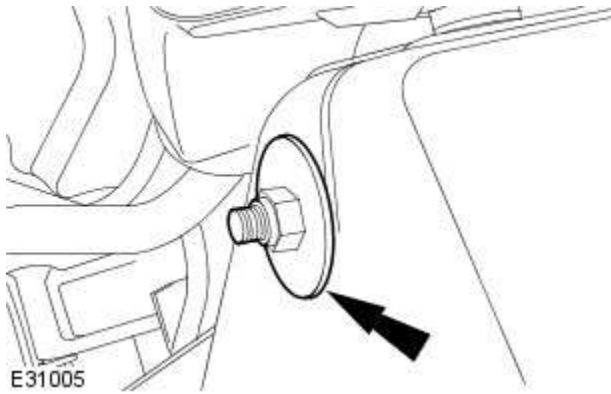


3.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Install the upper arm retaining nut, but do not tighten fully at this stage.

4. Install the front shock absorber.
For additional information, refer to: [Front Shock Absorber](#) (204-01 Front

Suspension, Removal and Installation).

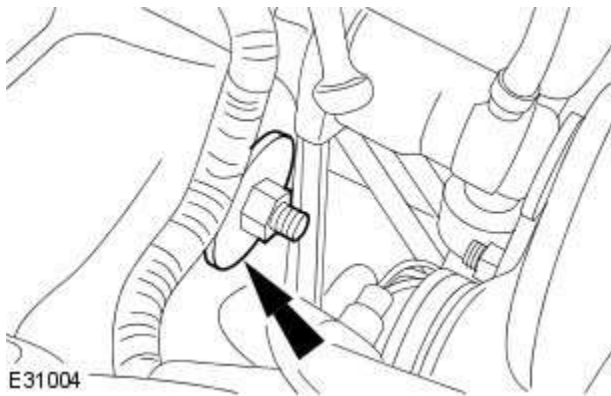


5. **CAUTION:** The final tightening of the suspension components must be carried out with the vehicle on its wheels.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Tighten to 47 Nm.



6. **CAUTION:** The final tightening of the suspension components must be carried out with the vehicle on its wheels.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Tighten to 47 Nm.

7. Install the air cleaner.

For additional information, refer to: Air Cleaner (303-12A, Removal and Installation) /

[Air Cleaner](#) (303-12B Intake Air Distribution and Filtering - V6 3.0L Petrol, Removal and Installation) /

Air Cleaner (303-12C, Removal and Installation) /

Air Cleaner LH (303-12D, Removal and Installation).


8. Install the secondary bulkhead panel LH.

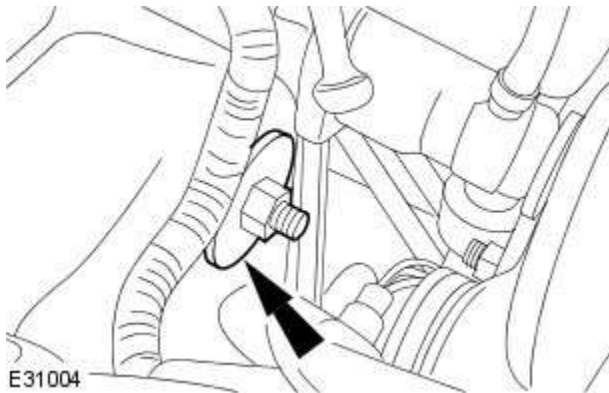
For additional information, refer to: [Secondary Bulkhead Panel LH - 3.0L NA V6 - AJ27](#) (501-02 Front End Body Panels, Removal and Installation).

Front Suspension - Upper Arm RH

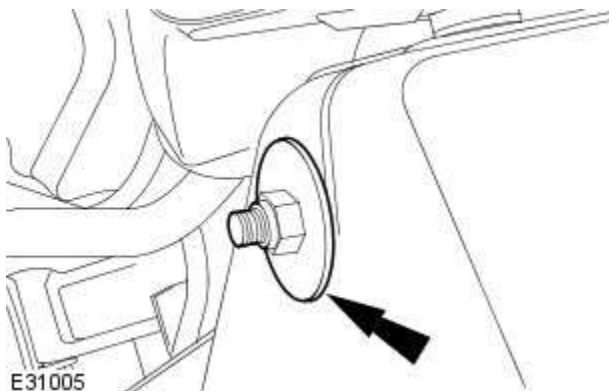
Removal and Installation


Removal

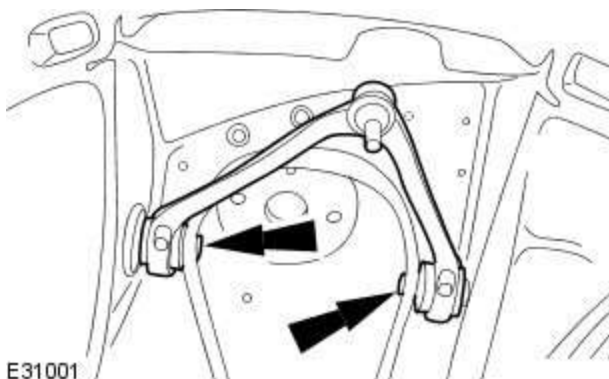
1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
Raise and support the vehicle.
2. Remove the front shock absorber.
For additional information, refer to: [Front Shock Absorber](#) (204-01 Front Suspension, Removal and Installation).
3. Remove the secondary bulkhead panel RH.
For additional information, refer to: [Secondary Bulkhead Panel RH - 3.0L NA V6 - AJZ7](#) (501-02 Front End Body Panels, Removal and Installation).



4. **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.
Remove the upper arm retaining nut.



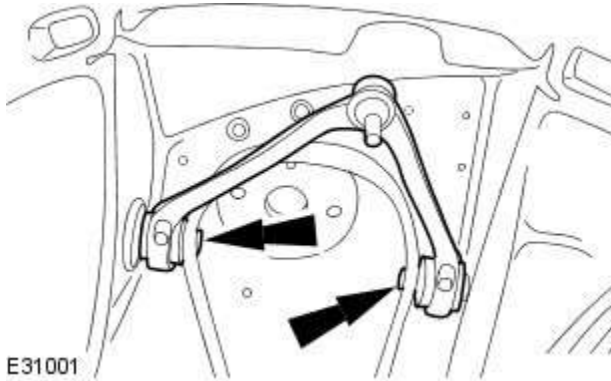
5.  **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.
Remove the upper arm retaining nut.




6. Remove the upper arm.

Installation

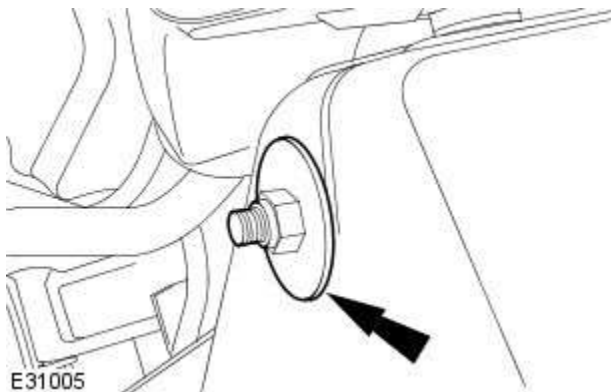
1. Install the upper arm.




E31001

2.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

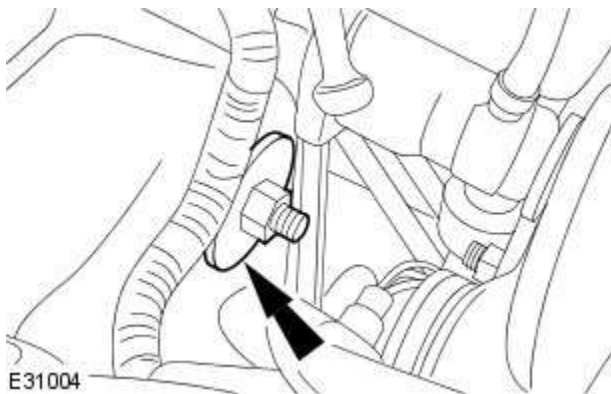
Install the upper arm retaining nut, but do not tighten fully at this stage.



E31005

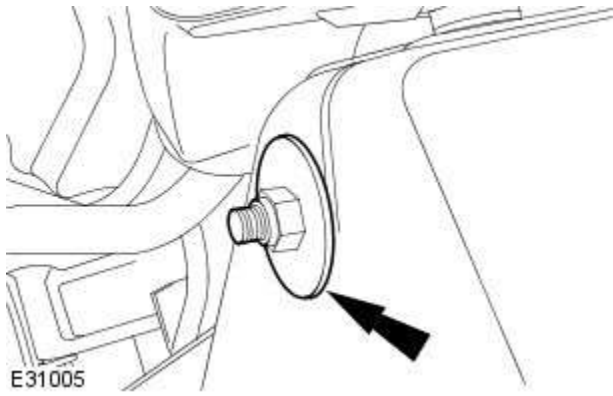
3.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Install the upper arm retaining nut, but do not tighten fully at this stage.



E31004

4. Install the front shock absorber.
For additional information, refer to: [Front Shock Absorber](#) (204-01 Front Suspension, Removal and Installation).

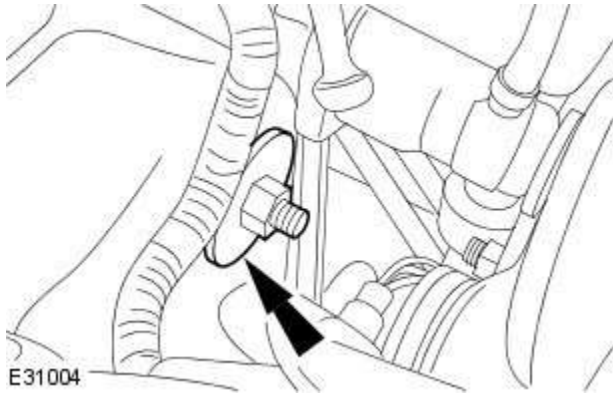


5. **CAUTION:** The final tightening of the suspension components must be carried out with the vehicle on its wheels.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Tighten to 47 Nm.



6.  **CAUTION:** The final tightening of the suspension components must be carried out with the vehicle on its wheels.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Tighten to 47 Nm.

7. Install the secondary bulkhead panel RH.
For additional information, refer to: [Secondary Bulkhead Panel RH - 3.0L NA V6 - AJZ7](#) (501-02 Front End Body Panels, Removal and Installation).


Front Suspension - Front Wheel Bearing and Wheel Hub TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

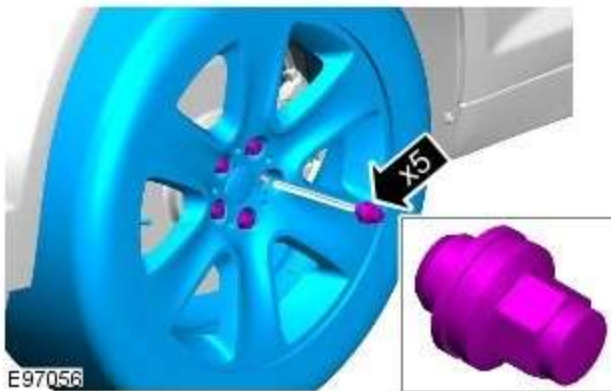
Removal



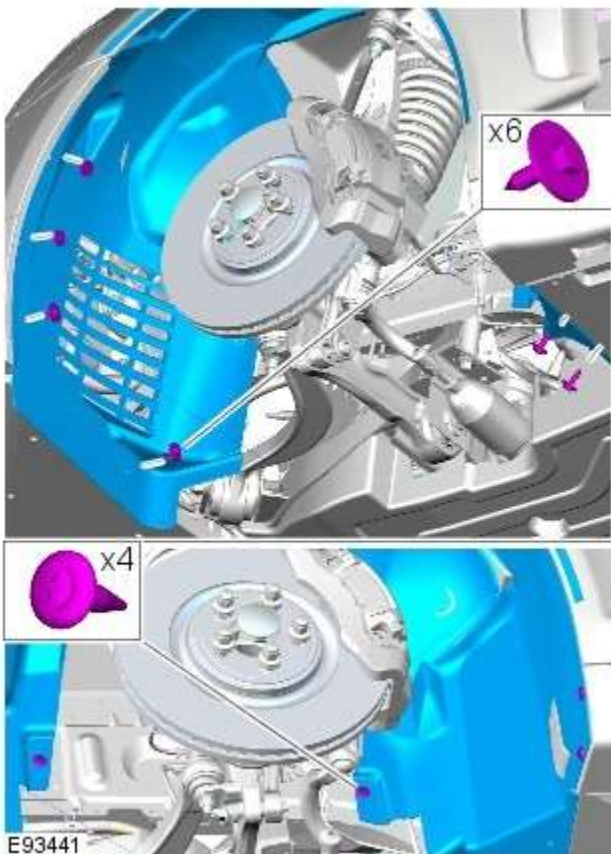
NOTE: Removal steps in this procedure may contain installation details.

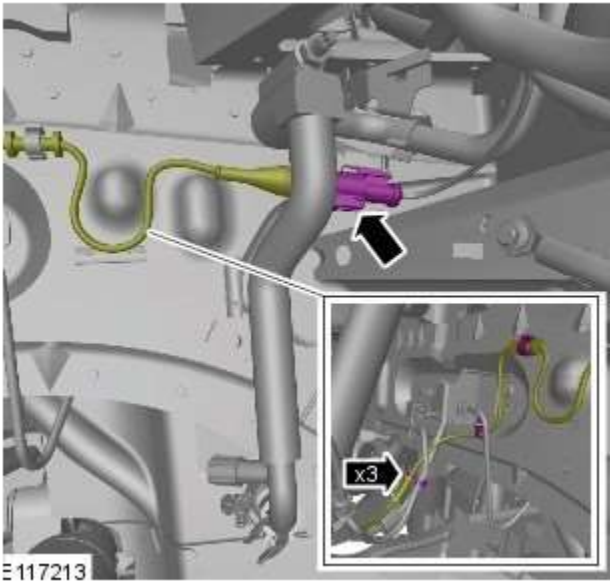
1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

2. Torque: 125 Nm



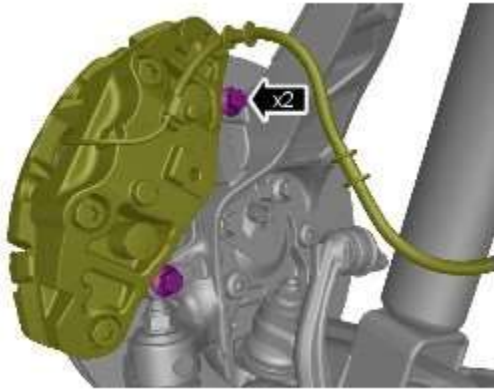
3. Torque: 10 Nm





E117213

4.  NOTE: LH illustration shown, RH is similar.




E117071

5.  CAUTION: Discard the bolts.

NOTES:

 LH illustration shown, RH is similar.

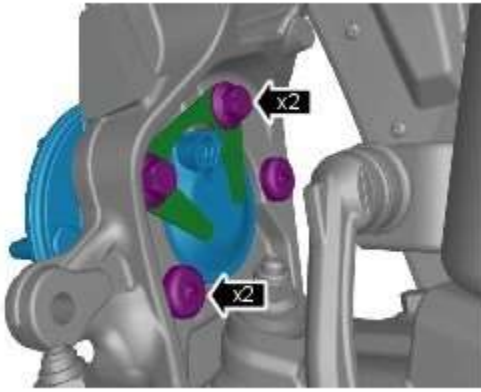
 Secure with cable ties.

Torque: 115 Nm



E83394

6.  NOTE: LH illustration shown, RH is similar.



E117072

7. CAUTIONS:



Discard the bolts.



Make sure that the area around the component is clean and free of foreign material.



Do not attempt to release the wheel hub by hitting it with a hammer directly, loosen the wheel hub retaining bolts partially before applying an even amount of force to the head of each bolts to release the wheel hub from the wheel knuckle. Failure to follow this instruction may cause damage to the component.

NOTES:



Some variation in the illustrations may occur, but the essential information is always correct.



LH illustration shown, RH is similar.



Install the components to their original fitted positions.

Torque: 90 Nm


Installation

1. To install, reverse the removal procedure.


Front Suspension - Wheel Knuckle

Removal and Installation

Special Tool(s)

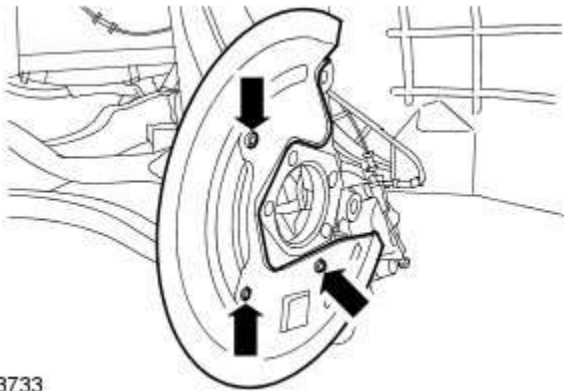
 <p>204-327</p> <p>E63732</p>	<p>Ball joint splitter 204-327</p>
--	--

Removal

-  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

- Remove the hub assembly.
For additional information, refer to: [Front Wheel Bearing and Wheel Hub - V6 3.0L Petrol](#) (204-01 Front Suspension, Removal and Installation).

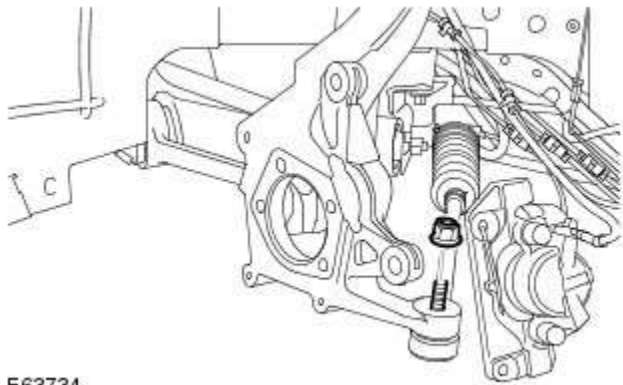


E63733

-  **NOTE:** LH illustration shown, RH is similar.

Remove the brake disc shield.

- Remove the 3 rivets.



E63734

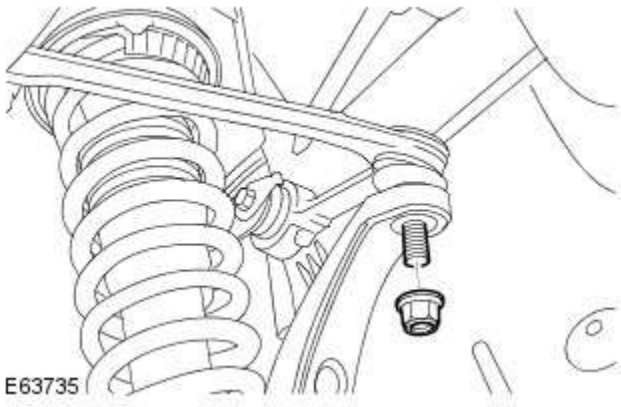
- NOTES:**

 LH illustration shown, RH is similar.

 Use an additional wrench to prevent the ball joint rotating.

Disconnect the steering gear tie rod end ball joint.

- Remove and discard the tie rod end retaining nut.



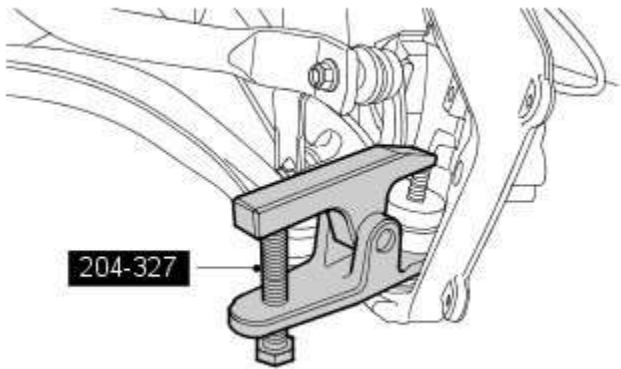
5. NOTES:


 Use an additional wrench to prevent the ball joint rotating.

 LH illustration shown, RH is similar.

Disconnect the upper arm from the wheel knuckle.

- Remove and discard the nut.



6.  **CAUTION:** Make sure the ball joint seal is not damaged. A damaged seal will lead to the premature failure of the joint.

NOTES:

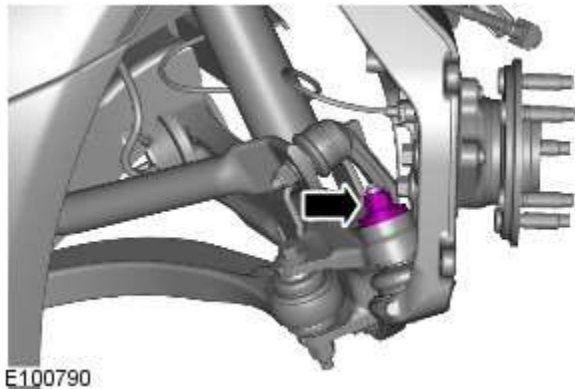
 Use an additional wrench to prevent the ball joint rotating.

 LH illustration shown, RH is similar.

Remove the wheel knuckle.

- Remove and discard the nut.
- Using the special tool, release the ball joint from the lower suspension arm.

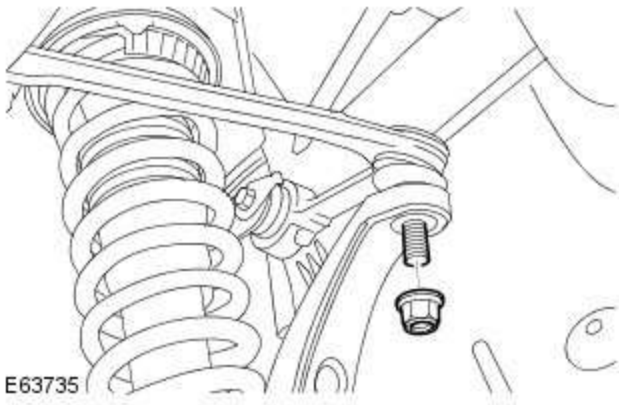
Installation



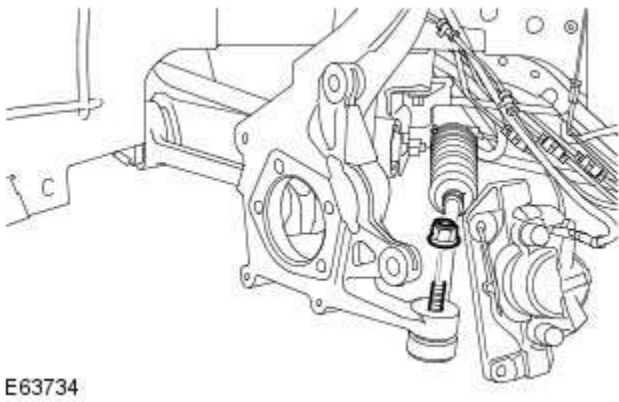
1. **NOTE:** Use an additional wrench to prevent the ball joint rotating.


Install the wheel knuckle.

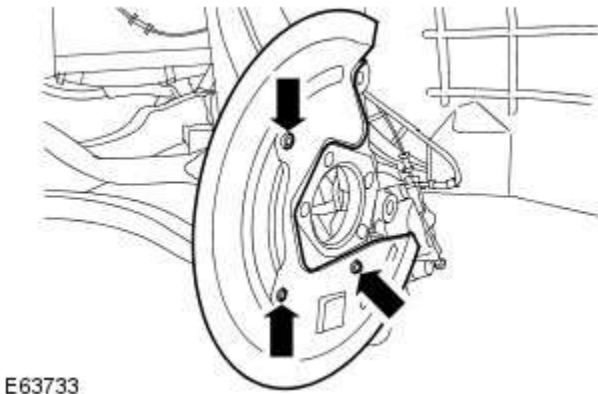
- Clean the component mating faces.
- Tighten the nut to 92 Nm.



2. **NOTE:** Use an additional wrench to prevent the ball joint rotating.
Connect the upper arm and wheel knuckle.
 - Tighten the nut to 90 Nm.



3.  **NOTE:** Use an additional wrench to prevent the component from rotating.
Connect the tie-rod end ball joint.
 - Tighten the nut to 133 Nm.



4. Install the brake disc shield.
 - Install the rivets.

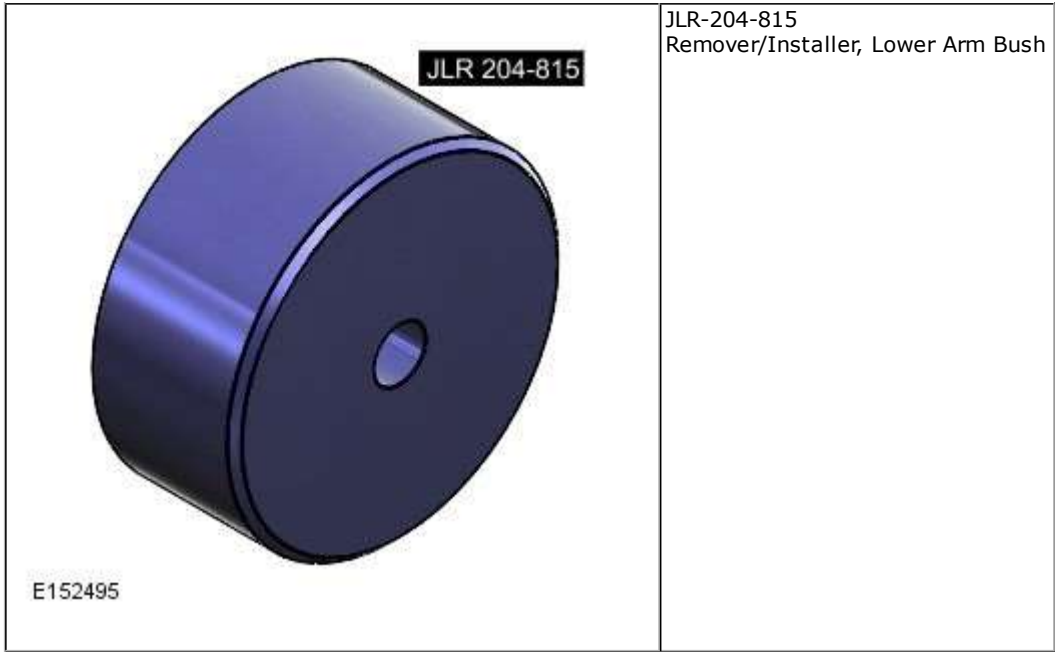
5. Install the hub assembly.
For additional information, refer to: [Front Wheel Bearing and Wheel Hub - V6 3.0L Petrol](#) (204-01 Front Suspension, Removal and Installation).

Front Suspension - Front Lower Arm Bushing

Removal and Installation

Special Tool(s)

 <p>JLR 204-813</p> <p>E152493</p>	<p>JLR-204-813 Remover/Installer, Lower Arm Bush</p>
 <p>JLR 204-814</p> <p>E152494</p>	<p>JLR-204-814 Remover/Installer, Lower Arm Bush</p>



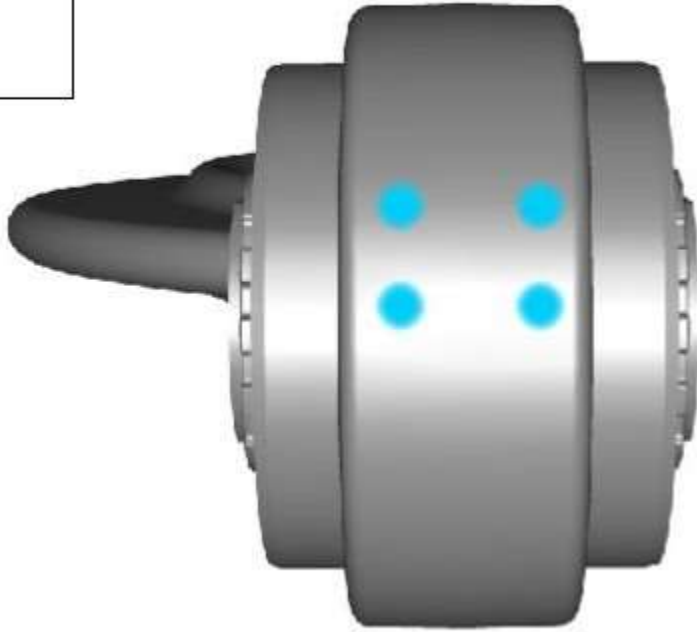
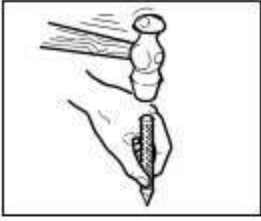
General Equipment

Center punch
Hydraulic press

Removal

 NOTE: Removal and installation of the bush requires the use of a press.

1. **Visually inspect the lower arm for signs of a center punch mark. If four marks are located on the lower arm in the area illustrated, install a new front lower arm.**

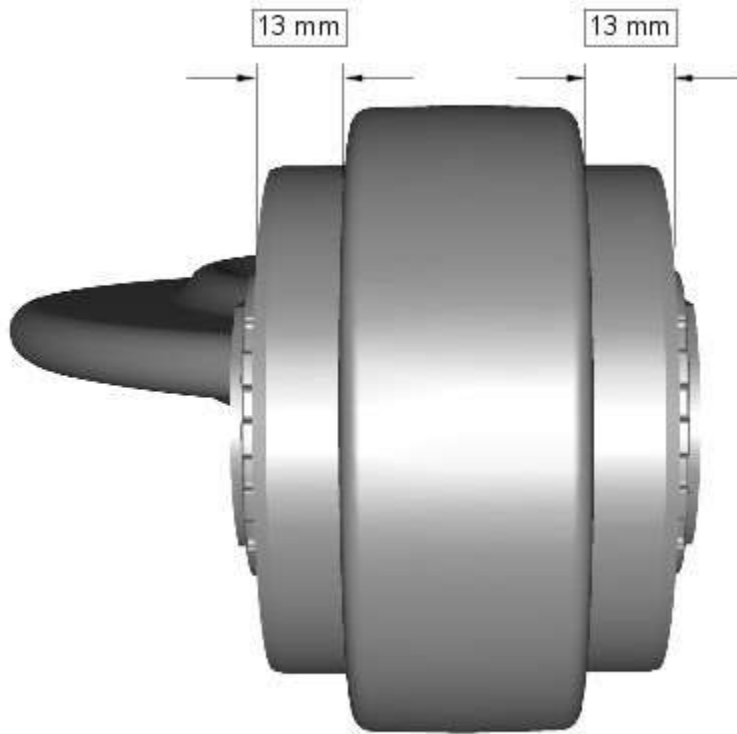


E154276


2. Only continue with the procedure below if there is less than four marks on the lower front arm.

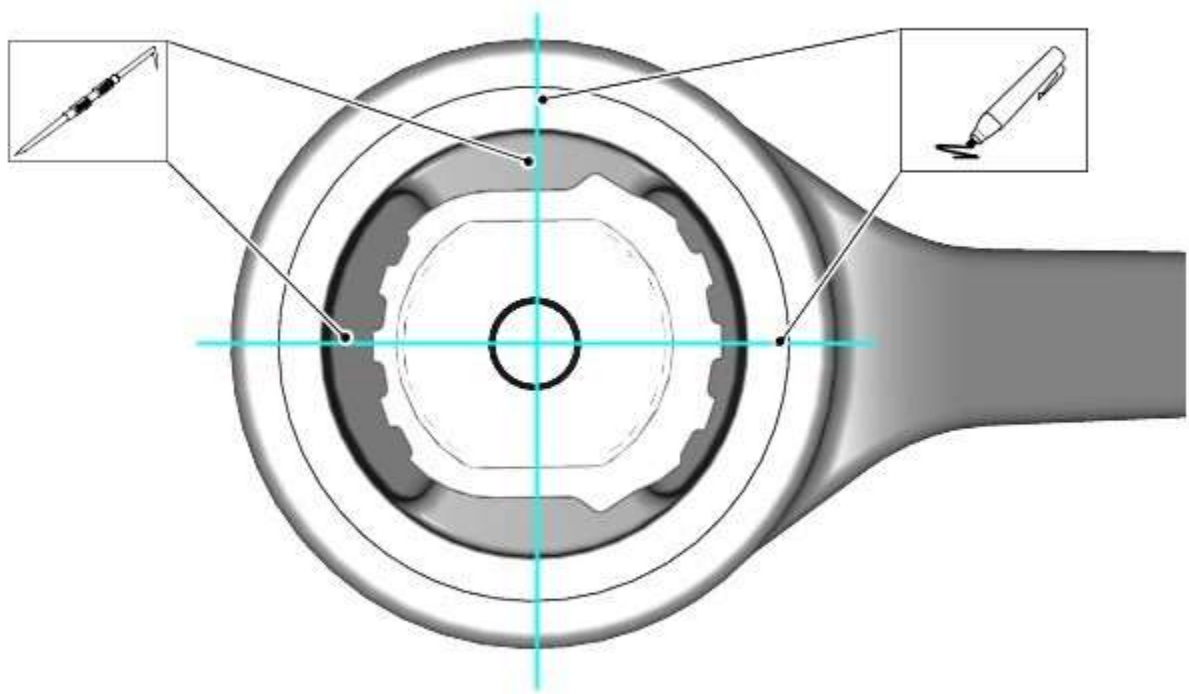
Refer to: [Front Lower Arm](#) (204-01 Front Suspension, Removal and Installation).

3. Measure and note the value both sides of the bush as illustrated prior to removal.



E154199

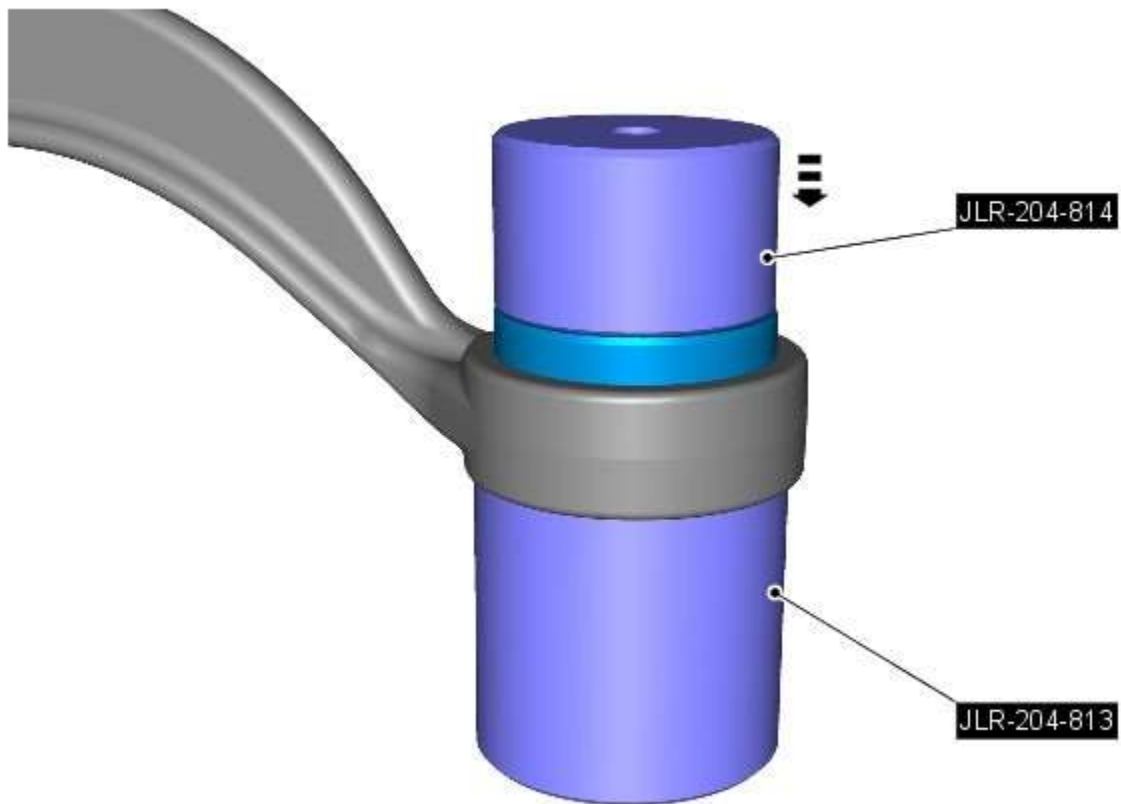
4.  **CAUTION:** Note the orientation of the bush prior to removal.
Using suitable marking tools, mark the bush and lower arm prior to removal.



E154197


5. Using the special tools, remove the bush.

Special Tool(s): [JLR-204-813](#), [JLR-204-814](#)
General Equipment: [Hydraulic press](#)

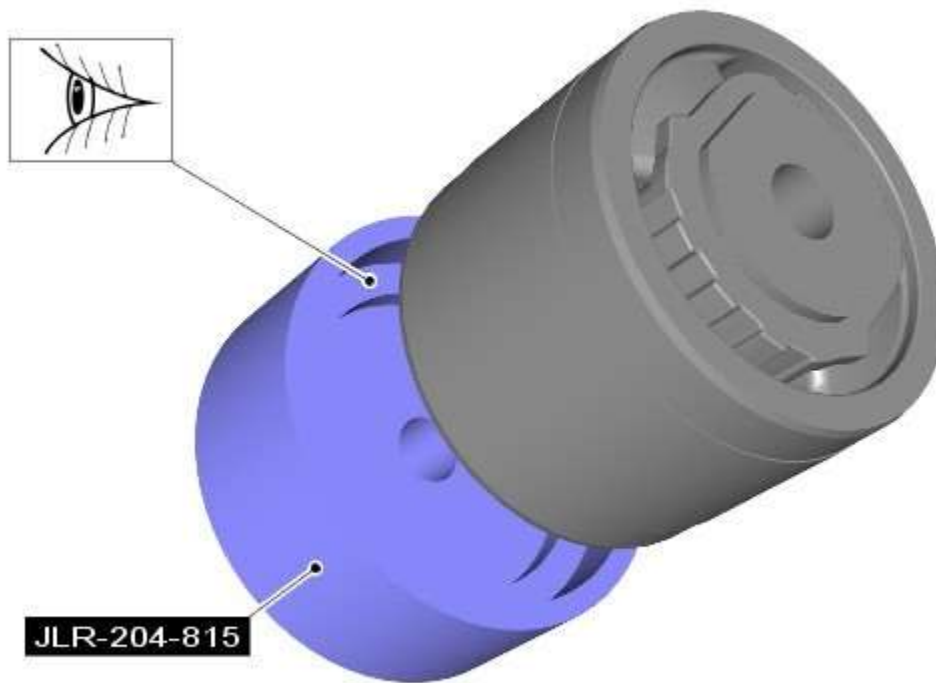


E154200

Installation

1.  NOTE: Make sure that the bush is correctly seated in the special tool.

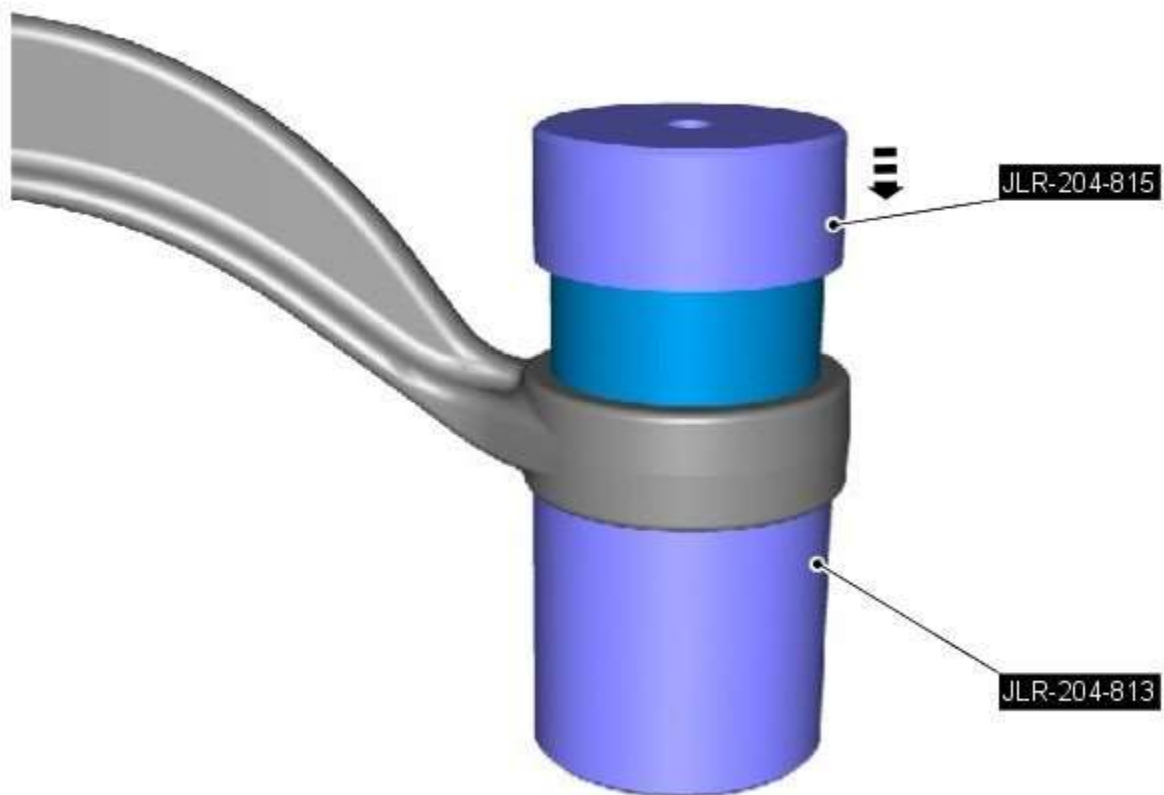
Special Tool(s): [JLR-204-815](#)



E154196

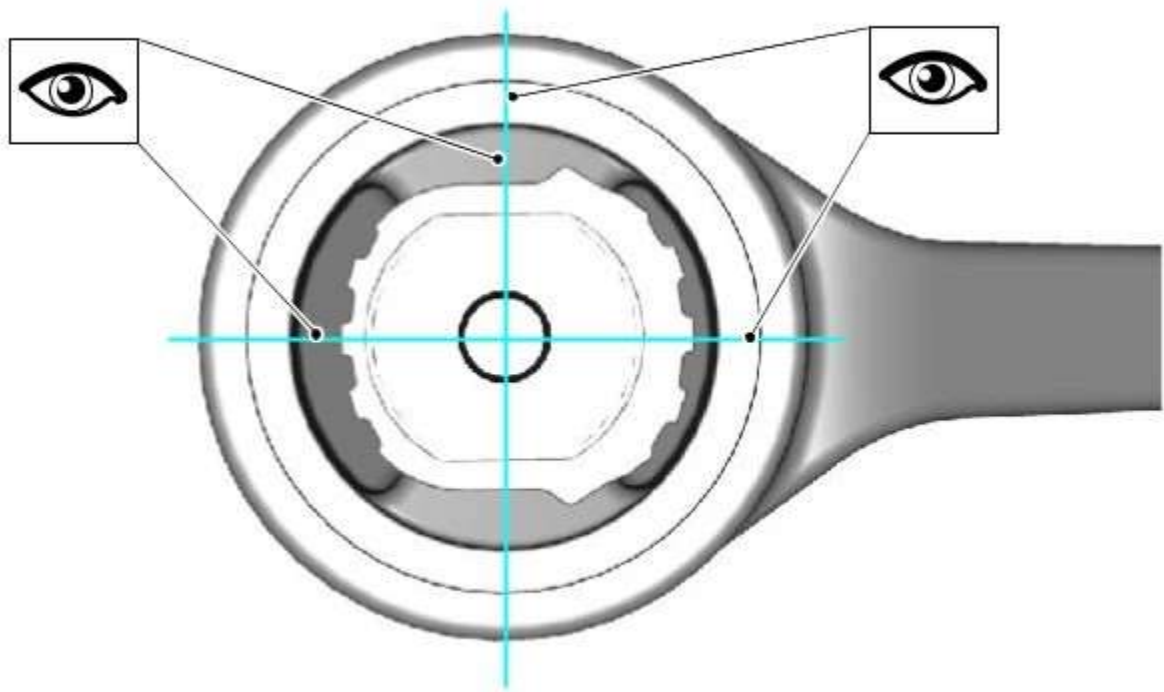
2. Using the special tools, remove the bush.

Special Tool(s): [JLR-204-813](#), [JLR-204-815](#)
General Equipment: [Hydraulic press](#)



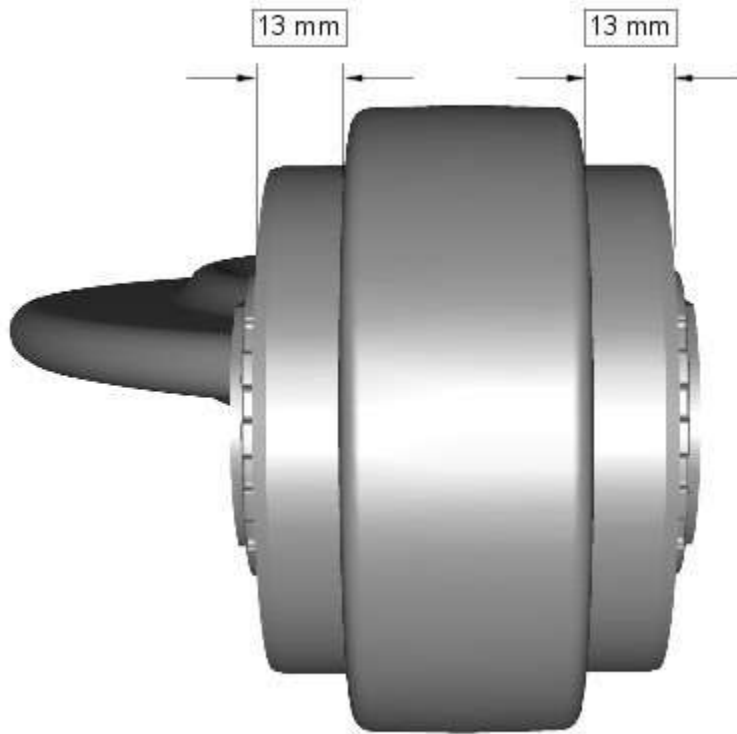
E154198

3. Make sure that the bush has been installed to the noted removal position.



E154277

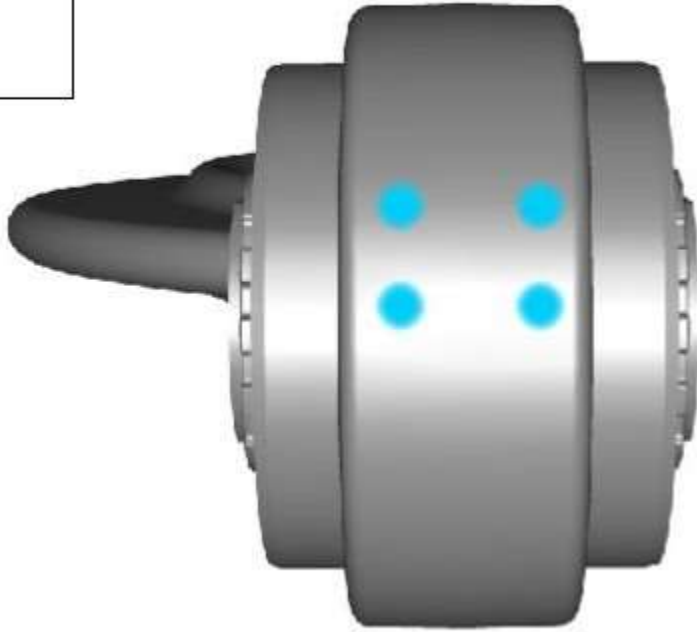
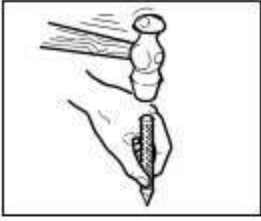
4. Make sure that measurement taken prior to removal is still correct.



E154199

5. **Mark the front lower arm with a center punch, once the procedure has been completed.**

General Equipment: [Center punch](#)



E154276

6. Refer to: [Front Lower Arm](#) (204-01 Front Suspension, Removal and Installation).

Rear Suspension -

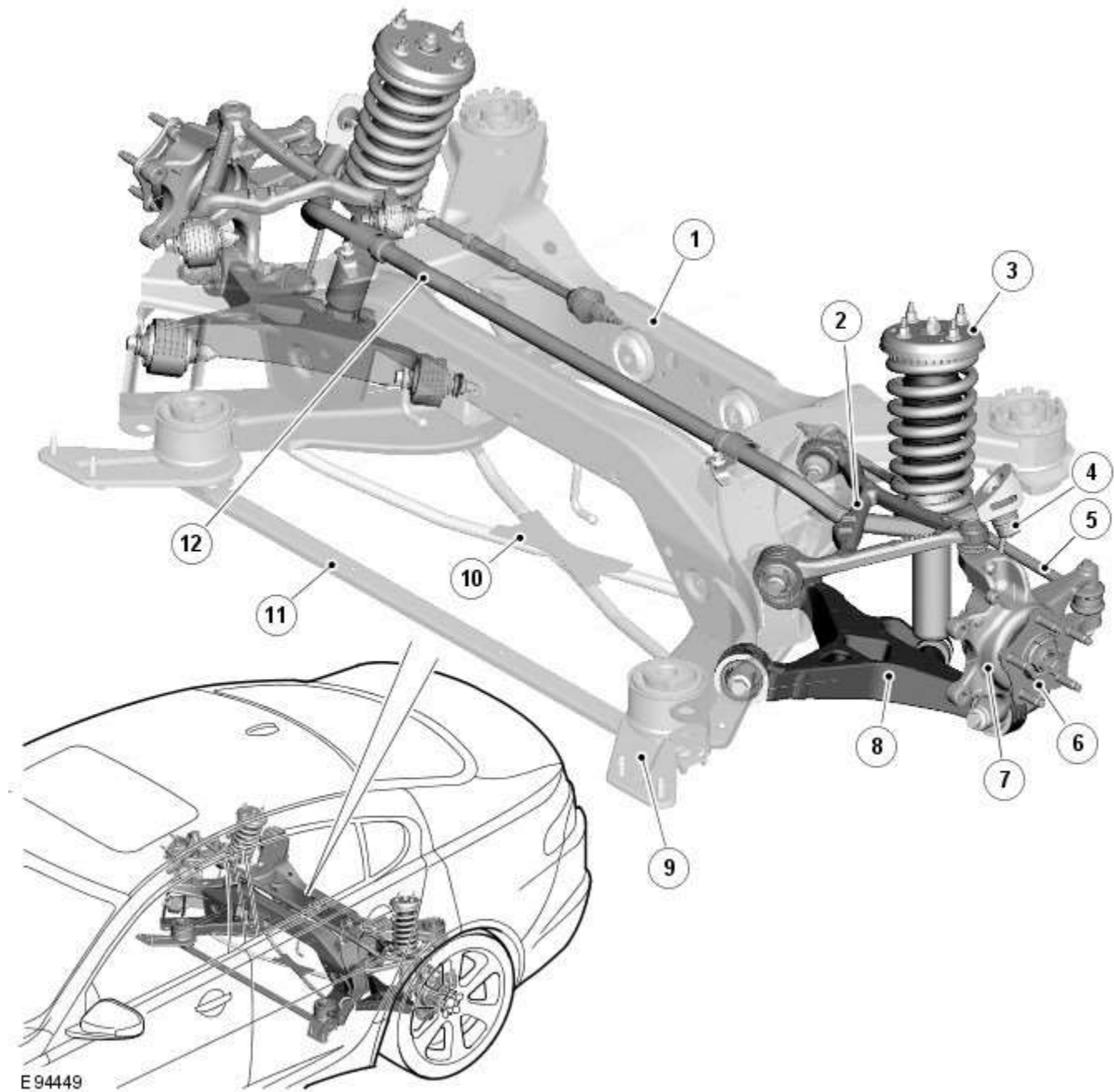
Torque Specifications

Description	Nm	lb-ft	lb-in
Halfshaft outer constant velocity joint retaining nut	300	221	-
Lower arm to wheel knuckle retaining nut and bolt	190	140	-
Lower arm to subframe retaining nut and bolt	192	142	-
Lower arm to subframe retaining bolt	192	142	-
Upper arm ball joint to wheel knuckle retaining nut	96	71	-
Upper arm to subframe retaining nut and bolt	115	85	-
Toe link to subframe ball joint retaining nut	90	66	-
Toe link to wheel knuckle retaining nut and bolt	63	46	-
Toe link setting nut	55	41	-
Shock absorber and spring assembly upper mounting to body retaining nuts	28	21	-
Shock absorber and spring assembly upper mounting retaining nut (without adaptive damping)	50	37	-
Shock absorber and spring assembly upper mounting retaining nut (with adaptive damping)	27	20	-
Shock absorber to lower arm retaining bolt	133	98	-
Stabilizer bar link to stabilizer bar retaining nut	48	35	-
Stabilizer bar clamp to subframe retaining bolt	55	41	-
Stabilizer bar link to lower arm retaining nut	48	35	-
Wheel and tire to wheel hub retaining nuts	125	92	-

Rear Suspension - Rear Suspension - Component Location

Description and Operation

COMPONENT LOCATION



E94449

Item	Description
1	Subframe
2	Upper control arm
3	Spring and damper assembly
4	Stabilizer bar link
5	Toe link
6	Wheel hub and bearing assembly
7	Wheel knuckle
8	Lower control arm
9	Shear bracket

10	Cross brace
11	Single brace
12	Stabilizer bar

Rear Suspension - Rear Suspension - Overview

Description and Operation

OVERVIEW

The double wishbone type rear-suspension is a fully independent design assembled on a steel subframe; large diameter bushes isolate the subframe from the vehicle's body.

A toe-link located between the wheel knuckle and the subframe is used to adjust the toe angle of the rear wheels.

The wheel knuckle attaches to the upper and lower control arms, and the coil spring and damper assembly is located between the lower control arm and the vehicle body.

Dependant on vehicle model there are three types of coil spring and damper available:

- a standard oil passive damper (All models except supercharged),
- an adaptive damper, also known as Computer Active Technology Suspension (CATS) on 4.2L supercharged vehicles up to 2010MY, For additional information refer to Vehicle Dynamic Suspension 4.2L.
- a continuously variable adaptive damper, also known as Adaptive Dynamics System on 5.0L supercharged vehicles from 2010MY. For additional information refer to Vehicle Dynamic Suspension 5.0L.

Rear Suspension - Rear Suspension - System Operation and Component Description

Description and Operation

System Operation

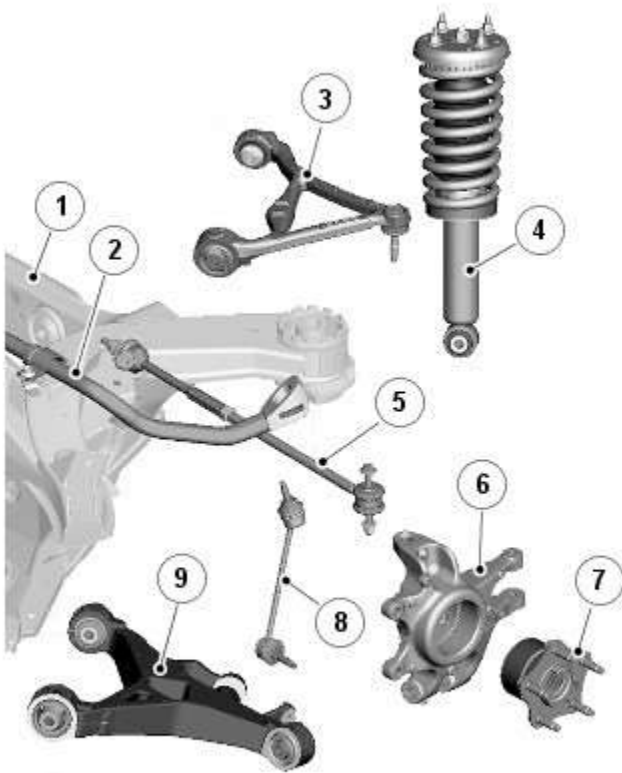
The double wishbone type rear-suspension is assembled on a fabricated high-grade steel subframe. Large diameter mounting bushes are used to isolate the subframe from the vehicle's body; the front bushes are hydrabushes, the rear are voided rubber.

To achieve optimum suspension refinement a cross-brace is used to increase the torsional stiffness of the subframe. The single brace attached to the shear brackets helps to reduce the transmission of road noise.

An adaptive damping system is available on specified models. For additional information refer to Vehicle Dynamic Suspension 4.2L or 5.0L.

Component Description

COMPONENTS



E94999

Item	Description
1	Subframe
2	Stabilizer bar
3	Upper control arm
4	Spring and damper assembly
5	Toe link
6	Wheel knuckle
7	Wheel hub and bearing assembly
8	Stabilizer bar link
9	Lower control arm

Upper Control Arm

The cast aluminum upper control arm locates to the subframe via one cross-axis joint and one plain rubber bush, and links to

the aluminum wheel knuckle via an integral ball-joint.

Lower Control Arm

The aluminum lower arm locates to the subframe via one cross-axis joint and one plain rubber bush, and to the wheel knuckle via a second plain rubber bush.

The rear of the control arm has mounting points for the damper and the stabilizer link.

Toe-Link

The toe-link is located between the wheel knuckle and brackets on the subframe.

The toe-link comprises an inner rod with integral axial ball joint. The inner ball joint has a threaded spigot which locates in a bracket on the subframe and is secured with a locknut. The rod has an internal thread which accepts the outer rod.

The outer rod has a cross-axis joint at its outer end which is located in a clevis on the wheel knuckle, and is secured with a bolt and locknut.

The length of the toe-link can be adjusted by rotating the inner rod. This allows for adjustment of the toe angle for the rear wheel. Once set the inner rod can be locked in position by tightening a locknut on the outer rod against the inner rod.

Wheel Knuckle

The cast aluminum wheel knuckle attaches to:

- the upper control arm via a ball-joint located in the arm,
- the lower control arm via a plain rubber bush located in the arm,
- the toe-link via a cross-axis joint located in the toe link.

The wheel knuckle also provides the mounting locations for the:

- wheel hub assembly,
- wheel bearing,
- wheel speed sensor,
- brake caliper,
- and disc shield.

Stabilizer Bar

The solid construction stabilizer bar and bushes have been designed to provide particular characteristics in maintaining roll rates, specifically in primary ride comfort. There are six derivatives of rear stabilizer bar, with different diameters, to support the various powertrains:

- V6 gasoline - 12.7 mm solid bar
- V8 4.2L and 5.0L gasoline - 13.6 mm solid bar
- V6 2.7L diesel - 14.5 mm solid bar
- V6 3.0L diesel - 14.5 mm solid bar
- V6 3.0L diesel with Adaptive Damping - 16mm tubular
- V8 4.2L gasoline supercharged - 16mm tubular
- V8 5.0L gasoline supercharged
 - SV8 - 17mm tubular
 - XFR - 18mm tubular

The stabilizer bar is attached to the top of the subframe with two bushes and mounting brackets. The stabilizer bar has crimped, 'anti-shuffle' collars pressed in position on the inside edges of the bushes. The collars prevent sideways movement of the stabilizer bar.

Each end of the stabilizer bar curves rearward to attach to a ball joint on each stabilizer link. Each link is attached via a second ball joint to a cast bracket on the lower control arm. The links allow the stabilizer bar to move with the wheel travel providing maximum effectiveness.

Spring and Damper Assembly

The spring and damper assembly are attached to cast brackets on the lower control arms and to the vehicle body by four studs secured by locking nuts. Dependant on vehicle model there are three types of coil spring and damper available:

- a standard oil passive damper (All models except supercharged),
- an adaptive damper, also known as Computer Active Technology Suspension (CATS) on 4.2L supercharged vehicles up to 2010MY, For additional information refer to Vehicle Dynamic Suspension 4.2L.
- a continuously variable adaptive damper, also known as Adaptive Dynamics System on 5.0L supercharged vehicles from 2010MY. For additional information refer to Vehicle Dynamic Suspension 5.0L.

The dampers are a monotube design with a spring located by a circlip onto the damper tube. The lower end of the damper has a spherical joint which locates in the lower control arm and is secured with a bolt.

The damper piston is connected to a damper rod which is sealed at its exit point from the damper body. The threaded outer end of the damper rod locates through a hole in the top mount. A self locking nut secures the top mount to the damper rod. The damper rod on the adaptive damper has an electrical connector on the outer end of the damper rod.

Supercharged 4.2L vehicles up to 2010MY: The damper functions by restricting the flow of hydraulic fluid through internal galleries in the damper's piston. The adaptive damper has a solenoid operated valve, which when switched allows a greater flow of hydraulic fluid through the damper's piston. This provides a softer damping characteristic from the damper. The adaptive damper defaults to a firmer setting when not activated. The solenoid is computer controlled and can switch between soft and hard damping settings depending on road wheel inputs and vehicle speed.

Supercharged 5.0L vehicles from 2010MY: The variable damper functions by adjustment of a solenoid operated variable orifice, which opens up an alternative path for oil flow within the damper. When de-energized the bypass is closed and all the oil flows through the main (firm) piston. When energized the solenoid moves an armature and control blade, which work against a spring. The control blade incorporates an orifice which slides inside a sintered housing to open up the bypass as required. In compression, oil flows from the lower portion of the damper through a hollow piston rod, a separate soft (comfort) valve, the slider housing and orifice and into the upper portion of the damper, thereby bypassing the main (firm) valve. In rebound the oil flows in the opposite direction

The damper rod is fitted with a spring aid which prevents the top mount making contact with the top of the damper body during full suspension compression and also assists with the suspension tune.

The spring rate of the coil springs can differ between models and are color coded for identification. The coil spring locates on a spring packer and a lower spring seat which is located on the damper body. The spring locates in an upper spring seat which is located on the underside of the top mount. The majority of the roll stiffness is provided by the springs rather than the stabilizer bar as this arrangement allows for a natural frequency of roll, providing a consistent suspension ride.

India-Specific Spring and Damper Assembly Spacers



E137440

Front and rear spring and damper assemblies are fitted with spacers to raise ride height in India-specific vehicles. The front and the rear spacers are the same, their color is black.

Rear Suspension - Rear Suspension

Diagnosis and Testing

Principle of Operation

For a detailed description of the suspension system, refer to the relevant Description and Operation section of the workshop manual. REFER to: (204-02 Rear Suspension)

[Rear Suspension](#) (Description and Operation),
[Rear Suspension](#) (Description and Operation),
[Rear Suspension](#) (Description and Operation).

Inspection and Verification

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection



Mechanical
<ul style="list-style-type: none"> • Damaged suspension dampers

3. If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the next step
4. If the fault is not visually evident, verify the symptom and refer to the following Symptom Chart

Symptom Chart

Symptom	Possible Cause	Action
Evidence of fluid on suspension damper	<ul style="list-style-type: none"> • Fluid on damper from an external source • Fluid leaking from damper 	<ul style="list-style-type: none"> • Damper not faulty, do not renew • GO to Pinpoint Test A.

PINPOINT TEST A : DAMPER FLUID LEAK DIAGNOSIS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: ASSESS LEAK	
NOTES:	
 Residual oil left over from the damper assembly process may create oil staining on the damper tube. This will not affect the function of the damper.	
 Slight seepage is considered normal.	
	1 Assess the extent of the oil leakage Is the leakage serious enough to indicate that the damper seal has failed? Yes GO to Pinpoint Test B . No Damper not faulty, do not renew.

PINPOINT TEST B : CONFIRM LEAK

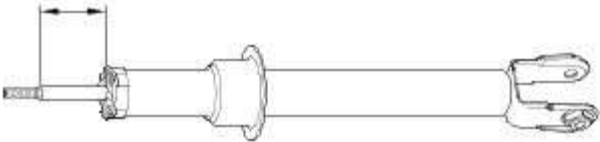
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: ROAD TEST	
	1 Clean all traces of oil from the damper 2 Drive the vehicle over a speed bump or similar ten times
	Is any fluid visible on the outside of the damper? Yes GO to Pinpoint Test C . No Damper not faulty, do not renew.

PINPOINT TEST C : DAMPER STICKOUT TEST

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: DAMPER STICKOUT TEST	



NOTE: If a significant quantity of fluid has leaked out of the damper, the dividing piston will be displaced upwards in the tube by the pressure of the gas below it. This will limit the downward travel of the piston.

	1 Remove the suspension strut assembly REFER to: Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).
	2 Remove the spring
	3 Remove the bump stop
	4 Push the damper piston fully into the damper tube
 E144894	5 Measure and record the stickout dimension (the distance between the damper tube cap and the piston rod shoulder)
	Is the stickout dimension greater than 12.0mm? Yes Damper unserviceable. Install a new suspension damper. Enclose a record of the stickout dimension with the returned part. No Damper serviceable. Re-assemble and re-install the suspension strut REFER to: Shock Absorber and Spring Assembly (204-02 Rear Suspension, Removal and Installation).

Rear Suspension - Lower Arm

Removal and Installation

Removal

NOTES:



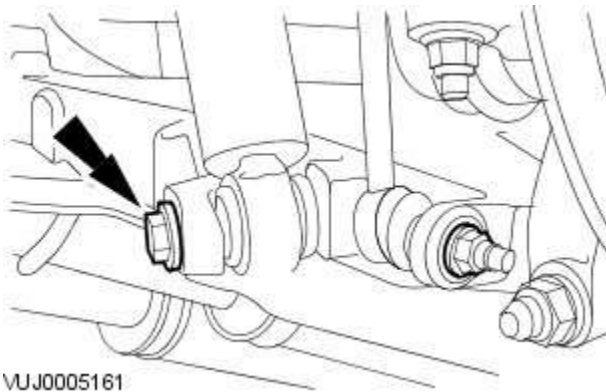
Before commencing work on the vehicle ensure the park brake is in the off position.



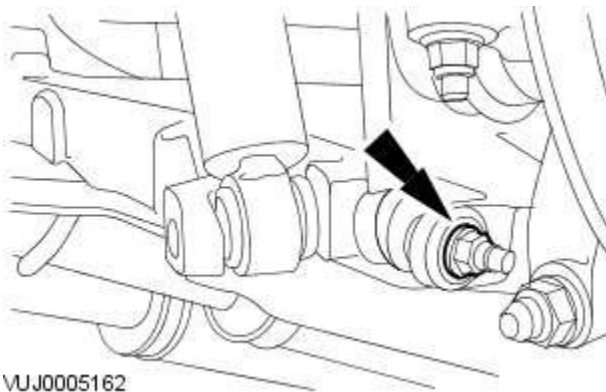
LH shown RH similar.

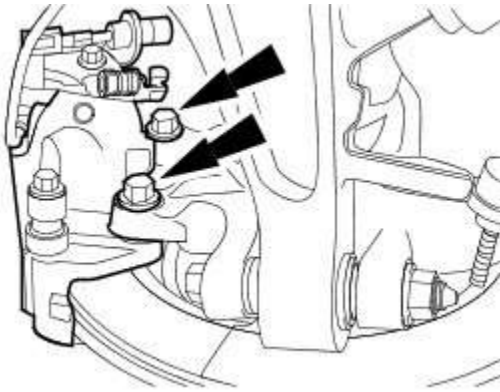
1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise the vehicle.
2. Remove the wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

3. Release the shock absorber and spring assembly from the lower arm.



4. Release the rear stabilizer bar link.





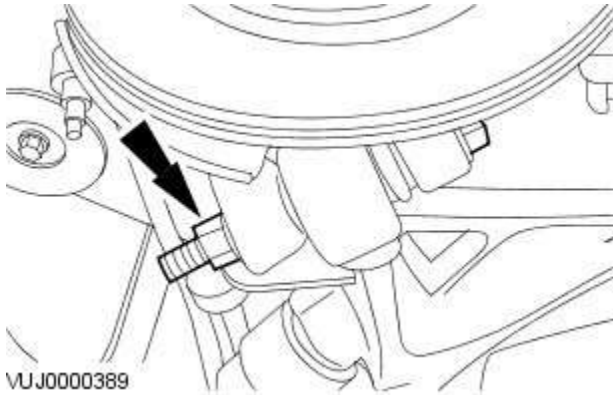
E30550

5. **CAUTION:** Do not allow the brake caliper to hang on the brake hose.



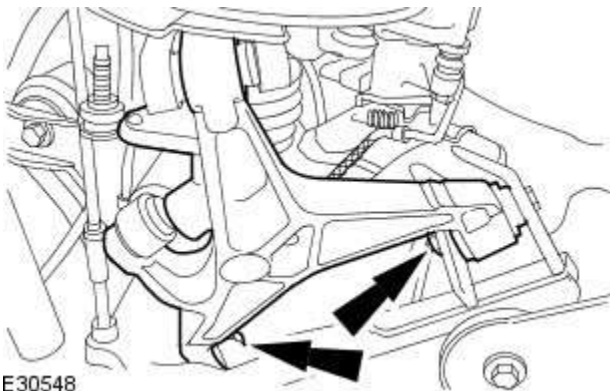
NOTE: Make sure that new bolts are installed.

Release the rear brake caliper and tie aside.



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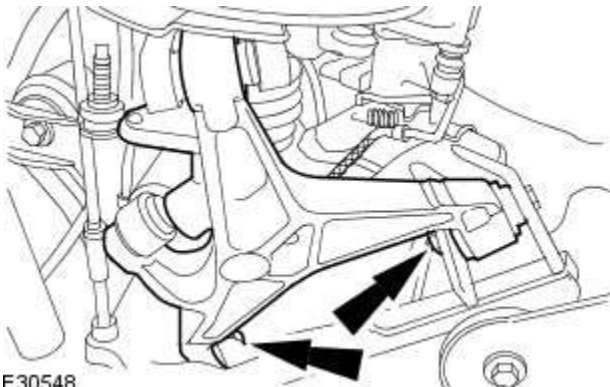
6. Release the lower arm from the wheel hub assembly.




E30548

7. Remove the lower arm.

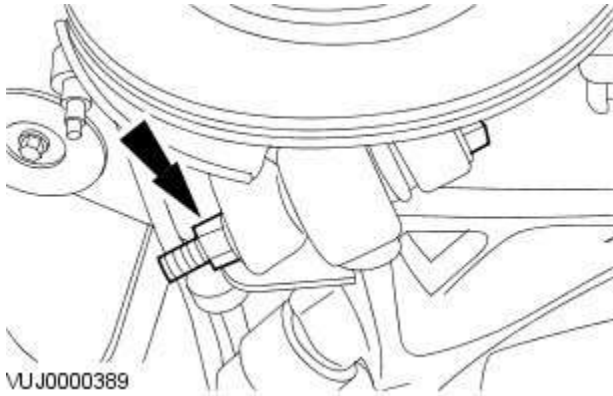
Installation




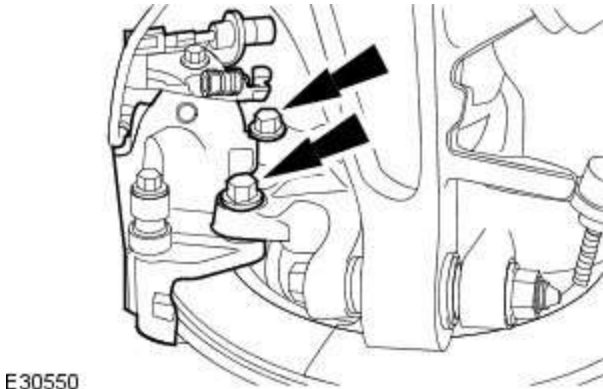
E30548



1.  **CAUTION:** Nuts and bolts must be tightened with the weight of the vehicle on the suspension.

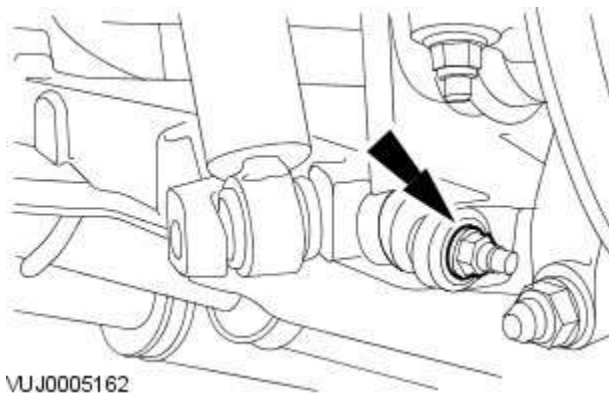
Install the lower arm.



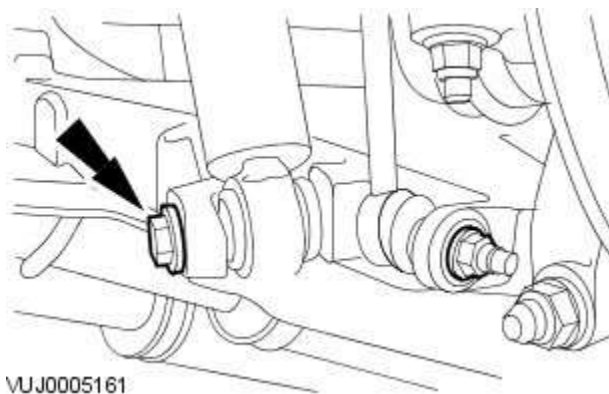
2.  **CAUTION:** Nuts and bolts must be tightened with the weight of the vehicle on the suspension.
Secure the lower arm to the wheel hub assembly.




3.  **CAUTION:** Do not allow the brake caliper to hang on the brake hose.
 **NOTE:** Make sure that new bolts are installed.
Secure the rear brake caliper.
 - Tighten the bolts to 103 Nm.



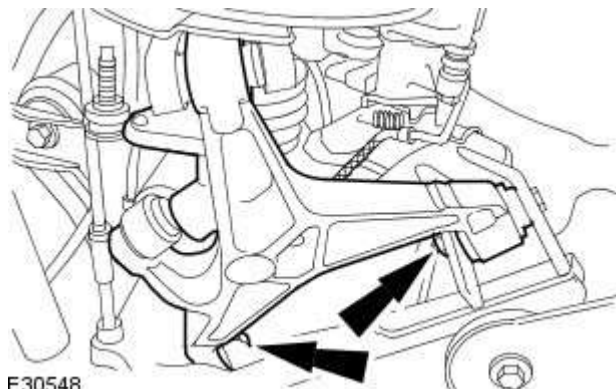
4. Secure the rear stabilizer bar link.
 - Tighten the nut to 48 Nm.



5.  **CAUTION:** Nuts and bolts must be tightened with the weight of the vehicle on the suspension.
Secure the shock absorber and spring assembly to the lower arm.

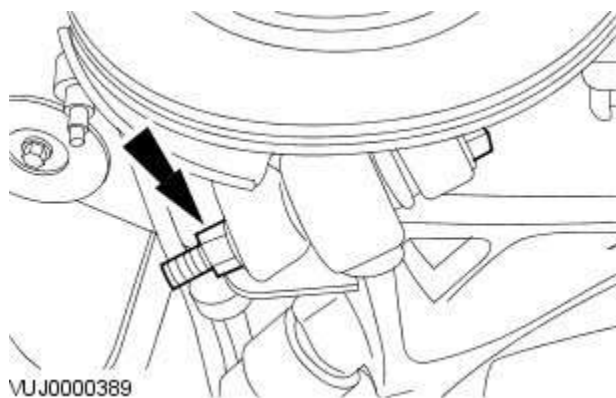
6. Install the wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

7. Lower the vehicle.



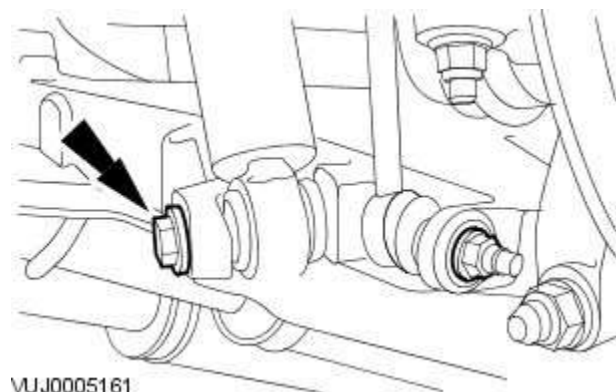
E30548

8. Tighten to 175 Nm.



VUJ0000389

9. Tighten to 190 Nm.



VUJ0005161

10. Tighten to 133 Nm.

Rear Suspension - Shock Absorber and Spring Assembly

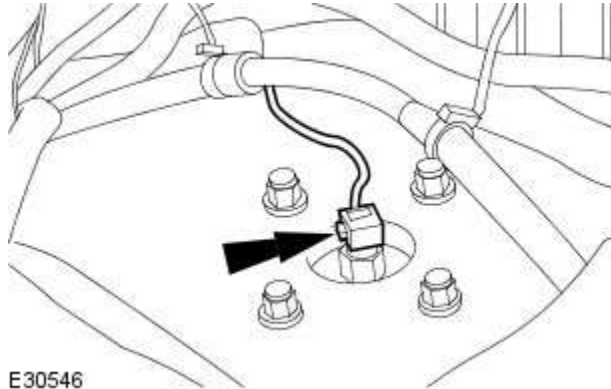
Removal and Installation

Removal

All vehicles

1. Remove the luggage compartment side trim panel.
For additional information, refer to: [Loadspace Trim Panel LH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

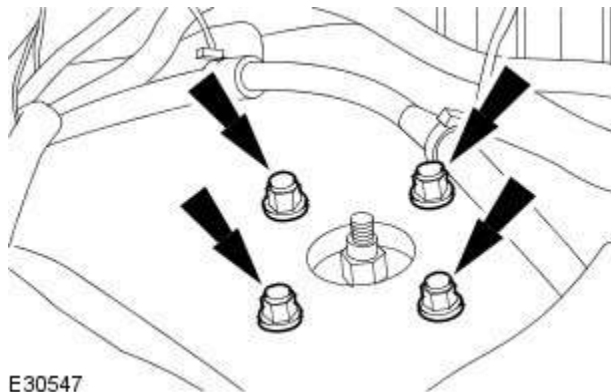
Vehicles with active damping



E30546

2. Disconnect the active suspension damper electrical connector.

All vehicles



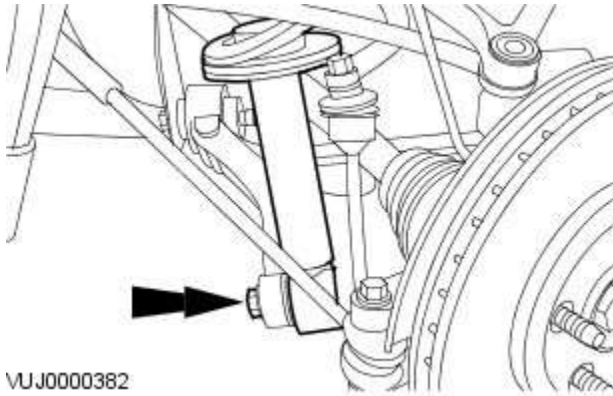
E30547

3. Remove the shock absorber and spring assembly top mount nuts. TORQUE: 28 Nm

4. **WARNING:** Make sure to support the vehicle with axle stands.

Raise the vehicle.

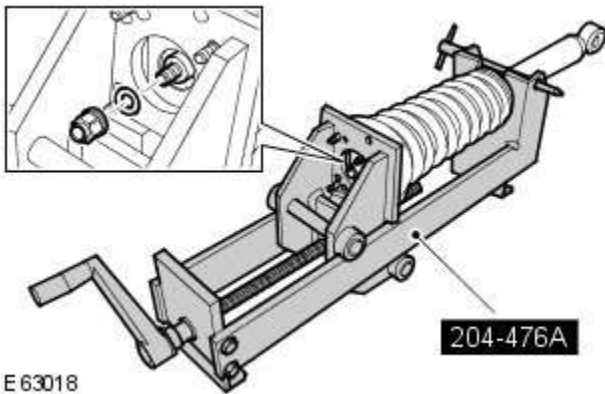
5. Remove the wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).




6. **NOTE:** Do not disassemble further if the component is removed for access only.

Remove the shock absorber and spring assembly. TORQUE: 133 Nm

Vehicles with active damping



7. **WARNINGS:**

 Make sure the shock absorber is secured by fully inserting the locking pin in to the special tool. Failure to follow these instructions may result in personal injury.

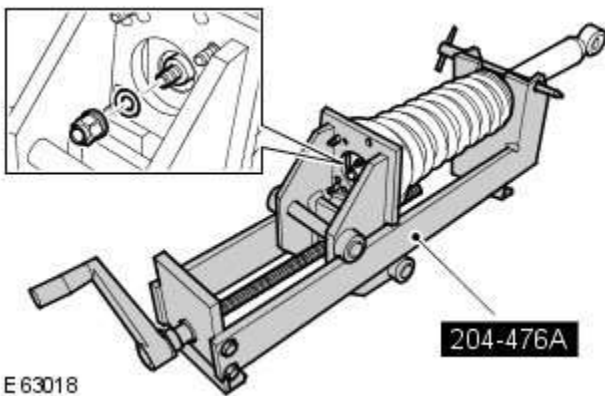
 As the spring is under extreme tension care must be taken at all times. Failure to follow these instructions may result in personal injury.

 Make sure that a new nut is installed.


Using the special tool, compress the suspension spring to remove the shock absorber.

- Compress the spring.
- Remove the nut. TORQUE: 27 Nm

Vehicles without active damping



8. **WARNINGS:**

 Make sure the shock absorber is secured by fully inserting the locking pin in to the special tool. Failure to follow these instructions may result in personal injury.

 As the spring is under extreme tension care must be taken at all times. Failure to follow these instructions may result in personal injury.

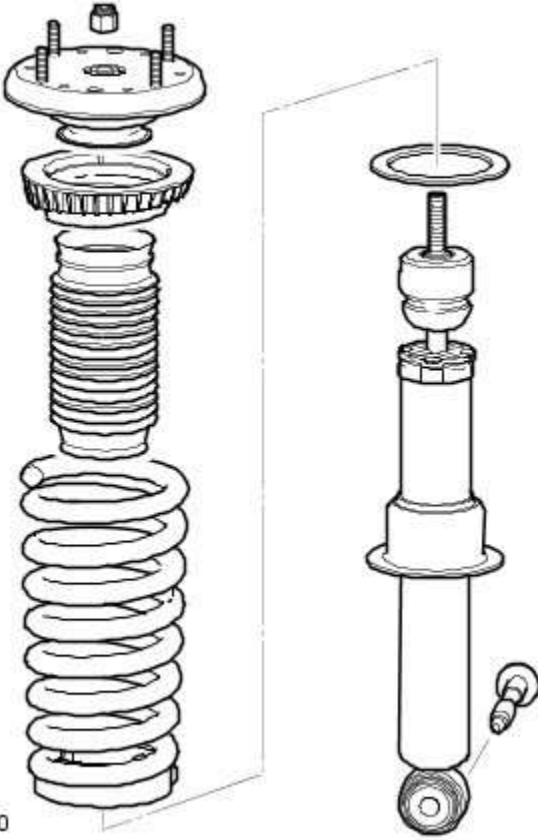
 Make sure that a new nut is installed.

Using the special tool, compress the suspension spring to remove the shock absorber.

- Compress the spring.
- Remove the nut. TORQUE: 50 Nm

All vehicles

9. Remove the shock absorber rod components.

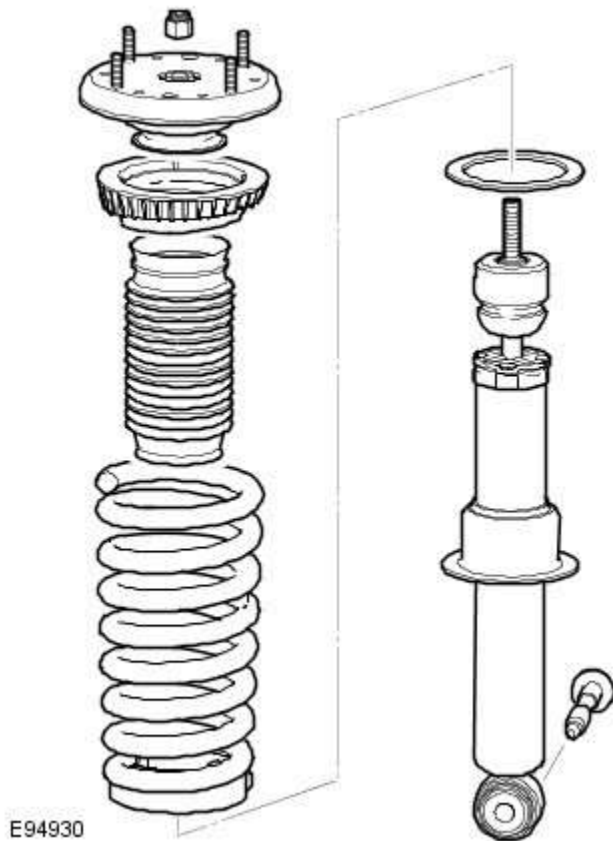


E94930

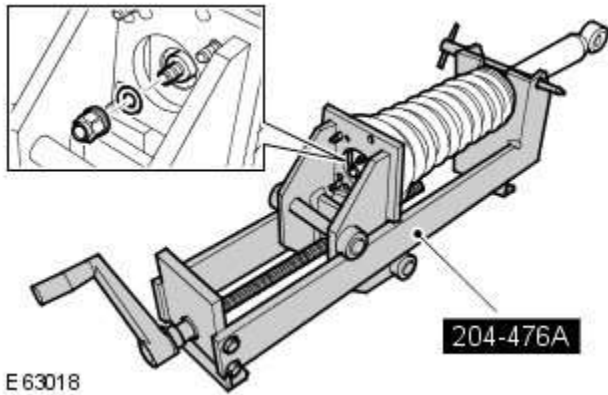
Installation

All vehicles


1. Install the shock absorber rod components.



Vehicles with active damping



2. **WARNINGS:**

 Make sure the shock absorber is secured by fully inserting the locking pin in to the special tool. Failure to follow these instructions may result in personal injury.

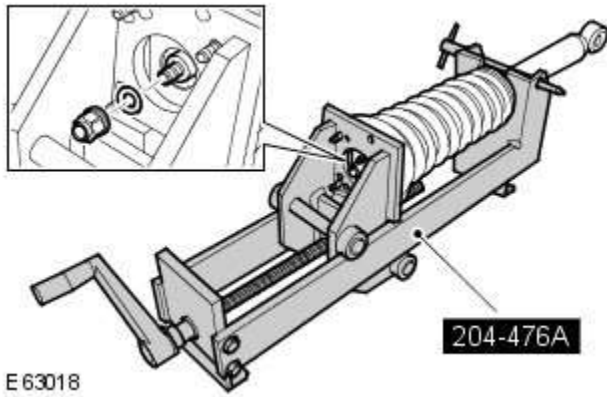
 As the spring is under extreme tension care must be taken at all times. Failure to follow these instructions may result in personal injury.

 Make sure that a new nut is installed.


Using the special tool, compress the suspension spring to install the shock absorber.

- Compress the spring.
- Tighten the nut to 27 Nm.


Vehicles without active damping



3. WARNINGS:

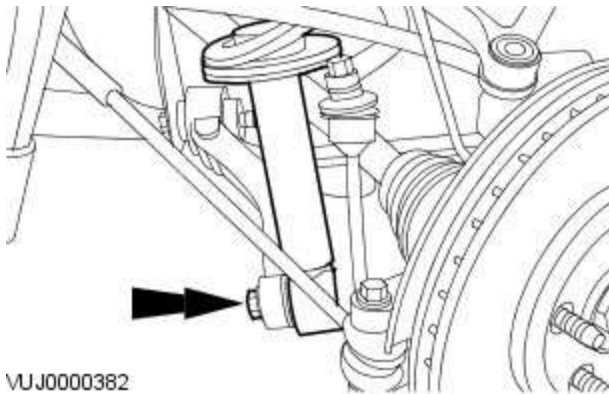
 Make sure the shock absorber is secured by fully inserting the locking pin in to the special tool. Failure to follow these instructions may result in personal injury.

 As the spring is under extreme tension care must be taken at all times. Failure to follow these instructions may result in personal injury.

 Make sure that a new nut is installed.

Using the special tool, compress the suspension spring to install the shock absorber.

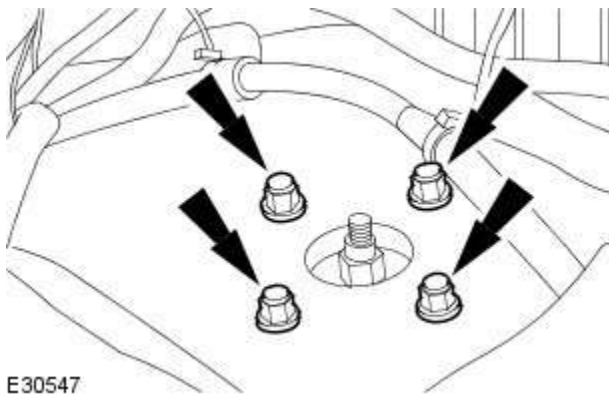
- Compress the spring.
- Tighten the nut to 50 Nm.



4. Install the shock absorber and spring assembly.
- Tighten to 133 Nm.

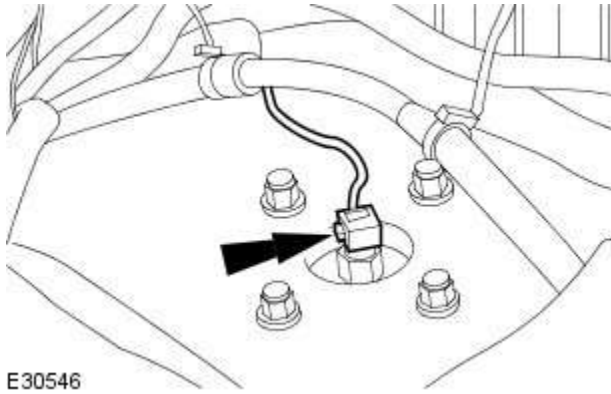
5. Install the wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

All vehicles



6. Install the shock absorber and spring assembly top mount nuts.
- Tighten to 28 Nm.

Vehicles with active damping



E30546

7. Connect the active suspension damper electrical connector.


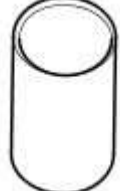

All vehicles

8. Install the luggage compartment side trim panel.
For additional information, refer to: [Loadspace Trim Panel LH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).


Rear Suspension - Shock Absorber Lower Bushing

Removal and Installation

Special Tool(s)

 <p>E52622</p>	<p>Bushing Remover / Installer 204-335</p>
 <p>E52621</p>	<p>Bushing remover 204-533</p>
 <p>E52620</p>	<p>Bushing installer 204-534</p>

Removal

- 
WARNING: Failure to follow this instruction may cause damage to the vehicle.

 Mark the orientation of the shock absorber in relation to the lower suspension arm.
- Remove the shock absorber and spring assembly. For additional information, refer to: [Shock Absorber and Spring Assembly](#) (204-02 Rear Suspension, Removal and Installation).

3. NOTES:

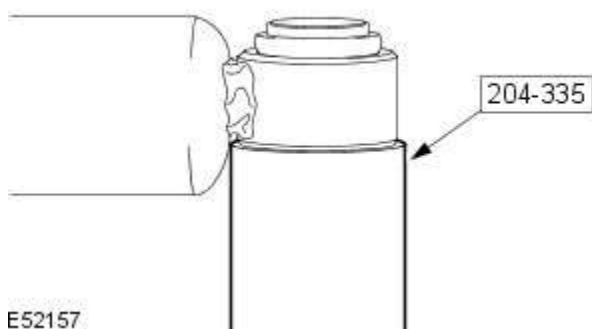


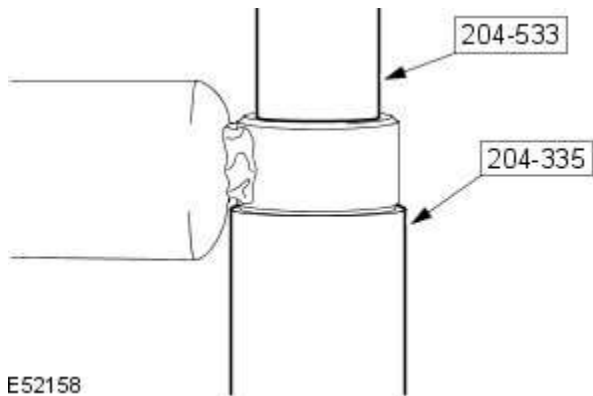
Place the shock absorber with the recessed side facing upwards.



With assistance make sure the special tool is aligned.

Using the special tool, support the shock absorber.





E52158

4. NOTES:

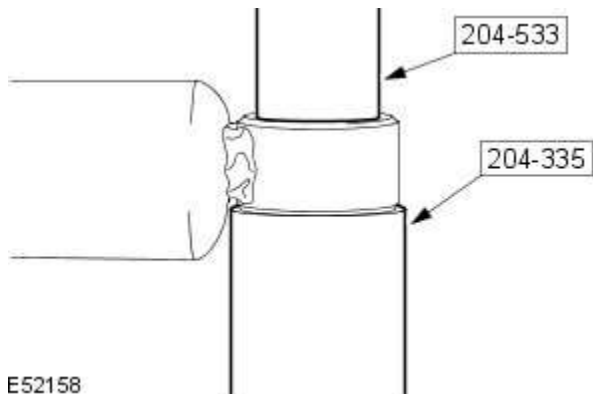


Position the special tool onto the recessed side of the bush.



With assistance make sure the special tool is aligned.

Position and align the special tool to the shock absorber bushing.



E52158

5. Using the special tools, carefully remove the bushing from the shock absorber.

Installation

1. NOTES:

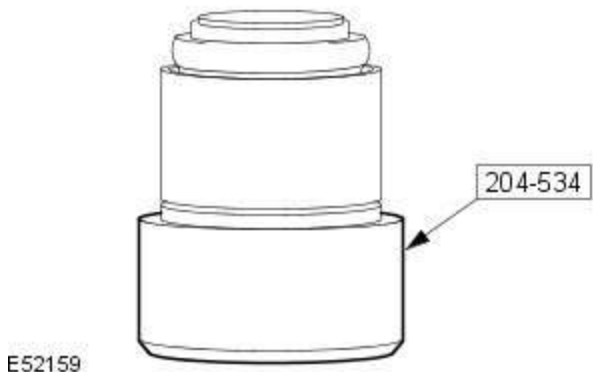


Make sure the bush is clean and free from oil or grease.



Use a suitable lubricant to allow the bush to locate into the special tool.

Locate the new bushing in the special tool.



E52159

2.  **WARNING:** Failure to follow this instruction may cause damage to the vehicle.

NOTES:



Make sure the shock absorber is clean and free from oil or grease and is not damaged prior to pushing in the new bush.

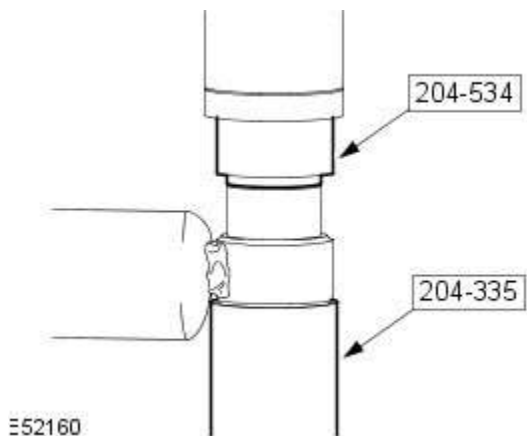


Make sure the bush is installed following the same direction as removal.

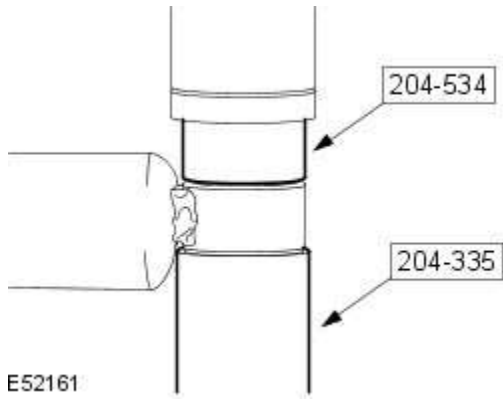



Make sure correct alignment is maintained.

Using the special tools, align the bushing to the shock absorber.



E52160




3.  NOTE: Make sure correct alignment is maintained.
Slowly push the bush into the shock absorber until the tool reaches the stop.

4. Install the shock absorber and spring assembly.
For additional information, refer to: [Shock Absorber and Spring Assembly \(204-02 Rear Suspension, Removal and Installation\)](#).

Rear Suspension - Rear Stabilizer Bar

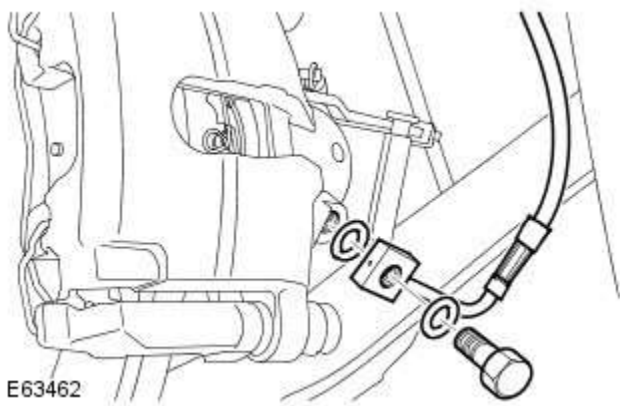
Removal and Installation

Special Tool(s)

	<p>Powertrain Assembly Jack, HTJ 1200-2</p>
---	---

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
3. Remove both rear wheels and tires.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
4. Drain the fuel tank.
For additional information, refer to: [Fuel Tank Draining](#) (310-00 Fuel System - General Information, General Procedures).
5. Remove the exhaust system.
For additional information, refer to: [Front Muffler](#) (309-00B Exhaust System - V6 3.0L Petrol, Removal and Installation).



6. **CAUTION:** Always plug any open connections to prevent contamination.

NOTES:



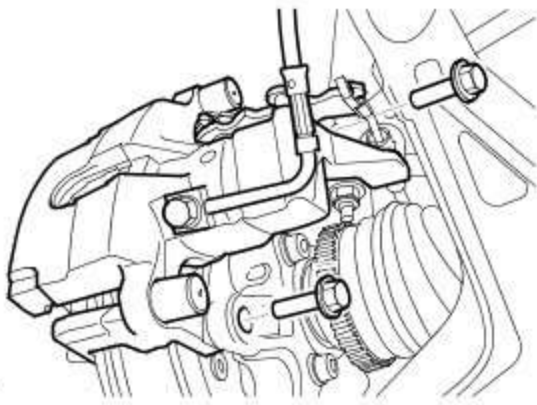
To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.



RH illustration shown, LH is similar.

Disconnect the brake hose from the brake caliper.

- Using the special tool, press and hold the brake pedal.
- Remove and discard the two sealing washers.

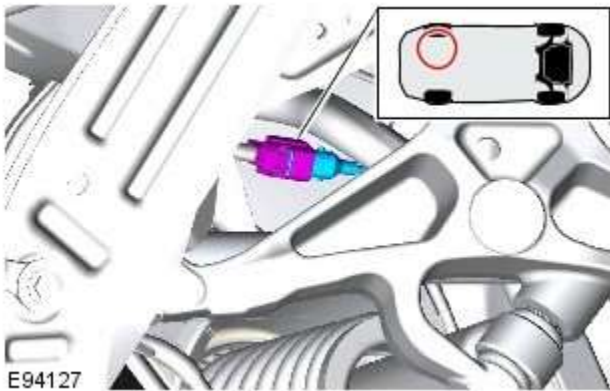


E64610

7.  NOTE: Left-hand shown, right-hand similar.

Release the brake caliper.

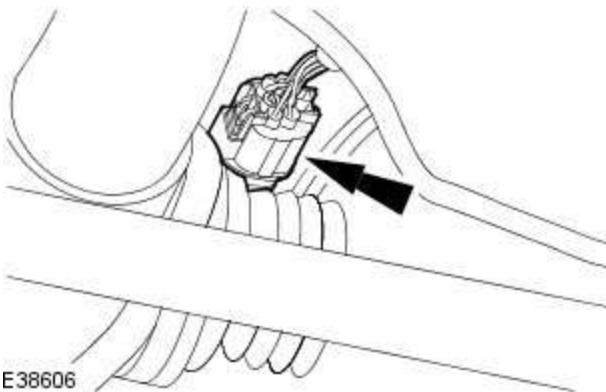
- Remove and discard the 2 bolts.
- Tie the brake caliper aside.



E94127

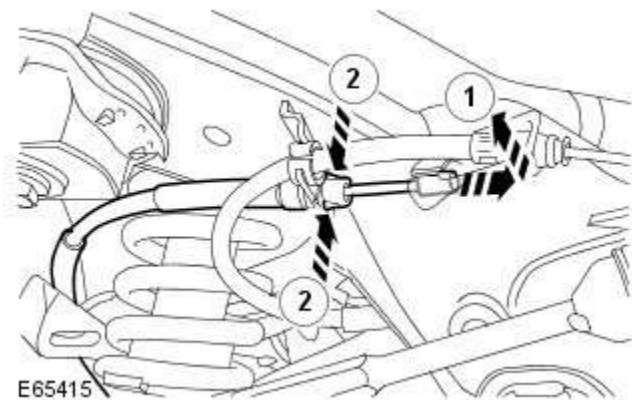
8.  NOTE: Left-hand shown, right-hand similar.

Disconnect the rear wheel speed sensor.



E38606

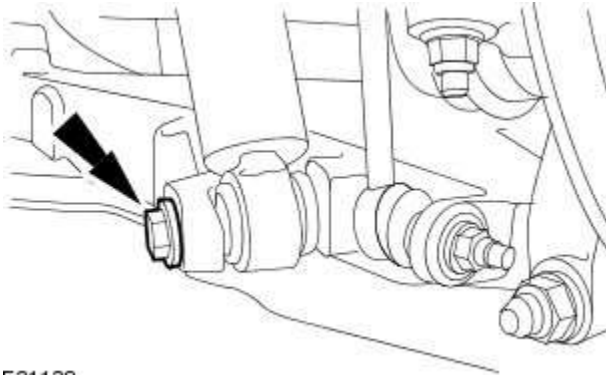
9. Disconnect the electronic parking brake actuator electrical connector.




E65415

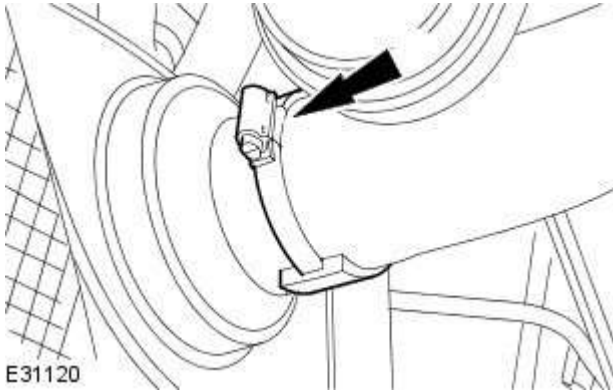
10.  NOTE: Left-hand shown, right-hand similar.

Disconnect both parking brake cables from the rear brake calipers.



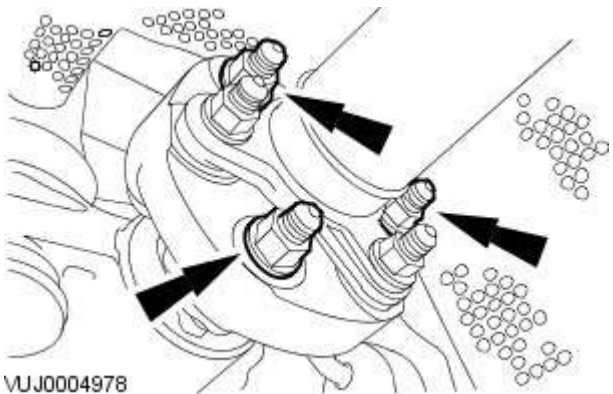
E31128

11.  **NOTE:** Left-hand shown, right-hand similar.
Detach the shock absorber.




E31120

12. Detach the fuel filler hose.

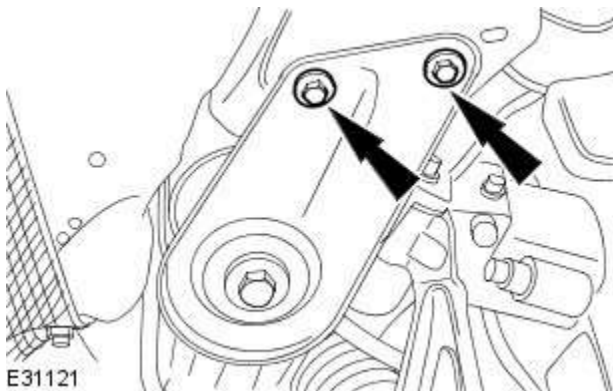


VUJ0004978


13.  **CAUTION:** Under no circumstances must the flexible coupling (or its fixings) be loosened or removed from the driveshaft.

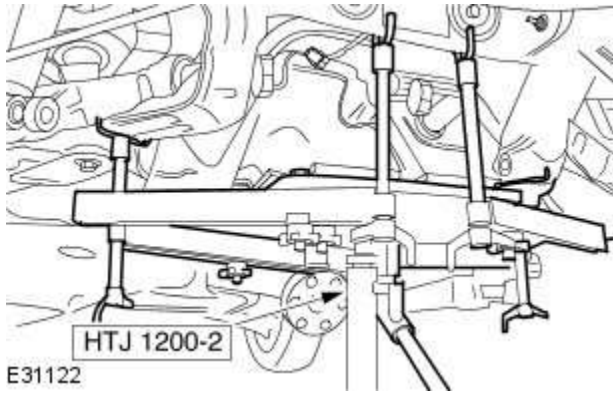
Detach the driveshaft from the rear drive axle flange.

- Mark the position of the driveshaft in relation to the rear drive axle flange.
- Mark the position of the balance nut in relation to the rear drive axle flange. (if fitted).
- Mark the position of each nut and bolt in relation to the driveshaft flexible joint.



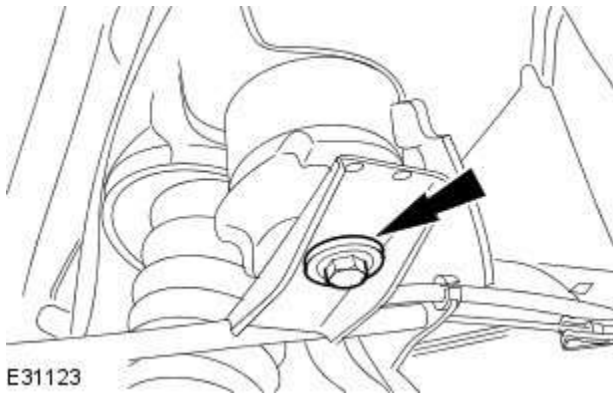
E31121

14.  **NOTE:** Left-hand shown, right-hand similar.
Remove the rear subframe reinforcement plate retaining bolts.



15.

Install the special tool to support the rear subframe.

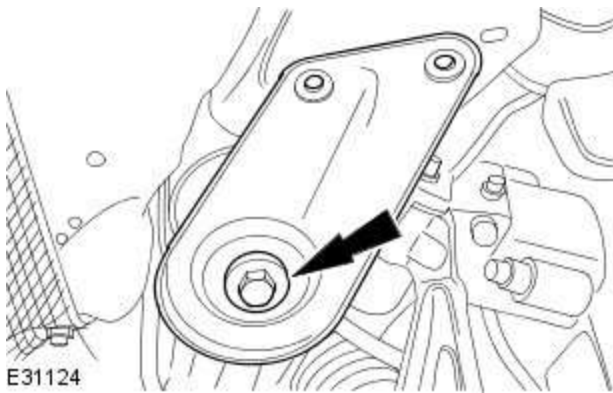


16.



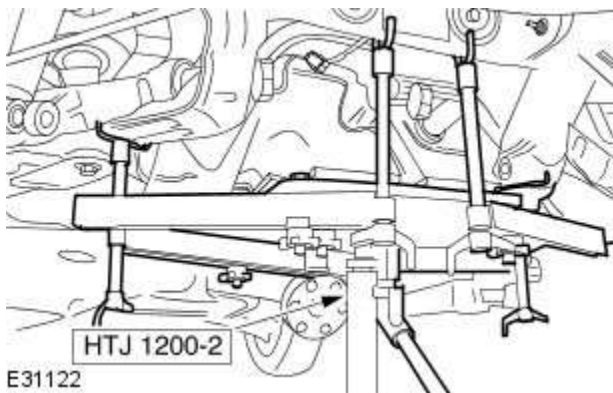
NOTE: Left-hand shown, right-hand similar.

Remove the rear subframe rear retaining bolt.



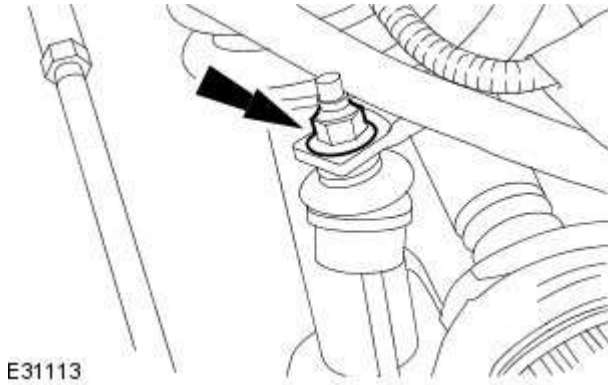
NOTE: Left-hand shown, right-hand similar.

17. Remove the rear subframe front retaining bolt.

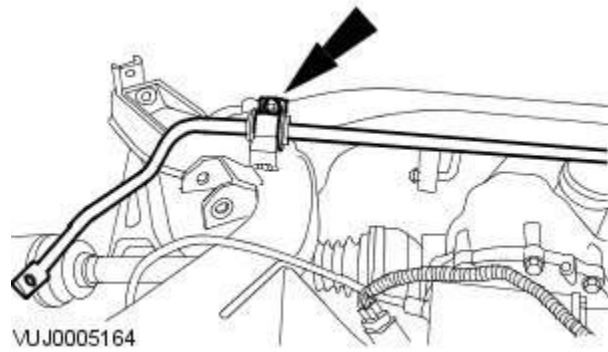


18.

Remove the rear subframe.



19. Remove the stabilizer bar link nuts.

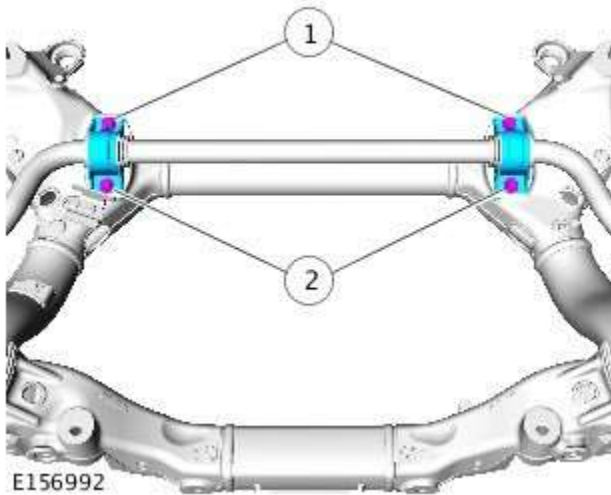


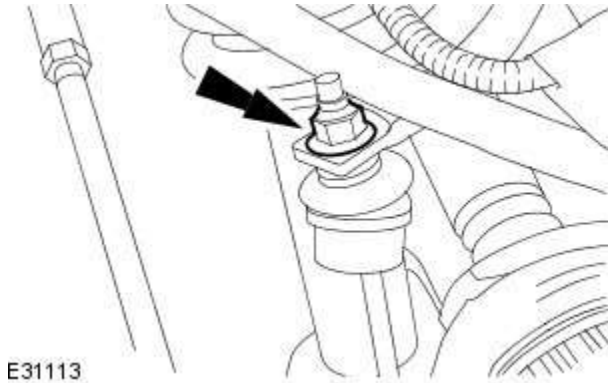
20. Remove the rear stabilizer bar.

- Remove the stabilizer bar bushings.

Installation

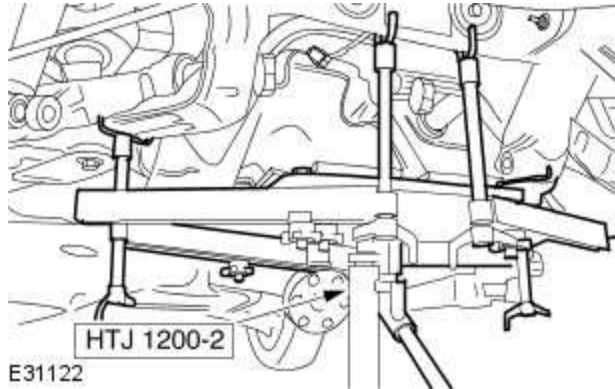
1. During installation tighten the bolts in the following sequence.
 - Bolt 1: 55 Nm.
 - Bolt 2: 55 Nm.
 - Bolt 1: 55 Nm.





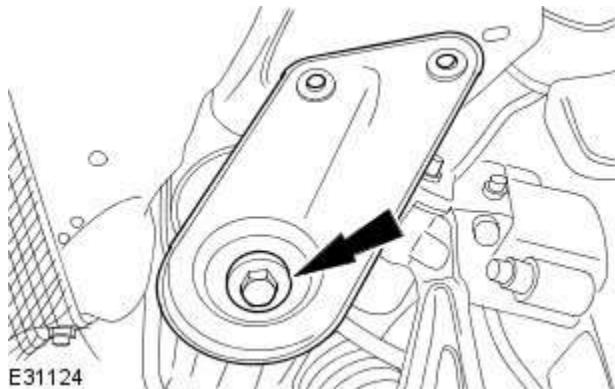
E31113

2. Install new nuts to the stabilizer bar links.
 - Tighten to 48 Nm.




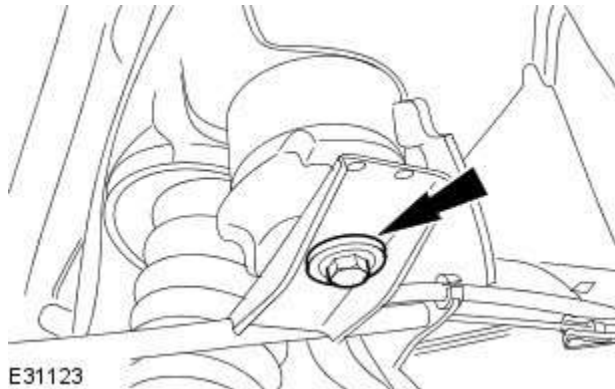
E31122

3. Install the rear subframe.



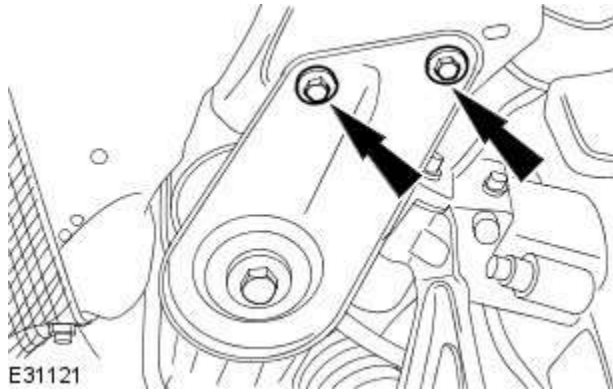
E31124


4.  NOTE: Left-hand shown, right-hand similar.
Loosely install the rear subframe front bolt.

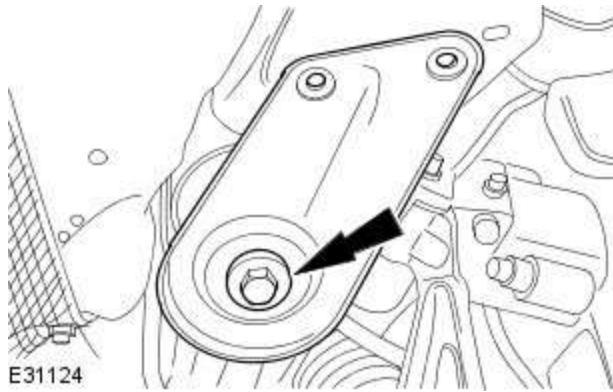


E31123

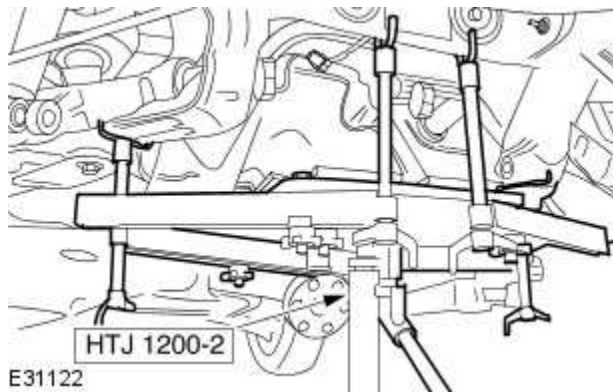
5. Loosely install the rear subframe rear bolt.



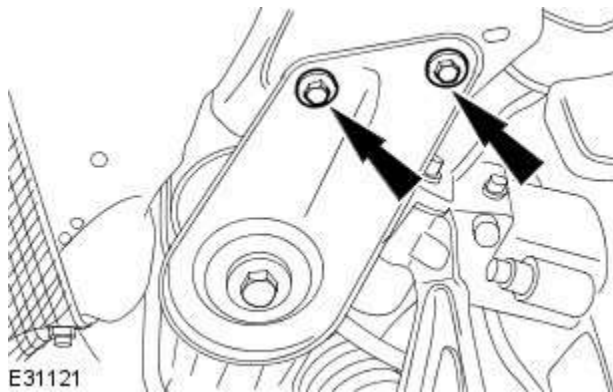
6.  NOTE: Left-hand shown, right-hand similar.
Loosely install the rear subframe reinforcement plate bolts.



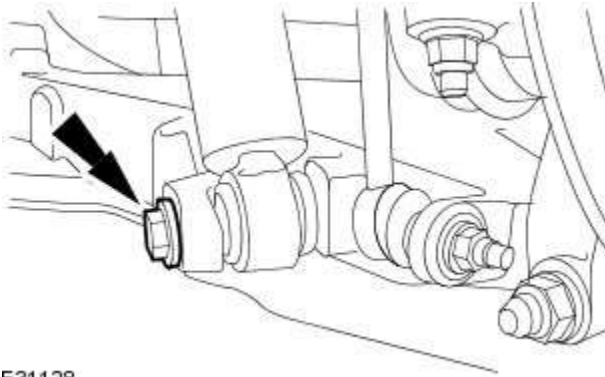
7. Tighten the subframe bolts.
• Tighten to 80 Nm + 240°.




8. Remove the special tool.



9. Tighten the rear subframe reinforcement plate retaining bolts.
• Tighten to 47 Nm.

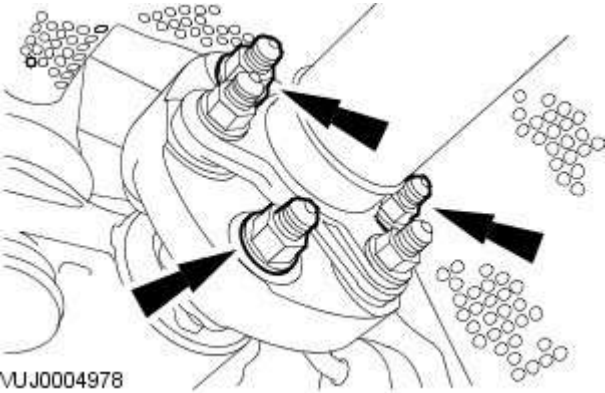


E31128

10.  NOTE: Left-hand shown, right-hand similar.

Install the shock absorber.

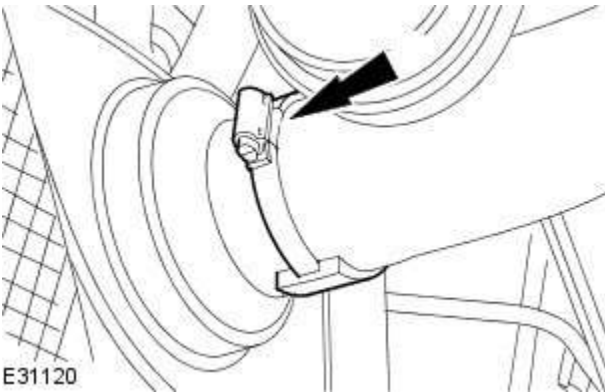
- Tighten to 133 Nm.



VUJ0004978

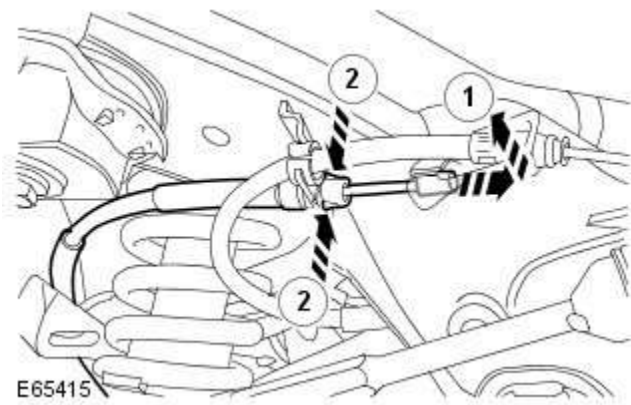
11.  NOTE: Install the components to their original fitted positions.

Attach the driveshaft to the rear drive axle flange.



E31120

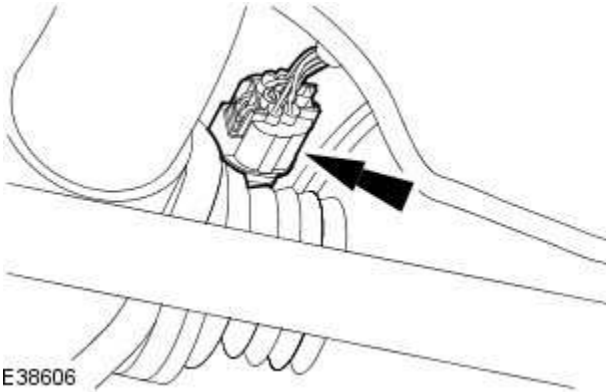
12. Attach the fuel filler hose to the fuel tank.



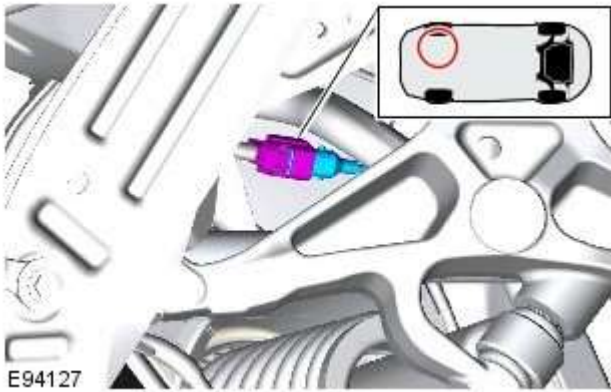
E65415

13. Connect both park brake cables to the rear brake calipers.

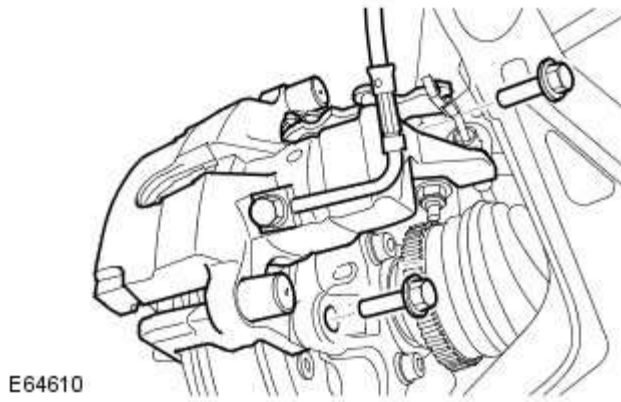
14. Connect the parking brake actuator electrical connector.



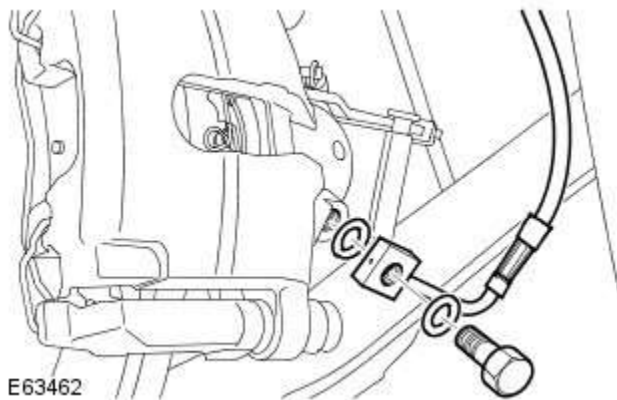
15. Connect the wheel speed sensor electrical connector.



16. Install the brake caliper.
• Tighten the bolts to 103 Nm.



17. Connect the brake hose to the brake caliper.
• Install new sealing washers.
• Tighten the union to 38 Nm.




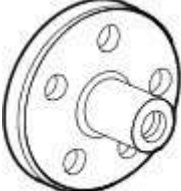
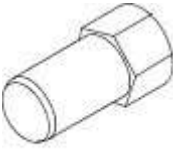
18. Install the exhaust system.
For additional information, refer to: [Front Muffler](#) (309-00B Exhaust System - V6 3.0L Petrol, Removal and Installation).
19. Refill the fuel tank.
For additional information, refer to: [Fuel Tank Draining](#) (310-00 Fuel System - General Information, General Procedures).
20. Bleed the brake system.
For additional information, refer to: [Brake System Bleeding](#) (206-00 Brake System - General Information, General Procedures).
21. Install the rear wheels and tires.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
22. Connect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
23. Using only four-wheel alignment equipment approved by Jaguar, check and adjust the wheel alignment.
For additional information, refer to: [Camber and Caster Adjustment](#) (204-00 Suspension System - General Information, General Procedures).

Rear Suspension - Rear Wheel Bearing

Removal and Installation

Special Tool(s)

 <p>204-250</p>	<p>204-250 Wheel bearing install and removal tool</p>
 <p>204-269</p>	<p>204-269 Flange remover forcing screw</p>
 <p>E117832</p>	<p>204-305 Remover, Wheel Bearing</p>
 <p>E101989</p> <p>204-725</p>	<p>204-725 Support Tool, Wheel Hub</p>
 <p>E101990</p> <p>204-726</p>	<p>204-726 Remover/Installer, Wheel Bearing</p>
 <p>E117751</p>	<p>204-727A Installer, Wheel Bearing</p>

 <p>E117752</p>	<p>204-791 Installer, Wheel Bearing</p>
 <p>205-491</p>	<p>205-491 Hub puller</p>
 <p>20549101</p>	<p>205-491-1 Adapter nuts</p>

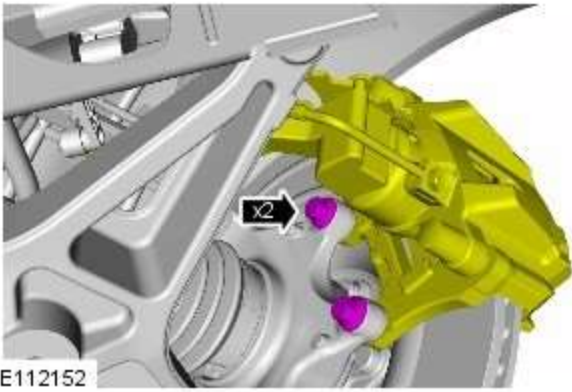
Removal

1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

3.



E112151



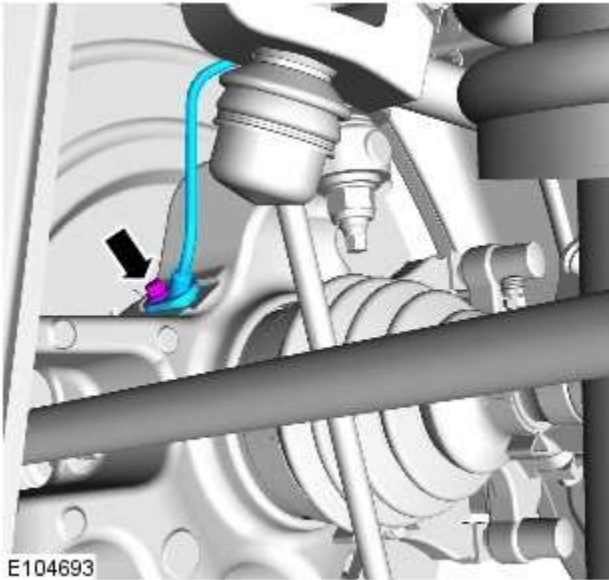
4.

E112152



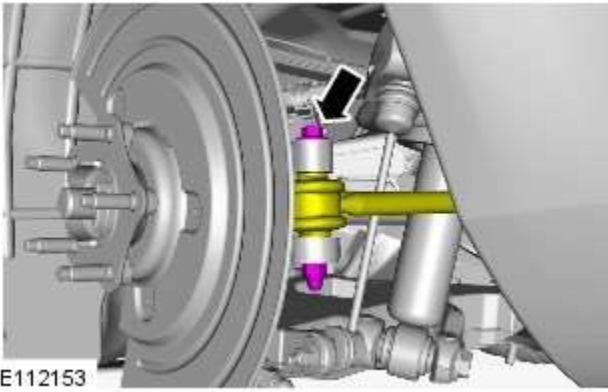
5.

E83394

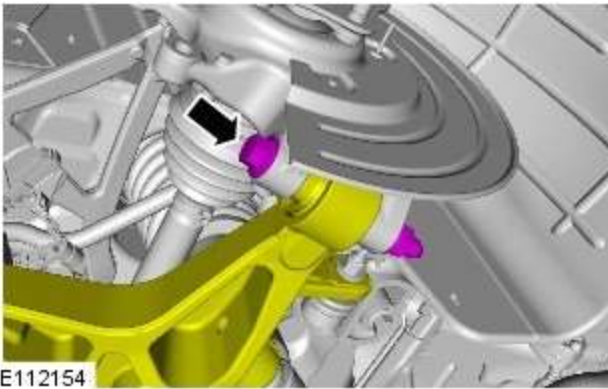


6.

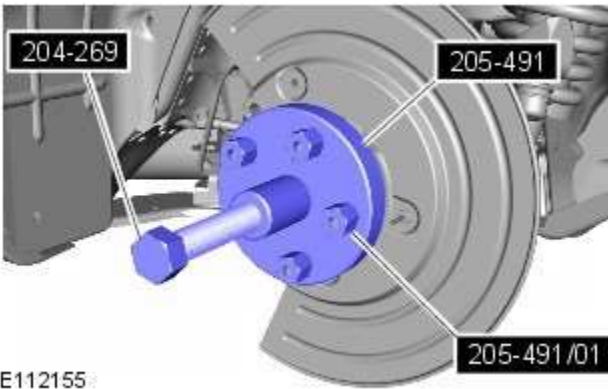
E104693



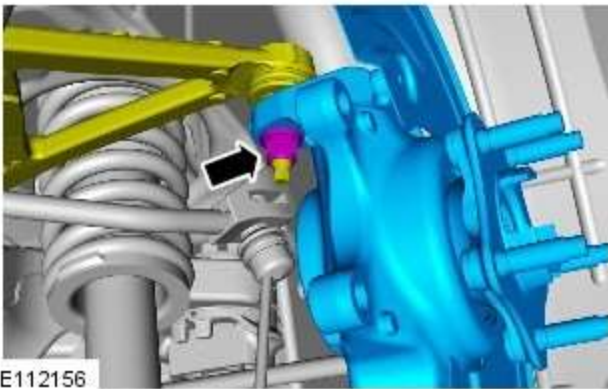
7.




8.




9.



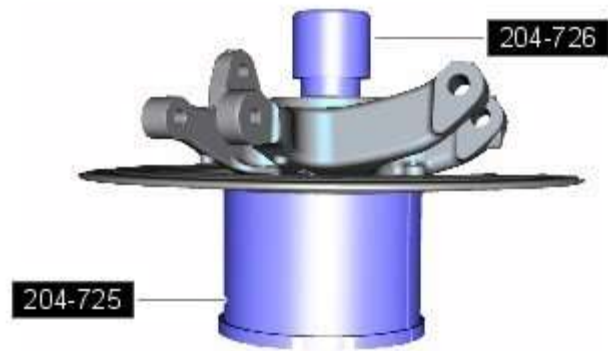
10.

 **CAUTION:** Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

Special Tool(s): [205-491](#), [205-491-1](#), [204-269](#)

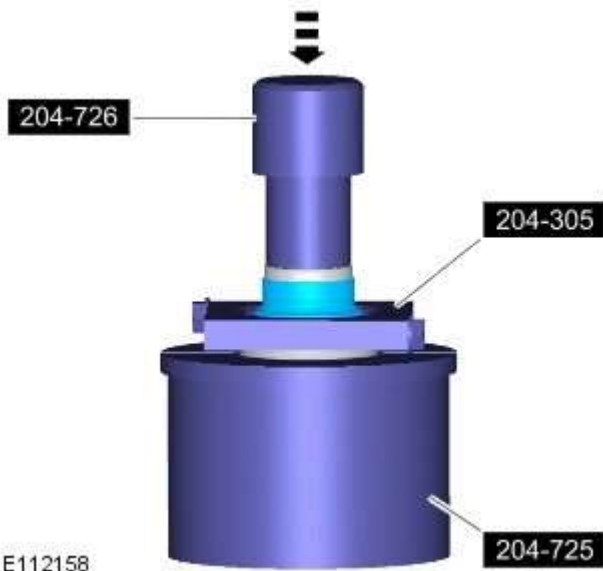
 **NOTE:** Use an additional wrench to prevent the component from rotating.

11. *Special Tool(s):* [204-726](#), [204-725](#)



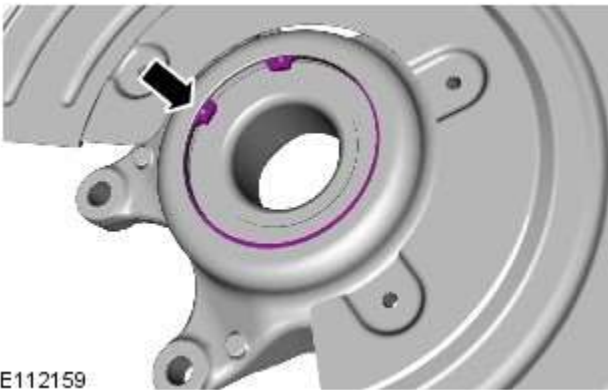
E112157

12. *Special Tool(s):* [204-305](#), [204-726](#), [204-725](#)

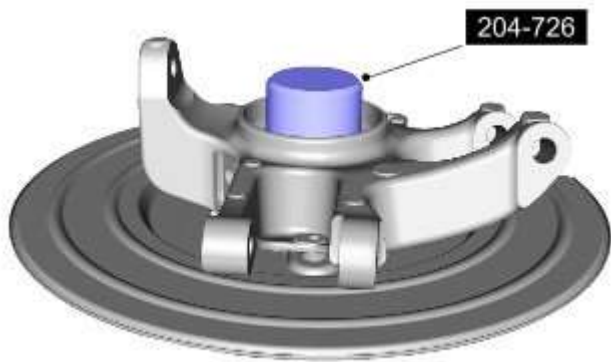


E112158

13.



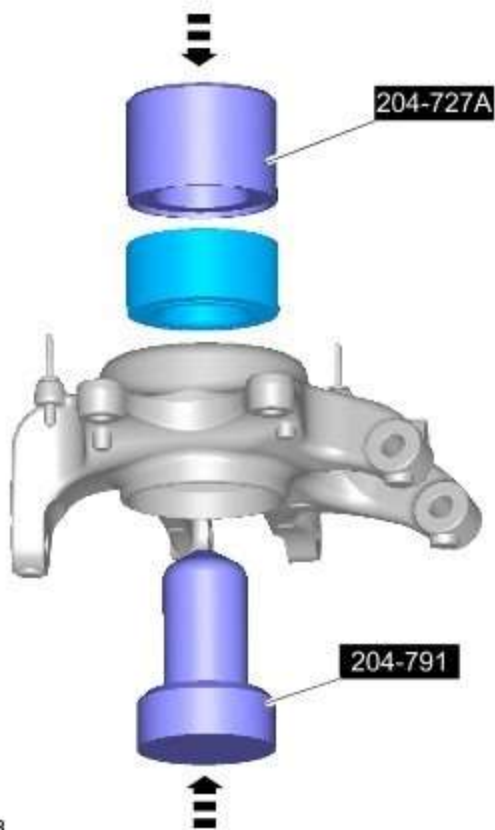
E112159



E112160


14. *Special Tool(s)*: [204-726](#)


Installation



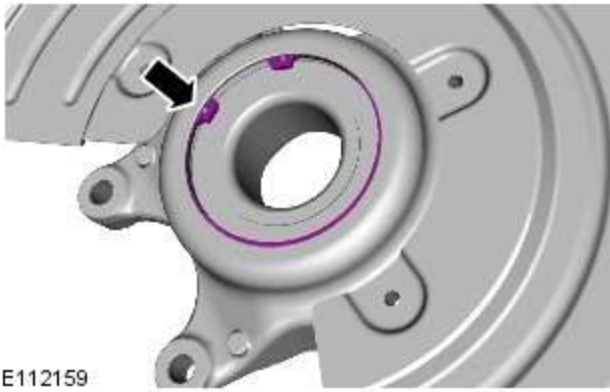
E117753

1. **NOTES:**

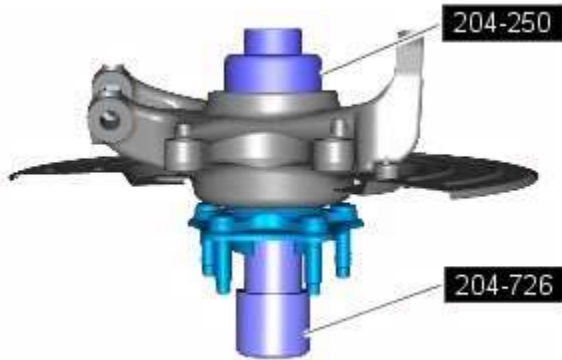
 Make sure bearing is installed in correct direction, encoder ring incorporated into the inboard seal of the wheel bearing.


 Make sure correct alignment of the bearing is maintained when installing into the hub carrier.

Special Tool(s): [204-727A](#), [204-791](#)

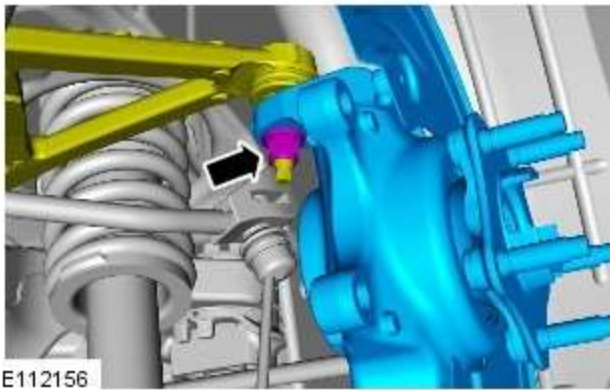


2.



3.  NOTE: Make sure the correct alignment of the drive flange is maintained when installing into the hub carrier and bearing assembly.


Special Tool(s): [204-726](#), [204-250](#)



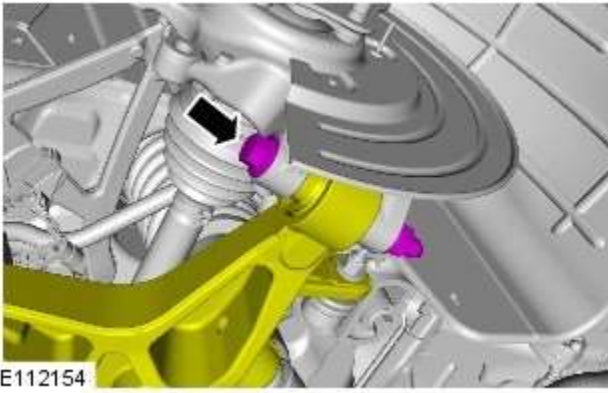
4.  CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

Torque: 90 Nm



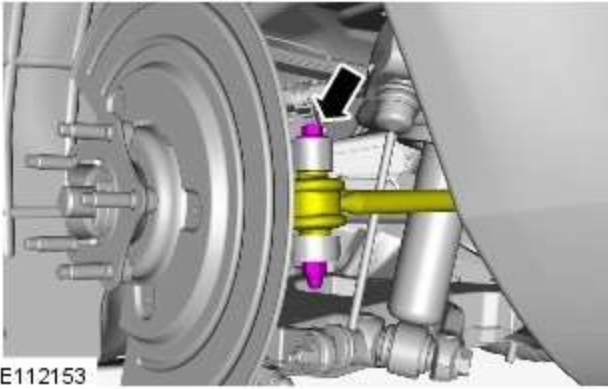
5.  CAUTION: Install the halfshaft nut finger tight.

 NOTE: The wheel hub nut is not tightened at this stage.



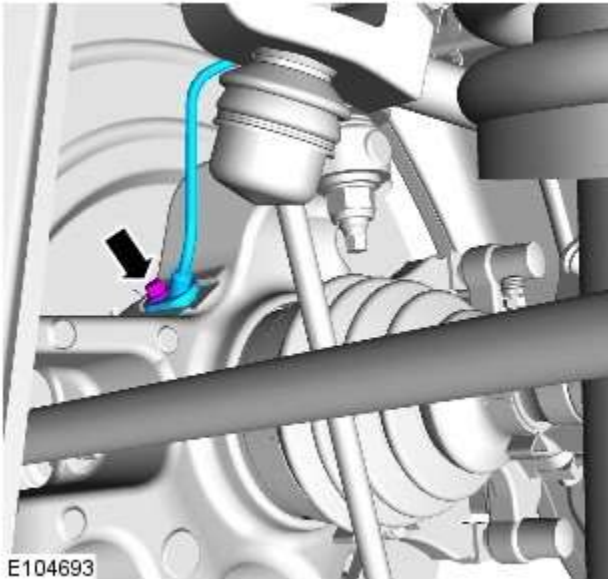
6.  CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

Torque: 150 Nm

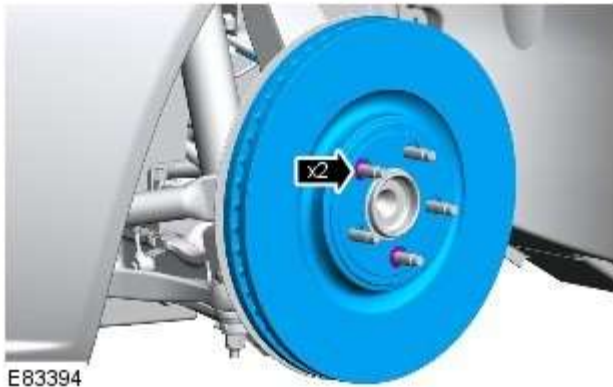


7.  CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

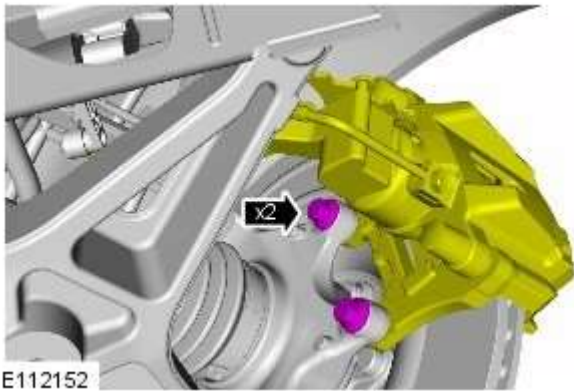
Torque: 55 Nm



8. *Torque: 6 Nm*




9.



10. *Torque: 103 Nm*



11.  **CAUTION:** Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Torque: 300 Nm

12. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

Rear Suspension - Upper Arm

Removal and Installation

Removal



CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

NOTES:



Removal steps in this procedure may contain installation details.



RH illustration shown, LH is similar.

1. Raise and lower the vehicle on a 4 post ramp.



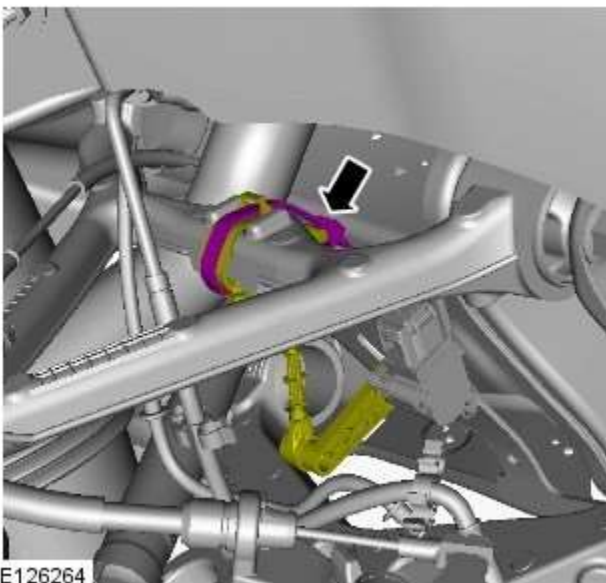
WARNING: Make sure to support the vehicle with axle stands.

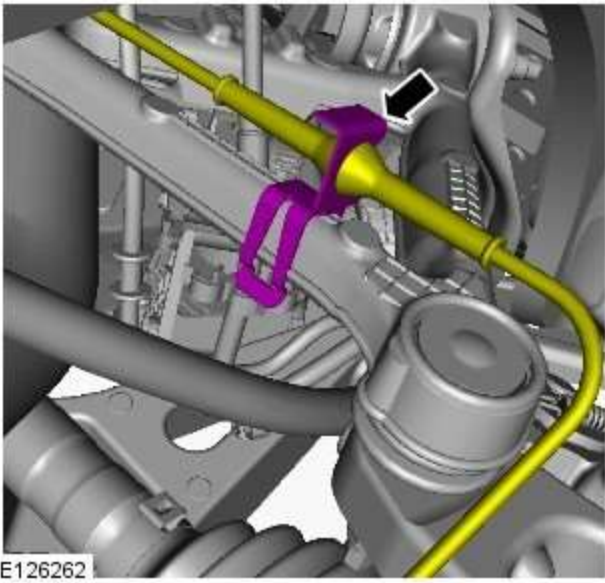
Raise and support the vehicle.

3. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

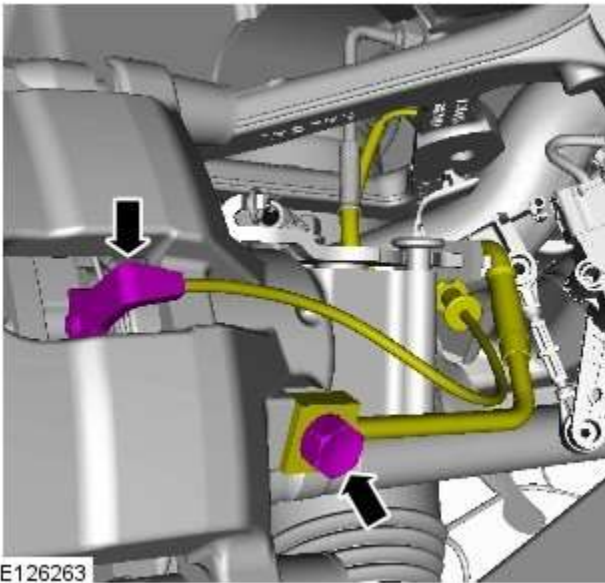
4. Refer to: Shock Absorber and Spring Assembly (204-02, Removal and Installation).

5.





6.



7. CAUTIONS:



Be prepared to collect escaping fluids.

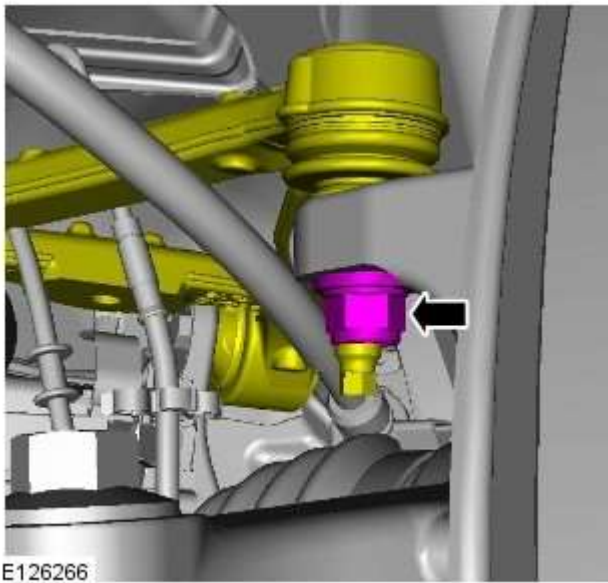


Make sure that the area around the component is clean and free of foreign material.

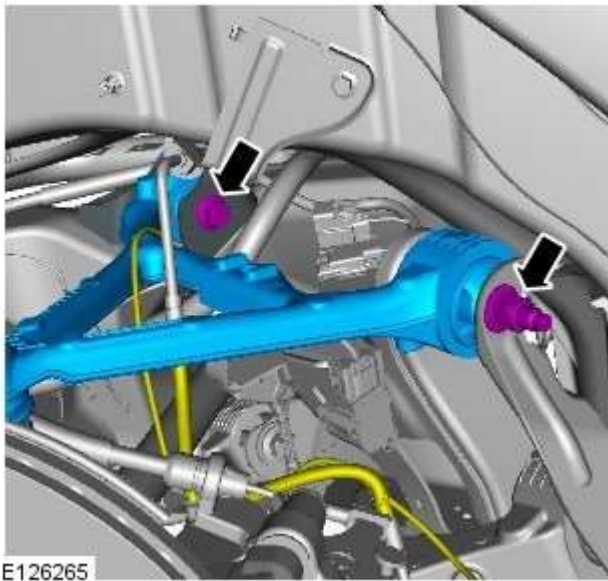


Make sure that all openings are sealed. Use new blanking caps.

Torque: 38 Nm



8. Torque: 96 Nm



9. Torque: 115 Nm

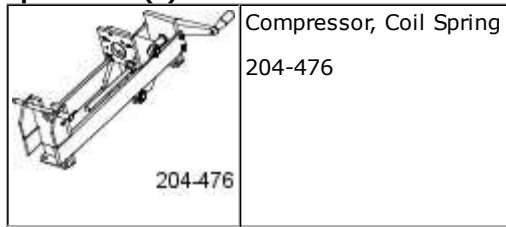
Installation

1. To install, reverse the removal procedure.
2. Refer to: Brake System Bleeding (206-00, General Procedures).

Rear Suspension - Shock Absorber and Spring Assembly

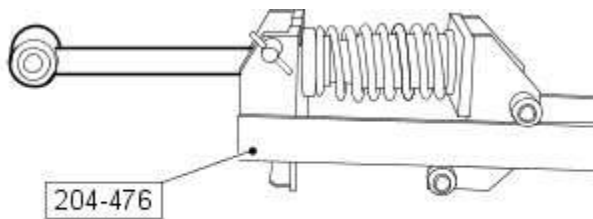
Disassembly and Assembly

Special Tool(s)



Disassembly

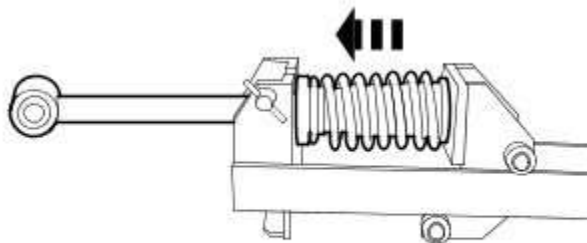
1. Remove the shock absorber and spring assembly.
For additional information, refer to [Shock Absorber and Spring Assembly](#) in this section.



E31044

2. **WARNING:** Make sure the shock absorber is secured by fully inserting the locking pin in to the special tool. Failure to follow these instructions may result in personal injury.

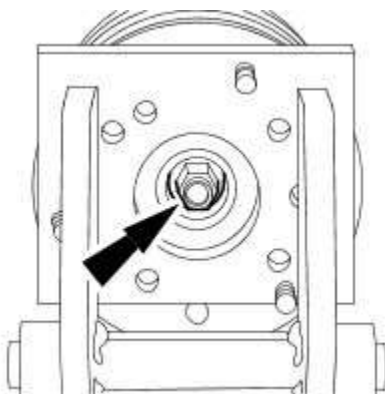
Install the shock absorber and spring assembly to the special tool as shown.



E31046

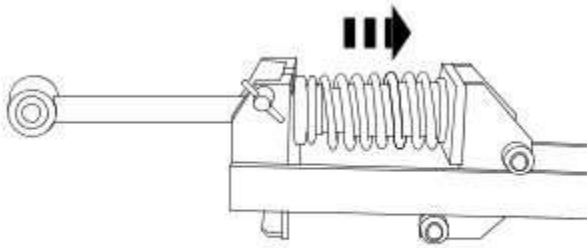
3. **WARNING:** AS THE SPRING IS UNDER EXTREME TENSION CARE MUST BE TAKEN AT ALL TIMES. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

Clamp the road spring.



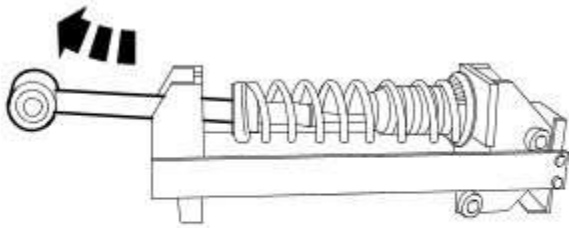
E43414

4. Remove the shock absorber retaining nut.
 - Remove and discard the retaining nut.



5. Release the road spring.

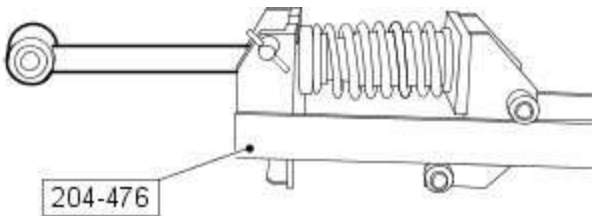
E31045




6. Remove the shock absorber.

E31047

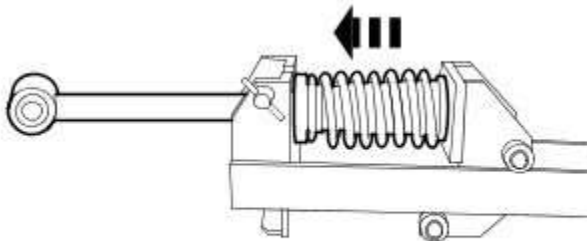
Assembly




1.  **CAUTION:** Make sure the spring ends butt correctly against the spring seats.

Install the shock absorber and spring assembly to the special tool.

E31044

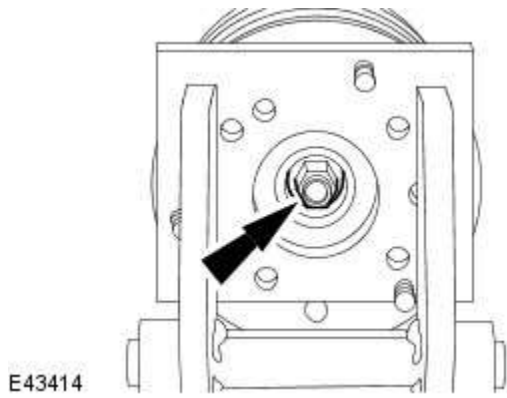


2.  **WARNING:** AS THE SPRING IS UNDER EXTREME TENSION CARE MUST BE TAKEN AT ALL TIMES. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

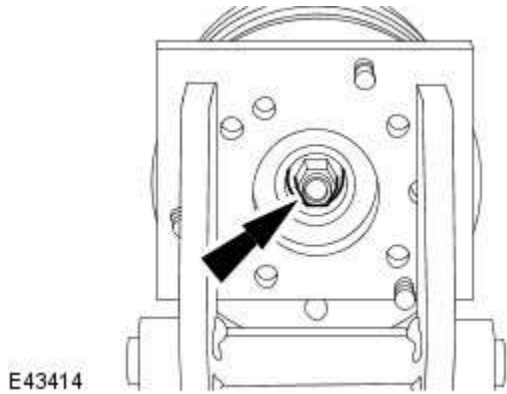
Clamp the road spring.

E31046

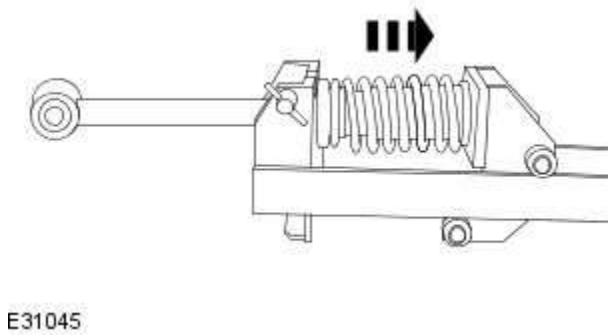
3. Vehicles without adaptive damping.
- Install a new retaining nut.
 - Tighten to 50 Nm.



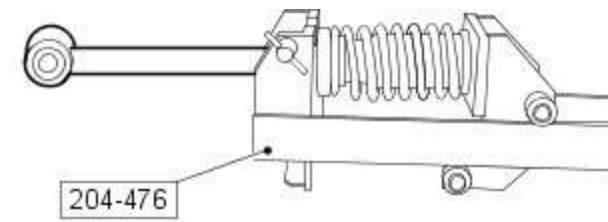
4. Vehicles with adaptive damping.
- Install a new retaining nut.
 - Tighten to 27 Nm.



5. Release the road spring.



6. Remove the shock absorber and spring assembly from the special tool.



Wheels and Tires -

Torque Specifications

Description	Nm	lb/ft	lb/in
Wheel nuts	125	92	-

Tire Pressures

Summer Tyres (ROW)		Up to 100 mph	Over 100 mph
235/55R17 99W	Front	2.3 bar (34 lbf/in ²)	2.3 bar (34 lbf/in ²)
	Rear	2.3 bar (34 lbf/in ²)	2.3 bar (34 lbf/in ²)
245/45R18 100 W&Y X/L	Front	2.1 bar (31 lbf/in ²)	2.6 bar (38 lbf/in ²)
	Rear	2.1 bar (31 lbf/in ²)	2.6 bar (38 lbf/in ²)
245/40R19 98 Y X/L	Front	2.1 bar (31 lbf/in ²)	2.5 bar (36 lbf/in ²)
	Rear	2.1 bar (31 lbf/in ²)	2.5 bar (36 lbf/in ²)
235/35R20 97Y X/L	Front	2.3 bar (34 lbf/in ²)	2.3 bar (34 lbf/in ²)
	Rear	-	-
285/30R20 99y X/L	Front	-	-
	Rear	2.3 bar (34 lbf/in ²)	2.3 bar (34 lbf/in ²)

Tire Pressures

All Season Tyres (USA & Canada)		0 mph - 121 mph
245/45R18 96H	Front	2.1 bar (31 lbf/in ²)
	Rear	2.1 bar (31 lbf/in ²)
245/40R19 94H	Front	2.4 bar (35 lbf/in ²)
	Rear	2.4 bar (35 lbf/in ²)

Wheel Specification

Wheel Type	Wheel Size
Libra	7.5 x 17
Cygnus	8.5 x 18
Venus	8.5 x 18
Auriga	8.5 x 19
Carelia	8.5 x 19
Volans (front)	8.5 x 20
Volans (rear)	9.5 x 20
Selena	8.5 x 20

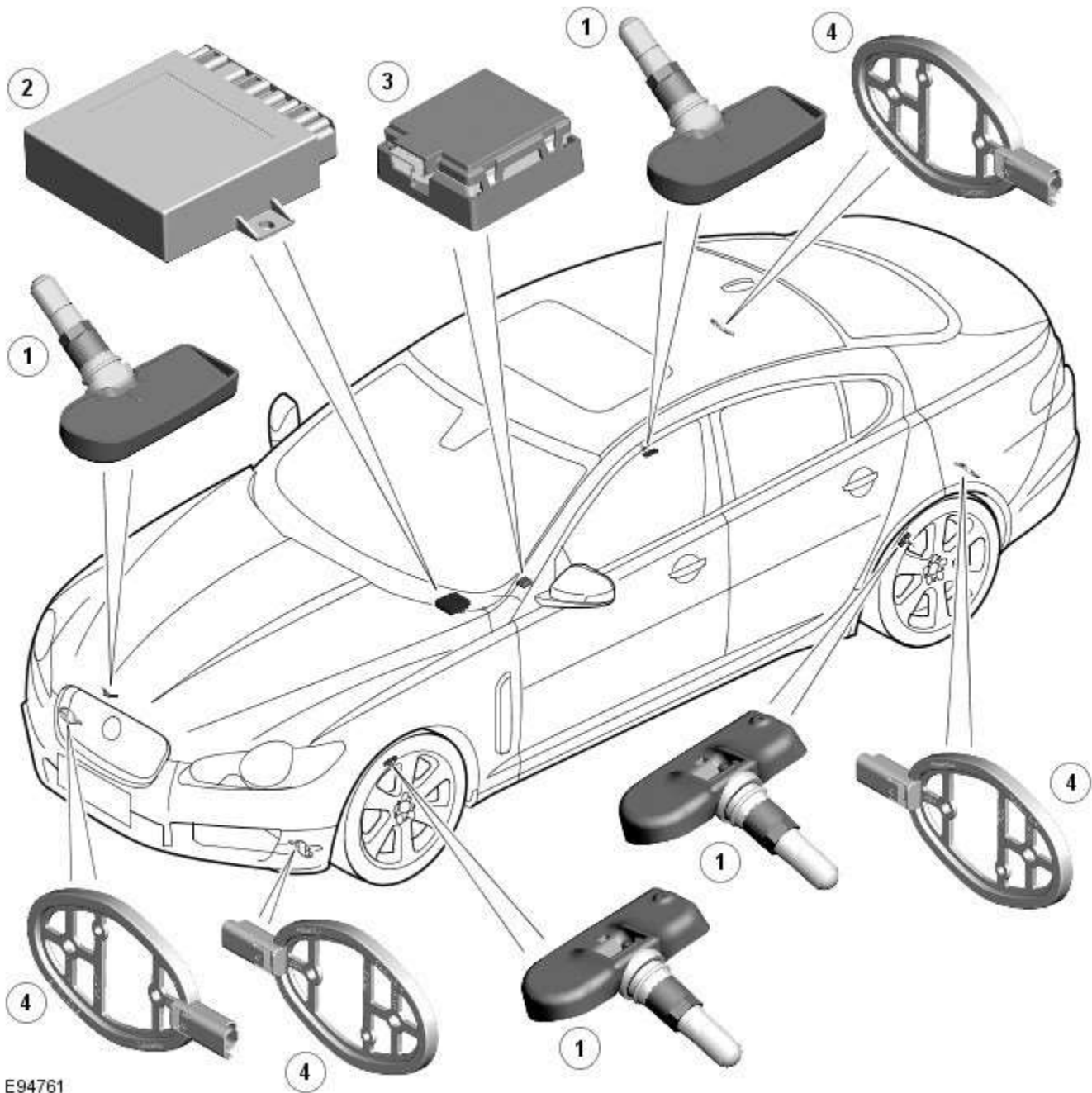
Tires and Fitment

Description	Wheels Type	Tire Type
Vehicles with 2.7L Diesel and 3.0L engine	Libra	235/55R17 99W Pirelli P7
	Cygnus	245/45R18 100W Dunlop SP01
Vehicles without supercharger	Cygnus	245/45R18 100W Dunlop SP01
Vehicles without supercharger (ROW)	Venus	245/45R18 100Y Pirelli PZero
	Carelia	245/40R19 98Y Dunlop SP01
	Auriga	245/40R19 98Y Dunlop SP01
Vehicles without supercharger (ROW) and vehicles with supercharger (USA & Canada)	Cygnus	245/45R18 96H Continental ProContact
	Auriga	245/40R19 96H Continental ProContact
Vehicles with supercharger	Volans (front)	255/35R20 97Y Pirelli PZero
	Volans (rear)	285/30R20 99Y Pirelli PZero

Wheels and Tires - Wheels and Tires - Component Location

Description and Operation

Tire Pressure Monitoring System (TPMS) Component Location



E94761

Item	Description
1	Tire pressure sensor
2	Tire pressure monitoring system module
3	Tire pressure receiver
4	Tire pressure monitoring system initiator

Wheels and Tires - Wheels and Tires - Overview

Description and Operation

OVERVIEW

A number of alloy wheel designs are available ranging from 17 to 20 inch in diameter. A Tire Pressure Monitoring System (TPMS) is used to monitor the air pressure in each tire and inform the driver if the pressure falls below predetermined thresholds.

All wheels are of cast construction in aluminum alloy with the choice of wheel design dependant on the vehicle trim level and engine derivative.

On normally aspirated petrol models and all diesel models a 4J X 18 inch temporary spare wheel is supplied as standard, supercharged petrol models are supplied with a 4Jx19 inch temporary spare wheel. In some major European markets an Instant Mobility System is offered as an alternative to the spare wheel. The Instant Mobility System is capable of providing a temporary repair and tire inflation to a puncture of up to 6mm in diameter in the tread area of the tire. A puncture in the tire wall cannot be repaired using the system.

The vehicle jack and accessories are stored in the spare wheel-well in the luggage compartment.

Tire Changing

WARNINGS:



Tires must be inflated to the recommended pressures when the tires are cold (ambient temperature) only. Refer to label on the 'B' pillar for recommended tire pressures. If the tires have been subjected to use or exposed to direct sunlight, move the vehicle into a shaded position and allow the tires to cool before checking or adjusting the pressures.

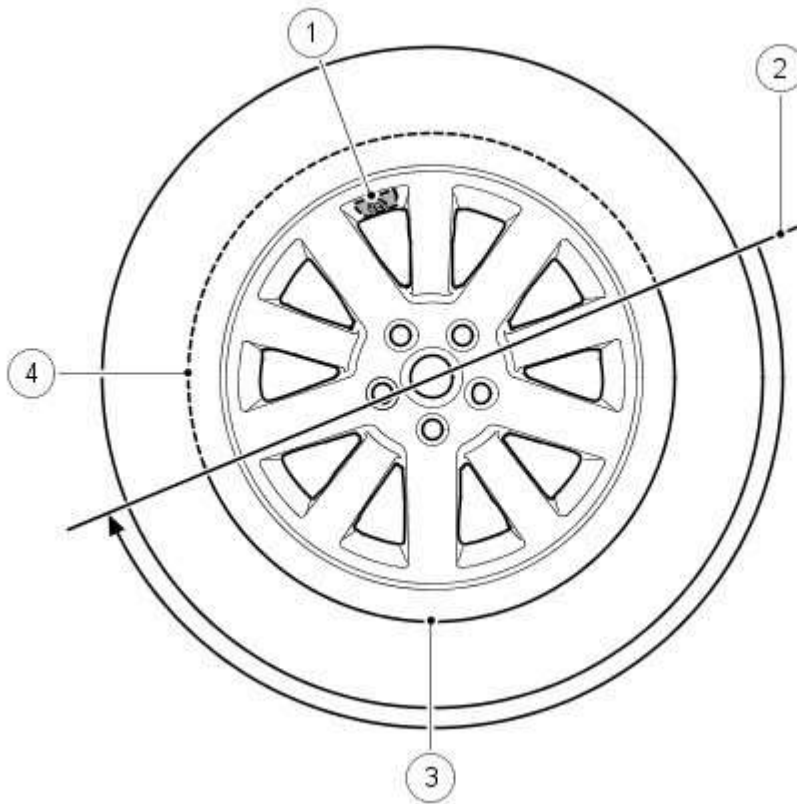


Valve stem seal, washer nut, valve core and cap should be replaced at every tire change. Valve stem seal, washer and nut must be replaced if the valve retention nut is loosened. Sensor units and nuts must be fitted using correct torque figures and associated profile. Damage to the vehicle and consequently injury to the vehicle's occupants may result if these instructions are not adhered to.



NOTE: The TPMS valve should be serviced using the suitable service kit, each time the tyre is dismantled, to ensure an air tight seal. Attention should be made to the detail of fitting this kit.

Vehicles fitted with TPMS can be visually identified by an external metal locknut and valve of the tire pressure sensor on the road wheels. Vehicles without TPMS will have rubber tire valve.



E45549

Item	Description
1	Tire valve and pressure sensor
2	Tire fitting/removal tool initial start position
3	High tire and bead tension area
4	Low tire and bead tension area

When removing the tire, the bead breaker must not be used within 90 degrees of the tire valve in each direction on each side of the tire.

When using the tire removal machine, the fitting arm start position must be positioned as shown in the tire changing illustration for each side of the tire. The wheel can then be rotated through 180 degrees in a counter-clockwise direction. This will relieve tension from the tire bead allowing the remaining 180 degrees of the tire to be manually pulled from the rim.

When refitting the tire, position the fitting arm as shown. Rotate the tire and take care that the bead on the low tension side of the tire does not damage the sensor.

Run-Flat Tires

Run-flat tires are not available on vehicles from 2011MY.

TREAD Act - NAS Only

Vehicles supplied to the North American markets must comply with the legislation of the Transport Recall Enhancement, Accountability and Documentation (TREAD) act. Part of the requirement of the TREAD act is for the vehicle to display a label which defines the recommended tire inflation pressure, load limits and maximum load of passengers and luggage weight the vehicle can safely carry. This label will be specific to each individual vehicle and will be installed on the production line. The label is positioned on the driver's side 'B' pillar on NAS vehicles and the inside rear face of the LH door on Canadian specification vehicles.

This label must not be removed from the vehicle. The label information will only define the specification of the vehicle as it came off the production line. It will not include dealer or owner fitted accessory wheels and tires of differing size from the original fitment.

If the label is damaged or removed for body repair, it must be replaced with a new label specific to that vehicle. A new label is requested from Jaguar parts and will be printed specifically for the supplied VIN of the vehicle.

Tire Pressure Monitoring System (TPMS)

The Tire Pressure Monitoring System (TPMS) is a driver assistance system which assists the driver to maintain the tire pressures at the optimum level. TPMS is standard fitment on NAS vehicles and an optional fitment in other markets. TPMS

provides the following benefits:

- Maintain optimal fuel consumption.
- Maintain ride and handling characteristics.
- Reduce the risk of rapid tire deflation - which may be caused by under inflated tires.
- Comply with legislation requirements in relevant markets.



CAUTION: TPMS is not intended as a replacement for regular tire pressure and tire condition checks and should be considered as additional to good tire maintenance practices.

The TPMS measures the pressure in each of the vehicle's tires and issues warnings to the driver if any of the pressures deviate from defined tolerances. The space saver spare wheel is not monitored.



NOTE: TPMS is not designed to warn the driver of a tire 'blow-out', as due to the short duration of a 'blow-out', it is not possible to give the driver sufficient warning that such an event is occurring. The design of the TPMS is to assist the driver in keeping the tires at the correct pressure, which will assist to reduce the likelihood of a tire 'blow-out' occurring.

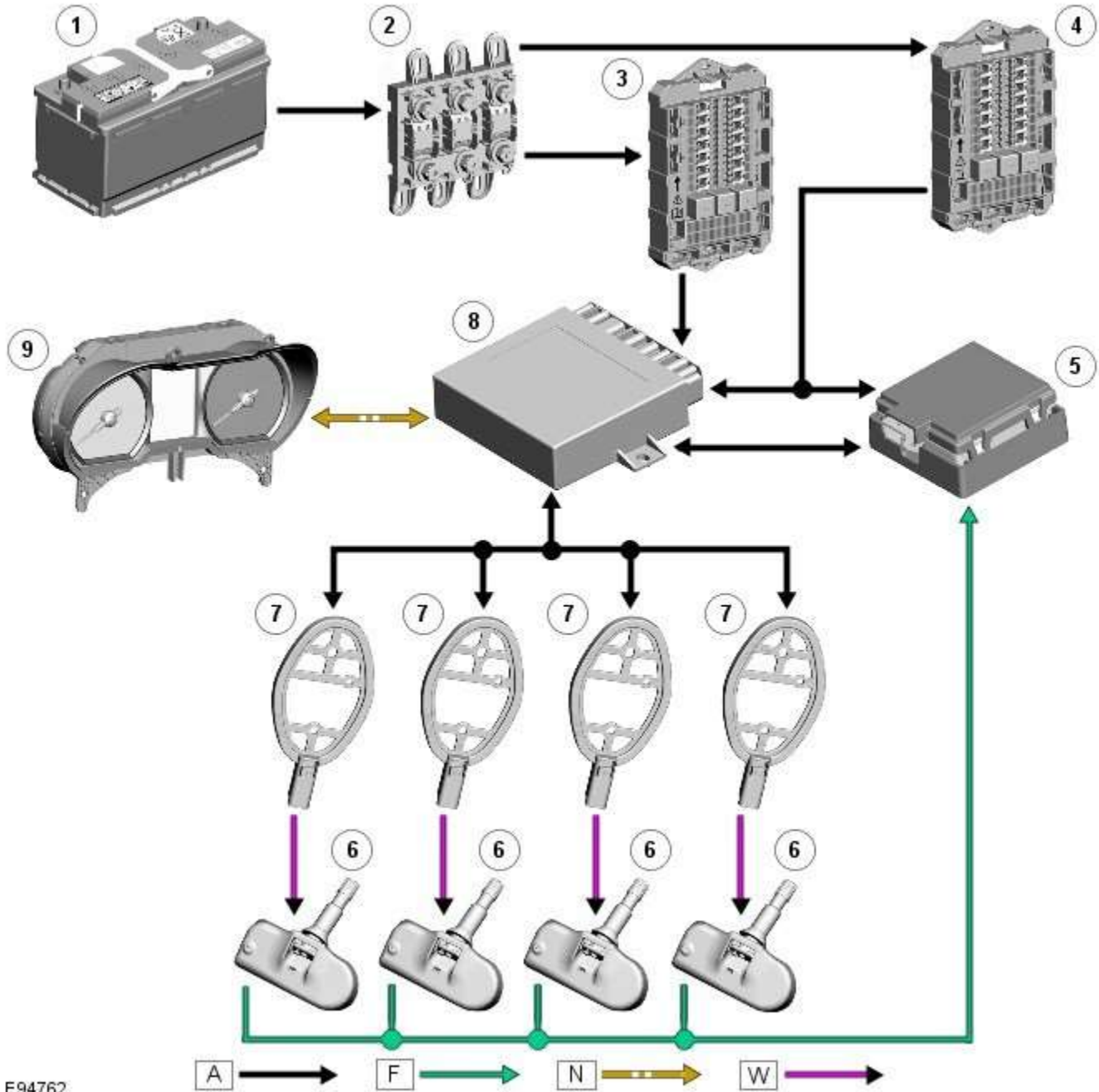
Wheels and Tires - Wheels and Tires - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **F** = RF Transmission; **N** = Medium speed CAN bus; **W** = LF Transmission



E94762

Item	Description
1	Battery
2	Megafuse (250A)
3	CJB (central junction box)
4	RJB (rear junction box)
5	TPMS receiver
6	Tire pressure sensors

7	Initiators
8	TPMS module
9	Instrument cluster

System Operation

Tire Pressure Monitoring System (TPMS)

The controlling software for the Tire Pressure Monitoring System (TPMS) is located within a Tire Pressure Monitoring System Module. The software detects the following:

- When the tire pressure is below the recommended low pressure value - under inflated tire.
- The location of the tire on the vehicle that is below the recommended pressure.
- Malfunction warning.

The TPMS system comprises:

- Tire pressure monitoring system module located below the right-hand front seat.
- Tire pressure receiver located near the gear shifter within the floor console.
- Two front initiators positioned forward of the wheels and behind the fender splash shields.
- Two rear initiators positioned rearward of the wheels and assembled on dedicated brackets located behind the fender splash shields.
- Four sensors, each sensor is integral with a tire valve and located within the tire; the space saver spare wheel is not fitted with a sensor.

The four initiators are hard wired to the TPMS module. The initiators transmit 125 KHz Low Frequency (LF) signals to the tire pressure sensors which respond by modifying the mode status within the Radio Frequency (RF) transmission. The 315 or 433 MHz RF signals are detected by the tire pressure receiver which is connected directly to the TPMS module. The received RF signals from the tire pressure sensors are passed to the TPMS module and contain identification, pressure, temperature and acceleration information for each wheel and tire.

The TPMS module communicates with the instrument cluster via the medium speed CAN bus to provide the driver with appropriate warnings. The TPMS module also indicates status or failure of the TPMS or components.

Tire Location and Identification

The TPMS can identify the position of the wheels on the vehicle and assign a received tire pressure sensor identification to a specific position on the vehicle, for example front left, front right, rear left and rear right. This feature is required because of the different pressure targets and threshold that could exist between the front and rear tires.

The wheel location is performed automatically by the TPMS module using an 'auto-location' function. This function is fully automatic and requires no input from the driver. The TPMS module automatically re-learns the position of the wheels on the vehicle if the tire pressure sensors are replaced or the wheel positions on the vehicle are changed.

The TPMS software can automatically detect, under all operating conditions, the following:

- one or more new tire pressure sensors have been fitted
- one or more tire pressure sensors have stopped transmitting
- TPMS module can reject identifications from tire pressure sensors which do not belong to the vehicle
- two 'running' wheels on the vehicle have changed positions.

If a new tire pressure sensor is fitted on any 'running' wheel, the module can learn the new sensor identification automatically through the tire learn and location process.

The tire-learn and location process is ready to commence when the vehicle has been stationary or traveling at less than 12 mph (20 km/h) for 15 minutes. This is known as 'parking mode'. The learn/locate process requires the vehicle to be driven at speeds of more than 12 mph (20 km/h) for 15 minutes. If the vehicle speed reduces to below 12 mph (20 km/h), the learn process timer is suspended until the vehicle speed increases to more than 12 mph (20 km/h), after which time the timer is resumed. If the vehicle speed remains below 12 mph (20 km/h) for more than 15 minutes, the timer is set to zero and process starts again.

Low Pressure Monitoring

The tire low pressure sensor transmits by RF (315 MHz or 433 MHz depending on market) signal. These signals contain data which corresponds to tire low pressure sensor identification, tire pressure, tire temperature, acceleration and tire low pressure sensor mode.

Each time the vehicle is driven, the tire pressure monitoring system module activates each LF antenna in turn. The corresponding tire low pressure sensor detects the LF signal and responds by modifying the mode status within the RF transmission.

The system enters 'parking mode' after the vehicle speed has been less than 20 km/h (12.5 miles/h) for 12 minutes. In parking mode the tire low pressure sensors transmit a coded signal to the tire pressure monitoring system module once every 13 hours. If the tire pressure decreases by more than 0.06 bar (1 lbf/in²) the tire low pressure sensor will transmit more often as pressure is lost.

As each wheel responds to the LF signal from the tire pressure monitoring system module, it is assigned a position on the vehicle and is monitored for the remainder of that drive cycle in that position.

When the vehicle has been parked for more than 15 minutes and then driven at a speed of more than 20 km/h (12.5 miles/h), the antennas fire in turn for 6 seconds on all except North American Specification (NAS) vehicles or for 18 seconds on NAS only vehicles in the following order:

- Front left
- Six second pause (for the tire pressure monitoring system module to detect a response from the tire low pressure sensor)
- Front right
- Six second pause
- Rear right
- Six second pause
- Rear left
- Six second pause.

Each tire low pressure sensor responds in turn so the tire pressure monitoring system module can establish the tire low pressure sensor positions at the start of the drive cycle. This process is repeated up to three times but less if the tire low pressure sensor positions are already known in the tire pressure monitoring system module.

This process is known as 'Auto Location' and takes:

- three to five minutes on all except North American specification vehicles to complete, and
- seven to eight minutes on North American specification vehicles to complete.

During this period the tire low pressure sensors transmit at regular intervals:

- once every 5 seconds on all except North American specification vehicles, and
- once every 15 seconds on North American specification vehicles.

For the remainder of the drive cycle the tire low pressure sensors transmit once every 60 seconds or if a change in tire pressure is sensed until the vehicle stops and the tire pressure monitoring system returns to parking mode.

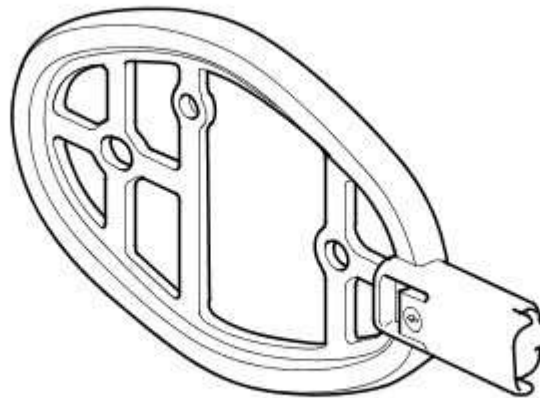
Once the wheel position is established, the antennas stop firing and do not fire again until the vehicle has been parked for more than 15 minutes. The signal transmissions from each tire low pressure sensor continue at one minute intervals whilst the vehicle is being driven. This transmission is to monitor the tire pressure. The warning occurs at 25% deflation and comprises the low tire pressure warning indicator and an appropriate message displayed in the instrument cluster message center. The message center will also display additional information about the position of the affected wheel(s).

Spare Tire Monitoring

Tire pressure sensors are not fitted to the space saver spare wheel and therefore the spare wheel is not monitored.

Component Description

Initiator

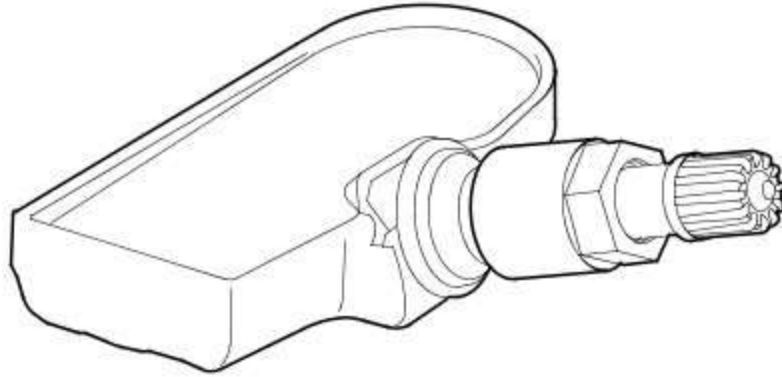


E45552

Each initiator has a connector which connects to the vehicle body harness. The initiator is a passive, LF transmitter. The initiators transmit their signals which are received by the tire pressure sensors, prompting them to modify their mode status.

The TPMS module energizes each initiator in turn using LF drivers. The corresponding tire pressure sensor detects the LF signal and responds by modifying the mode status within the RF transmission.

Tire Pressure Sensor



E45553

The TPMS uses active tire pressure sensors which are located on each wheel, inside the tire cavity. The sensor incorporates the tire valve and is secured in the wheel by a nut on the outside of the wheel. The sensor contains a Printed Circuit Board which houses a PTC (positive temperature coefficient) sensor, a Piezo pressure sensor, a radio receiver and transmitter and a lithium battery.

The tire pressure sensors use the PTC sensor and the Piezo sensor to periodically measure the pressure and temperature of the air inside the tire. The data is transmitted by RF data signals at either 315 MHz or 433 MHz dependant on market requirements.

The RF transmission from the sensor contains a unique identification code in its transmission data. This allows the TPMS to identify the wheel on the vehicle. If the sensor is replaced on a wheel, the new sensor identification will be learnt through the learn and location process.

The tire pressure sensor can also detect when the wheel is rotating. In order to preserve battery power, the sensor uses different transmission rates when the wheel is stationary or moving.



NOTE: For important information regarding the removal and fitting of tire pressure sensors and associated valves, see the [Tire Changing](#) section.

Instrument Cluster Indications



E94763

Item	Description
1	Low tire pressure warning indicator
2	Message center

The warning indications to the driver are common on all vehicles fitted with TPMS. The driver is alerted to system warnings by a low tire pressure warning indicator in the instrument cluster and an applicable text message in the message centre.

The TPMS module passes system status information to the instrument cluster on the medium speed CAN bus. The instrument cluster converts this data into illumination of the warning indicator and the display of an appropriate message.

When the ignition is switched on, the warning indicator is illuminated for 3 seconds for a bulb check.



NOTE: If the vehicle is not fitted with the TPMS, the warning indicator will not illuminate.

The instrument cluster checks, within the 3 second bulb check period, for a CAN bus message from the TPMS. During this time the TPMS performs internal tests and CAN bus initialization. The warning indicator will be extinguished if the TPMS module does not issue a fault message or tire pressure warning message.

If a TPMS fault warning message is detected by the instrument cluster at ignition on, the warning indicator will flash for 72 seconds after the 3 second bulb check period and then remain permanently illuminated.

If a tire pressure warning message is detected by the instrument cluster at ignition on, the warning indicator will extinguish briefly after the 3 second bulb check period, before re-illuminating to indicate a tire pressure warning.

The following table shows the warning indicator functionality for given events:

Event	Instrument Cluster Indications
Low pressure warning limit reached in one wheel	Warning indicator illuminated. 'CHECK TYRE PRESSURE' message displayed and applicable tire highlighted on display.
Low pressure warning limit reached in one or more wheels in low speed mode (only if programmed or learning)	Warning indicator illuminated. 'CHECK ALL TYRE PRESSURES' message displayed.
TPMS fault	Warning indicator flashes for 72 seconds and is then permanently illuminated. The flash sequence repeats after ignition on cycle. 'TYRE PRESSURE SYSTEM FAULT' message displayed.
No transmission from a specific tire pressure sensor or Specific tire pressure sensor fault	Warning indicator flashes for 72 seconds and is then permanently illuminated. The flash sequence repeats after ignition on cycle. 'TYRE NOT MONITORED' message displayed.
No transmission from more than one tire pressure sensor or more than one tire pressure sensor fault	Warning indicator flashes for 72 seconds and is then permanently illuminated. The flash sequence repeats after ignition on cycle. 'TYRE PRESSURE SYSTEM FAULT' message displayed.
CAN (controller area network) signals missing	Warning indicator flashes for 72 seconds and is then permanently illuminated. The flash sequence repeats after ignition on cycle. 'TYRE PRESSURE SYSTEM FAULT' message displayed.
Vehicle enters high speed mode (only available in certain markets)	Warning indicator illuminated. 'TYRE PRESSURE LOW FOR SPEED' message displayed.

Wheels and Tires - Wheels and Tires

Diagnosis and Testing

Principle of Operation

For a detailed description of the wheels and tires, refer to the relevant Description and Operation section in the workshop manual. REFER to: (204-04 Wheels and Tires)

[Wheels and Tires](#) (Description and Operation),
[Wheels and Tires](#) (Description and Operation),
[Wheels and Tires](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer complaint. As much information as possible should be gathered from the driver to assist in diagnosing the cause(s). Confirm which of the following two warning types (A or B) exist for the Tire Pressure Monitoring System when the ignition status is switched from 'OFF' to 'ON'
 - **(A) Check Tire Pressure Warnings.** A low tire pressure warning will **continuously** illuminate the low tire pressure warning lamp. This warning may be accompanied by a text message such as CHECK TIRE PRESSURE (refer to owner literature). The manufacturer approved diagnostic system does NOT need to be used. Diagnostic Trouble Codes (DTCs) are not generated with this type of warning. To extinguish this warning it is essential that, with the ignition 'ON', all vehicle tires (including the spare) are to be set to the correct pressure as stated in the vehicle handbook or as indicated on the placard label in the passenger/driver door aperture. **It is not necessary to drive the vehicle to clear 'check tire pressure' warnings - just changing the tire pressure causes the tire low pressure sensor to transmit new data.**

NOTES:



The tire pressures should be set by:

- Using a calibrated tire pressure gauge
- With 'cold' tires (vehicle parked in the ambient temperature for at least one hour, not in a garage with an artificial ambient temperature)



If the tire pressure warning does not clear within two minutes, it is likely that the gauge is not correctly calibrated or the tires are 'warm'. Carry out the following steps until the warning has cleared:

- Increase the tire pressures by 3psi
- Wait a further two minutes
- When the tires are at ambient temperature and a **calibrated** gauge is available, reset the tire pressures to the correct pressure.



Tire pressure adjustments are part of routine owner maintenance. Tire pressure adjustments that are required due to a lack of owner maintenance are not to be claimed under vehicle warranty.

- **(B) System Fault Warnings.** When a system fault is detected, the low tire pressure warning lamp will flash for approximately 75 seconds prior to being continuously illuminated. Visually inspect for obvious signs of damage and system integrity. Check for the presence of tire low pressure sensors on all four wheels (note: a tire low pressure sensor has a metal valve stem rather than a rubber one).

2. Check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.



NOTE: If the tester fails to communicate with the Tire Pressure Monitoring System module, the following actions are recommended:

- Remove the Tire Pressure Monitoring System power supply fuse, inspect and re-install (if intact). Test to see if communications have been re-established.
- Remove the Tire Pressure Monitoring System ignition fuse (if applicable), inspect and re-install (if intact). Test to see if communications have been re-established.
- With ignition status set to 'ON', refer to the electrical circuit diagrams and check Tire Pressure Monitoring System module for power, ignition and ground supplies .
- Carry out CAN network integrity test using the manufacturer approved diagnostic system.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. If this is the case, match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.




If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
C1A56-31	Left Front Tire Pressure Sensor and Transmitter Assembly-no signal	<ul style="list-style-type: none"> Missing, incompatible or defective tire low pressure sensor or radio frequency receiver 	GO to Pinpoint Test F.
C1A56-68	Left Front Tire Pressure Sensor and Transmitter Assembly-event information	<ul style="list-style-type: none"> Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event 	No action required.
C1A56-91	Left Front Tire Pressure Sensor and Transmitter Assembly-parametric	<ul style="list-style-type: none"> Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration 	Replace defective tire low pressure sensor. Refer to the relevant section of the workshop manual.
C1A56-93	Left Front Tire Pressure Sensor and Transmitter Assembly-no operation	<ul style="list-style-type: none"> No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction 	GO to Pinpoint Test G.
C1A57-11	Left Front Initiator-circuit short to ground	<ul style="list-style-type: none"> Left front initiator circuit is short to ground 	GO to Pinpoint Test B. Refer to Pinpoint test B1
C1A57-12	Left Front Initiator-circuit short to battery	<ul style="list-style-type: none"> Left front initiator circuit is short to power 	GO to Pinpoint Test B. Go to Pinpoint test B2
C1A57-13	Left Front Initiator-circuit open	<ul style="list-style-type: none"> Left front initiator circuit open 	GO to Pinpoint Test B. Go to Pinpoint test B9
C1A58-31	Right Front Tire Pressure Sensor and Transmitter Assembly-no signal	<ul style="list-style-type: none"> Missing, incompatible or defective tire low pressure sensor or radio frequency receiver 	GO to Pinpoint Test F.
C1A58-68	Right Front Tire Pressure Sensor and Transmitter Assembly-event information	<ul style="list-style-type: none"> Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event 	No action required.

DTC	Description	Possible Cause	Action
C1A58-91	Right Front Tire Pressure Sensor and Transmitter Assembly-parametric	<ul style="list-style-type: none"> Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration 	Replace defective tire low pressure sensor. refer to the relevant section of the workshop manual.
C1A58-93	Right Front Tire Pressure Sensor and Transmitter Assembly-no operation	<ul style="list-style-type: none"> No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction 	GO to Pinpoint Test G.
C1A59-11	Right Front Initiator-circuit short to ground	<ul style="list-style-type: none"> Right front initiator circuit is short to ground 	GO to Pinpoint Test C. Go to Pinpoint test C1
C1A59-12	Right Front Initiator-circuit short to battery	<ul style="list-style-type: none"> Right front initiator circuit is short to power 	GO to Pinpoint Test C. Go to Pinpoint test C2
C1A59-13	Right Front Initiator-circuit open	<ul style="list-style-type: none"> Right front initiator circuit open 	GO to Pinpoint Test C. Go to Pinpoint test C9
C1A60-31	Left Rear Tire Pressure Sensor and Transmitter Assembly-no signal	<ul style="list-style-type: none"> Missing, incompatible or defective tire low pressure sensor or radio frequency receiver 	GO to Pinpoint Test F.
C1A60-68	Left Rear Tire Pressure Sensor and Transmitter Assembly-event information	<ul style="list-style-type: none"> Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event 	No action required.
C1A60-91	Left Rear Tire Pressure Sensor and Transmitter Assembly-parametric	<ul style="list-style-type: none"> Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration 	Replace defective tire low pressure sensor, refer to the relevant section of the workshop manual.
C1A60-93	Left Rear Tire Pressure Sensor and Transmitter Assembly-no operation	<ul style="list-style-type: none"> No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction 	GO to Pinpoint Test G.
C1A61-11	Left Rear Initiator-circuit short to ground	<ul style="list-style-type: none"> Left rear initiator circuit short to ground 	GO to Pinpoint Test D. Go to Pinpoint test D1
C1A61-12	Left Rear Initiator-circuit short to battery	<ul style="list-style-type: none"> Left rear initiator circuit short to power 	GO to Pinpoint Test D. Go to Pinpoint test D2
C1A61-13	Left Rear Initiator-circuit open	<ul style="list-style-type: none"> Left rear initiator circuit open 	GO to Pinpoint Test D. Go to Pinpoint test D9
C1A62-31	Right Rear Tire Pressure Sensor and Transmitter Assembly-no signal	<ul style="list-style-type: none"> Missing, incompatible or defective tire low pressure sensor or radio frequency receiver 	GO to Pinpoint Test F.
C1A62-68	Right Rear Tire Pressure Sensor and Transmitter Assembly-event information	<ul style="list-style-type: none"> Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event 	No action required.

DTC	Description	Possible Cause	Action
C1A62-91	Right Rear Tire Pressure Sensor and Transmitter Assembly-parametric	<ul style="list-style-type: none"> Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration 	Replace defective tire low pressure sensor, refer to the relevant section of the workshop manual.
C1A62-93	Right Rear Tire Pressure Sensor and Transmitter Assembly-no operation	<ul style="list-style-type: none"> No tire low pressure sensor can be localized at this position due to an initiator or tire low pressure sensor malfunction 	GO to Pinpoint Test G.
C1A63-11	Right Rear Initiator-circuit short to ground	<ul style="list-style-type: none"> Right rear initiator circuit short to ground 	GO to Pinpoint Test E. Go to Pinpoint test E1
C1A63-12	Right Rear Initiator-circuit short to battery	<ul style="list-style-type: none"> Right rear initiator circuit short to power 	GO to Pinpoint Test E. Go to Pinpoint test E2
C1A63-13	Right Rear Initiator-circuit open	<ul style="list-style-type: none"> Right rear initiator circuit open 	GO to Pinpoint Test E. Go to Pinpoint test E9
C1A64-68	Spare Wheel Tire Pressure Sensor and Transmitter Assembly-event information	<ul style="list-style-type: none"> Information only - vehicle exposed to extreme temperature environment and/or tire low pressure sensor low battery voltage event 	No action required.
C1A64-91	Spare Wheel Tire Pressure Sensor and Transmitter Assembly-parametric	<ul style="list-style-type: none"> Tire low pressure sensor has reported out of range information for pressure, temperature or acceleration 	Replace defective tire low pressure sensor, refer to the relevant section of the workshop manual.
C1A64-93	Spare Wheel Tire Pressure Sensor and Transmitter Assembly-no operation	<ul style="list-style-type: none"> Missing, incompatible or defective tire low pressure sensor or radio frequency receiver 	GO to Pinpoint Test H.
C1D19-11	External Receiver Data Line-circuit short to ground	<ul style="list-style-type: none"> Tire pressure monitoring system radio frequency receiver or data line circuit is short to ground 	GO to Pinpoint Test A.
C1D19-12	External Receiver Data Line-circuit short to battery	<ul style="list-style-type: none"> Tire pressure monitoring system radio frequency receiver or data line circuit is short to power 	GO to Pinpoint Test I.
C1D19-87	External Receiver Data Line-missing message	<ul style="list-style-type: none"> Radio Frequency reception blocked Tire pressure monitoring system radio frequency receiver faulty Tire pressure monitoring system radio frequency receiver or data line circuits open circuit Missing, incompatible or defective tire low pressure sensors 	GO to Pinpoint Test J.
U0010-88	Medium Speed CAN Communication Bus-bus off	<ul style="list-style-type: none"> CAN bus fault 	Carry out CAN network integrity tests. Refer to the electrical wiring diagrams and check CAN network for short, open circuit.
U0140-00	Lost communication with body control module-no sub type information	<ul style="list-style-type: none"> CAN bus fault Central Junction Box fault 	Refer to the electrical wiring diagrams and check Central Junction Box power and ground supplies for short, open circuit. Carry out CAN network integrity tests.

DTC	Description	Possible Cause	Action
U0142-00	Lost Communication With Body Control Module "B" -no sub type information	<ul style="list-style-type: none"> CAN bus fault Auxiliary Junction Box fault 	Refer to the electrical wiring diagrams and check Auxiliary Junction Box power and ground supplies for short, open circuit. Carry out CAN network integrity tests.
U0155-00	Lost Communications With Instrument Panel Cluster (IPC) Control Module-no sub type information	<ul style="list-style-type: none"> CAN bus fault Instrument cluster fault 	Refer to the electrical wiring diagrams and check instrument cluster power and ground supplies for short, open circuit. Carry out CAN network integrity tests.
U0164-00	Lost Communication With HVAC Control Module-no sub type information	<ul style="list-style-type: none"> CAN bus fault Climate control module fault 	Refer to the electrical wiring diagrams and check climate control module power and ground supplies for short, open circuit. Carry out CAN network integrity tests.
U0300-00	Internal Control Module Software Incompatibility-no sub type information	<ul style="list-style-type: none"> Incompatible tire pressure monitoring system module for vehicle CAN network 	Check correct tire pressure monitoring system module is installed to vehicle specification, otherwise suspect the Auxiliary Junction Box.
U0415-00	Invalid Data Received From Anti-Lock Brake System (ABS) Control Module-no subtype information	<ul style="list-style-type: none"> Invalid data received from the Anti-Lock Braking System Control Module CAN bus fault Anti-Lock Braking System fault 	Check Anti-Lock Braking System control module and Instrument Cluster for related DTCs and refer to the relevant DTC Index. Carry out CAN network integrity tests.
U0424-00	Invalid Data Received From HVAC Control Module-no sub type information	<ul style="list-style-type: none"> HVAC control module fault 	Check climate control module for related DTCs and refer to relevant DTC Index.
U1A14-49	CAN Initialisation Failure-internal electronic failure	<ul style="list-style-type: none"> Tire pressure monitoring system module fault 	Install a new tire pressure monitoring module. Refer to the new module/component installation note at the top of the DTC Index.
U3000-55	Control Module-not configured	<ul style="list-style-type: none"> Tire pressure monitoring system configuration data is invalid 	Check and amend the car configuration file.
U3000-87	Control Module-missing message	<ul style="list-style-type: none"> Tire pressure monitoring system configuration data not received 	Check the Auxiliary Junction Box for related DTCs and refer to the relevant DTC Index. Carry out CAN network integrity test.
U3002-81	Vehicle Identification Number - invalid serial data received	<ul style="list-style-type: none"> Tire pressure monitoring system module and vehicle VIN mis-match 	 NOTE: This DTC indicates that the tire pressure monitoring system module is not the original part installed to the vehicle at the factory/dealer and could have been substituted. Refer to the note above the DTC index about replacing components which may remain under manufacturer warranty. Re-install the original or a new tire pressure monitoring system control module.

Component Tests

Wheels and Tires

For wheel and tire specification information (pressures, torques, etc).

When replacing wheels or tires, local legislation regarding health and safety must be complied with.

If the vehicle has a Tire Pressure Monitoring System installed, only Jaguar approved wheels and tires should be used. If the wheel and tire size is changed (for example from R18 to R20) the Tire Pressure Monitoring System module should be updated with the correct pressure information appropriate to the new wheel and tire set. Update the Tire Pressure Monitoring System module using the Jaguar approved diagnostic system.

As a general guideline, only replace tires in pairs or as a set, and only with tires of equivalent size and specification.

Confirm the symptoms of the customer complaint.

As much information as possible should be gathered from the driver to assist in diagnosing the cause(s).

1. Before a road test, carry out a basic inspection to make sure the vehicle is safe and legal to drive.

Basic inspection

- Correct tire inflation
- Legal tire tread depth

- Cuts/Bulges in tire sidewall(s)
- Tire ply separation
- Embedded objects
- Wheel rim damage
- Correct tire installation (specification, direction of rotation, etc)
- Any obvious distortion of the tire (flat/high spots)
- Worn/Damaged steering or suspension components

Road test

If the results of the basic inspection are acceptable, carry out a road test to confirm the symptoms.

To reproduce the symptoms, test the vehicle on similar roads to those on which the fault occurs and at similar speeds (provided it is legal to do so).

If the vibration or noise can be reproduced, note the speed at which it occurs and see if it is possible to drive through the symptom, meaning, is it possible to alter the fault by driving faster or slower than the speed at which it occurs?

If it is possible, it is likely that the fault is caused by an imbalance in the wheel or tire.

If the vibration or noise gets worse as the vehicle speed increases, it is likely that the fault is caused by distortion in the wheel or tire, or worn or damaged components.

Distortion checks

Check for distortion by raising the vehicle so that the wheels are free and placing an axle stand or similar fixed object next to each wheel in turn.

If the stand is placed at the tread of the tire, the tire can be checked for ovality by turning the wheel by hand and checking for high or low spots where the gap between the tread and the stand increases or reduces.

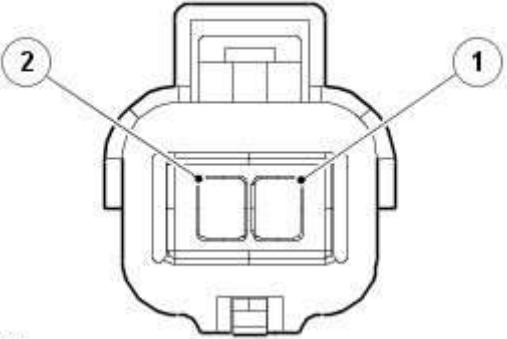
If the stand is placed next to the wheel rim or tire sidewall, the wheel and tire can be checked for run-out in a similar way.

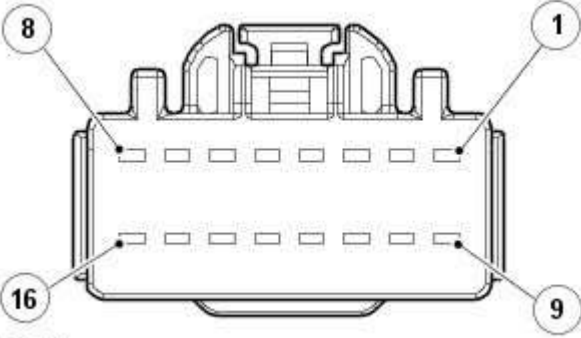
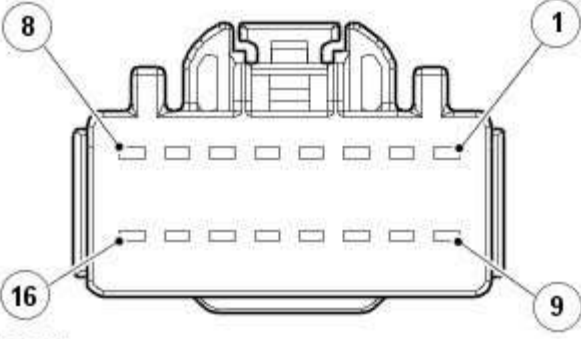
Pinpoint Tests

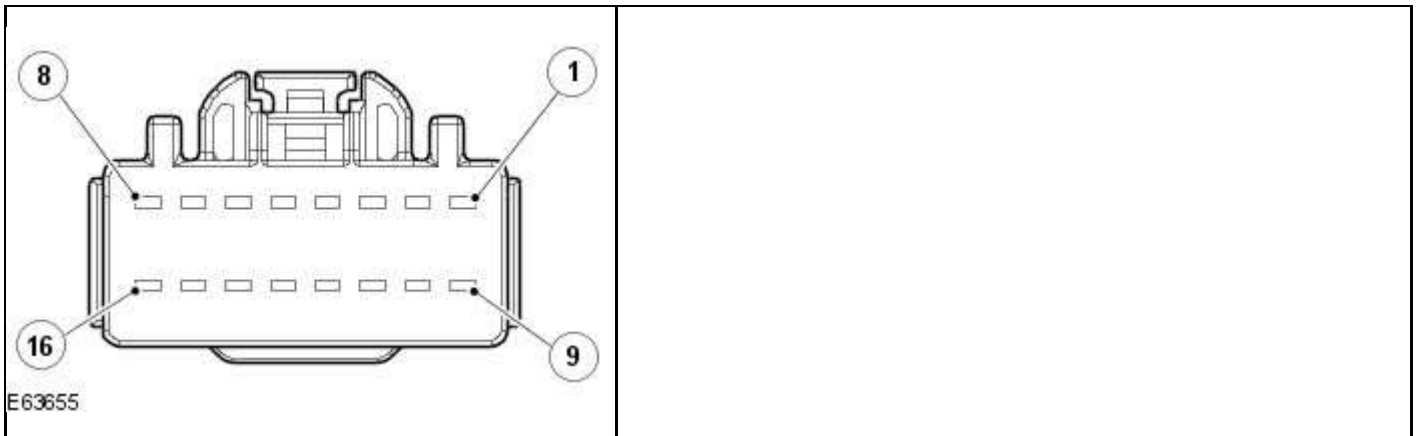
PINPOINT TEST A : C1D1911 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO GROUND	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: C1D1911 VERIFY EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO GROUND	
	1 Ignition off.
	2 Disconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.
	3 Measure the resistance between
	C3MC45, harness side
	Battery
	Pin 1 Negative terminal
	Is the resistance less than 5 Ohms? Yes GO to A2. GO to A2. No GO to A3. GO to A3.
A2: C1D1911 CHECK THE EXTERNAL RECEIVER DATA LINE CIRCUIT FOR SHORT CIRCUIT TO GROUND	
	1 Disconnect the Tire Pressure Monitoring System Control Module electrical connector, C3MC39B.
	2 Measure the resistance between
	C3MC45, harness side
	Battery
	Pin 1 Negative terminal
	Is the resistance less than 5 Ohms? Yes REPAIR the short circuit in wiring harness. No GO to A4. GO to A4.
A3: C1D1911 CHECK THE TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER FOR SHORT CIRCUIT TO GROUND	
	1 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.
	2 Using manufacturer approved diagnostic system run On Demand Self Test (0x0202).
	Is the DTC C1D1911 set? Yes Replace Tire Pressure Monitoring Receiver. No Investigate possible cause of intermittent failure.
A4: C1D1911 CHECK THE TIRE PRESSURE MONITORING SYSTEM CONTROL MODULE FOR SHORT CIRCUIT TO GROUND	
	1 Reconnect the Tire Pressure Monitoring System Control Module electrical connector, C3MC39B.
	2 Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.

	3 Using manufacturer approved diagnostic system run On Demand Self Test (0x0202).
	Is the DTC C1D1911 set? Yes Replace Tire Pressure Monitoring System Control Module. No Investigate possible cause of intermittent failure.

PINPOINT TEST B : LEFT FRONT LOW FREQUENCY INITIATOR CIRCUIT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS				
B1: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND					
	1 Ignition off.				
	2 Disconnect the left hand front low-frequency initiator electrical connector, C1MC40.				
 <p>E63657</p>					
	3 Measure the resistance between:				
	<table border="1"> <thead> <tr> <th>C1MC40, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 2</td> <td>Negative terminal</td> </tr> </tbody> </table>	C1MC40, harness side	Battery	Pin 2	Negative terminal
C1MC40, harness side	Battery				
Pin 2	Negative terminal				
	Is the resistance less than 10,000 ohms? Yes GO to B5. No GO to B2.				
B2: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER					
	1 Measure the resistance between:				
	<table border="1"> <thead> <tr> <th>C1MC40, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 2</td> <td>Positive terminal</td> </tr> </tbody> </table>	C1MC40, harness side	Battery	Pin 2	Positive terminal
C1MC40, harness side	Battery				
Pin 2	Positive terminal				
	Is the resistance less than 10,000 ohms? Yes GO to B6. No GO to B3.				
B3: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND					
	1 Measure the resistance between:				
	<table border="1"> <thead> <tr> <th>C1MC40, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 1</td> <td>Negative terminal</td> </tr> </tbody> </table>	C1MC40, harness side	Battery	Pin 1	Negative terminal
C1MC40, harness side	Battery				
Pin 1	Negative terminal				
	Is the resistance less than 10,000 ohms? Yes GO to B7. No GO to B4.				
B4: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER					
	1 Measure the resistance between:				
	<table border="1"> <thead> <tr> <th>C1MC40, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 1</td> <td>Positive terminal</td> </tr> </tbody> </table>	C1MC40, harness side	Battery	Pin 1	Positive terminal
C1MC40, harness side	Battery				
Pin 1	Positive terminal				
	Is the resistance less than 10,000 ohms? Yes GO to B8. No GO to B9.				
B5: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE					

 <p>E63655</p>	<p>1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.</p>						
	<p>2 Measure the resistance between:</p> <table border="1"> <thead> <tr> <th></th> <th>C1MC40, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 2</td> <td></td> <td>Negative terminal</td> </tr> </tbody> </table>		C1MC40, harness side	Battery	Pin 2		Negative terminal
	C1MC40, harness side	Battery					
Pin 2		Negative terminal					
	<p>Is the resistance less than 10,000 ohms?</p> <p>Yes REPAIR the short circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.</p> <p>No INSTALL a new Tire Pressure Monitoring System module. REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).</p>						
<p>B6: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE</p>							
 <p>E63655</p>	<p>1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.</p>						
	<p>2 Measure the resistance between:</p> <table border="1"> <thead> <tr> <th></th> <th>C1MC40, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 2</td> <td></td> <td>Positive terminal</td> </tr> </tbody> </table>		C1MC40, harness side	Battery	Pin 2		Positive terminal
	C1MC40, harness side	Battery					
Pin 2		Positive terminal					
	<p>Is the resistance less than 10,000 ohms?</p> <p>Yes REPAIR the short circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.</p> <p>No INSTALL a new Tire Pressure Monitoring System module. REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).</p>						
<p>B7: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE</p>							
	<p>1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.</p>						



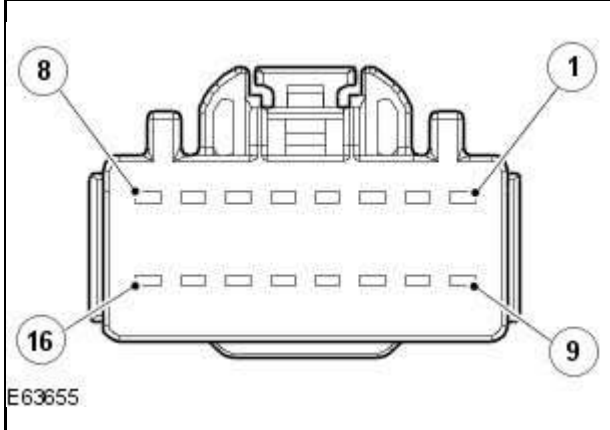
2 Measure the resistance between:

C1MC40, harness side	Battery
Pin 1	Negative terminal

Is the resistance less than 10,000 ohms?
Yes
 REPAIR the short circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.
No
 INSTALL a new Tire Pressure Monitoring System module. REFER to: [Tire Pressure Monitoring System \(TPMS\) Module](#) (204-04 Wheels and Tires, Removal and Installation).

B8: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.



2 Measure the resistance between:

C1MC40, harness side	Battery
Pin 1	Positive terminal

Is the resistance less than 10,000 ohms?
Yes
 REPAIR the short circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.
No
 INSTALL a new Tire Pressure Monitoring System module. REFER to: [Tire Pressure Monitoring System \(TPMS\) Module](#) (204-04 Wheels and Tires, Removal and Installation).

B9: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C3MC39A, harness side	C1MC40, harness side
Pin 14	Pin 2

	<p>Is the resistance greater than 5 ohms?</p> <p>Yes</p> <p>REPAIR the high resistance circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.</p> <p>No</p> <p>GO to B10.</p>
--	---

B10: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

	<p>1 Measure the resistance between:</p> <table border="1"> <tr> <td>C3MC39A, harness side</td> <td>C1MC40, harness side</td> </tr> <tr> <td>Pin 13</td> <td>Pin 1</td> </tr> </table>	C3MC39A, harness side	C1MC40, harness side	Pin 13	Pin 1
C3MC39A, harness side	C1MC40, harness side				
Pin 13	Pin 1				

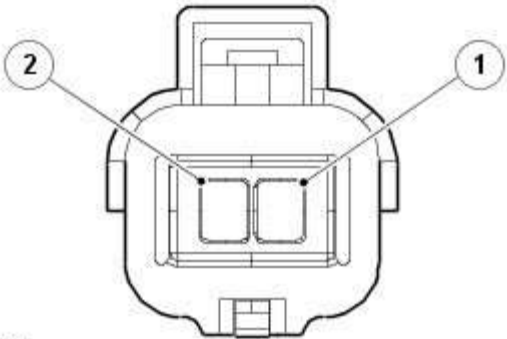
	<p>Is the resistance greater than 5 ohms?</p> <p>Yes</p> <p>REPAIR the high resistance circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.</p> <p>No</p> <p>INSTALL a new left hand front low-frequency initiator. REFER to: Tire Pressure Monitoring System (TPMS) Front Antenna (204-04 Wheels and Tires, Removal and Installation).</p>
--	---

PINPOINT TEST C : RIGHT FRONT LOW FREQUENCY INITIATOR CIRCUIT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
-----------------	-------------------------

C1: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

	<p>1 Ignition off.</p> <p>2 Disconnect the right hand front low-frequency initiator electrical connector, C1MC41.</p>
--	---

 <p>E63657</p>	<p>3 Measure the resistance between:</p> <table border="1"> <tr> <td>C1MC41, harness side</td> <td>Battery</td> </tr> <tr> <td>Pin 2</td> <td>Negative terminal</td> </tr> </table>	C1MC41, harness side	Battery	Pin 2	Negative terminal
C1MC41, harness side	Battery				
Pin 2	Negative terminal				

	<p>Is the resistance less than 10,000 ohms?</p> <p>Yes</p> <p>GO to C5.</p> <p>No</p> <p>GO to C2.</p>
--	--

C2: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

	<p>1 Measure the resistance between:</p> <table border="1"> <tr> <td>C1MC41, harness side</td> <td>Battery</td> </tr> <tr> <td>Pin 2</td> <td>Positive terminal</td> </tr> </table>	C1MC41, harness side	Battery	Pin 2	Positive terminal
C1MC41, harness side	Battery				
Pin 2	Positive terminal				

	<p>Is the resistance less than 10,000 ohms?</p> <p>Yes</p> <p>GO to C6.</p> <p>No</p> <p>GO to C3.</p>
--	--

C3: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

	<p>1 Measure the resistance between:</p> <table border="1"> <tr> <td>C1MC41, harness side</td> <td>Battery</td> </tr> <tr> <td>Pin 1</td> <td>Negative terminal</td> </tr> </table>	C1MC41, harness side	Battery	Pin 1	Negative terminal
C1MC41, harness side	Battery				
Pin 1	Negative terminal				

Is the resistance less than 10,000 ohms?
Yes
[GO to C7.](#)
No
[GO to C4.](#)

C4: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

1 Measure the resistance between:

C1MC41, harness side	Battery
Pin 1	Positive terminal

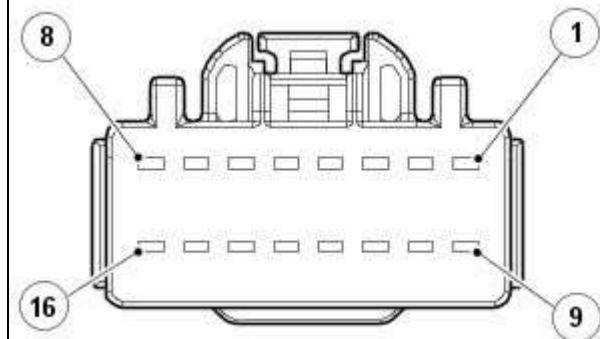
Is the resistance less than 10,000 ohms?
Yes
[GO to C8.](#)
No
[GO to C9.](#)

C5: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.

2 Measure the resistance between:

C1MC41, harness side	Battery
Pin 2	Negative terminal



E63655

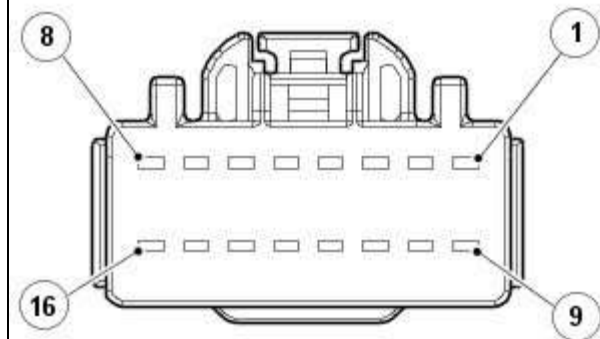
Is the resistance less than 10,000 ohms?
Yes
 REPAIR the short circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.
No
 INSTALL a new Tire Pressure Monitoring System module. REFER to: [Tire Pressure Monitoring System \(TPMS\) Module](#) (204-04 Wheels and Tires, Removal and Installation).

C6: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.

2 Measure the resistance between:

C1MC41, harness side	Battery
Pin 2	Positive terminal



E63655

Is the resistance less than 10,000 ohms?
Yes
 REPAIR the short circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.
No
 INSTALL a new Tire Pressure Monitoring System module. REFER to:

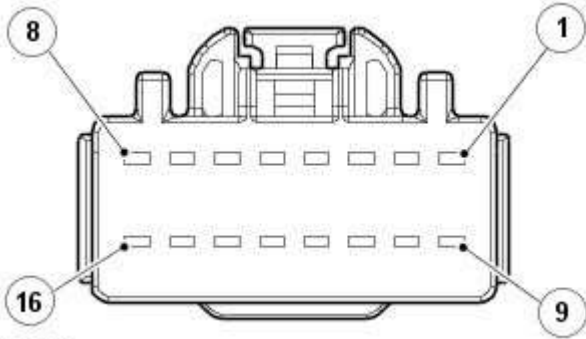
[Tire Pressure Monitoring System \(TPMS\) Module](#) (204-04 Wheels and Tires, Removal and Installation).

C7: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.

2 Measure the resistance between:

C1MC41, harness side	Battery
Pin 1	Negative terminal



E63655

Is the resistance less than 10,000 ohms?

Yes

REPAIR the short circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

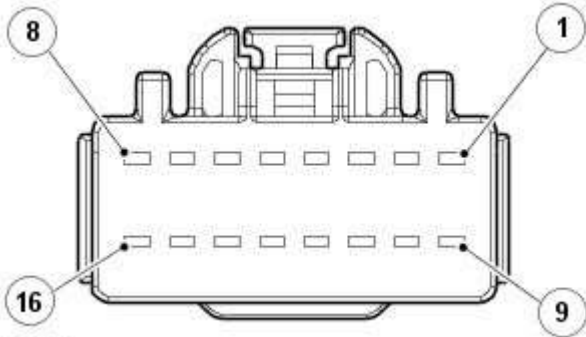
INSTALL a new Tire Pressure Monitoring System module. REFER to: [Tire Pressure Monitoring System \(TPMS\) Module](#) (204-04 Wheels and Tires, Removal and Installation).

C8: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.

2 Measure the resistance between:

C1MC41, harness side	Battery
Pin 1	Positive terminal



E63655

Is the resistance less than 10,000 ohms?

Yes

REPAIR the short circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No

INSTALL a new Tire Pressure Monitoring System module. REFER to: [Tire Pressure Monitoring System \(TPMS\) Module](#) (204-04 Wheels and Tires, Removal and Installation).

C9: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C3MC39A, harness side	C1MC41, harness side
Pin 16	Pin 2

Is the resistance greater than 5 ohms?

Yes

REPAIR the high resistance circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to

confirm rectification.
No
[GO to C10.](#)

C10: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C3MC39A, harness side	C1MC41, harness side
Pin 15	Pin 1

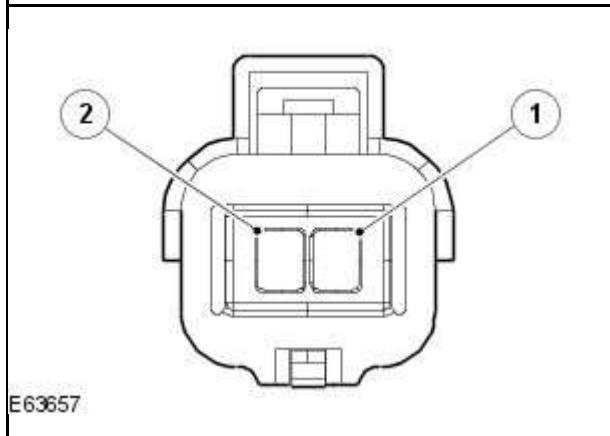
Is the resistance greater than 5 ohms?
Yes
 REPAIR the high resistance circuit. This circuit contains intermediate connector, C13-B. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.
No
 INSTALL a new right hand front low-frequency initiator. REFER to: [Tire Pressure Monitoring System \(TPMS\) Front Antenna](#) (204-04 Wheels and Tires, Removal and Installation).

PINPOINT TEST D : LEFT REAR LOW FREQUENCY INITIATOR CIRCUIT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
-----------------	-------------------------

D1: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

1 Ignition off.
2 Disconnect the left hand rear low-frequency initiator electrical connector, C4MC42.



3 Measure the resistance between:

C4MC42, harness side	Battery
Pin 2	Negative terminal

Is the resistance less than 10,000 ohms?
Yes
[GO to D5.](#)
No
[GO to D2.](#)

D2: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

1 Measure the resistance between:

C4MC42, harness side	Battery
Pin 2	Positive terminal

Is the resistance less than 10,000 ohms?
Yes
[GO to D6.](#)
No
[GO to D3.](#)

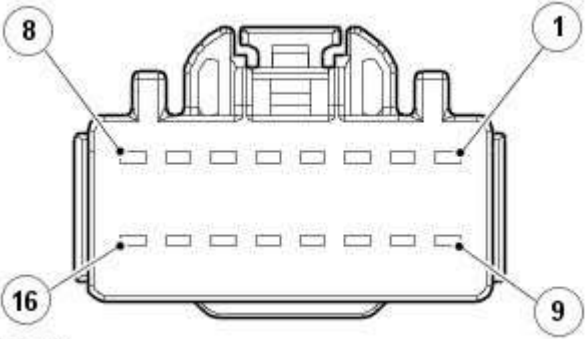
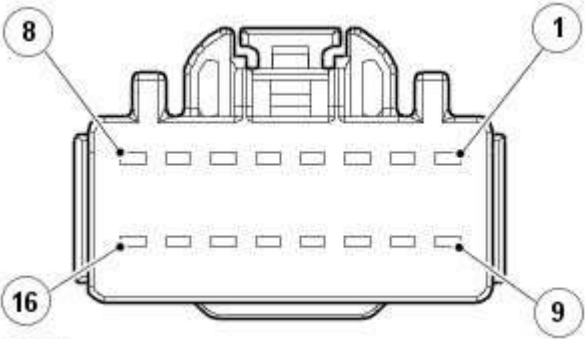
D3: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND

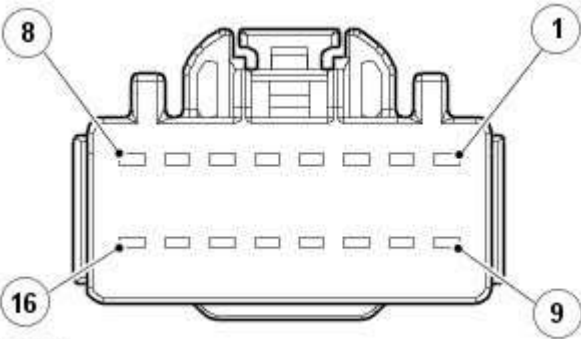
1 Measure the resistance between:

C4MC42, harness side	Battery
Pin 1	Negative terminal

Is the resistance less than 10,000 ohms?
Yes
[GO to D7.](#)
No
[GO to D4.](#)

D4: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER

	<p>1 Measure the resistance between:</p> <table border="1"> <thead> <tr> <th>C4MC42, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 1</td> <td>Positive terminal</td> </tr> </tbody> </table>	C4MC42, harness side	Battery	Pin 1	Positive terminal
C4MC42, harness side	Battery				
Pin 1	Positive terminal				
	<p>Is the resistance less than 10,000 ohms? Yes GO to D8. No GO to D9.</p>				
D5: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE					
	<p>1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.</p>				
 <p>E63655</p>	<p>2 Measure the resistance between:</p> <table border="1"> <thead> <tr> <th>C4MC42, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 2</td> <td>Negative terminal</td> </tr> </tbody> </table>	C4MC42, harness side	Battery	Pin 2	Negative terminal
C4MC42, harness side	Battery				
Pin 2	Negative terminal				
	<p>Is the resistance less than 10,000 ohms? Yes REPAIR the short circuit. This circuit contains intermediate connector, C44-W. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification. No INSTALL a new Tire Pressure Monitoring System module. REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).</p>				
D6: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE					
	<p>1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.</p>				
 <p>E63655</p>	<p>2 Measure the resistance between:</p> <table border="1"> <thead> <tr> <th>C4MC42, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 2</td> <td>Positive terminal</td> </tr> </tbody> </table>	C4MC42, harness side	Battery	Pin 2	Positive terminal
C4MC42, harness side	Battery				
Pin 2	Positive terminal				
	<p>Is the resistance less than 10,000 ohms? Yes REPAIR the short circuit. This circuit contains intermediate connector, C44-W. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification. No INSTALL a new Tire Pressure Monitoring System module. REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).</p>				
D7: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE					
	<p>1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.</p>				



E63655

2 Measure the resistance between:	
C4MC42, harness side	Battery
Pin 1	Negative terminal

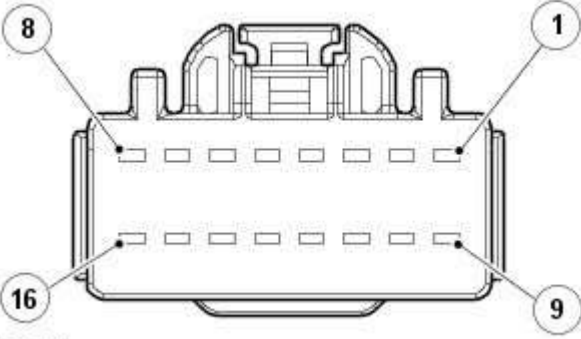
Is the resistance less than 10,000 ohms?

Yes
REPAIR the short circuit. This circuit contains intermediate connector, C44-W. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No
INSTALL a new Tire Pressure Monitoring System module. REFER to: [Tire Pressure Monitoring System \(TPMS\) Module](#) (204-04 Wheels and Tires, Removal and Installation).

D8: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.



E63655

2 Measure the resistance between:	
C4MC42, harness side	Battery
Pin 1	Positive terminal

Is the resistance less than 10,000 ohms?

Yes
REPAIR the short circuit. This circuit contains intermediate connector, C44-W. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No
INSTALL a new Tire Pressure Monitoring System module. REFER to: [Tire Pressure Monitoring System \(TPMS\) Module](#) (204-04 Wheels and Tires, Removal and Installation).

D9: CHECK THE INITIATOR RETURN CIRCUIT FOR HIGH RESISTANCE

1 Measure the resistance between:

C3MC39A, harness side	C4MC42, harness side
Pin 6	Pin 2

Is the resistance greater than 5 ohms?

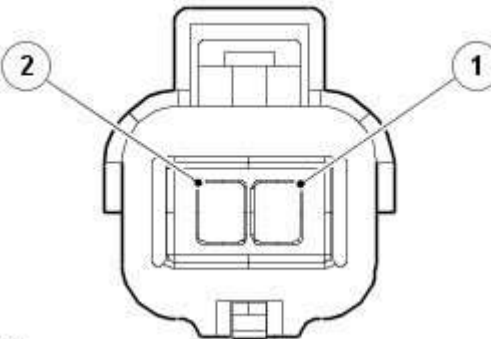
Yes
REPAIR the high resistance circuit. This circuit contains intermediate connector, C44-W. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.

No
[GO to E1.](#)

D10: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE

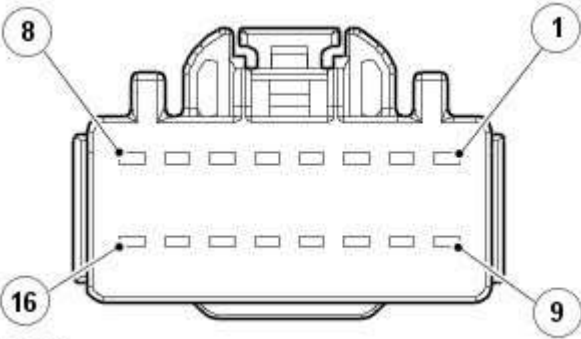
	1 Measure the resistance between:				
	<table border="1"> <tr> <th>C3MC39A, harness side</th> <th>C4MC42, harness side</th> </tr> <tr> <td>Pin 5</td> <td>Pin 1</td> </tr> </table>	C3MC39A, harness side	C4MC42, harness side	Pin 5	Pin 1
C3MC39A, harness side	C4MC42, harness side				
Pin 5	Pin 1				
	Is the resistance greater than 5 ohms? Yes REPAIR the high resistance circuit. This circuit contains intermediate connector, C44-W. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification. No INSTALL a new rear left hand low-frequency initiator. REFER to: Tire Pressure Monitoring System (TPMS) Rear Antenna (204-04 Wheels and Tires, Removal and Installation).				

PINPOINT TEST E : RIGHT REAR LOW FREQUENCY INITIATOR CIRCUIT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS				
E1: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND					
	1 Ignition off. 2 Disconnect the right hand rear low-frequency initiator electrical connector, C4MC43.				
 <p>E63657</p>	3 Measure the resistance between: <table border="1"> <tr> <th>C4MC43, harness side</th> <th>Battery</th> </tr> <tr> <td>Pin 2</td> <td>Negative terminal</td> </tr> </table>	C4MC43, harness side	Battery	Pin 2	Negative terminal
	C4MC43, harness side	Battery			
Pin 2	Negative terminal				
	Is the resistance less than 10,000 ohms? Yes GO to E5. No GO to E2.				
E2: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER					
	1 Measure the resistance between: <table border="1"> <tr> <th>C4MC43, harness side</th> <th>Battery</th> </tr> <tr> <td>Pin 2</td> <td>Positive terminal</td> </tr> </table>	C4MC43, harness side	Battery	Pin 2	Positive terminal
C4MC43, harness side	Battery				
Pin 2	Positive terminal				
	Is the resistance less than 10,000 ohms? Yes GO to E6. No GO to E3.				
E3: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO GROUND					
	1 Measure the resistance between: <table border="1"> <tr> <th>C4MC43, harness side</th> <th>Battery</th> </tr> <tr> <td>Pin 1</td> <td>Negative terminal</td> </tr> </table>	C4MC43, harness side	Battery	Pin 1	Negative terminal
C4MC43, harness side	Battery				
Pin 1	Negative terminal				
	Is the resistance less than 10,000 ohms? Yes GO to E7. No GO to E4.				
E4: CHECK THE INITIATOR CIRCUIT FOR SHORT CIRCUIT TO POWER					
	1 Measure the resistance between: <table border="1"> <tr> <th>C4MC43, harness side</th> <th>Battery</th> </tr> <tr> <td>Pin 1</td> <td>Positive terminal</td> </tr> </table>	C4MC43, harness side	Battery	Pin 1	Positive terminal
C4MC43, harness side	Battery				
Pin 1	Positive terminal				

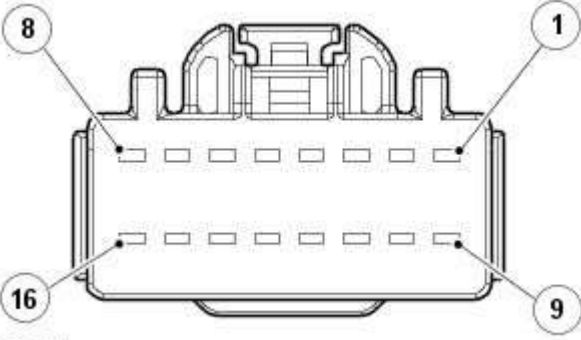
	<p>Is the resistance less than 10,000 ohms?</p> <p>Yes GO to E8.</p> <p>No GO to E9.</p>
--	--

E5: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

	<p>1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.</p>				
 <p>E63655</p>	<p>2 Measure the resistance between:</p> <table border="1"> <thead> <tr> <th>C4MC43, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 2</td> <td>Negative terminal</td> </tr> </tbody> </table>	C4MC43, harness side	Battery	Pin 2	Negative terminal
	C4MC43, harness side	Battery			
	Pin 2	Negative terminal			

	<p>Is the resistance less than 10,000 ohms?</p> <p>Yes REPAIR the short circuit. This circuit contains intermediate connector, C44-Y. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.</p> <p>No INSTALL a new Tire Pressure Monitoring System module. REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).</p>
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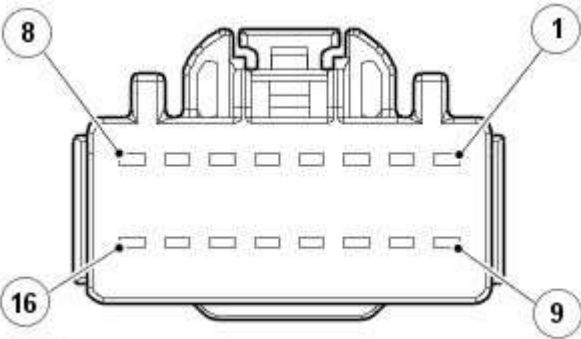
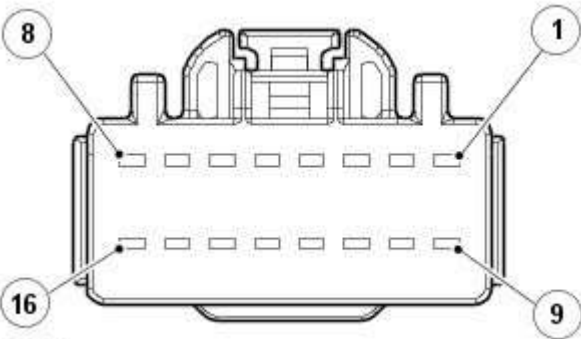
E6: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

	<p>1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.</p>				
 <p>E63655</p>	<p>2 Measure the resistance between:</p> <table border="1"> <thead> <tr> <th>C4MC43, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 2</td> <td>Positive terminal</td> </tr> </tbody> </table>	C4MC43, harness side	Battery	Pin 2	Positive terminal
	C4MC43, harness side	Battery			
	Pin 2	Positive terminal			

	<p>Is the resistance less than 10,000 ohms?</p> <p>Yes REPAIR the short circuit. This circuit contains intermediate connector, C44-Y. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.</p> <p>No INSTALL a new Tire Pressure Monitoring System module. REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).</p>
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E7: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE

	<p>1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.</p>
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 <p>E63655</p>	<p>2 Measure the resistance between:</p> <table border="1"> <thead> <tr> <th>C4MC43, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 1</td> <td>Negative terminal</td> </tr> </tbody> </table>	C4MC43, harness side	Battery	Pin 1	Negative terminal
C4MC43, harness side	Battery				
Pin 1	Negative terminal				
	<p>Is the resistance less than 10,000 ohms?</p> <p>Yes REPAIR the short circuit. This circuit contains intermediate connector, C44-Y. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.</p> <p>No INSTALL a new Tire Pressure Monitoring System module. REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).</p>				
<p>E8: CHECK WHETHER THE SHORT CIRCUIT IS IN THE HARNESS OR THE MODULE</p>					
	<p>1 Disconnect the Tire Pressure Monitoring System module connector, C3MC39A.</p>				
 <p>E63655</p>	<p>2 Measure the resistance between:</p> <table border="1"> <thead> <tr> <th>C4MC43, harness side</th> <th>Battery</th> </tr> </thead> <tbody> <tr> <td>Pin 1</td> <td>Positive terminal</td> </tr> </tbody> </table>	C4MC43, harness side	Battery	Pin 1	Positive terminal
C4MC43, harness side	Battery				
Pin 1	Positive terminal				
	<p>Is the resistance less than 10,000 ohms?</p> <p>Yes REPAIR the short circuit. This circuit contains intermediate connector, C44-Y. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.</p> <p>No INSTALL a new Tire Pressure Monitoring System module. REFER to: Tire Pressure Monitoring System (TPMS) Module (204-04 Wheels and Tires, Removal and Installation).</p>				
<p>E9: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE</p>					
	<p>1 Measure the resistance between:</p> <table border="1"> <thead> <tr> <th>C3MC39A, harness side</th> <th>C4MC43, harness side</th> </tr> </thead> <tbody> <tr> <td>Pin 8</td> <td>Pin 2</td> </tr> </tbody> </table>	C3MC39A, harness side	C4MC43, harness side	Pin 8	Pin 2
C3MC39A, harness side	C4MC43, harness side				
Pin 8	Pin 2				
	<p>Is the resistance greater than 5 ohms?</p> <p>Yes REPAIR the high resistance circuit. This circuit contains intermediate connector, C44-Y. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.</p> <p>No GO to E10.</p>				
<p>E10: CHECK THE INITIATOR CIRCUIT FOR HIGH RESISTANCE</p>					

	1 Measure the resistance between:				
	<table border="1"> <tr> <th>C3MC39A, harness side</th> <th>C4MC43, harness side</th> </tr> <tr> <td>Pin 7</td> <td>Pin 1</td> </tr> </table>	C3MC39A, harness side	C4MC43, harness side	Pin 7	Pin 1
C3MC39A, harness side	C4MC43, harness side				
Pin 7	Pin 1				
	<p>Is the resistance greater than 5 ohms?</p> <p>Yes REPAIR the high resistance circuit. This circuit contains intermediate connector, C44-Y. For additional information, refer to the wiring diagram. Clear the DTC and run an On Demand Self Test (ODST) using the manufacturer approved diagnostic system to confirm rectification.</p> <p>No INSTALL a new rear right hand low-frequency initiator. REFER to: Tire Pressure Monitoring System (TPMS) Rear Antenna (204-04 Wheels and Tires, Removal and Installation).</p>				

PINPOINT TEST F : MISSING, INCOMPATIBLE OR DEFECTIVE RUNNING TIRE LOW PRESSURE SENSOR OR RECEIVER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: CHECK FOR CORRECT WHEEL AND TIRE ASSEMBLY AND TIRE LOW PRESSURE SENSOR	
1	Establish that a full size running wheel and tire assembly has a tire low pressure sensor installed. As a visual confirmation, a tire low pressure sensor has a metal valve stem rather than a rubber one and cannot be installed to a mini/space saver wheel.
	<p>Is a full size wheel and tire assembly with tire low pressure sensor installed?</p> <p>Yes GO to F2.</p> <p>No Install the correct wheel and tire assembly or tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application.</p>
F2: CHECK FOR ADDITIONAL DTCS	
1	Remove the Tire Pressure Monitoring System power supply fuse and re-install it. Clear DTCs and leave the vehicle stationary for 15 minutes, then drive it at a speed greater than 15.5 mph (25 kph) continuously for at least 10 minutes. (Note: If the vehicle speed drops below this value, the drive time to complete the test will need to be increased.) The use of the manufacturer approved diagnostic system, and the datalogger signal 'Tire pressure monitor system status – learn mode status' will verify the completion of the test when the value returns to 'Inactive'.
2	Check for additional DTCs C1A5631, C1A5831, C1A6031, C1A6231, with identical time stamps.
	<p>Have all four DTCs logged with identical time stamps in the tire pressure monitoring system module?</p> <p>Yes Replace the tire pressure monitoring system radio frequency receiver. REFER to: Tire Pressure Monitoring System (TPMS) Receiver (204-04 Wheels and Tires, Removal and Installation).</p> <p>No GO to F3.</p>
F3: VERIFY THE POSITION OF THE DEFECTIVE TIRE LOW PRESSURE SENSOR	
1	Check tire pressure monitoring system DTCs.
	<p>Are any C1AXX31 DTCs logged?</p> <p>Yes Install the correct tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application, to the position identified by the logged DTC. REFER to: Tire Low Pressure Sensor (204-04 Wheels and Tires, Removal and Installation).</p> <p>No No further action is required. (Note: The use of the manufacturer approved diagnostic system, and the datalogger signal 'Tire pressure monitor system status – learn completed successfully' will verify the successful completion of the test.)</p>

PINPOINT TEST G : LOCALIZATION FAILURE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: CHECK FOR ADDITIONAL DTCS	
1	Check for additional DTCs: C1A5711, C1A5712, C1A5713, C1A5911, C1A5912, C1A5913, C1A6111, C1A6112, C1A6113, C1A6311, C1A6312, C1A6313.
	<p>Are any of the DTCs listed above also logged?</p> <p>Yes Refer to the DTC Index and remedial actions.</p> <p>No GO to G2.</p>
G2: CHECK FOR ADDITIONAL DTCS	

	1 Check for additional DTCs: C1A5631, C1A5831, C1A6031 or C1A6231
	Is a C1A5631, C1A5831, C1A6031 or C1A6231 DTC also logged? Yes Refer to the DTC Index and remedial actions. No GO to G3.
G3: CHECK INITIATOR INSTALLATION	
	1 Check for correct installation of Initiator. REFER to: (204-04 Wheels and Tires) Tire Pressure Monitoring System (TPMS) Front Antenna (Removal and Installation), Tire Pressure Monitoring System (TPMS) Rear Antenna (Removal and Installation).
	Is the Initiator correctly installed? Yes GO to G4. No Rectify as required. REFER to: (204-04 Wheels and Tires) Tire Pressure Monitoring System (TPMS) Front Antenna (Removal and Installation), Tire Pressure Monitoring System (TPMS) Rear Antenna (Removal and Installation).
G4: CHECK FOR SHORT CIRCUIT IN INITIATOR HARNESS	
	1 Locate and remove module blue connector L.
	2 Measure the resistance across the relevant initiator circuits within the blue connector.
	Is the resistance less than 1 Ohm? Yes A value of less than 1 Ohm indicates a short circuit, rectify the short circuit as required. No Install the correct tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application, to the position identified by the logged DTC. REFER to: Tire Low Pressure Sensor (204-04 Wheels and Tires, Removal and Installation).

PINPOINT TEST H : SPARE TIRE LOW PRESSURE SENSOR NO OPERATION

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: ESTABLISH THE TYPE OF SPARE WHEEL AND TIRE ASSEMBLY INSTALLED	
	1 Establish the type of spare wheel and tire assembly Installed.
	Is the spare wheel a mini/space saver type? Yes Tire low pressure sensors are not installed to mini/space-saver spare wheels. Tire low pressure sensors are installed to full size spare wheels only. The DTC is to be ignored and no repair action is required. No GO to H2.
H2: ESTABLISH THAT THE SPARE WHEEL HAS A TIRE LOW PRESSURE SENSOR INSTALLED	
	1 Establish that the spare wheel has a tire low pressure sensor installed, considering the following additional information: <ul style="list-style-type: none"> a) As a visual confirmation, the tire low pressure sensor has a metal valve stem rather than a rubber one.
	Is a tire low pressure sensor installed? Yes GO to H3. No A new spare tire low pressure sensor should be installed. Note: Refer to the note above the DTC index about replacing components which may remain under manufacturer warranty. Refer to the relevant section of the workshop manual.
H3: CONFIRM OPERATION OF THE SPARE WHEEL PRESSURE SENSOR	
	1 Deflate the spare tire, in close proximity to the vehicle, until it is completely deflated.
	2 Complete an ignition cycle to ignition on and verify that the instrument cluster reports a spare tire pressure warning for approximately 20 seconds.
	3 Re-inflate the spare tire, in close proximity to the vehicle, to the recommended spare tire pressure.
	4 Complete an ignition cycle to ignition on and verify that the instrument cluster no longer reports a spare tire pressure warning.
	Does the instrument cluster continue to report a spare tire pressure warning? Yes GO to H4. No No repair action is required. It is possible that the customer may have placed items in the vehicle's luggage compartment that prevented correct RF reception.
H4: VERIFY THAT THE SPARE TIRE LOW PRESSURE SENSOR ID HAS BEEN CORRECTLY PROGRAMMED TO THE MODULE	
	1 Remove tire low pressure sensor. Record the 8 character hexadecimal ID written on the casing.
	2 Use the approved diagnostic system to read the spare tire sensor ID from the module. Refer to the relevant procedure in the workshop manual.
	3 Compare the IDs from steps 1 & 2.


	<p>Do the IDs match?</p> <p>Yes Replace the spare tire low pressure sensor. Refer to the relevant installation section in the workshop manual. The identification for the sensor must be programmed into the tire pressure monitoring system module using the manufacturer approved diagnostic system. The identification code is provided on a label with the complete assembly and is also printed on the casing of each sensor.</p> <p>No Program the spare tire sensor ID, recorded in step 1, to the module using the approved diagnostic system. The identification code is provided on a label with the complete assembly and is also printed on the casing of each sensor. Repeat test to ensure correct operation. GO to H3.</p>
--	---

PINPOINT TEST I : C1D1912 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO POWER

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS					
I1: C1D1912 VERIFY EXTERNAL RECEIVER DATA LINE CIRCUIT SHORT TO POWER						
	1	Ignition off.				
	2	Disconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.				
	3	Measure the resistance between				
		<table border="1" style="width: 100%;"> <tr> <th style="width: 50%;">C3MC45, harness side</th> <th style="width: 50%;">Battery</th> </tr> <tr> <td>Pin 1</td> <td>Positive terminal</td> </tr> </table>	C3MC45, harness side	Battery	Pin 1	Positive terminal
C3MC45, harness side	Battery					
Pin 1	Positive terminal					
		Is the resistance less than 5 Ohms? Yes GO to I2. No GO to I3.				
I2: C1D1912 CHECK THE EXTERNAL RECEIVER DATA LINE CIRCUIT FOR SHORT CIRCUIT TO POWER						
	1	Disconnect the Tire Pressure Monitoring System Control Module electrical connector, C3MC39B.				
	2	Measure the resistance between				
		<table border="1" style="width: 100%;"> <tr> <th style="width: 50%;">C3MC45, harness side</th> <th style="width: 50%;">Battery</th> </tr> <tr> <td>Pin 1</td> <td>Positive terminal</td> </tr> </table>	C3MC45, harness side	Battery	Pin 1	Positive terminal
C3MC45, harness side	Battery					
Pin 1	Positive terminal					
		Is the resistance less than 5 Ohms? Yes REPAIR the short circuit in wiring harness. No GO to I4.				
I3: C1D1912 CHECK THE TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER FOR SHORT CIRCUIT TO POWER						
	1	Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.				
	2	Using manufacturer approved diagnostic system run On Demand Self Test (0x0202) .				
		Is the DTC C1D1912 set? Yes Replace Tire Pressure Monitoring Receiver. No Investigate possible cause of intermittent failure.				
I4: C1D1912 CHECK THE TIRE PRESSURE MONITORING SYSTEM CONTROL MODULE FOR SHORT CIRCUIT TO POWER						
	1	Reconnect the Tire Pressure Monitoring System Control Module electrical connector, C3MC39B.				
	2	Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.				
	3	Using manufacturer approved diagnostic system run On Demand Self Test (0x0202) .				
		Is the DTC C1D1912 set? Yes Replace Tire Pressure Monitoring System Control Module. No Investigate possible cause of intermittent failure.				

PINPOINT TEST J : C1D1987 TIRE PRESSURE MONITORING SYSTEM EXTERNAL RECEIVER DATA LINE MISSING MESSAGE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS	
J1: C1D1987 VERIFY EXTERNAL RECEIVER DATA LINE MISSING MESSAGE		
	1	Using manufacturer approved diagnostic system run On Demand Self Test (0x0202).
		Is the DTC C1D1987 set? Yes GO to J2. No GO to J5.
J2: C1D1987 CHECK EXTERNAL RECEIVER DATA LINE CIRCUIT		

	1	Ignition off.				
	2	Disconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.				
	3	Disconnect the Tire Pressure Monitoring System Control Module electrical connector, C3MC39B.				
	4	Measure the resistance between				
		<table border="1" style="width: 100%;"> <tr> <td style="width: 50%; text-align: center;">C3MC45, harness side</td> <td style="width: 50%; text-align: center;">C3MC39B, harness side</td> </tr> <tr> <td style="text-align: center;">Pin 1</td> <td style="text-align: center;">Pin4</td> </tr> </table>	C3MC45, harness side	C3MC39B, harness side	Pin 1	Pin4
C3MC45, harness side	C3MC39B, harness side					
Pin 1	Pin4					
		Is the resistance less than 5 ohms? Yes GO to J3. No REPAIR the high resistance/open circuit in wiring harness.				
J3: C1D1987 CHECK EXTERNAL RECEIVER						
	1	Reconnect the Tire Pressure Monitoring System Control Module electrical connector, C3MC39B.				
	2	Reconnect the Tire Pressure Monitoring System Receiver electrical connector, C3MC45.				
	3	Using manufacturer approved diagnostic system run On Demand Self Test (0x0202).				
		Is the DTC C1D1987 set? Yes Replace Tire Pressure Monitoring Receiver. GO to J4. No Investigate possible cause of intermittent failure.				
J4: C1D1987 CHECK TIRE PRESSURE MONITORING SYSTEM CONTROL MODULE						
	1	Using manufacturer approved diagnostic system run On Demand Self Test (0x0202).				
		Is the DTC C1D1987 set? Yes Replace Tire Pressure Monitoring System Control Module. No Test is complete. No further action is required.				
J5: C1D1987 CHECK WHEELS HAVE TIRE SENSORS INSTALLED						
		 NOTE: As a visual check, a tire low pressure sensor has a metal valve stem rather than a rubber one and cannot be installed to a mini/space saver spare wheel.				
	1	Check that all full size running wheel and tire assemblies have tire low pressure sensors installed.				
		Is a full size wheel and tire assembly with tire low pressure sensor installed to all running wheel positions? Yes GO to J6. No If agreed with the customer install correct tire low pressure sensors in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application, as required. <small>(Note: Confirm why the vehicle has non-Tire Pressure Monitoring System wheel & tire assemblies installed before installing tire low pressure sensors, which are not to be claimed under vehicle warranty.)</small>				
J6: C1D1987 CHECK TIRE SENSOR COMPATIBILITY TO TIRE PRESSURE MONITORING SYSTEM RECEIVER						
	1	Remove tire low pressure sensor from 1 wheel.				
	2	Verify the tire low pressure sensor part number from the information on the casing.				
		Is the tire low pressure sensor the correct part for the vehicle? Yes Replace Tire Pressure Monitoring Receiver. Carry out the following to verify repair. Remove the Tire Pressure Monitoring System power supply fuse and re-install it. Clear DTCs and leave the vehicle stationary for 15 minutes, then drive it at a speed greater than 15.5 mph (25 kph) continuously for at least 10 minutes. <small>(Note: If the vehicle speed drops below this value, the drive time to complete the test will need to be increased. The use of the manufacturer approved diagnostic system, and the datalogger signal 'Tire pressure monitor system status - learn mode status' will verify the completion of the test when the value returns to 'Inactive'.)</small> No Install the correct tire low pressure sensor, of correct frequency, in accordance with that defined in the manufacturer approved diagnostic system new tire low pressure sensor application, to the position(s) identified. <small>(Note: Confirm why the vehicle has incorrect Tire Pressure Monitoring System wheel & tire assemblies installed before installing tire low pressure sensors, which are not to be claimed under vehicle warranty.)</small>				

Wheels and Tires - Tire Low Pressure Sensor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

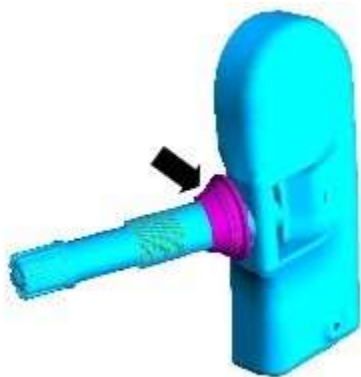
1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
3. Remove the tire from the wheel, release the tire bead from the rim 180 degrees from the valve.

4.

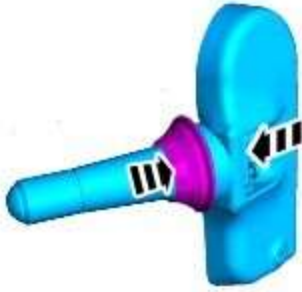


5.

- Discard the tire valve and retaining nut.




Installation



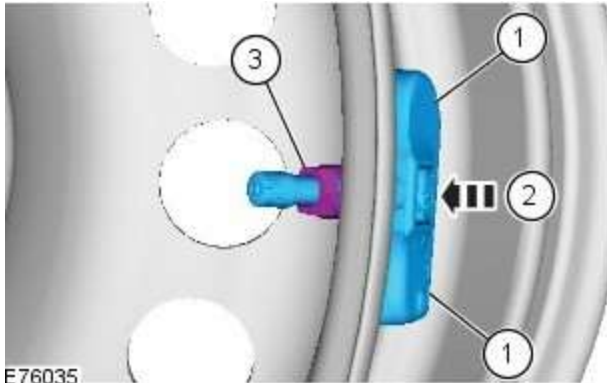
E100831

1. CAUTIONS:

 Make sure that the seal is correctly located.

 Make sure that new components are installed.


Install the washer and seal, making sure the valve remains pressed fully onto its seat.



E76035

2. WARNINGS:

 Make sure that any corrosion or dirt is removed from the mating surfaces.

 Make sure that a new tire valve, valve core, seal, washer, cap and retaining nut is installed.

CAUTIONS:

 Use lint free cloth.

 Only use moderate force when installing the sensor.

 NOTE: Only tighten the nut finger tight at this stage.

- Install the tire low pressure sensor and support the sensor body in position.
- Support the back of the valve stem in order to prevent rotation to the tire low pressure sensor body.
- Gently push the nut towards the center of the wheel. Tighten the nut.

Torque: 8 Nm

3. Install the tire and balance the wheel.

4. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

5. **WARNING:** Make sure to support the vehicle with axle stands.

Lower the vehicle.

Wheels and Tires - Tire Pressure Monitoring System (TPMS) Front Antenna

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. **WARNING:** Make sure to support the vehicle with axle stands. Raise and support the vehicle.

2. NOTES:



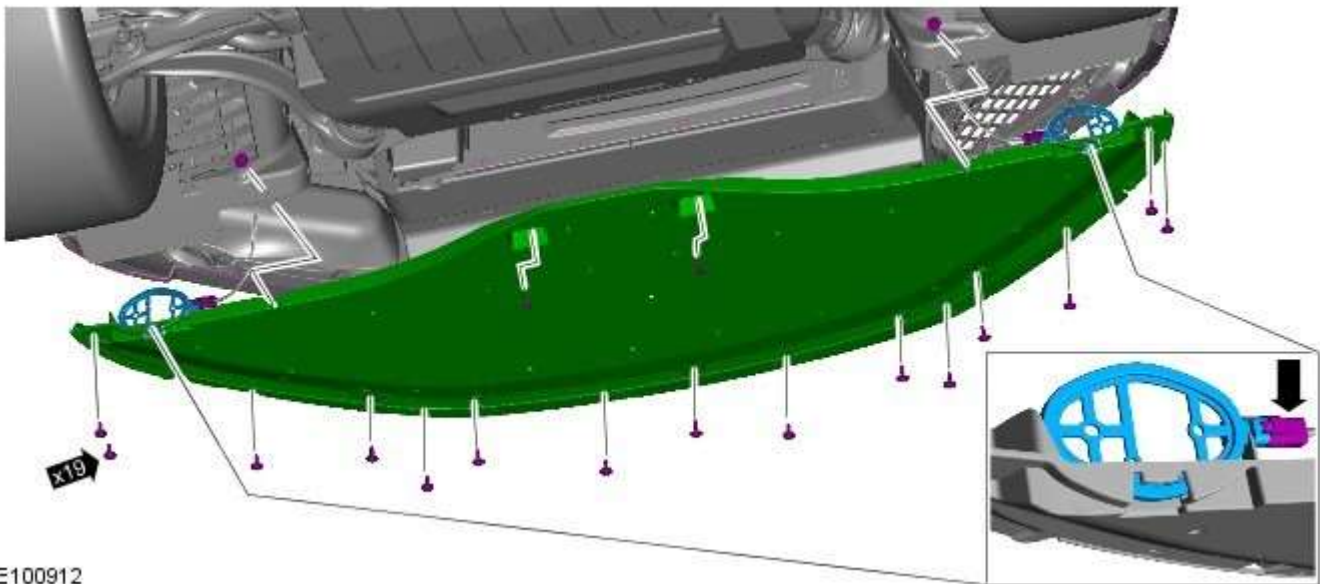
This step requires the aid of another technician.



Lower the radiator splash shield enough to access the tire pressure monitoring system front antenna.



Note the position of the component before removal.



E100912

Installation

1. **CAUTION:** Make sure that the component is secured in the retainer.



NOTE: Make sure that the component is installed to the noted removal position.

To install, reverse the removal procedure.

Wheels and Tires - Tire Pressure Monitoring System (TPMS) Rear Antenna

Removal and Installation

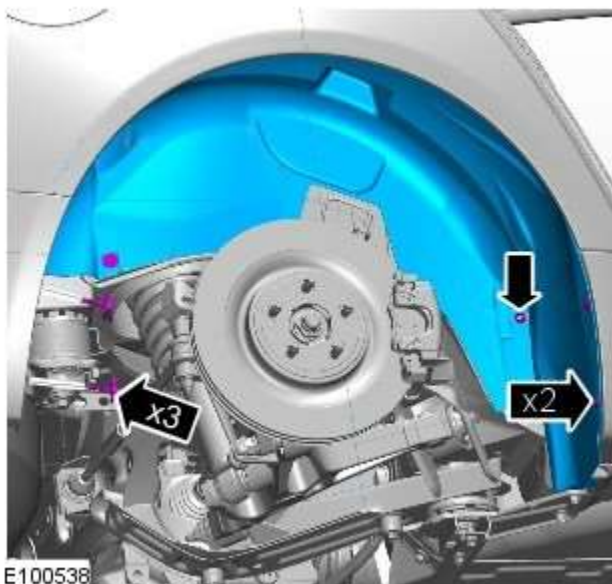
Removal



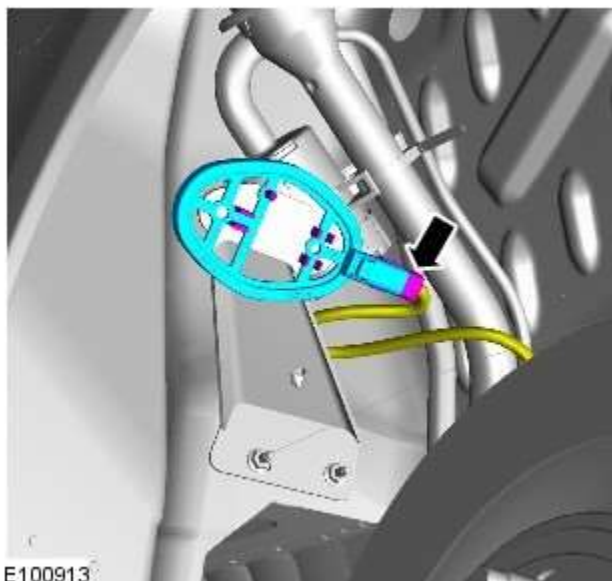
NOTE: Removal steps in this procedure may contain installation details.

1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).


3.



4. NOTE: Note the position of the component before removal.



Installation

1.  CAUTION: Make sure that the component is secured in the retainer.

 NOTE: Make sure that the component is installed to the noted removal position.

To install, reverse the removal procedure.

Wheels and Tires - Tire Pressure Monitoring System (TPMS) Module

Removal and Installation

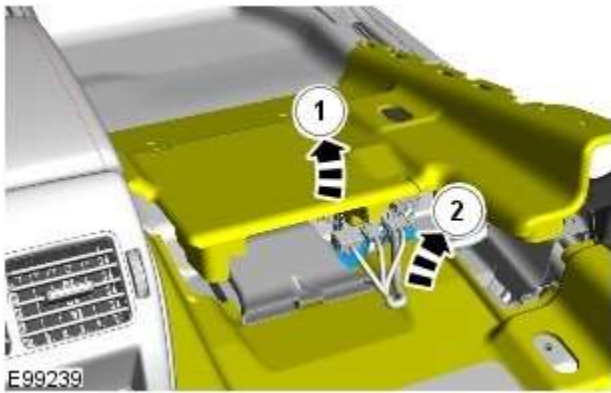
Removal



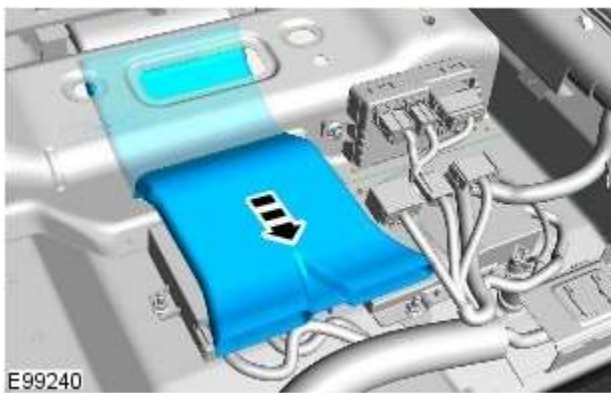
NOTE: Removal steps in this procedure may contain installation details.

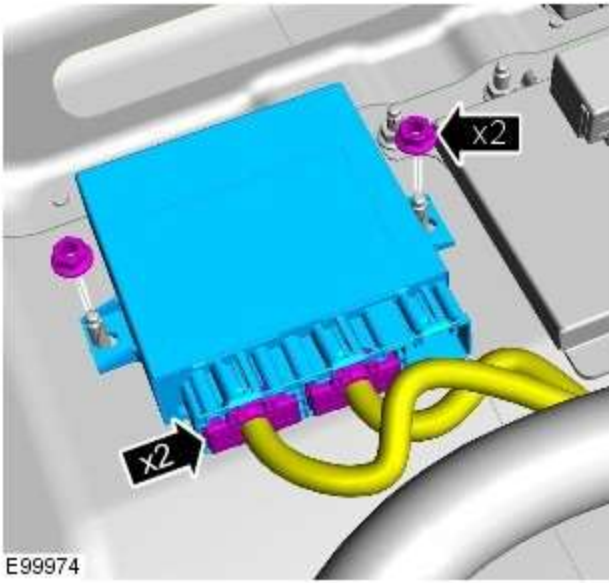
1. Switch the ignition off.
2. Remove the right-hand front seat.

Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
3. Refer to: [B-Pillar Lower Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
4. Detach and reposition the floor covering.



- 5.





6.

Installation

1. To install, reverse the removal procedure.

Wheels and Tires - Tire Pressure Monitoring System (TPMS) Receiver

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



The tire pressure monitoring system receiver is installed in the same location on both LHD and RHD vehicles.

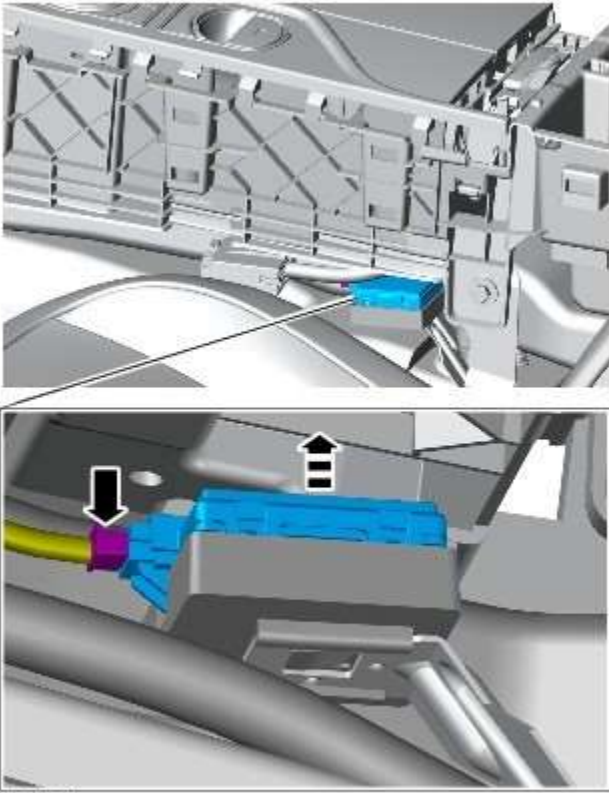
1. Switch the ignition off.
2. Remove the left-hand floor console side trim panel.

Refer to: [Floor Console Side Trim Panel](#) (501-12 Instrument Panel and Console, Removal and Installation).



3.

4.



E95065

Installation

1. To install, reverse the removal procedure.
2. Configure the tire pressure monitoring system using the diagnostic tool.


Wheels and Tires - Wheel and Tire

Removal and Installation

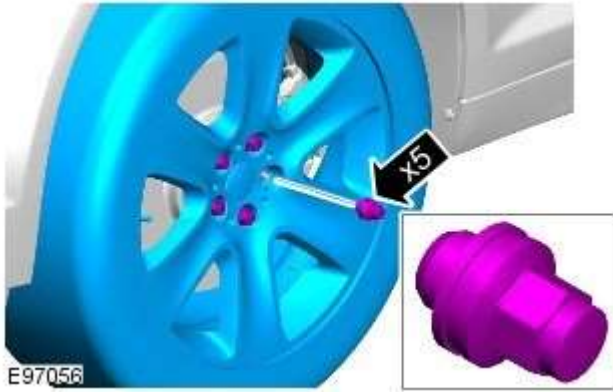
Removal



NOTE: Removal steps in this procedure may contain installation details.

1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

2. Torque: 125 Nm



Installation



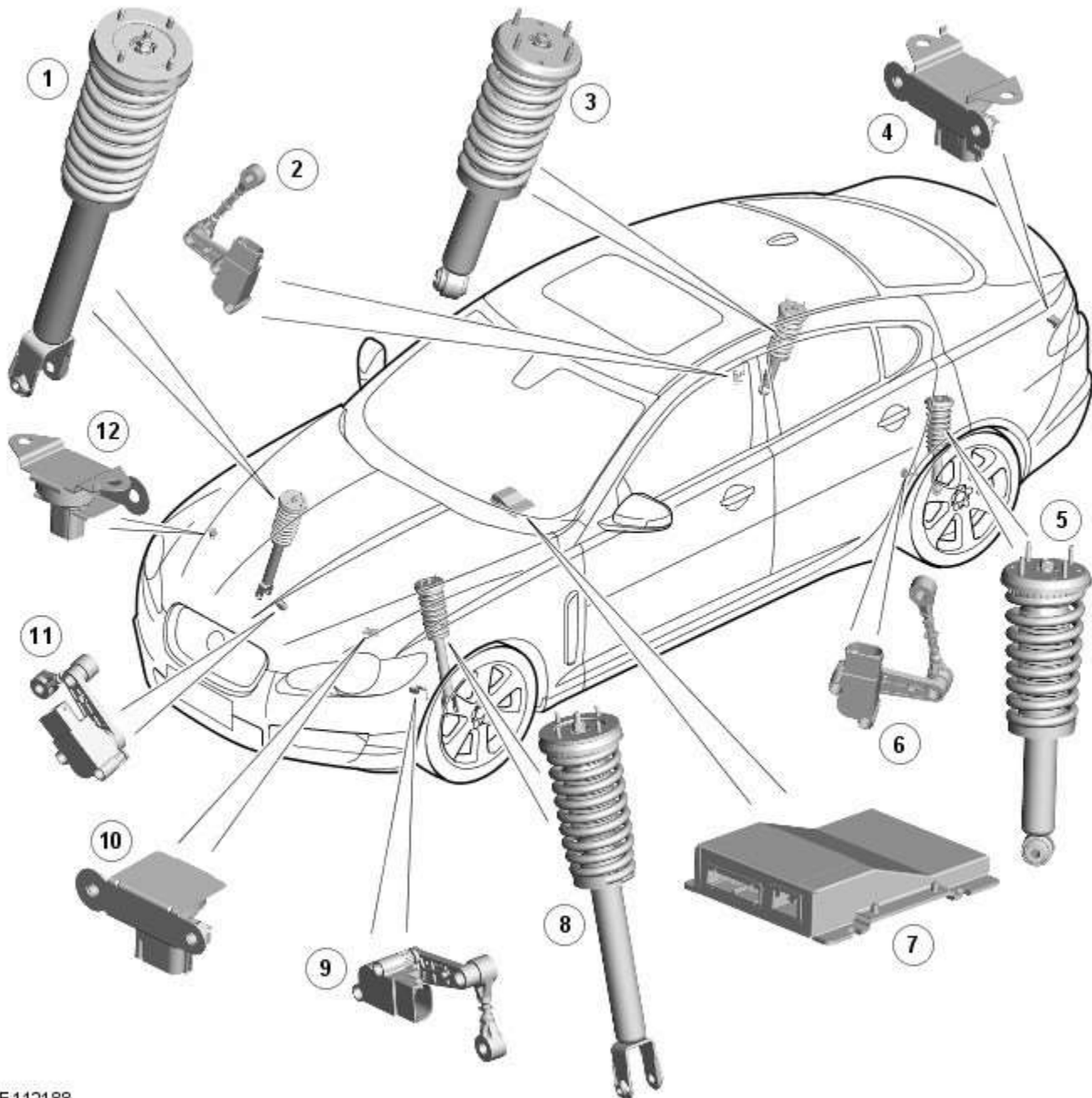
1. **CAUTION:** Apply a small amount of grease to the hub and wheel mating surfaces before installation. Make sure the grease does not come into contact with the vehicles braking components and the wheel stud threads. Failure to follow these instructions may result in personal injury.

To install, reverse the removal procedure.

Vehicle Dynamic Suspension - Vehicle Dynamic Suspension V8 5.0L Petrol/V8 S/C 5.0L Petrol - Component Location

Description and Operation

Component Location - Supercharged Vehicles from 2010MY



E112188

Item	Description
1	RH (right-hand) front-spring and damper assembly
2	RH rear suspension height sensor
3	RH rear-spring and damper assembly
4	Rear vertical accelerometer
5	LH (left-hand) rear-spring and damper assembly
6	LH rear suspension height sensor
7	Adaptive damping module
8	LH front-spring and damper assembly

9	LH front suspension height sensor
10	LH front vertical accelerometer
11	RH front suspension height sensor
12	RH front vertical accelerometer

Vehicle Dynamic Suspension - Vehicle Dynamic Suspension V8 5.0L Petrol/V8 S/C 5.0L Petrol - Overview

Description and Operation

OVERVIEW

Adaptive Dynamics - Supercharged Vehicles from 2010MY

The adaptive dynamics system, is an electronically controlled suspension system which constantly adjusts the damping characteristics of the suspension dampers in reaction to the existing driving conditions. The adaptive dynamics system is available on specified models.

The system is controlled by an Adaptive Damping Module (ADM), located beneath the right-hand front seat. The module receives signals from three dedicated vertical accelerometers; two at the front of the vehicle and one at the rear, which, together with four suspension height sensors, determine the state of the body and wheel motions. In addition to these inputs, further signals from other vehicle electronic system components to determine vehicle state and driver inputs are monitored by the adaptive damping module. These combined signals are used by the adaptive damping module to continuously adjust the damping characteristics of each of the suspension dampers in reaction to the current driving conditions to give the optimum body control and vehicle ride.

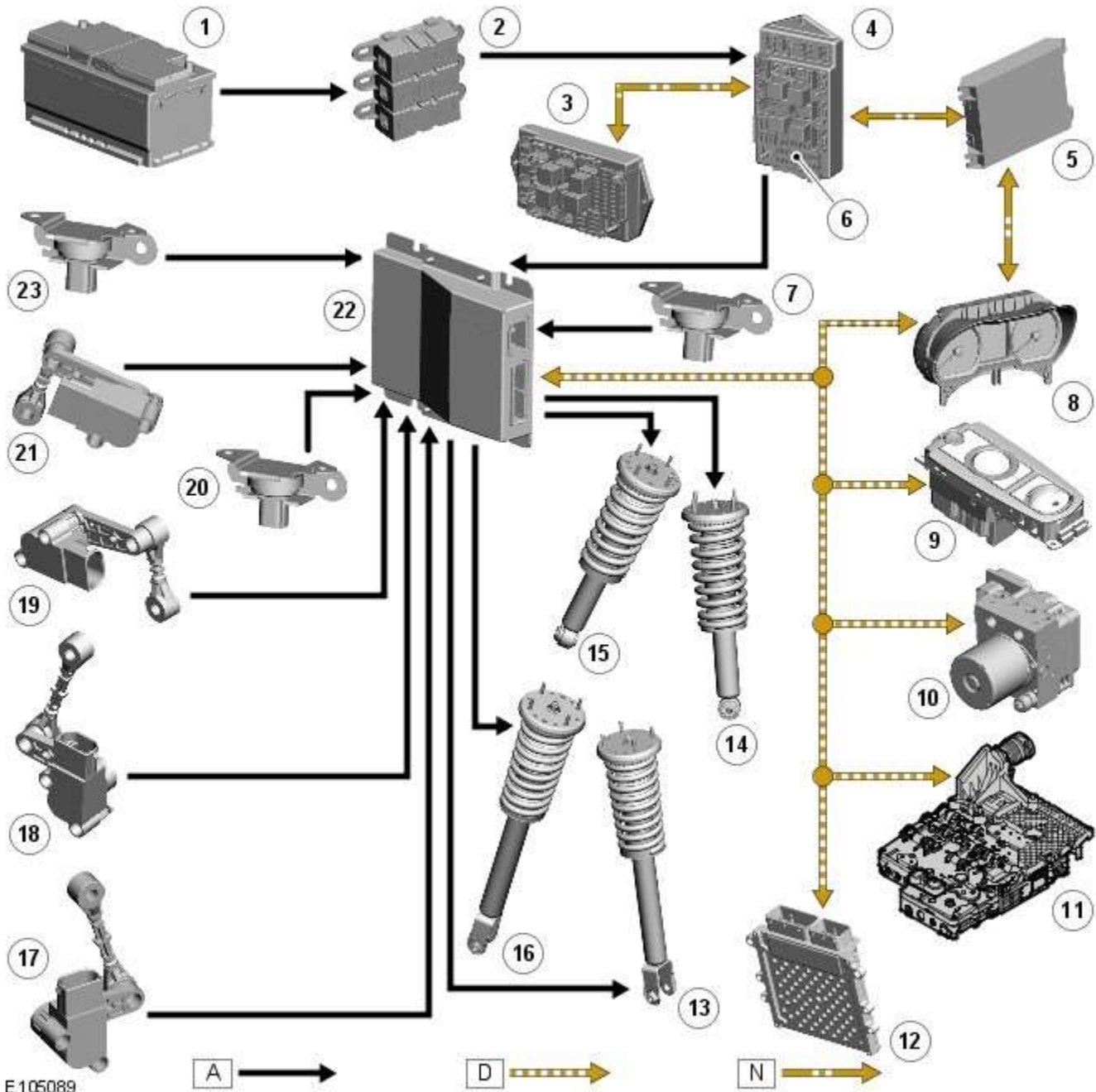
Vehicle Dynamic Suspension - Vehicle Dynamic Suspension V8 5.0L Petrol/V8 S/C 5.0L Petrol - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus



Item	Description
1	Battery
2	BJB (battery junction box) (Megafuse (250 A))
3	AJB (auxiliary junction box)
4	CJB (central junction box)
5	ATC (automatic temperature control) module
6	Fuse 36 (10 A) - from delayed power-off relay

7	Rear accelerometer
8	Instrument cluster
9	JaguarDrive selector module
10	ABS (anti-lock brake system) module
11	TCM (transmission control module)
12	ECM (engine control module)
13	RH (right-hand) rear damper
14	RH front damper
15	LH (left-hand) front damper
16	LH rear damper
17	LH rear suspension height sensor
18	RH rear suspension height sensor
19	LH front suspension height sensor
20	RH front accelerometer
21	RH front suspension height sensor
22	Adaptive damping module
23	LH front accelerometer

System Operation

PRINCIPLES OF OPERATION

The adaptive damping module uses a combination of information from other system modules and data from the accelerometers and suspension height sensors to measure the vehicle and suspension states and driver inputs. Using this information, the adaptive damping module applies algorithms to control the dampers for the current driving conditions.

The adaptive damping module receives signals on the high speed [CAN](#) bus from the following system components:

- Brake Pressure - [ABS](#) module.
- Brake Pressure Quality Factor - [ABS](#) module.
- Car Configuration Parameters - [AJB](#).
- Center Differential Range Actual - [ECM](#).
- Engine Speed - [ECM](#).
- Engine Speed Quality Factor - [ECM](#).
- Engine Torque Flywheel Actual - [ECM](#).
- Engine Torque Flywheel Actual Quality Factor - [ECM](#).
- Gear Position Target - [TCM](#).
- Lateral Acceleration - [ABS](#) module.
- Power Mode (Ignition Signal) - [CJB](#).
- Power Mode Quality Factor - [CJB](#).
- Roll Stability Control Mode - [ABS](#) module.
- Steering Wheel Angle - [ABS](#) module.
- Steering Wheel Angle Speed - [ABS](#) module.
- Steering Wheel Angle Status - [ABS](#) module.
- Terrain Mode Requested - JaguarDrive selector.
- Torque Converter Slip - [TCM](#).
- Vehicle Information Parameters HS - [AJB](#)
- Vehicle Speed - [ABS](#) module.
- Vehicle Speed Quality Factor - [ABS](#) module.
- Front Left Wheel Speed - [ABS](#) module.
- Front Left Wheel Speed Quality Factor - [ABS](#) module.
- Front Right Wheel Speed - [ABS](#) module.
- Front Right Wheel Speed Quality Factor - [ABS](#) module.
- Rear Left Wheel Speed - [ABS](#) module.
- Rear Left Wheel Speed Quality Factor - [ABS](#) module.
- Rear Right Wheel Speed Quality Factor - [ABS](#) module.
- Rear Right Wheel Speed - [ABS](#) module.

The adaptive damping module also outputs information on the high speed [CAN](#) bus for use by other systems as follows:

- Fault Message - instrument cluster.
- Terrain Mode Change Status - JaguarDrive selector.
- Terrain Mode - JaguarDrive selector.

The adaptive damping module monitors the input signals and operates the damper solenoids. The input signals are used in control modes and a force required for each damper for that mode is calculated. An arbitration mode monitors the force requirements from each mode and apportions a force to a damper. The force is converted to the appropriate current and sent to the damper.

The control modes are as follows:

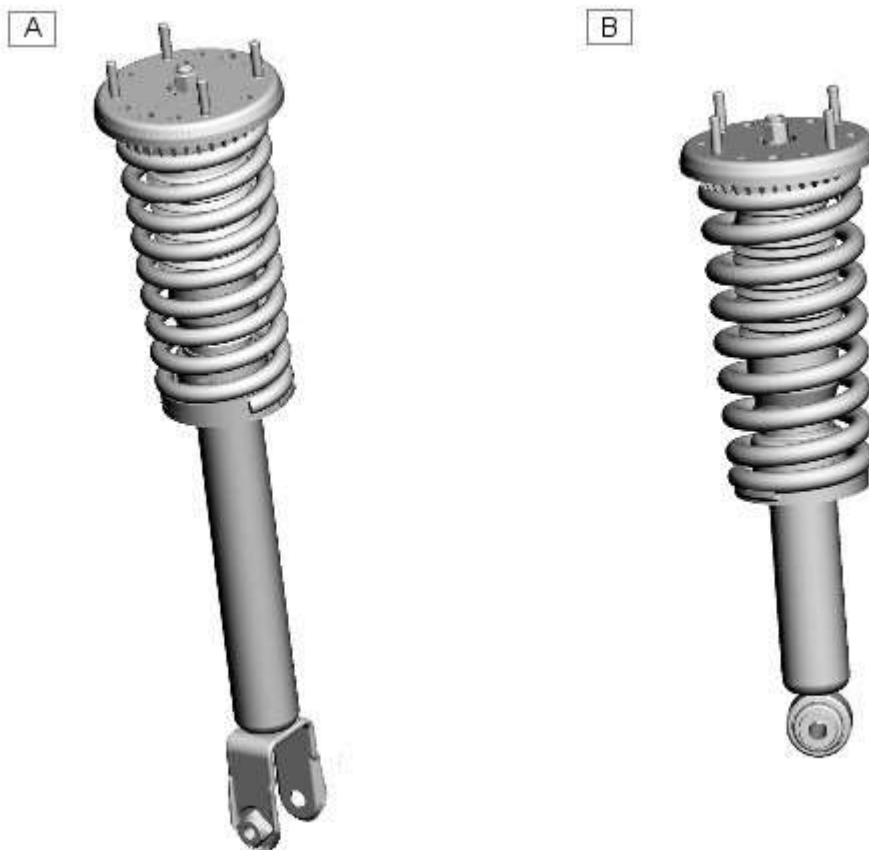
- Body Control – Uses [CAN](#) and accelerometer inputs. Calculates road induced body motions 100 times a second and sets each damper to the appropriate level to maintain a flat and level body.
- Roll Rate Control – Uses [CAN](#) inputs. Predicts vehicle roll rate due to driver steering inputs 100 times a second and increases damping to reduce roll rate.
- Pitch Rate Control – Uses [CAN](#) inputs. Predicts vehicle pitch rate due to driver throttle and braking inputs 100 times a second and increases damping to reduce pitch rate.
- Bump Rebound Control – Uses suspension height sensor and [CAN](#) inputs. Monitors the position of the wheel 500 times a second and increases the damping rate as the damper approaches the end of its travel.
- Wheel Hop Control – Uses suspension height sensor and [CAN](#) inputs. Monitors the position of the wheel 500 times a second and detects when the wheel is at its natural frequency and increases the damping to reduce vertical wheel motion.

Under normal road conditions when the vehicle is stationary with the engine running, the dampers are set to the firm condition to reduce power consumption.

The adaptive damping module receives its power supply via a relay and fuse in the [CJB](#). The relay remains energized for a period of time after the ignition is off. This allows the adaptive damping module to record and store any [DTC \(diagnostic trouble code\)](#) relating to adaptive dynamics system faults.

Component Description

DAMPERS



E105085

Item	Description
A	Front spring and damper assembly
B	Rear spring and damper assembly

The 'Adaptive Dynamics' dampers are monotube, nitrogen gas and oil filled units, manufactured by Bilstein. The dampers are continuously variable, which allows the damping force to be electrically adjusted when the vehicle is being driven. The variable dampers provide the optimum compromise between vehicle control and ride comfort.

The dampers have an electrical connector on the end of the piston rod, in the center of the top mount (the dampers look identical to those on the Computer Active Technology Suspension (CATS) system of 4.2L supercharged vehicles, but have a different part number).

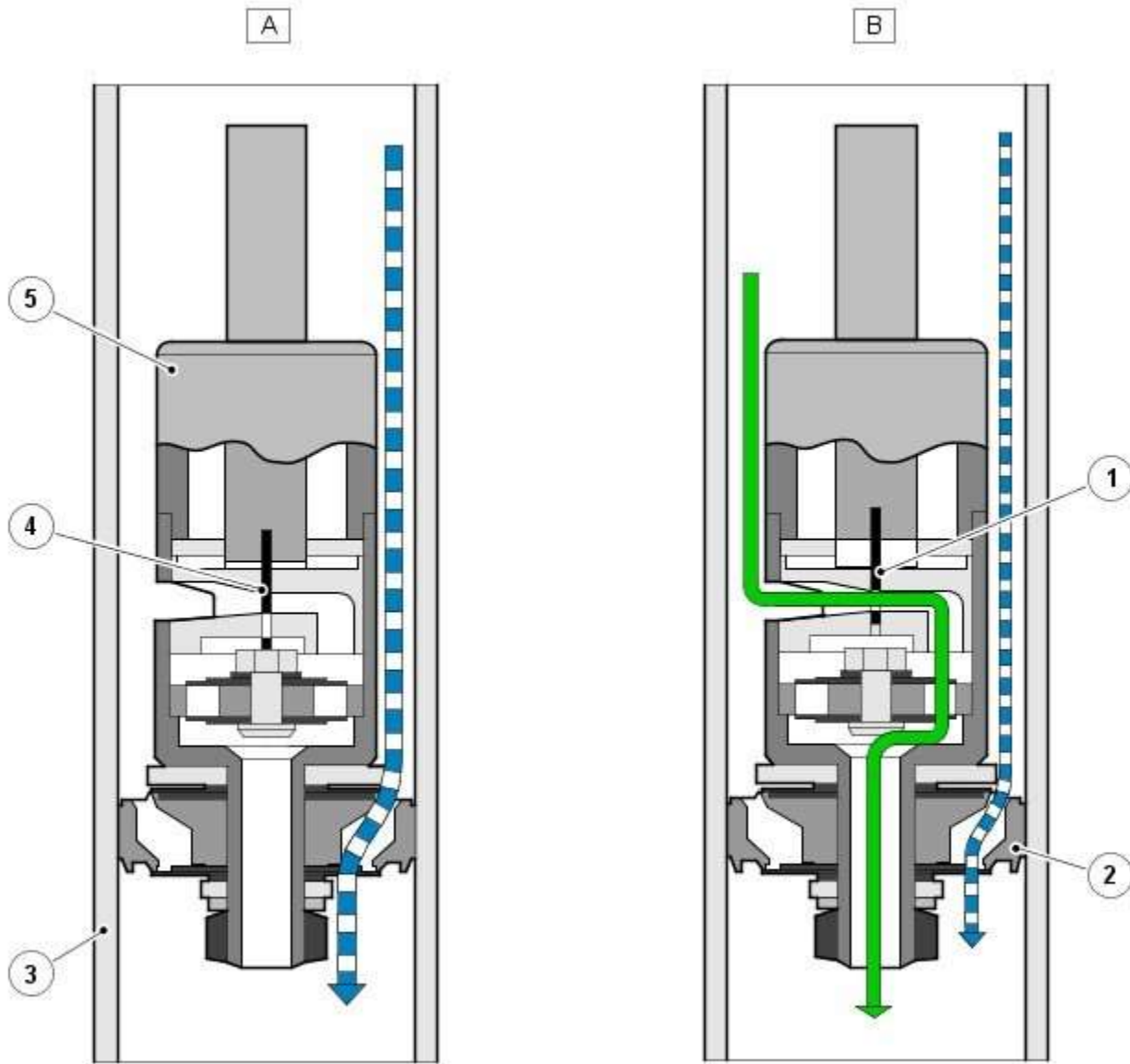
In each damper, the continuous damping adjustment is achieved by a solenoid operated variable orifice, which opens up an alternative path for oil flow within the damper. When de-energized the bypass is closed and all the oil flows through the main (firm) piston. When energized, the solenoid moves an armature and control blade, which work against a spring. The control blade incorporates an orifice which slides inside a sintered housing to open up the bypass as required. In compression, oil flows from the lower portion of the damper through a hollow piston rod, a separate soft (comfort) valve, the slider housing and orifice and into the upper portion of the damper, thereby bypassing the main (firm) valve. In rebound the oil flows in the

opposite direction.

In the firm setting, oil flows through the main (firm) valve only, but when the bypass is opened by any amount the oil flows through both valves in a pressure balance. When fully energized the solenoid moves the armature and therefore the slider to the maximum extension and opens the orifice completely. The damper operates continuously between these two boundary conditions.

The solenoid in each damper is operated by a 526 Hz PWM (pulse width modulation) signal from the adaptive damping module. When fully energized, the adaptive damping module applies a 1.5 A current to operate the damper in the soft setting. When de-energized (0.0 A) the damper is in the firm setting. The current varies continuously as required to increase and decrease the damping individually in each of the dampers.

Sectioned Views of Damper Operating States

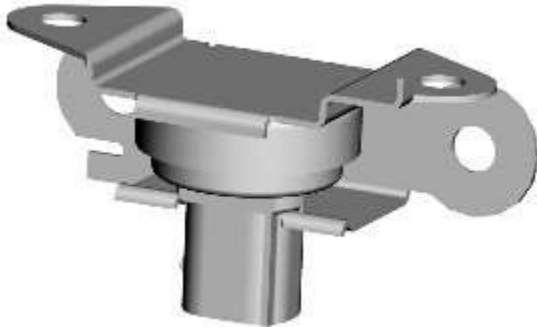


E105350

Item	Description
A	Firm setting
B	Soft setting
C	Main oil flow
D	Bypass oil flow
1	Bypass valve (open)

2	Main piston
3	Tube
4	Bypass valve (closed)
5	Piston and rod assembly

ACCELEROMETERS



E105087

Three accelerometers are used in the adaptive dynamics system. The accelerometers are located as follows:

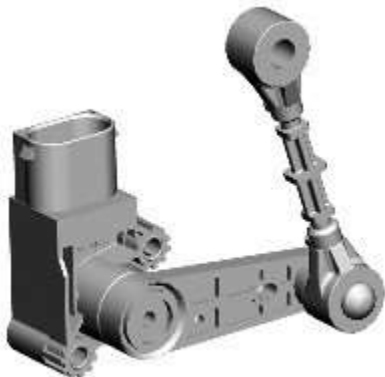
- One each on the rear edge of the radiator support panel.
- One in the luggage compartment, in the rear [LH](#) corner adjacent to the rear lamp assembly.

The accelerometers measure acceleration in the vertical plane and output a corresponding analogue signal to the adaptive damping module. The algorithms in the adaptive damping module calculate the heave, pitch and roll motions of the vehicle, which are used by the module to control road induced body modes.

Each accelerometer is connected to the adaptive damping module via three wires, which supply ground, 5 V supply and signal return.

The sensing element comprises a single parallel plate capacitor, one plate of which moves relative to the other dependant on the force (acceleration) applied. This causes the capacitance to change as a function of applied acceleration. This capacitance is compared with a fixed reference capacitor in a bridge circuit and the signal is processed by means of a dedicated integrated circuit to generate an output voltage that varies as a function of applied acceleration. The sensors output a signal voltage of approximately $1 \text{ V/g} \pm 0.05 \text{ V/g}$.

SUSPENSION HEIGHT SENSORS



E105088

Four suspension height sensors are used in the adaptive dynamics system, two for the front suspension and two for the rear suspension. A front suspension height sensor is attached to each side of the front subframes and connected by a sensor arm and sensor link to the related lower lateral arm of the front suspension. A rear suspension height sensor is attached to each side of the rear subframe and connected by a sensor arm and sensor link to the related upper control arm of the rear suspension. On each suspension height sensor, the sensor arm and sensor link convert linear movement of the suspension into rotary movement of the sensor shaft.

The sensors are also used for the static dynamic headlamp leveling system on vehicles fitted with xenon headlamps.

The suspension height sensors measure suspension displacement at each corner of the vehicle and output a corresponding analogue signal to the adaptive damping module. The algorithms in the adaptive damping module calculate the position, velocity and frequency content of the signals and use the results for wheel control.

Each suspension height sensor is connected to the adaptive damping module via three wires, which supply ground, 5 V supply

and signal return.

The sensing element consists of an array of Hall effect devices arranged to measure the direction of the magnetic field of a small magnet attached to the end of the sensor shaft. As the sensor shaft rotates, so do the lines of magnetic flux from the magnet. The signals from the Hall effect elements are processed by means of a dedicated integrated circuit to generate an output voltage that varies as the sensor shaft is rotated. The sensor has a measurement range of $\pm 40^\circ$ around its nominal position and the nominal sensitivity is 57 mV/° of shaft rotation.

ADAPTIVE DAMPING MODULE



E105086

The adaptive damping module is installed on the floor pan, below the [RH](#) front seat.

System Fault Message

The adaptive damping module has a high speed [CAN](#) connection to the instrument cluster. If a fault is detected by the adaptive damping module, a message is sent to the instrument cluster and the message 'ADAPTIVE DYNAMICS FAULT' is displayed. The adaptive damping module also logs an appropriate [DTC](#). The adaptive damping module can be interrogated using an approved Jaguar diagnostic system.

When a fault is detected, the adaptive damping module implements a strategy based on the type of fault. If there is an electrical power fault, or the adaptive damping module cannot control the dampers, they default to the firm condition. If a sensor fails that only affects one or more control modes then an intermediate damper setting is used as the lower threshold and the remaining working modes can demand higher damping as required.

Vehicle Dynamic Suspension - Vehicle Dynamic Suspension

Diagnosis and Testing

Principle of Operation

For a detailed description of the adaptive damping system operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (204-05 Vehicle Dynamic Suspension)

Vehicle Dynamic Suspension - V8 5.0L Petrol/V8 S/C 5.0L Petrol (Description and Operation),

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Coil spring(s) • Shock absorber(s) • Accelerometer(s) installation • Height sensor(s) installation 	<ul style="list-style-type: none"> • Fuse(s) • Wiring harness/electrical connectors • Accelerometer(s) • Adaptive Damping Control Module • Height sensor(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check the system for any logged Diagnostic Trouble Codes (DTCs) and refer to the DTC index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Adaptive Damping Module \(SUMB\)](#) (100-00 General Information, Description and Operation).

Vehicle Dynamic Suspension - Adaptive Damping Module

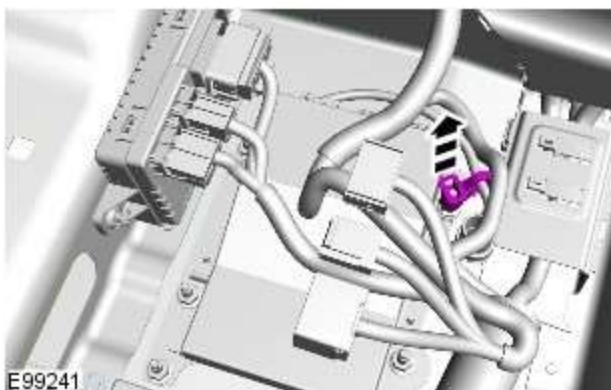
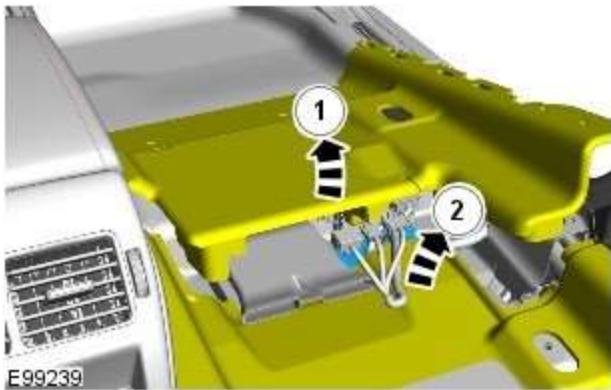
Removal and Installation

Removal



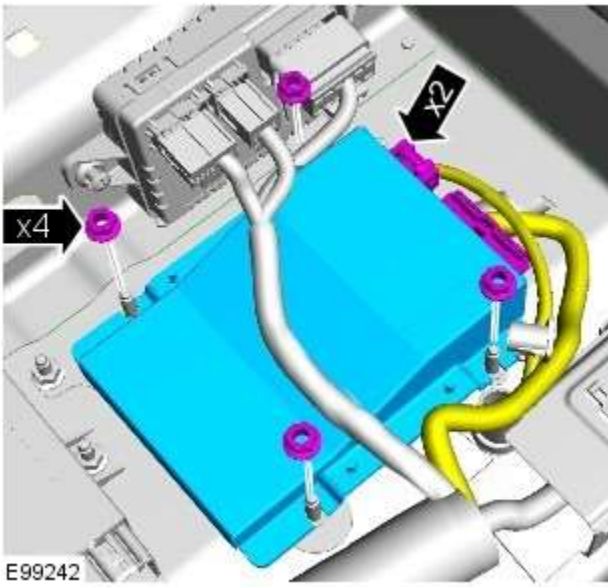
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
2. Refer to: [B-Pillar Lower Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Detach and reposition the floor covering.



4.

5.



- Torque: 5 Nm

6.

Installation

1. To install, reverse the removal procedure.

Vehicle Dynamic Suspension - Front Suspension Vertical Accelerometer

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.



1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).



E99236

3. **CAUTION:** The accelerometer is an extremely delicate component and can easily be rendered unserviceable. Never use an accelerometer which has been dropped or subjected to mistreatment of any type.

- *Torque: 5 Nm*

Installation

1. **CAUTION:** The accelerometer is an extremely delicate component and can easily be rendered unserviceable. Never use an accelerometer which has been dropped or subjected to mistreatment of any type.

To install, reverse the removal procedure.

Vehicle Dynamic Suspension - Rear Suspension Vertical Accelerometer

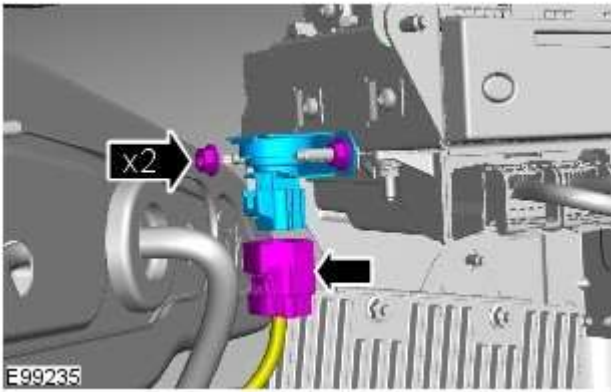
Removal and Installation


Removal



NOTE: Removal steps in this procedure may contain installation details.


1. Refer to: [Loadspace Trim Panel LH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



2.  CAUTION: The accelerometer is an extremely delicate component and can easily be rendered unserviceable. Never use an accelerometer which has been dropped or subjected to mistreatment of any type.

- Torque: 5 Nm

Installation

1.  CAUTION: The accelerometer is an extremely delicate component and can easily be rendered unserviceable. Never use an accelerometer which has been dropped or subjected to mistreatment of any type.

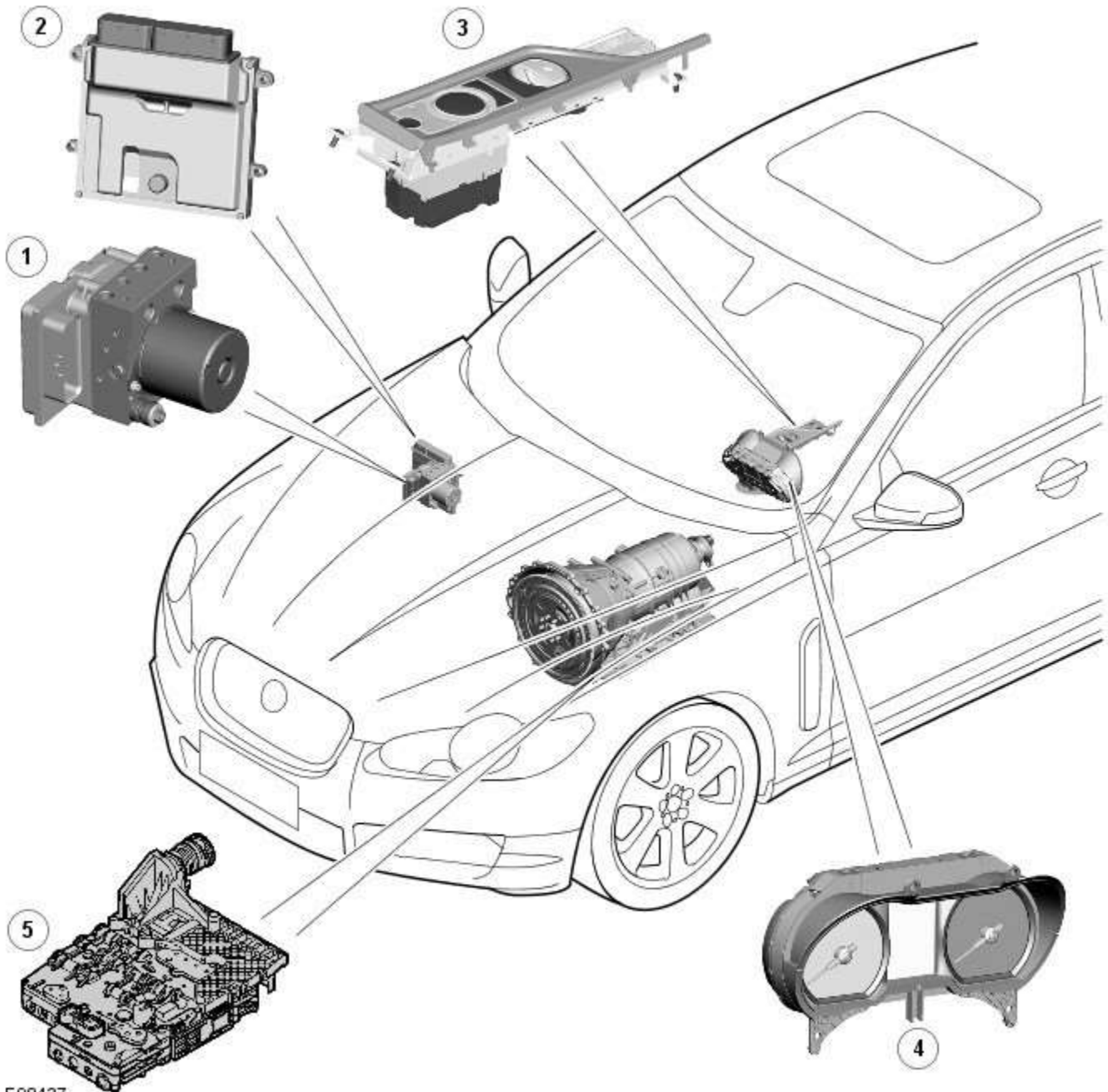
To install, reverse the removal procedure.

Ride and Handling Optimization - Ride and Handling Optimization -

Component Location

Description and Operation

COMPONENT LOCATION



E98437

Item	Description
1	ABS (anti-lock brake system) module
2	ECM (engine control module)
3	JaguarDrive Control selection buttons
4	Instrument cluster
5	TCM (transmission control module)

Ride and Handling Optimization - Ride and Handling Optimization - Overview

Description and Operation

OVERVIEW

JaguarDrive Control is a selectable vehicle optimisation system, designed to fine-tune the driving characteristics of the vehicle by accommodating different driving conditions or driving styles. The system allows the performance envelope of the vehicle to be stretched and prevents the necessity for a single, compromised configuration for all conditions. JaguarDrive Control increases the vehicle's abilities by changing the characteristics of engine mapping, transmission shifts and stability and traction interventions. The software for the JaguarDrive control is incorporated in the JaguarDrive selector module.



NOTE: The JaguarDrive Control system is a co-ordinating system only. It CANNOT generate a fault in one of the participating sub-systems. All participating subsystems should be FULLY diagnosed before assuming a fault with JaguarDrive Control. Replacing the JaguarDrive selector module should not be done until all other options have been exhausted.

Ride and Handling Optimization - Ride and Handling Optimization - System Operation and Component Description

Description and Operation

System Operation

JAGUARDRIVE CONTROL OPERATION

Engine Management System

The Engine Management System (EMS) varies the accelerator pedal maps to change the amount of torque per percentage of pedal travel. The EMS can also change the accelerator pedal response to control the allowed torque change relative to the speed of pedal travel.

Each driving mode uses a combination of operating parameters for each sub-system. Changing between driving modes initiates a different set of operating characteristics, which will be noticeable to the driver. The driver will notice differences in engine response when, for example, the accelerator pedal is held in a constant position and the driving mode is changed from Winter to Dynamic, the driver will notice the torque and engine speed increase. Similarly, if the mode is changed from Normal or Dynamic to Winter the driver will notice a reduction in torque and engine speed.



NOTE: The change in torque and engine speed can take approximately 30 seconds and care must be taken not to confuse the JaguarDrive Control system operation with an EMS fault.

Transmission Control

The TCM (transmission control module) changes the shift maps for the JaguarDrive Control mode selected. This changes the shift points providing early or late upshifts and downshifts. For example, on slippery surfaces in Winter mode the transmission will select 2nd gear for starting from a standstill on a flat surface to minimize wheel slip.

Anti-lock Braking System Control

The ABS (anti-lock brake system) module controls several vehicle functions and adjusts the operating parameters of these functions to optimize the selected JaguarDrive Control mode. Traction control uses different slip/acceleration thresholds to improve traction and vehicle composure. For example, the system sensitivity is increased on slippery surfaces to reduce wheel spin.

If TracDSC is selected or DSC is switched off, then subsequently the JaguarDrive Control mode is changed, DSC is automatically switched back on (or to TracDSC for Dynamic mode).

The stability control uses different threshold values for the selected mode, reducing the requirement for the driver to change the DSC system mode for optimum performance in various driving scenarios.

Incorrect Mode Usage

Selection of an inappropriate mode is discouraged in the following ways:

- The active mode icon is continually displayed in the instrument cluster message center
- In any special mode, when the ignition has been in the off position continuously for more than 6 hours, the JaguarDrive Control system defaults to the special modes off (DSC on).

Selection of an inappropriate mode for the conditions will not endanger the driver or immediately cause damage to the vehicle. Continued use of an inappropriate mode may reduce the life of some components. The driver may notice a different vehicle response, with the engine and transmission responses being different than in the special modes off.

Driver Information

The instrument cluster contains a message center, which displays vehicle information to the driver. The message center contains the JaguarDrive Control mode icons, which display the currently selected mode. If no symbol is displayed, no special mode is selected and the system is in special modes off.

Any required changes to the subsystems are also passed to the driver in the form of warning illumination in the instrument cluster or appropriate messages in the message center, DSC off for example.

In Dynamic mode when the transmission is in manual mode, the gear information is displayed in amber when the appropriate engine speed is reached for optimum sporty change point.

DIAGNOSTICS

JaguarDrive Control relies on the correct functionality of the sub-systems. If one of the sub-systems develops a fault, the JaguarDrive Control system will not function, even though the fault is not in the JaguarDrive Control system.

The JaguarDrive Selector module and rotary control should only be investigated if there are no apparent faults in any of the sub-systems. If a fault in a sub-system is subsequently corrected, the JaguarDrive Control system will function normally after an ignition on and off cycle.

JaguarDrive Control Sub-System Faults

If a fault occurs in a sub-system, the driver is alerted by the illumination of a warning indicator and/or an appropriate message for that sub-system in the instrument cluster message center. No JaguarDrive Control message will be shown when a failed sub-system displays its own message.

When a sub-system fault is present and the driver attempts to select a different JaguarDrive Control mode or at the next ignition on cycle, a message 'WINTER MODE FAULT' or 'DYNAMIC MODE FAULT' will appear in the message center. This generally implies that the JaguarDrive Control system has a fault, but only because a sub-system fault is preventing its operation. This message will be displayed once per ignition cycle, but is repeated if a further selection is made by the driver using the JaguarDrive Control buttons or at the next ignition on cycle.



NOTE: The message 'WINTER MODE FAULT' or 'DYNAMIC MODE FAULT' can also in very rare circumstances be generated by a fault in the JaguarDrive Control module.

It is not possible for the JaguarDrive Control module to cause any fault behavior (warning indicator illumination or message generation) in any of the sub-systems. Illumination of a sub-system warning indicator and/or a sub-system related message will never be associated with a JaguarDrive Control module or JaguarDrive Control system fault.

The sub-system control modules can detect a fault with the [CAN \(controller area network\)](#) bus signal from the transmission selector module. If a fault in the JaguarDrive Control system is detected, the sub-system control modules will operate in the 'special modes off' setting. The sub-system control modules will record a fault code for a failure of the JaguarDrive Control [CAN](#) signal. These faults can be retrieved using the Jaguar approved diagnostic tool and will provide useful information to indicate investigation of the JaguarDrive Selector module or the [CAN](#) bus network.

JaguarDrive Control System or Control Module Fault

If a fault occurs in the JaguarDrive Control system, all button icon [LED \(light emitting diode\)](#)'s will be turned off (background illumination will remain on) and pressing of the JaguarDrive Control buttons is ignored. The instrument cluster message center will display a message 'WINTER MODE FAULT' or 'DYNAMIC MODE FAULT' when the fault occurs, if the fault is present and the driver attempts to select a special mode (if the control module is able to do this) or at the next ignition on cycle.

The JaguarDrive Control buttons and control module (JaguarDrive Selector module) are an integral unit. If a fault occurs in either component, the whole unit will require replacement, however, this is extremely unlikely.

CAN Bus Faults

If a [CAN](#) bus fault exists and prevents JaguarDrive Control system operation, all of the JaguarDrive Control button icon [LED](#)'s will be illuminated and rotation pressing of the JaguarDrive Control buttons is ignored.

If the instrument cluster does not receive a JaguarDrive Control system [CAN](#) bus message from the JaguarDrive Control module, the message 'SPECIAL MODE UNAVAILABLE' will be displayed when the fault occurs and will be repeated at every ignition on cycle.

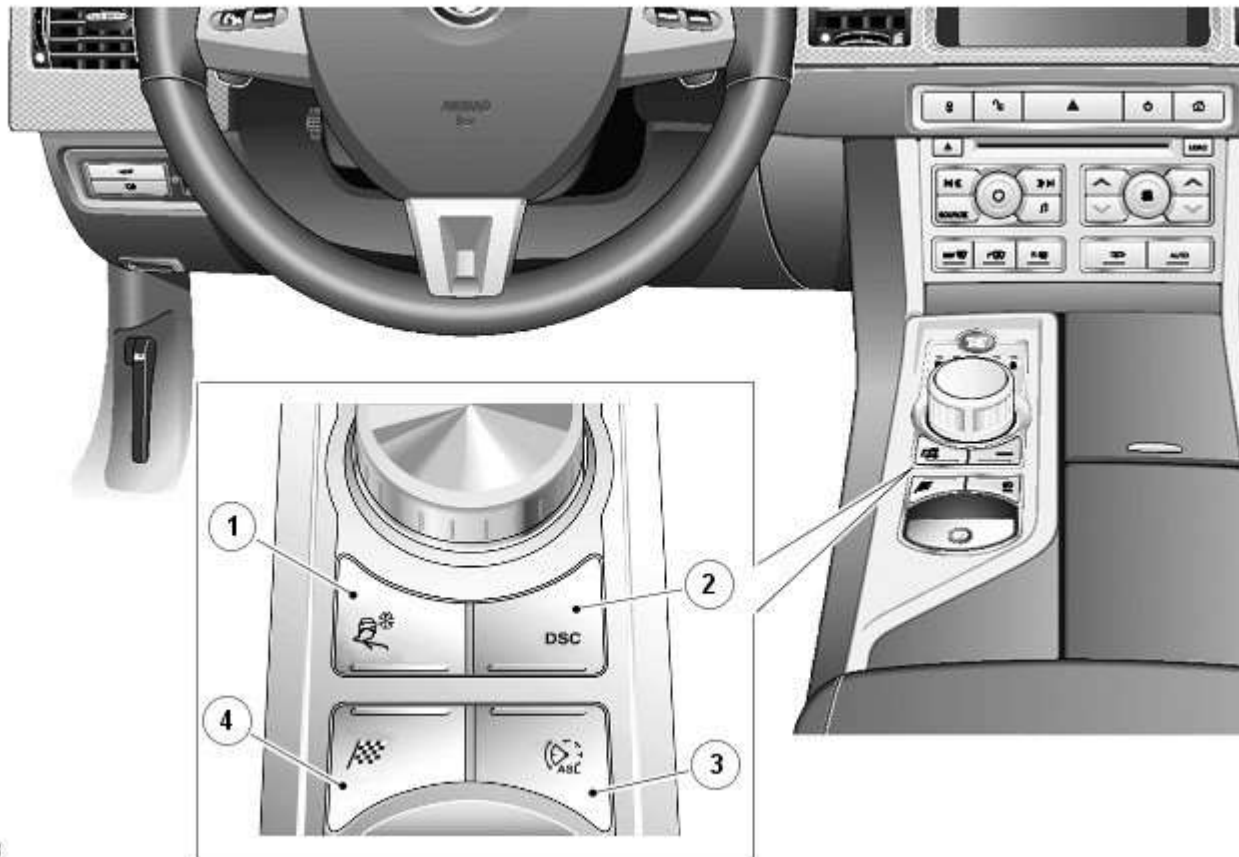
User Error

A special mode change while DSC or [ABS](#) is active (this includes [ABS](#) cycling) may be misinterpreted as a system fault.

Component Description

JAGUARDRIVE CONTROL DESCRIPTION

JAGUARDRIVE CONTROLS



E98438

Item	Description
1	Winter mode button
2	DSC/TracDSC mode button
3	ASL (automatic speed limiter) - Reference only, not part of JaguarDrive system
4	Dynamic mode (Supercharged models only)

The system is controlled by buttons adjacent to the JaguarDrive Selector located on the floor console. The buttons allow the selection of one of the following 3 modes:

- Special modes off
- Winter mode
- Dynamic mode (Supercharged models only).

The instrument cluster will display the selected JaguarDrive Control mode in the message center.

The JaguarDrive Control system uses a combination of a number of vehicle sub-systems to achieve the required vehicle characteristics for the mode selected. The following sub-systems make up the JaguarDrive Control system:

- The Engine Management System (EMS)
- Automatic transmission
- Brake system.

The JaguarDrive Control software is stored in the JaguarDrive Selector module located below the JaguarDrive selector. The module detects the selection made using the buttons and transmits a signal on the high speed [CAN](#) bus, which is received by each of the sub-system control modules.

Each of the affected sub-system control modules contain software, which applies the correct operating parameters to their controlled system for the JaguarDrive Control mode selection made.

Each sub-system control module also provides a feedback for the selected mode so that the JaguarDrive Control software can check that all systems have changed to the correct operating parameters.



NOTE: The JaguarDrive Control system is a co-ordinating system only. It **CANNOT** generate a fault in one of the participating sub-systems. All participating sub-systems should be **FULLY** diagnosed before assuming a fault with JaguarDrive Control. Replacing the JaguarDrive Selector module should not be done until all other options have been exhausted.

Winter Mode



To activate winter mode, press the winter mode button briefly (not less than 300 ms) to activate or de-activate the mode.



NOTE: Winter mode cannot be active at the same time as dynamic mode (Supercharged models only).

When active the winter mode icon and message appear in the instrument cluster message center to confirm the activation.

Dynamic Stability Control (DSC)



Press the DSC mode button briefly (not less than 300 ms) to switch between DSC and TracDSC. The instrument cluster message center will display either 'DSC ON' or 'TRAC DSC' depending on which selection is made. When TracDSC is selected, the DSC warning lamp in the instrument cluster is illuminated and the DSC button is illuminated.

DSC can be manually switched off by pressing the DSC mode button for more than 10 seconds. Confirmation is given by a chime from the instrument cluster, 'DSC OFF' is displayed in the instrument cluster message center and the DSC warning lamp in the instrument cluster is illuminated.



NOTE: DSC is operational at all times when the engine is running unless manually switched off.

Dynamic Mode (Supercharged models only)



To activate Dynamic mode, press the button briefly. The dynamic mode and DSC buttons are illuminated. 'Dynamic Mode Confirmed' message is displayed in the instrument cluster message center and the DSC off warning lamp in the instrument cluster is illuminated (due to automatic selection of TracDSC in Dynamic mode).



NOTE: Dynamic mode cannot be active at the same time as winter mode.

Once activated, TracDSC is automatically selected. In gearbox Sport mode, the driver has full control over the transmission shift points and the [TCM](#) will not intervene to prevent engine overspeed (for example; upshifts are inhibited in gearbox sport mode when Dynamic mode is selected). In this setting, the gear indicator in the instrument cluster will turn amber at high rev's to indicate an appropriate manual upshift point.

Driveline System - General Information - Driveline System

Diagnosis and Testing

Principle of Operation

For a detailed description of driveline operation, refer to the relevant Description and Operation section in the workshop manual. REFER to:

[Driveshaft](#) (205-01 Driveshaft, Description and Operation),
[Driveshaft](#) (205-01 Driveshaft, Description and Operation),
[Driveshaft](#) (205-01 Driveshaft, Description and Operation),
 Rear Drive Axle and Differential (205-02, Description and Operation),
 Rear Drive Axle and Differential (205-02, Description and Operation),
 Rear Drive Axle and Differential (205-02, Description and Operation),
[Rear Drive Halfshafts](#) (205-05 Rear Drive Halfshafts, Description and Operation),
[Rear Drive Halfshafts](#) (205-05 Rear Drive Halfshafts, Description and Operation),
[Rear Drive Halfshafts](#) (205-05 Rear Drive Halfshafts, Description and Operation).

Inspection and Verification



CAUTION: Only serviceable items can be renewed or adjusted. Failure to follow this instruction may result in the warranty of the component being rejected.

Certain driveline trouble symptoms are also common to the engine, transmission, wheel bearings, tires, and other parts of the vehicle. For this reason, make sure that the cause of the trouble is in the driveline before adjusting, repairing, or installing any new components. For additional information, refer to Workshop Manual section 100-04 Noise, Vibration and Harshness.

1. Verify the customer concern by carrying out a road test of the vehicle.
2. Visually inspect for obvious signs of mechanical damage and system integrity.
3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom and refer to the Symptom Chart.

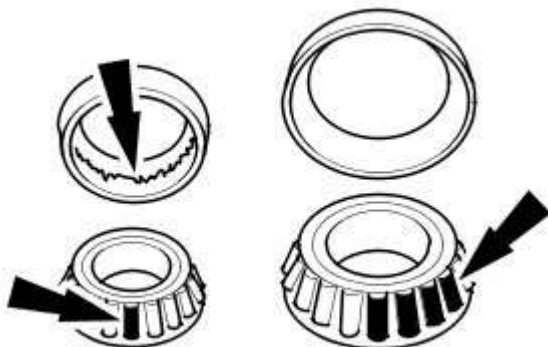
Identify the Condition

Gear Howl and Whine

Howling or whining of the ring gear and pinion is due to an incorrect gear pattern, gear damage or incorrect bearing preload.

Bearing Whine

Bearing whine is a high-pitched sound similar to a whistle. It is usually caused by worn/damaged pinion bearings, which are operating at driveshaft speed. Bearing noise occurs at all driving speeds. This distinguishes it from gear whine which is speed dependent.



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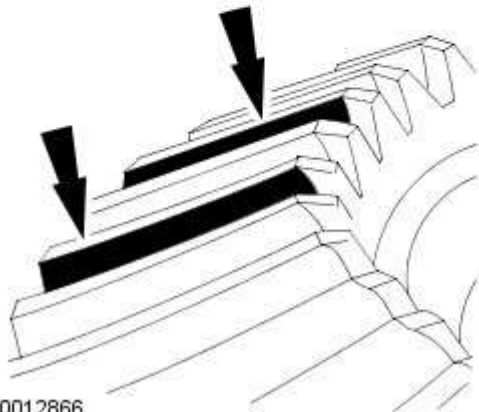
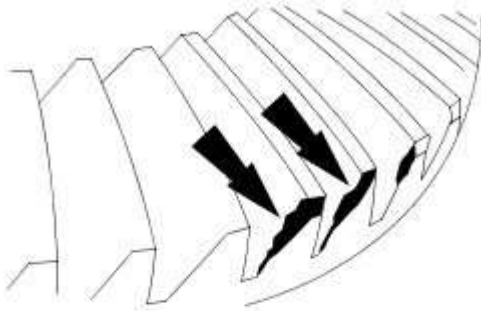
As noted, pinion bearings make a high-pitched, whistling noise, usually at all speeds. If however there is only one pinion bearing that is worn/damaged, the noise may vary in different driving phases.

A wheel bearing noise can be mistaken for a pinion bearing noise.

Chuckle

Chuckle that occurs on the coast driving phase is usually caused by excessive clearance between the differential gear hub and the differential case bore.

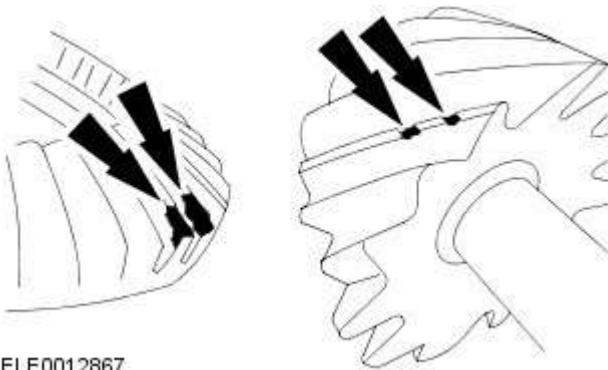
Damage to a gear tooth on the coast side can cause a noise identical to a chuckle. A very small tooth nick or ridge on the edge of a tooth can cause the noise.



ELE0012866

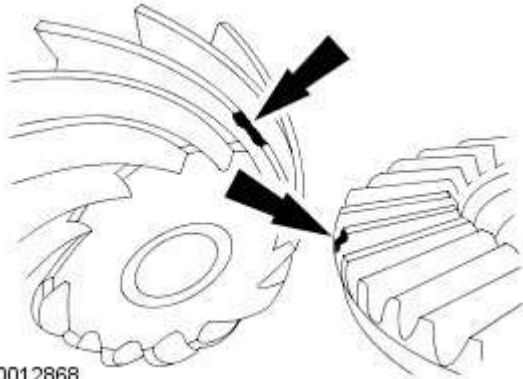
Knock

Knock, which can occur on all driving phases, has several causes including damaged teeth or gearset.



ELE0012867

A gear tooth damaged on the drive side is a common cause of the knock.



ELE0012868

Clunk

Clunk is a metallic noise heard when the automatic transmission is engaged in REVERSE or DRIVE. The noise may also occur when the throttle is applied or released. Clunk is caused by transmission calibration, backlash in the driveline or loose suspension components and is felt or heard in the vicinity of the rear drive axle.

Bearing Rumble

Bearing rumble sounds like marbles being tumbled. This condition is usually caused by a worn/damaged wheel bearing. The lower pitch is because the wheel bearing turns at only about one-third of the driveshaft speed. Wheel bearing noise also may be high-pitched, similar to gear noise, but will be evident in all four driving modes.

Symptom Chart

Symptom	Possible Cause	Action
Noise is at constant tone over a narrow vehicle speed range. Usually heard on light drive and coast conditions	<ul style="list-style-type: none"> Rear drive axle 	<ul style="list-style-type: none"> For additional information, GO to Pinpoint Test A.
Noise is the same on drive or coast	<ul style="list-style-type: none"> Road Worn or damaged driveshaft joint Driveshaft center bearing Wheel bearing 	<ul style="list-style-type: none"> No action required for road noise Install new components as required
Noise is produced with the vehicle standing and driving	<ul style="list-style-type: none"> Engine Transmission 	<ul style="list-style-type: none"> For additional information, REFER to: Engine - 3.0L/4.2L (303-00 Engine System - General Information, Diagnosis and Testing), Engine - 2.7L Diesel (303-00 Engine System - General Information, Diagnosis and Testing), Diagnostic Strategy (307-01A Automatic Transmission/Transaxle - V6 3.0L Petrol, Diagnosis and Testing).
Loud clunk in the driveline when shifting from reverse to forward	<ul style="list-style-type: none"> Transmission calibration Transmission Mount Transmission Suspension components Backlash in the driveline Engine idle speed set too high Engine mount 	<ul style="list-style-type: none"> Using the Manufacturer approved diagnostic system, re-configure the Transmission Control Module (TCM) with the latest available calibration Inspect and install new transmission mounts as required For additional transmission information, REFER to: Diagnostic Strategy (307-01A Automatic Transmission/Transaxle - V6 3.0L Petrol, Diagnosis and Testing). Inspect and install new suspension components as required Inspect and install new driveline components as required Check and adjust the idle speed as required Inspect and install new engine mounts as required
Clicking, popping, or grinding noises	<ul style="list-style-type: none"> Inadequate or contaminated lubrication in the rear drive halfshaft constant velocity (CV) joint Another component contacting the 	<ul style="list-style-type: none"> Inspect, clean and lubricate with new grease as required Inspect and repair as required Inspect and install new components as required

Symptom	Possible Cause	Action
	rear drive halfshaft <ul style="list-style-type: none"> Wheel bearings, brakes or suspension components 	
Vibration at highway speeds	<ul style="list-style-type: none"> Out-of-balance wheel(s) or tire(s) Driveline out of balance/misalignment Driveshaft center bearing touching body mounting point 	<ul style="list-style-type: none"> Balance and install new wheel(s) and tire(s) as required REFER to: Wheel and Tire (204-04 Wheels and Tires, Removal and Installation). For additional information, REFER to: Driveline Angle Inspection (205-00 Driveline System - General Information, General Procedures). Refer to the Manufacturer approved diagnostic system for driveshaft balancing application Check for correct spacer washer thickness. Inspect and install new washers as required
Shudder, Vibration During Acceleration	<ul style="list-style-type: none"> Powertrain/driveline misalignment High constant velocity (CV) joint operating angles caused by incorrect ride height 	<ul style="list-style-type: none"> Check for misalignment. Install new components as required. For driveshaft alignment, REFER to: Driveline Angle Inspection (205-00 Driveline System - General Information, General Procedures). Check the ride height and verify the correct spring rate. Install new components as required
Lubricant Leak	<ul style="list-style-type: none"> Rear drive axle breather Damaged seal Rear drive axle filler plug Rear drive axle rear cover joint 	<ul style="list-style-type: none"> Check oil level and correct as required Install new components as required

Pinpoint Tests

PINPOINT TEST A : EXCESSIVE DRIVELINE NOISE	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK NOISE FROM VEHICLE ON ROAD TEST	
	1 Road test vehicle to determine load and speed conditions when noise occurs.
	2 Assess the noise with different gears selected.
	Does the noise occur in different gears at the same vehicle speed?
Yes	Install a new rear drive axle/differential assembly. REFER to: Axle Assembly - V6 3.0L Petrol (205-02 Rear Drive Axle/Differential, Removal and Installation). Re-test the system for normal operation.
No	Suspect the engine or transmission. For additional information, REFER to: Engine - 3.0L/4.2L (303-00 Engine System - General Information, Diagnosis and Testing), Engine - 2.7L Diesel (303-00 Engine System - General Information, Diagnosis and Testing), Diagnostic Strategy (307-01A Automatic Transmission/Transaxle - V6 3.0L Petrol, Diagnosis and Testing).


Driveline System - General Information - Driveline Angle Inspection

General Procedures

Special Tool(s)

 <p>205-535</p> <p>E98972</p>	<p>Alignment Tool</p> <p>205-535</p>
--	--------------------------------------

All vehicles

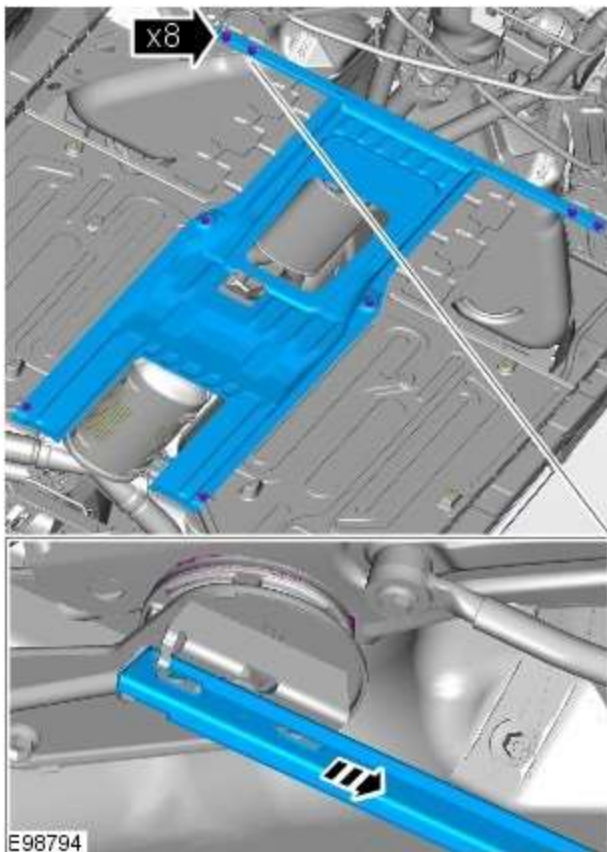
1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

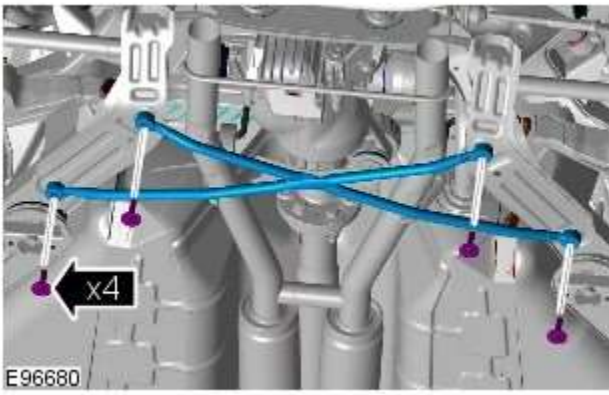
Raise and support the vehicle.

All vehicles

2. Remove the air deflector.
For additional information, refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

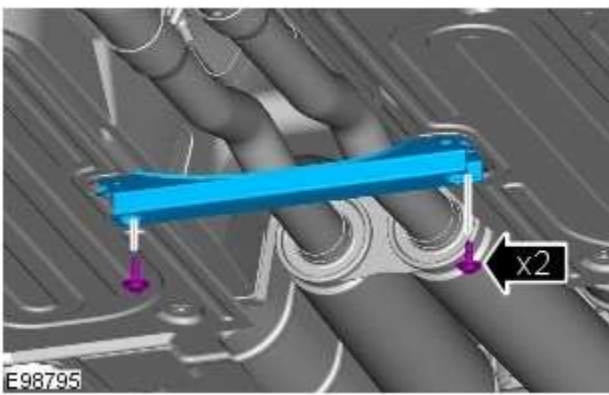
3. Remove the engine rear undershield.



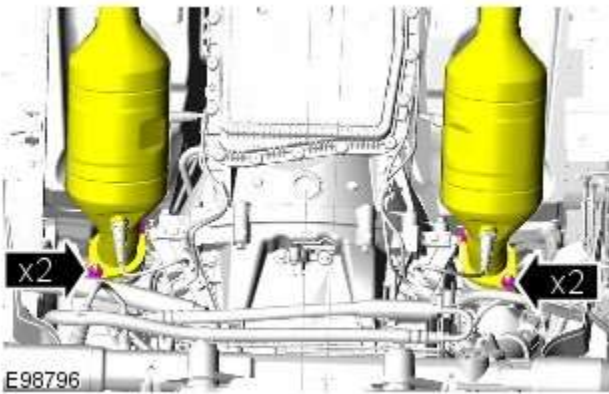


4. Remove the rear subframe crossbrace.

All except vehicles with diesel engine

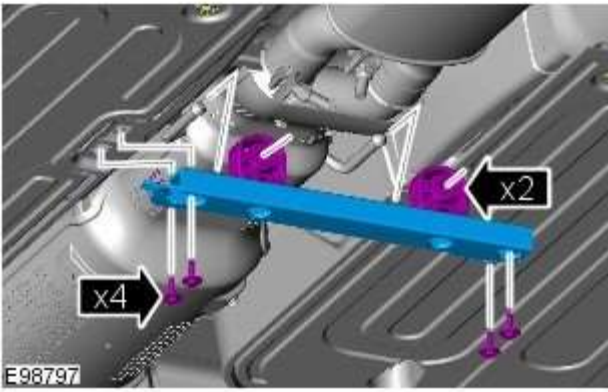


5. Remove the support bracket.

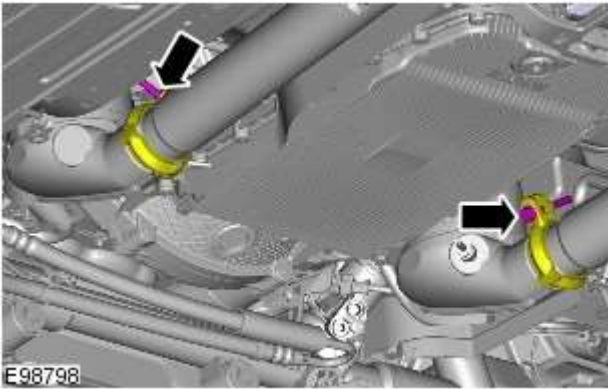


6. Loosen the retaining nuts.

Vehicles with diesel engine

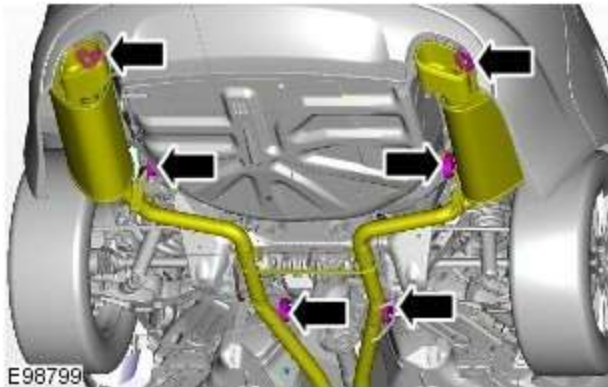



7. Remove the support bracket.
 - Remove the bolts.
 - Detach the intermediate muffler exhaust hanger insulators.



8. Loosen the catalytic converter to diesel particulate filter (DPF) retaining clamps.

All vehicles

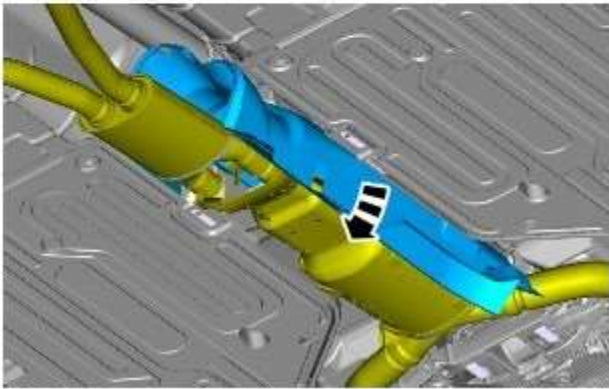
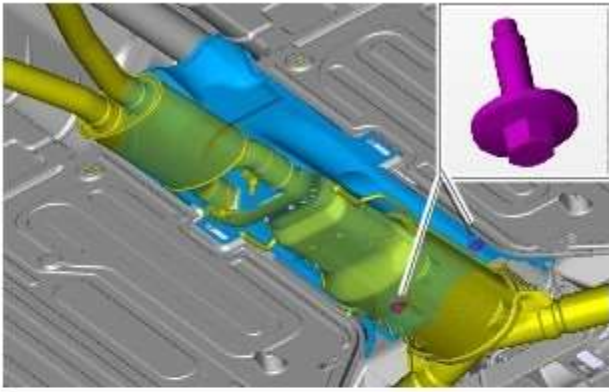


9.  **CAUTION:** Make sure that the exhaust system is supported with a suitable transmission stand.

Lower the exhaust assembly sufficiently to gain access to the driveshaft heat shield.

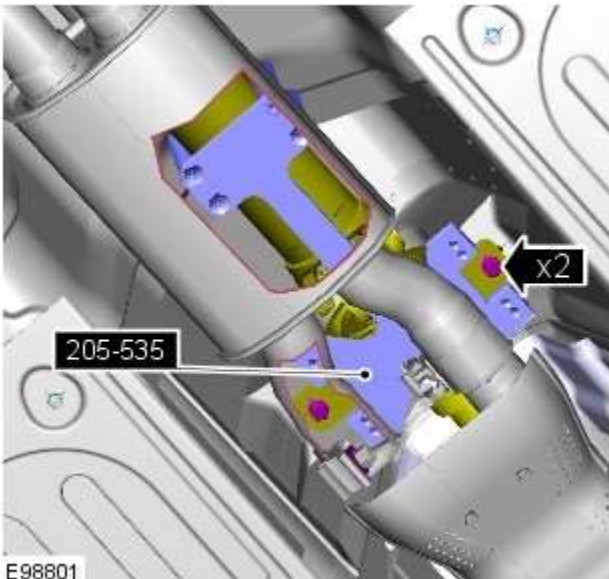
- Release the 6 exhaust hangers.

10. Remove the driveshaft heat shield.




E98800

All vehicles

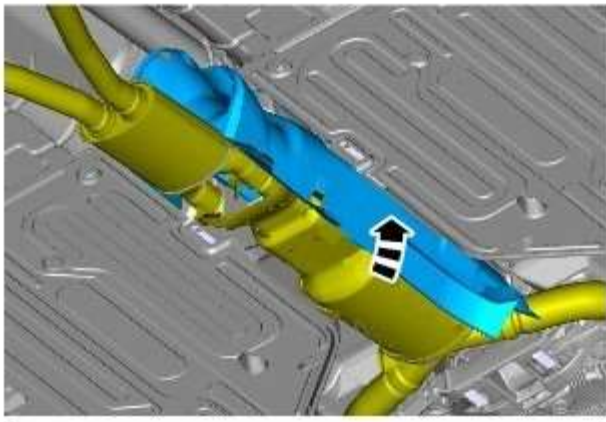


E98801

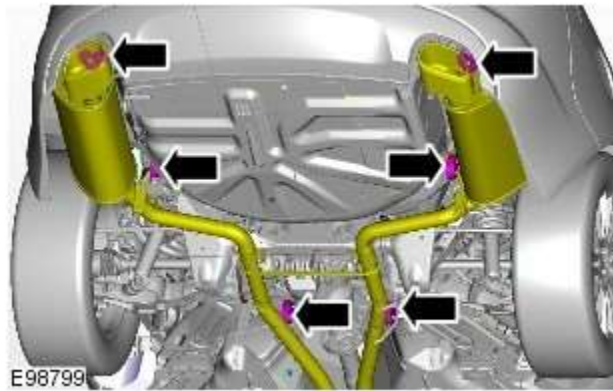
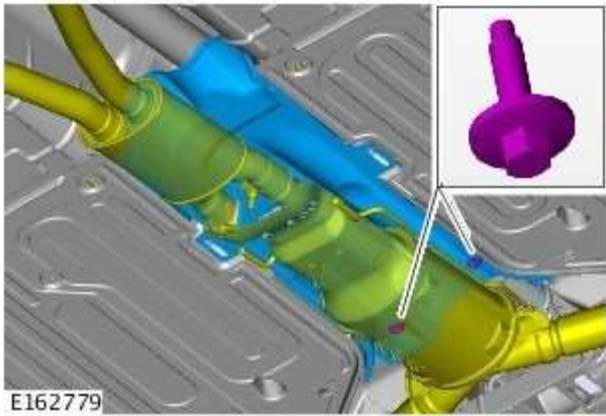
11.  **CAUTION:** Make sure that the special tool is correctly located.


Using the special tool, align the driveshaft center bearing.

- Tighten to 40 Nm.

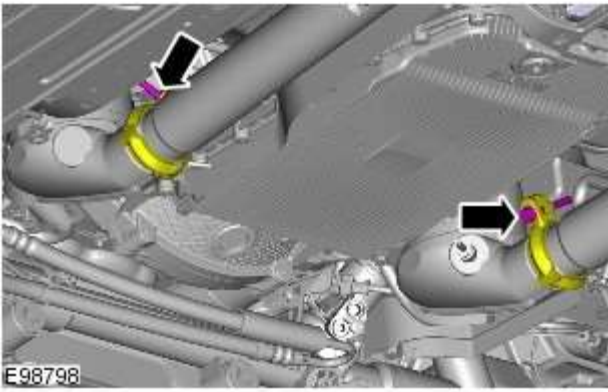


12. Install the driveshaft heat shield.
 - Tighten to 10 Nm.

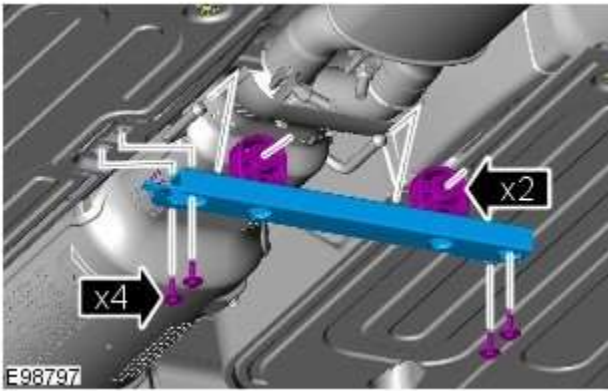


13.  **CAUTION:** Make sure that the exhaust system is supported with a suitable transmission stand.
Attach the exhaust hangers.

Vehicles with diesel engine

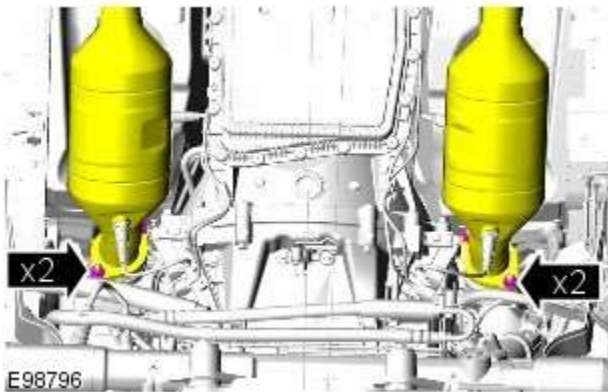


14. Tighten the catalytic converter to DPF retaining clamps.
 - Tighten to 11 Nm.

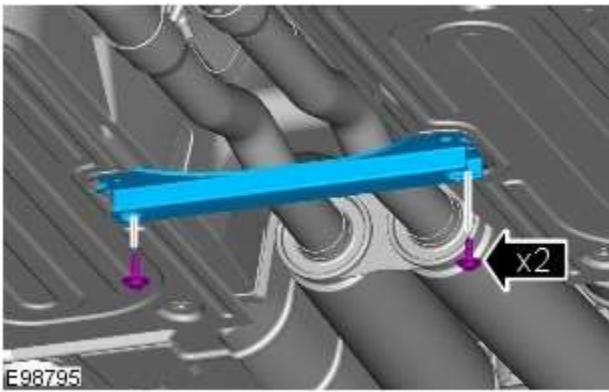


15. Install the support bracket.
 - Attach the intermediate muffler exhaust hanger insulators.
 - Tighten to 10 Nm.

All except vehicles with diesel engine

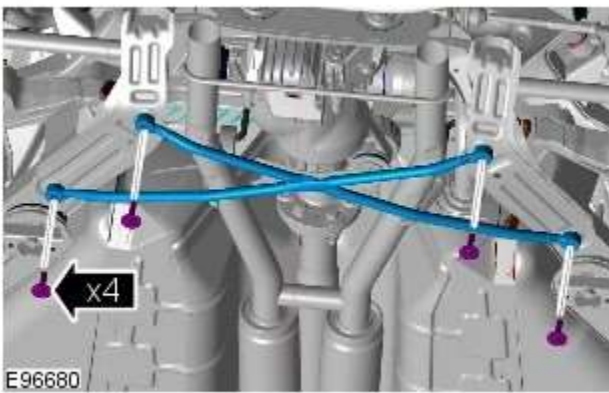


16. Tighten the retaining nuts.
 - Tighten to 45 Nm.

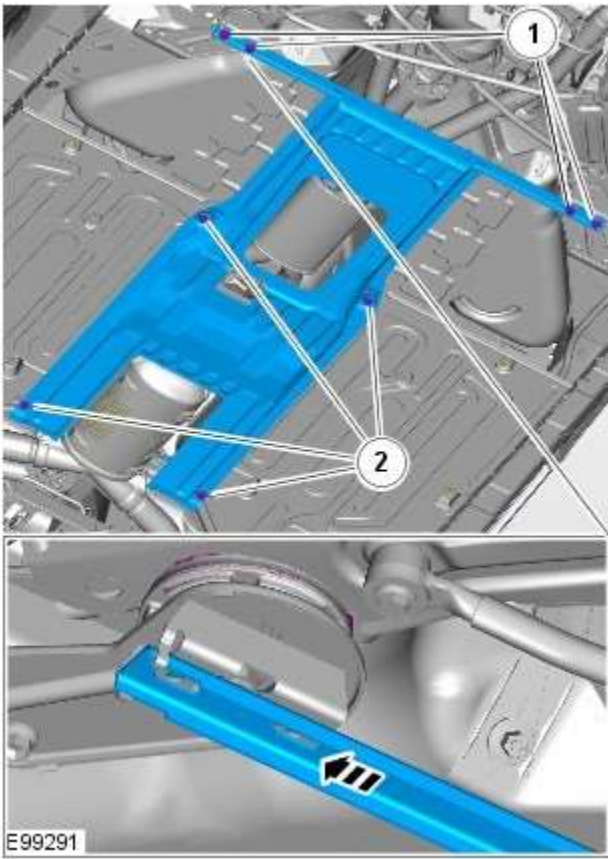


17. Install the support bracket.
 - Tighten to 10 Nm.

All vehicles



18. Install the rear subframe cross brace.
 - Tighten to 62 Nm.



19. Install the engine rear undershield.
1. Tighten to 30 Nm.
 2. Tighten to 10 Nm.

20. Install the air deflector.
For additional information, refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

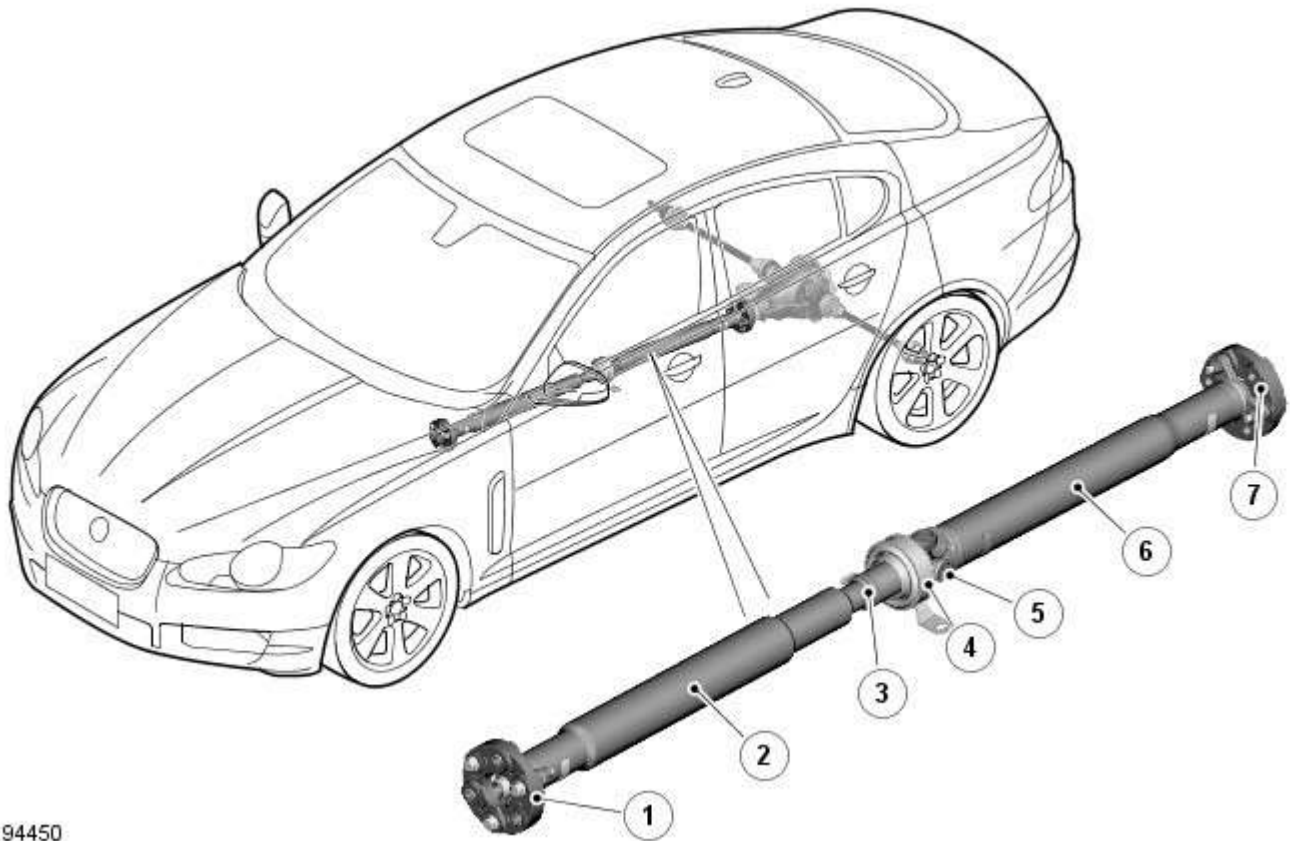
Driveshaft -

Torque Specifications

Description	Nm	lb-ft	lb-in
Centre bearing retaining bolts	48	36	-
Transmission flexible joint retaining bolts	127	94	-
Rear drive axle CV joint retaining bolts	73	54	-
Driveshaft heat shield retaining bolts	7	-	62

Driveshaft - Driveshaft - Component Location

Description and Operation



E94450

Item	Description
1	Transmission flexible joint
2	Collapsible front driveshaft tube
3	Splined slip joint
4	Center bearing
5	Universal joint
6	Rear driveshaft tube
7	Differential flexible joint

Driveshaft - Driveshaft - Overview

Description and Operation

Driveshaft Overview

The two-piece driveshaft, manufactured from lightweight tubular steel, transmits drive from the engine, via the transmission, to the differential. The driveshaft aligns with the centerline of the vehicle's body and is supported by a center bearing.

Driveshaft - Driveshaft - System Operation and Component Description

Description and Operation

System Operation

Driveshaft

The two-piece driveshaft, manufactured from lightweight tubular steel, transmits drive from the engine, via the transmission, to the differential. The driveshaft aligns with the centerline of the vehicle's body and is supported by a center bearing.

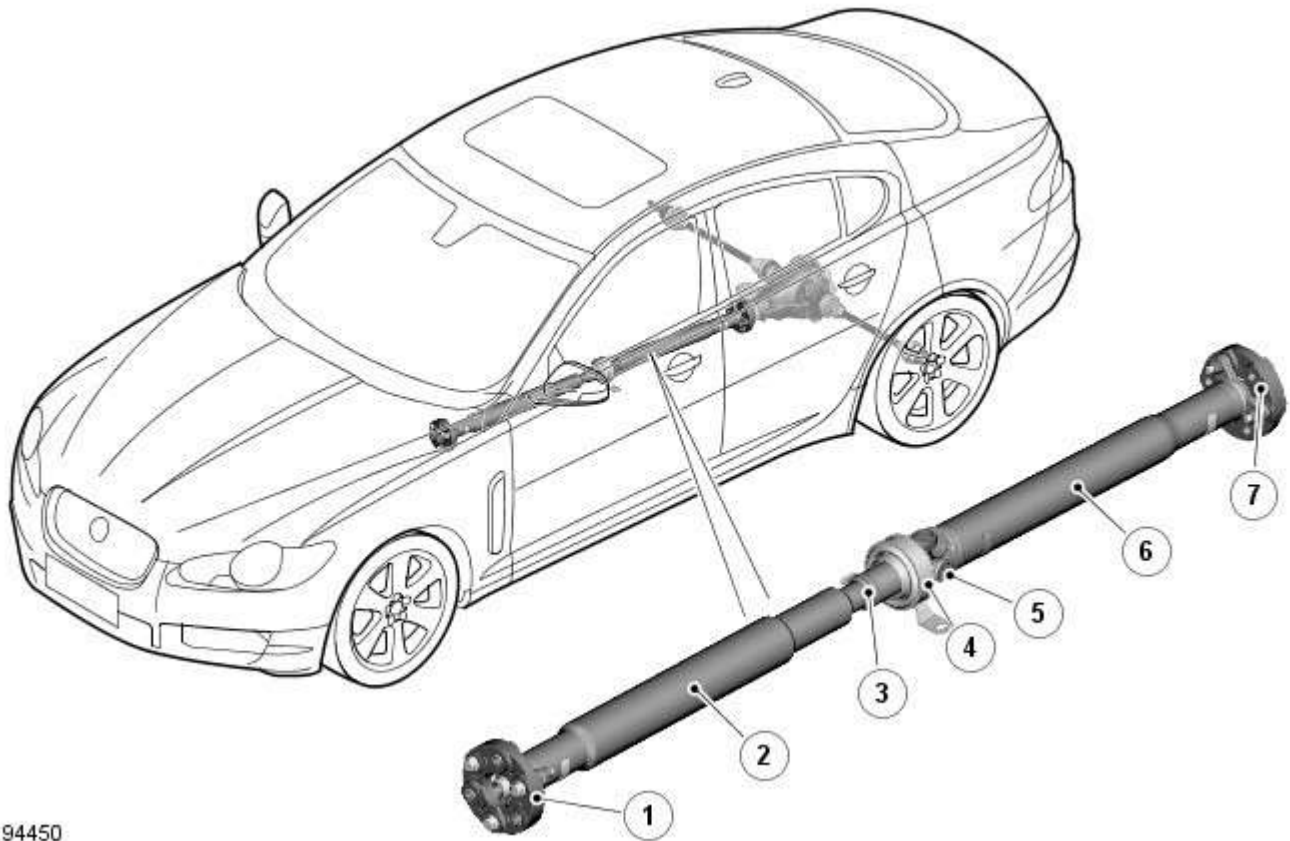
The driveshaft's front tube is of swaged construction, which is a crash energy management feature, designed to collapse progressively and predictably in the event of a severe frontal impact. A low-friction splined slip-joint at the center of the driveshaft provide the driveshaft's plunge capability.

Flexible couplings connecting the driveshaft to both the transmission and the differential counteract the angular movement of the driveshaft caused by the driveline's acceleration and braking forces.

The center universal joint is positioned at a specified angle using shims between the center bearing and the vehicle's body. The driveline angles have been carefully configured to balance minimum power losses with excellent vibration and wear characteristics. The universal joint is lubricated during manufacture and sealed for life.

Driveshaft - Universal Joints - Component Location

Description and Operation



E94450

Item	Description
1	Transmission flexible joint
2	Collapsible front driveshaft tube
3	Splined slip joint
4	Center bearing
5	Universal joint
6	Rear driveshaft tube
7	Differential flexible joint

Driveshaft - Universal Joints - Overview

Description and Operation

Refer to: [Driveshaft](#) (205-01 Driveshaft, Description and Operation).

Driveshaft - Universal Joints - System Operation and Component Description

Description and Operation

System Operation

Refer to: [Driveshaft](#) (205-01 Driveshaft, Description and Operation).

Driveshaft - Driveshaft

Diagnosis and Testing

For additional information.

REFER to: [Driveline System](#) (205-00 Driveline System - General Information, Diagnosis and Testing).

Driveshaft - Driveshaft Runout and Balancing

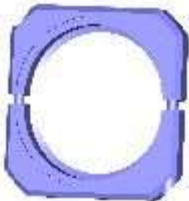
General Procedures

1. For additional information, refer to the Jaguar Approved Diagnostic System.

Driveshaft - Driveshaft V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Special Tool(s)

 E117586	205-932 Remover, Driveshaft
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Removal



NOTE: Select NEUTRAL before disconnecting the battery, to allow the driveshaft to be turned.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

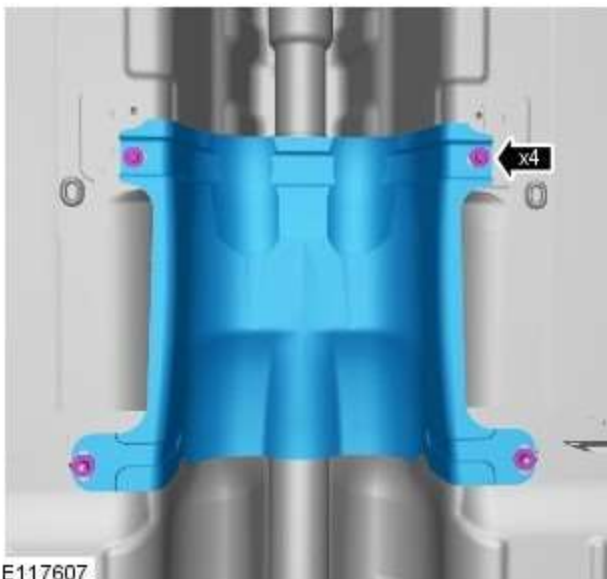


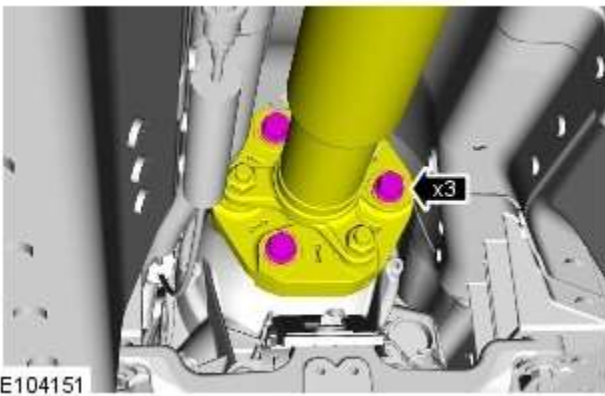
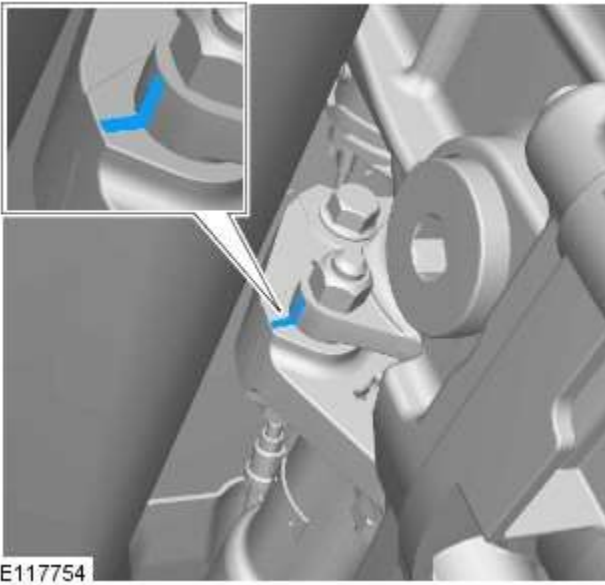
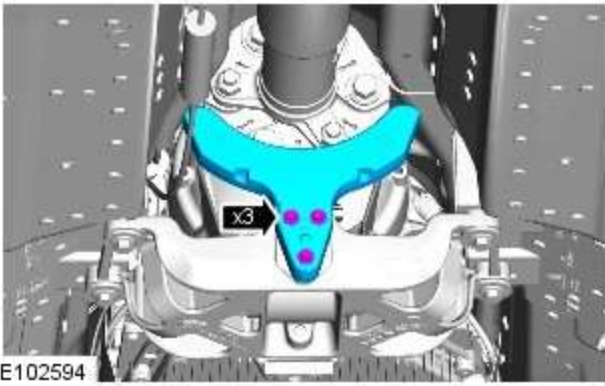
2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Exhaust System](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).


4.

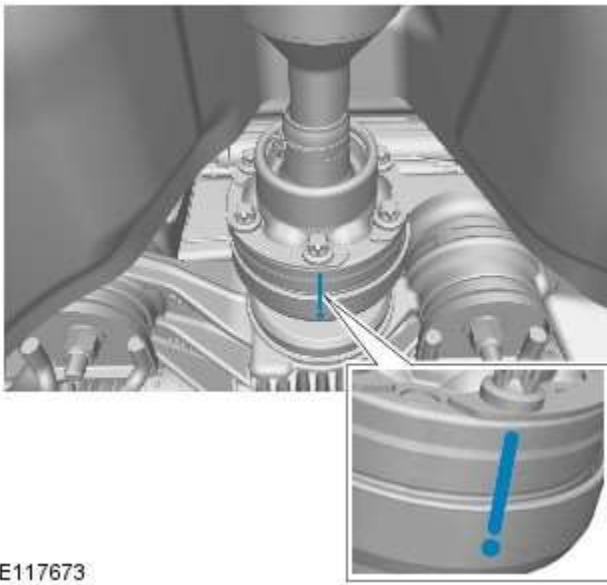





5.


6.  NOTE: Mark the position of the driveshaft on the transmission flange.

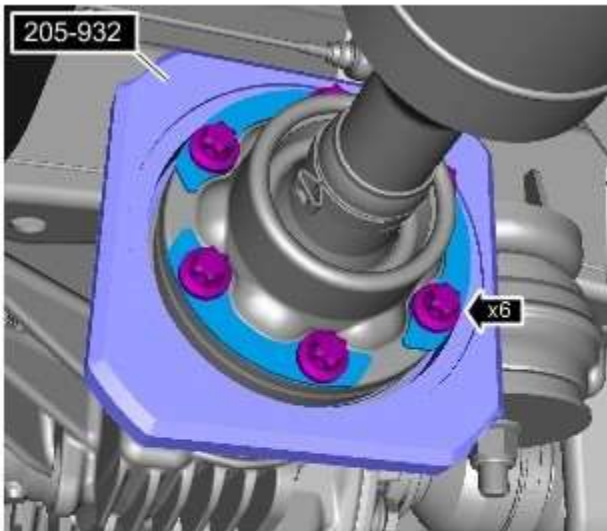
7.  CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.




E117673

8.  **CAUTION:** Do not use the 5mm hole on the differential case flange for the alignment mark.

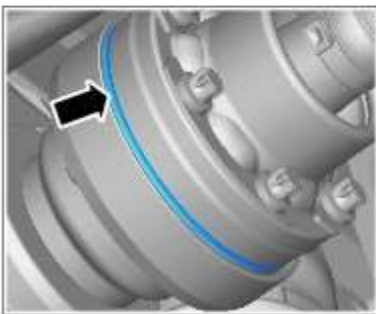
 **NOTE:** Using the 3mm hole on the differential case flange, paint an alignment mark (as indicated) to aid correct installation of the driveshaft to the differential case.



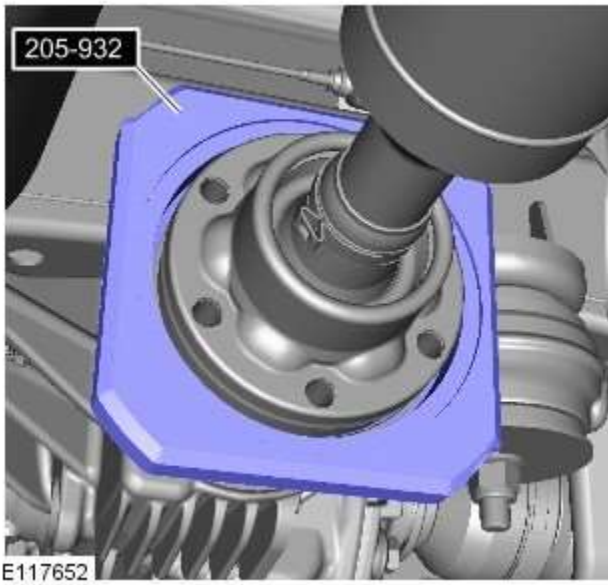
9.  **CAUTION:** To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.


 **NOTE:** Make sure that the special tool is correctly installed to the recess on the driveshaft.

Special Tool(s): [205-932](#)



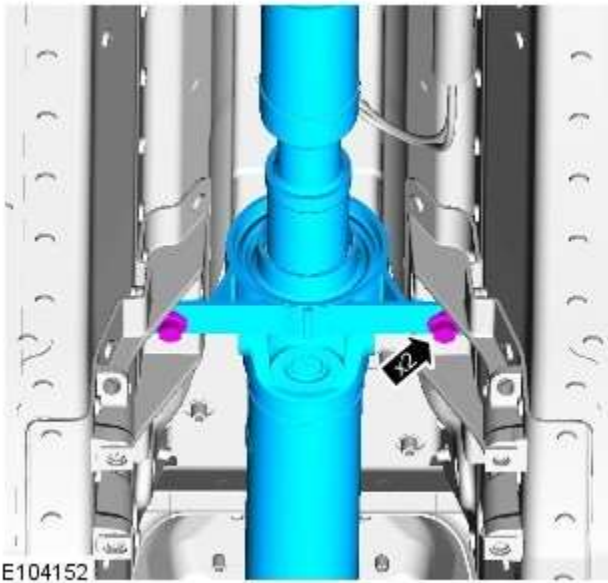
E117651



10.  **CAUTION:** To avoid damage to the joint or gaiter, do not allow the driveshaft to hang.

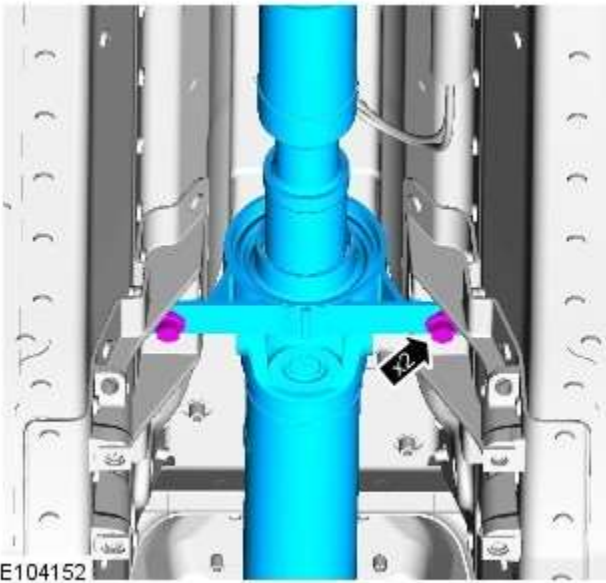
 **NOTE:** Using a suitable hammer and drift, make sure that you only hit the corner edges of the special tool to remove the driveshaft.

Special Tool(s): [205-932](#)

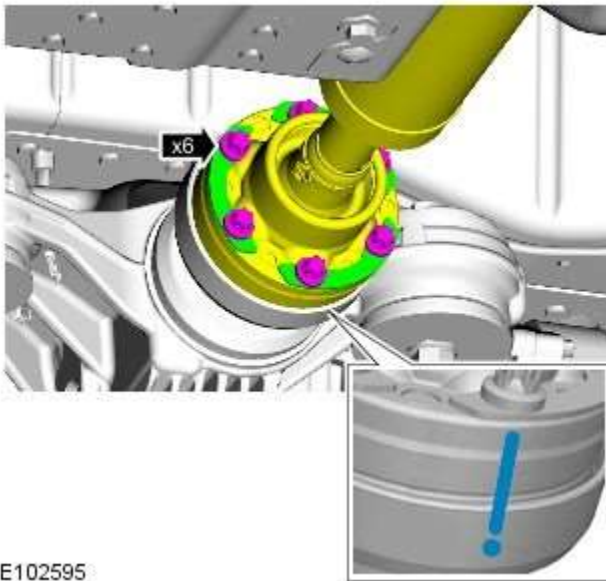



- 11.

Installation

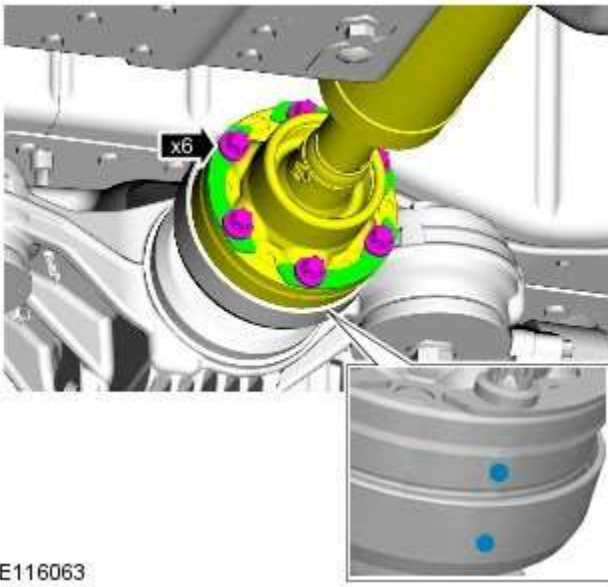


1.  **CAUTION:** Only tighten the bolts finger-tight at this stage.

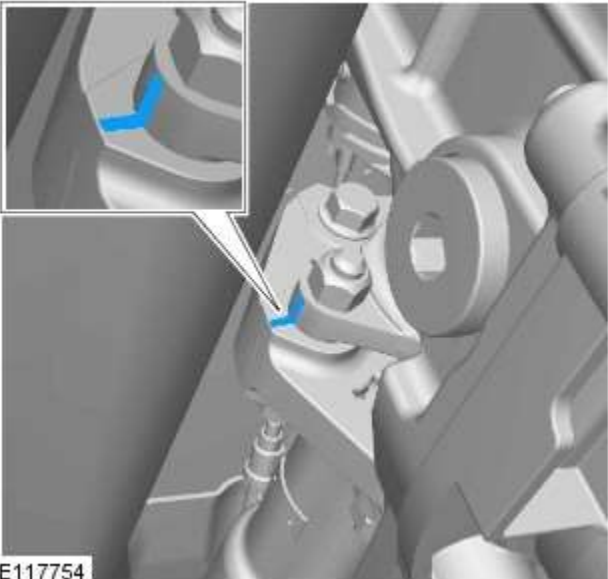


2.  **NOTE:** Make sure that the alignment mark on the driveshaft is correctly aligned to the alignment mark on the differential case.

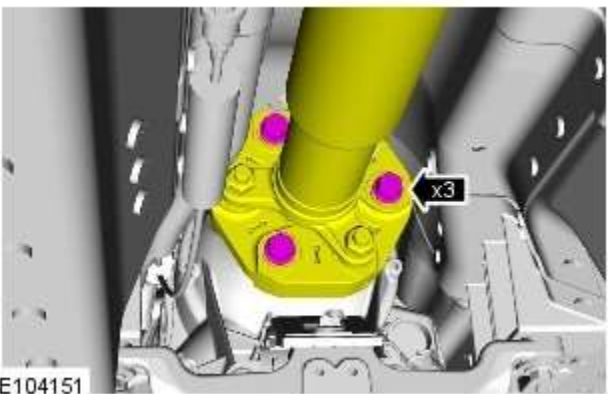
Torque: 75 Nm



E116063





E117754




E104151


3. NOTES:

 This step only applies if a new driveshaft is being installed.

 Using the 3mm hole on the differential case flange and paint alignment mark on the driveshaft (as indicated). Make sure that the alignment marks are correctly aligned.

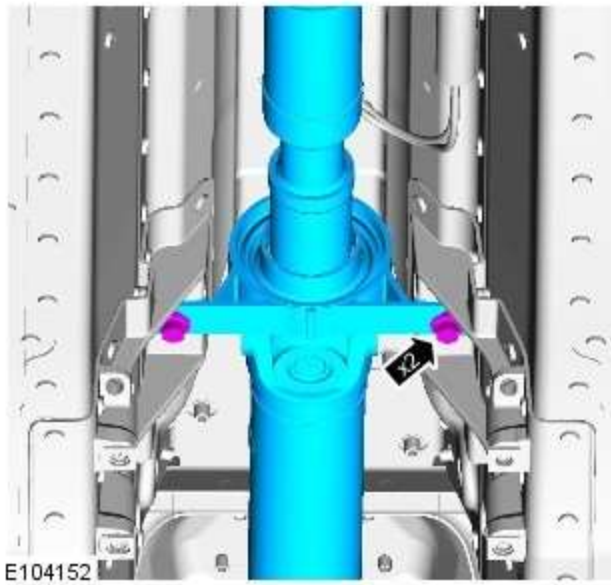
Torque: 75 Nm

4.  NOTE: Make sure that you re-align the driveshaft to the transmission flange using the alignment mark.

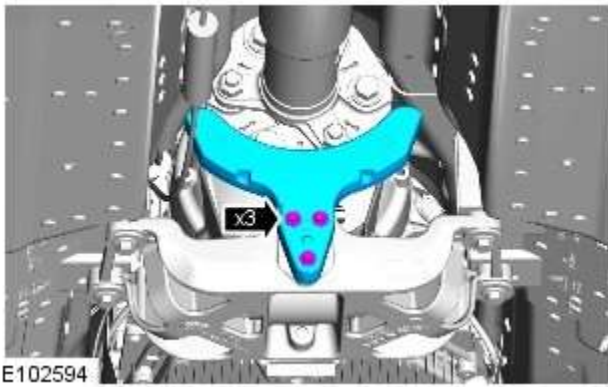
5.  CAUTION: Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.

Torque: 127 Nm

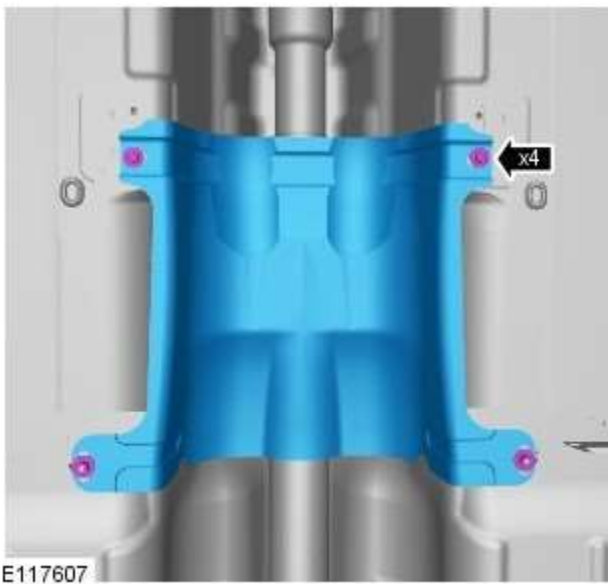
6. Torque: 40 Nm



7. Torque: 5 Nm



8. Torque: 7 Nm



9. Refer to: [Exhaust System](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

10. Lower the vehicle.

11. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Rear Drive Axle/Differential -

General Specifications

Item	Specification
Differential fluid - vehicles without supercharger	Castrol SAF XO (75W 90)
Differential fluid - vehicles with supercharger	Castrol BOT 720 (75W 90)

Initial Specifications

Item	Specification
Differential fluid capacity - vehicles without supercharger	0.9 Liters
Differential fluid capacity - vehicles with supercharger	1.3 Liters

Service Specifications

Item	Specification
Differential fluid capacity - vehicles without supercharger	0.85 Liters
Differential fluid capacity - vehicles with supercharger	1.25 Liters

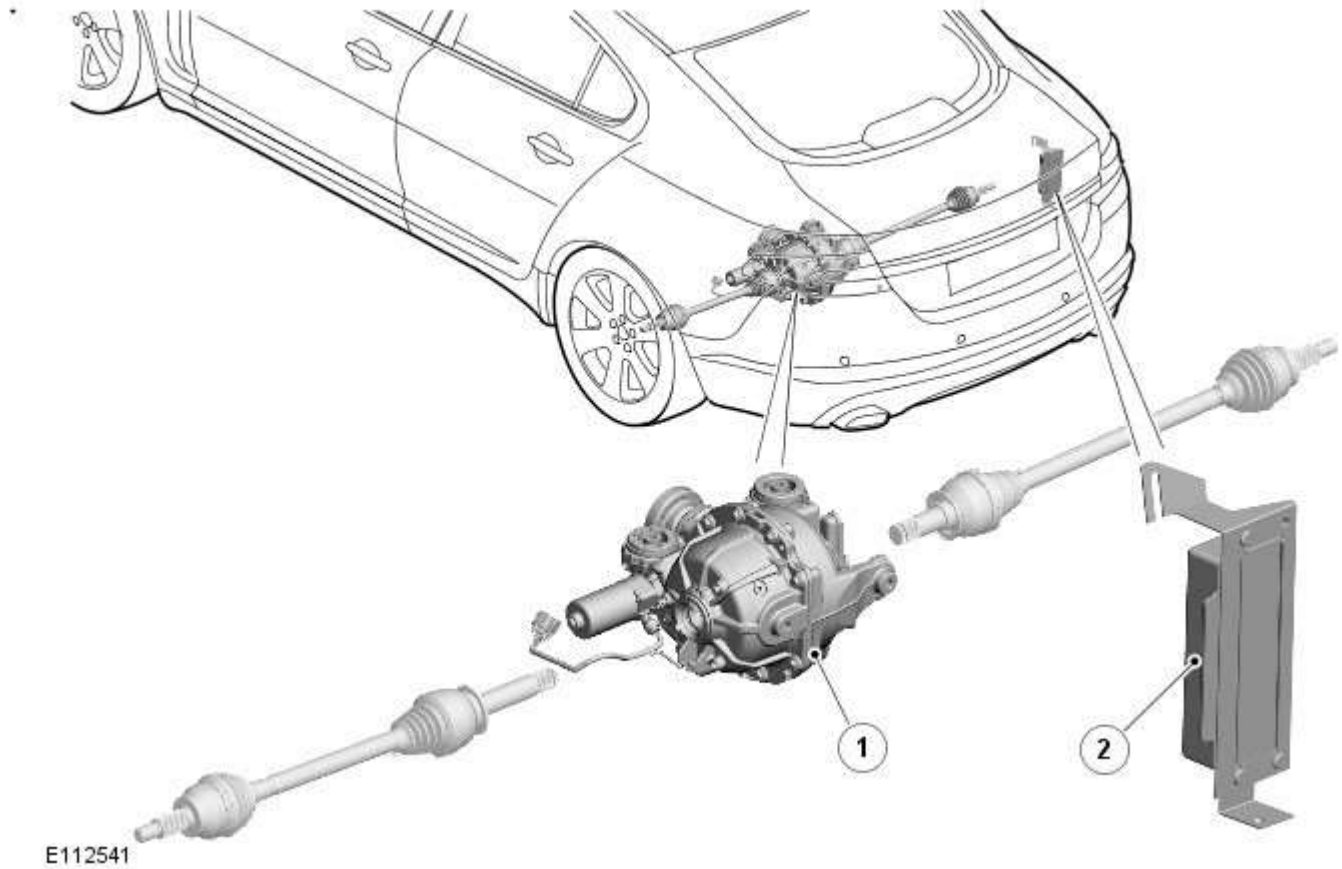
Torque Specifications

Description	Nm	lb-ft	lb-in
Differential case front retaining bolt	90	66	-
Differential case rear retaining bolts	192	142	-
Differential filler plug	27	20	-
Differential drain plug	27	20	-
Halfshaft constant velocity joint nut	300	221	-
Driveshaft retaining bolts	73	54	-

Rear Drive Axle/Differential - Rear Drive Axle and Differential - Component Location

Description and Operation

ELECTRONIC DIFFERENTIAL - 5.0L SUPERCHARGER VEHICLES FROM 2010MY



Item	Description
1	Electronic differential
2	Differential Locking Module (DLM)

Rear Drive Axle/Differential - Rear Drive Axle and Differential - Overview

Description and Operation

OVERVIEW

The differential has two functions:

- to convert the 'angle of drive' through 90° and distribute drive, via the rear drive halfshafts, to the rear wheels.
- to compensate for differences in the rotational speeds of the vehicle's rear wheels during cornering.

Two types of differential are installed:

- an open differential on 5.0L V8 normally aspirated, 4.2L V8 naturally aspirated, 3.0L V6 petrol and 3.0L V6 diesel vehicles
- an electronic differential on 5.0L V8 [SC \(supercharger\)](#) vehicles.

Both types of differential are attached to the rear subframe at four mounting points. Each mounting point incorporates a rubber bush to reduce [NVH \(noise, vibration and harshness\)](#). The bushes in the forward mounting points are installed in the differential. The bushes in the rear mounting points are installed in the rear subframe.

The open differentials are almost identical in their design and differ only in the final drive ratio and a heavier input flange which is fitted to 3.0L V6 diesel vehicles. The final drive ratios for the open and the electronic differentials are as follows:

- 5.0L V8, 4.2L V8 naturally aspirated, 5.0L V8 [SC](#) and 3.0L V6 petrol engines - 3.31:1
- 3.0L V6 diesel engines - 2.73:1.

Rear Drive Axle/Differential - Rear Drive Axle and Differential - System Operation and Component Description

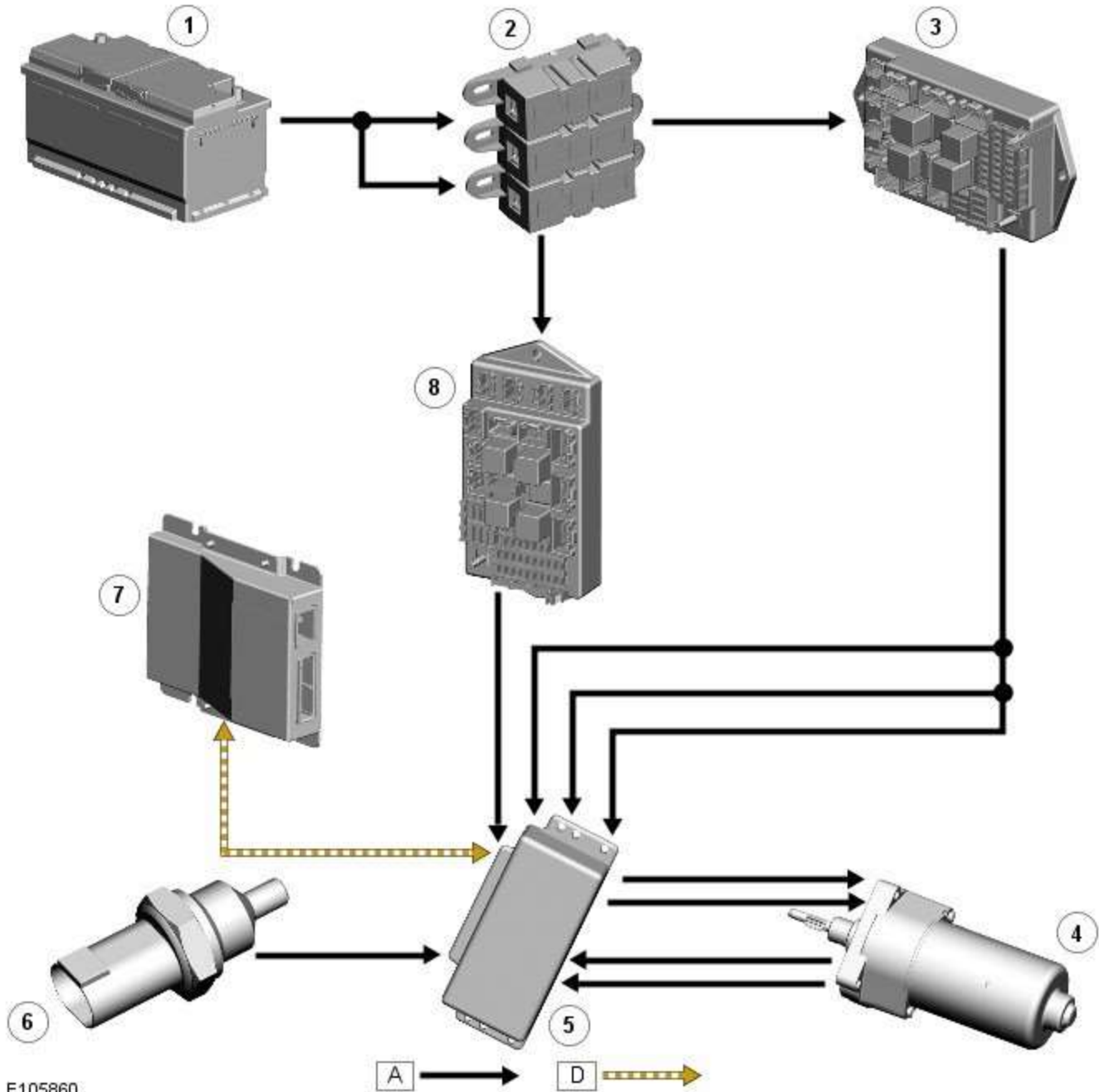
Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus

Control Diagram - 5.0L Supercharger Vehicles Only



E105860

Item	Description
1	Battery
2	Megafuse (175 A)
3	AJB (auxiliary junction box)
4	Motor

5	Differential Locking Module (DLM)
6	Oil temperature sensor
7	High speed CAN from suspension control module
8	CJB (central junction box)

System Operation

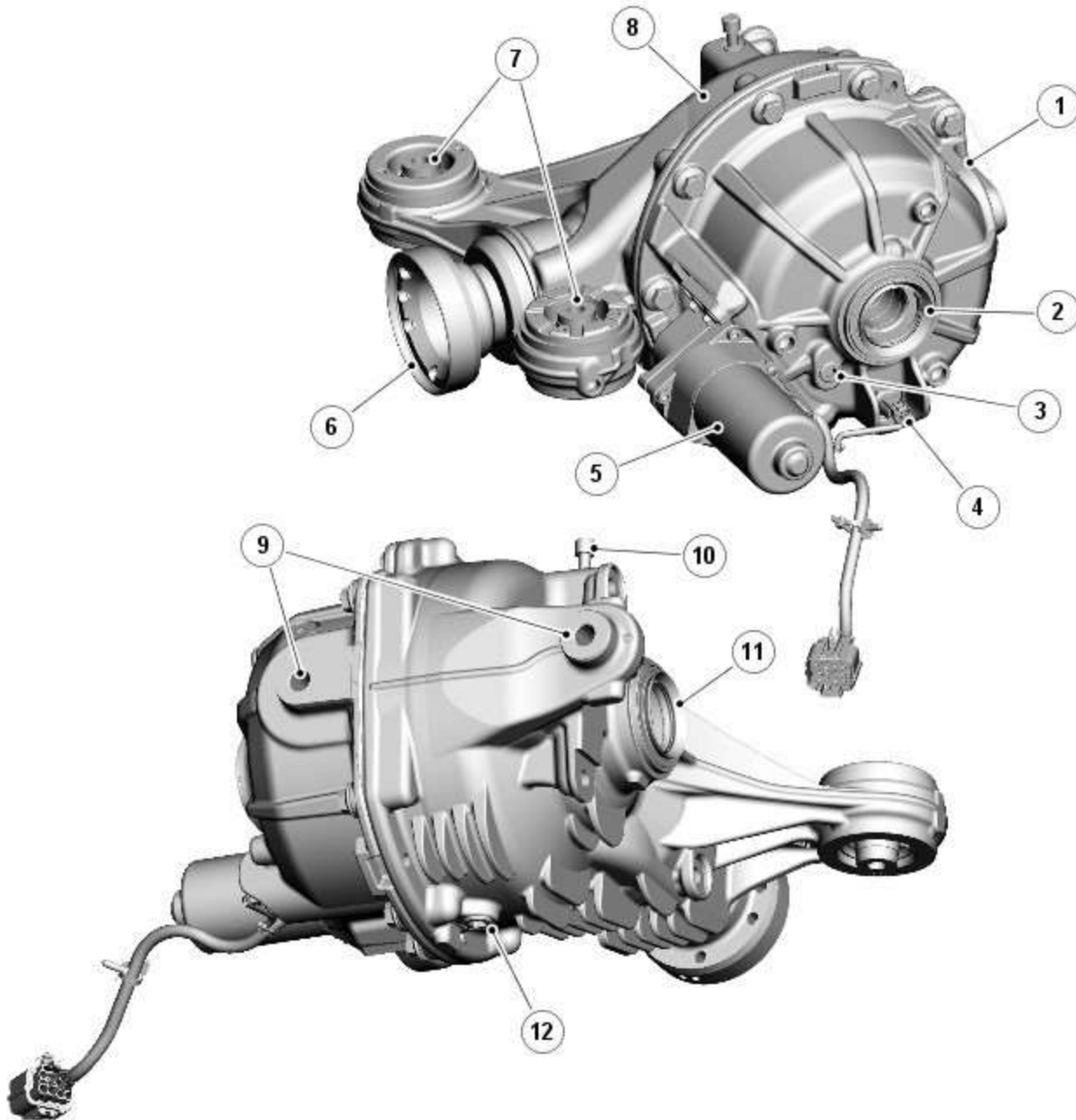
ELECTRONIC DIFFERENTIAL - 5.0L SUPERCHARGER VEHICLES FROM 2010MY

The multi-plate clutch prevents excessive differential slip and therefore maximizes the traction performance of the vehicle. This is fundamentally different from 'braked' traction control systems, which can only counteract differential slip when it occurs.

A certain amount of differential slip is required to allow the vehicle to turn corners and to remain stable under control of the [ABS \(anti-lock brake system\)](#). The system is completely automatic and does not require any special driver input.

The multi-plate clutch actively controls the torque flow through the differential and optimizes the torque distribution in the driveline. The clutch biases the torque from the differential to the wheel with the higher grip and prevents the wheel with the lower grip from spinning.

ELECTRONIC DIFFERENTIAL - 5.0L SUPERCHARGER - VEHICLES FROM 2010MY



E105858

Item	Description
1	Cover
2	LH rear drive halfshaft oil seal
3	Filler/Level plug
4	Temperature sensor
5	Motor
6	Input flange
7	Front mounting points with insulator assemblies
8	Carrier
9	Rear mounting points
10	Breather
11	RH rear drive halfshaft oil seal
12	Magnetic drain plug

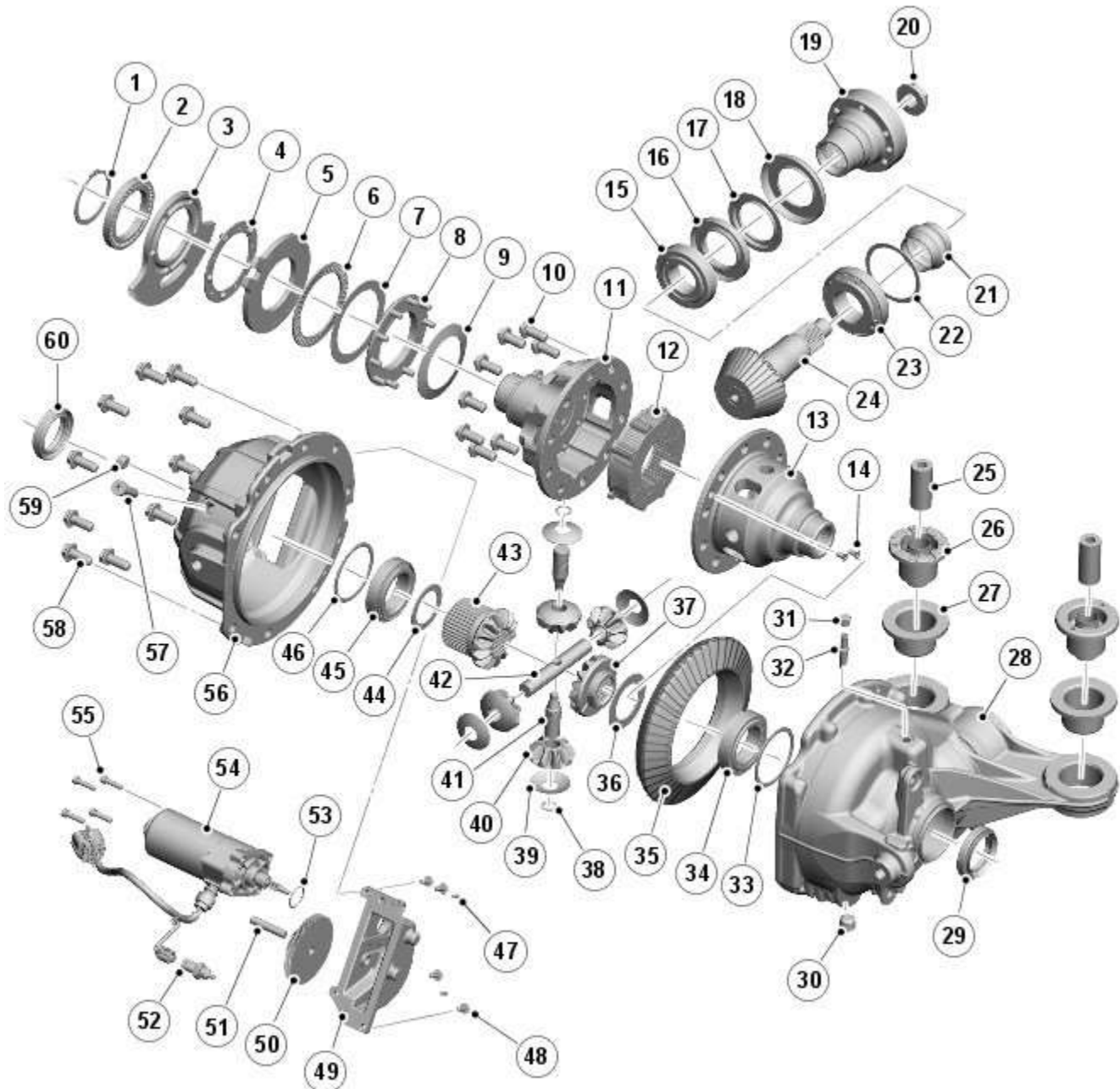
The electronic differential has the same functionality as the open differential, but it also incorporates a locking and torque biasing function to give improved traction performance and vehicle dynamic stability. Operation of the electronic differential is controlled by the Differential Locking Module (DLM).

The basic construction of the electronic differential is similar to the open differential. However, the electronic differential also has the following:

- Two additional planet gears in the differential carrier, to cater for the higher torque through the differential during locking events.
- A multi-plate clutch and actuator assembly installed on the LH sun gear
- A motor and reduction gearbox, attached to the cover.
- A temperature sensor installed in the cover.

The DLM (differential locking module) operates the motor of the electronic differential under the control of the ADM (adaptive damping module).

Exploded View of Electronic Differential



E105859

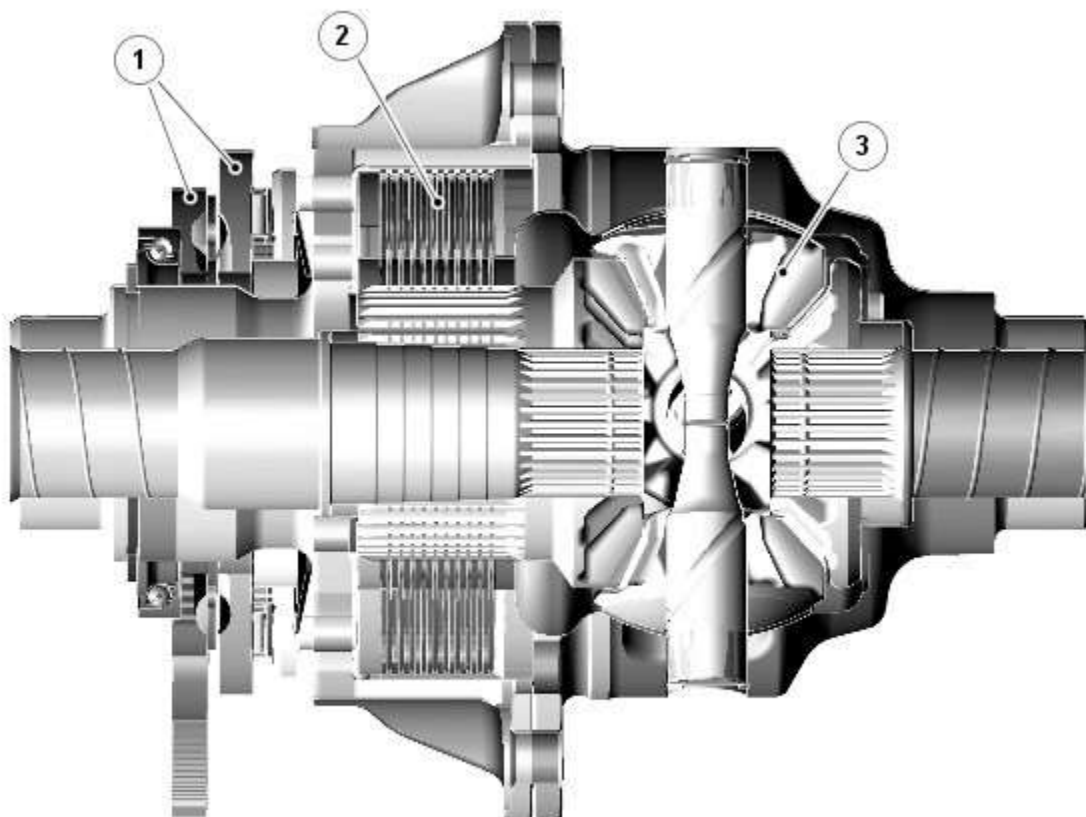
Item	Description
1	Circlip
2	Bearing assembly
3	Input actuator
4	Actuator balls
5	Output actuator

6	Thrust race
7	Shim
8	Thrust plate
9	Dished washer
10	Bolt (10 off)
11	Clutch basket
12	Multi-plate clutch and pressure disc
13	Differential case
14	Screw (2 off)
15	Bearing assembly
16	Oil seal
17	Oil slinger inner
18	Oil slinger outer
19	Input flange
20	Pinion nut
21	Collapsible spacer
22	Shim
23	Bearing assembly
24	Pinion shaft
25	Mounting insulator inner (2 off)
26	Mounting insulator rubber (2 off)
27	Mounting insulator outer (2 off)
28	Carrier
29	Oil seal
30	Drain plug
31	Vent
32	Breather cap
33	Shim
34	Bearing assembly
35	Drive gear
36	Shim
37	RH sun gear
38	Circlip
39	Thrust washer (4 off)
40	Planet gear (4 off)
41	Pin (2 off)
42	Shaft
43	LH sun gear
44	Shim
45	Bearing assembly
46	Shim
47	Dowel (2 off)
48	Bolt (4 off)
49	Reduction gear casing
50	Reduction gear
51	Shaft
52	Temperature sensor
53	O-ring seal
54	Motor
55	Screw (4 off)
56	Cover
57	Output actuator locking pin
58	Bolt (9 off)

59	Filler/Level plug
60	Oil seal

The multi-plate clutch is contained in a clutch basket attached to the differential carrier with the crown wheel securing bolts. Alternate plates of the clutch pack are keyed to the clutch basket and the [LH](#) sun gear. A pressure disc is installed on the outer end of the clutch pack and keyed to the clutch basket. A thrust race on the end of the clutch basket incorporates lugs which extend through the clutch basket onto the pressure disc.

The actuator assembly is mounted on bearings on the outboard end of the clutch basket, against the thrust race. The actuator assembly consists of input and output actuators separated by five ball bearings. A locking pin in the cover engages with a slot in the output actuator to prevent it turning, but allow it to move axially. The input actuator engages with the reduction gearbox and is free to rotate relative to the cover. Ball bearings locate in curved grooves in the mating faces of the input and output actuators. The bottom surface of each groove incorporates a ramp. Rotation of the input actuator forces the ball bearings up the ramps in the grooves and induces an axial movement in the output actuator. The thrust race and pressure disc transfer the axial movement from the output actuator to the clutch pack.



E 112539

Item	Description
1	Actuator
2	Multi-plate clutch
3	Differential

The motor is a 12 V dc motor that adjusts the frictional loading of the multi-plate clutch, via the reduction gearbox and the actuator assembly, under the control of the DLM. Adjusting the frictional loading of the multi-plate clutch adjusts the locking torque between the crown wheel drive gear and the sun wheel.

Four bolts attach the motor to the reduction gearbox, which is located in position on the cover with two dowels, and secured with four bolts. An O-ring seals the joint between the motor and the reduction gearbox.

The motor is driven by a 12 V dc feed direct from the DLM. The motor also incorporates the following connections with the DLM:

- A motor temperature sensor, to prevent excessive use from damaging the motor.
- Two Hall effect motor position sensors, to enable closed loop control of the motor.

The temperature sensor provides a differential oil temperature signal to the DLM, to prevent excessive use from damaging the multi-plate clutch.

Differential Locking Module (DLM)

The DLM controls operation of the electronic differential. The DLM is attached to a bracket located on the [LH](#) side of the luggage compartment, immediately forward of the fender tail lamp, behind the trim.

The DLM receives three battery feeds from the [AJB](#) and an ignition feed from the [CJB](#). A connection with the high speed [CAN](#) bus allows the DLM to communicate with other systems on the vehicle.

A certain amount of differential slip is required to allow the vehicle to turn corners and to remain stable under control of the [ABS](#). The ADM monitors the driver's demands through primary vehicle controls and automatically sets the slip torque in the differential. The system is completely automatic and does not require any special driver input.

The differential strategy in the ADM includes:

- A pre-loading function, increasing locking torque with increased driving torque.
- A slip controller to decrease locking torque for optimum comfort, e.g. parking.

The ADM memorizes the position of the motor when the ignition is switched off.

[CAN](#) bus messages used by the ADM include wheel speed, steering angle, automatic transmission speed, temperature information, car configuration, axle ratios and mode inputs.

The ADM also sends messages via the [CAN](#) bus to tell other control modules on the network the status of the electronic differential. The clutch torque and default mode status are some of the main signals sent out by the ADM.

If the DLM or ADM are replaced, a Jaguar approved diagnostic system must be connected to the vehicle and the differential self-calibration procedure must be performed. This procedure must also be performed if the motor or electronic differential is replaced.

If a fault occurs with the electronic differential, the ADM, the DLM, or one of the required input signals, the ADM records an error code and displays a warning in the message center.

The following messages can be displayed:

Message	Description	Chime
E-DIFF NOT AVAILABLE	Differential temperature has reached the overheat threshold. System deactivated until temperature returns within limits.	Single
E-DIFF FAULT	Fault has occurred with electronic differential. System deactivated until fault rectified.	Single

Rear Drive Axle/Differential - Rear Drive Axle and Differential

Diagnosis and Testing

Principle of Operation

For a detailed description of the Rear Drive Axle and Differential, refer to the relevant Description and Operation section in the workshop manual. REFER to: [Rear Drive Axle and Differential](#) (205-02 Rear Drive Axle/Differential, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Mechanical	Electrical
<ul style="list-style-type: none"> • Fixings that secure Rear Differential Control Module (Heat path for Module Heatsink) 	<ul style="list-style-type: none"> • Fuses/Relays • Damaged, Loose or Corroded Connector(s) • Damage to Wiring Loom/Incorrect Location, Stretched or Taught

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check the system for any logged Diagnostic Trouble Codes (DTCs) and refer to the DTC index.

DTC Index

For a list of diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Rear Differential Control Module \(RDCM\)](#) (100-00 General Information, Description and Operation).

Rear Drive Axle/Differential - Differential Draining and Filling

General Procedures

Check



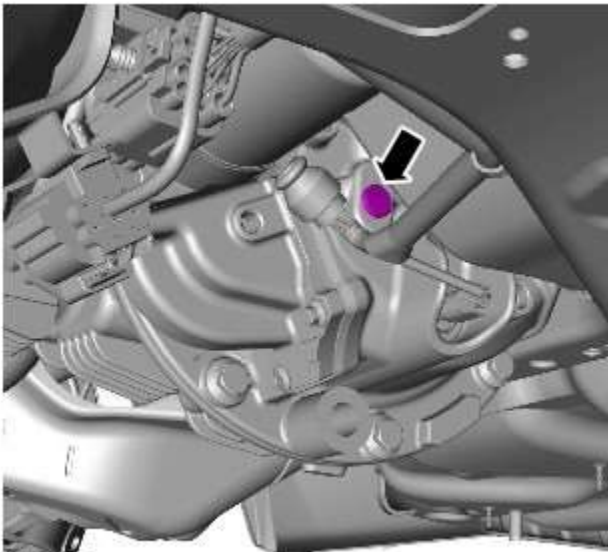
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Specifications - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-02 Rear Drive Axle/Differential, Specifications).



2. **WARNING:** Make sure to support the vehicle with axle stands.

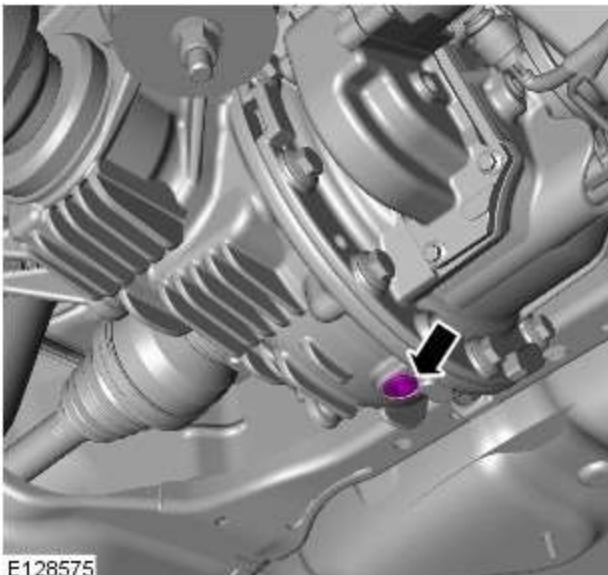
Raise and support the vehicle.



E128569

3.

- Clean the area around the lubricant filler plug.
- Position container to collect fluid loss.

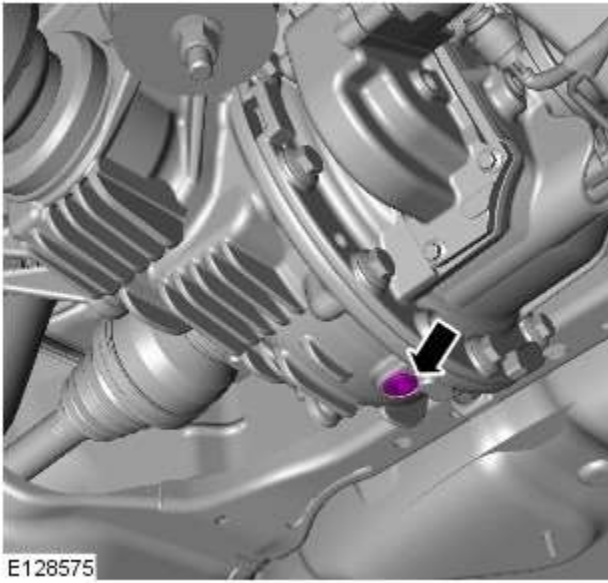


E128575

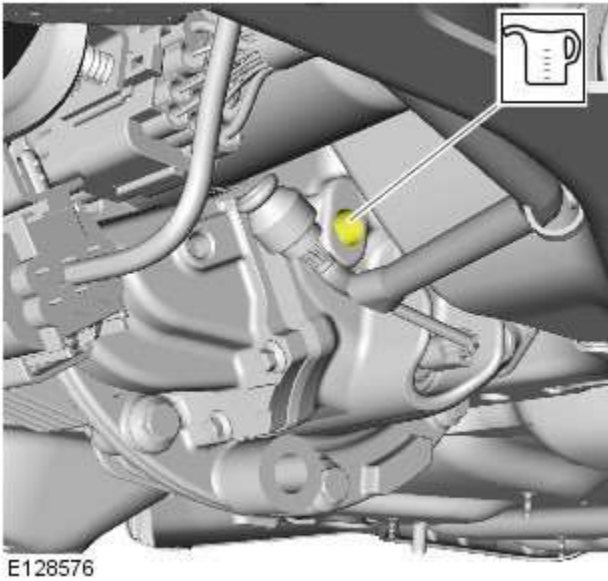
4.

- Clean the area around the drain plug.
- Remove the fluid drain plug.
- Drain the differential lubricant.


Adjustment



1.
 - Clean the drain plug.
 - *Torque: 27 Nm*

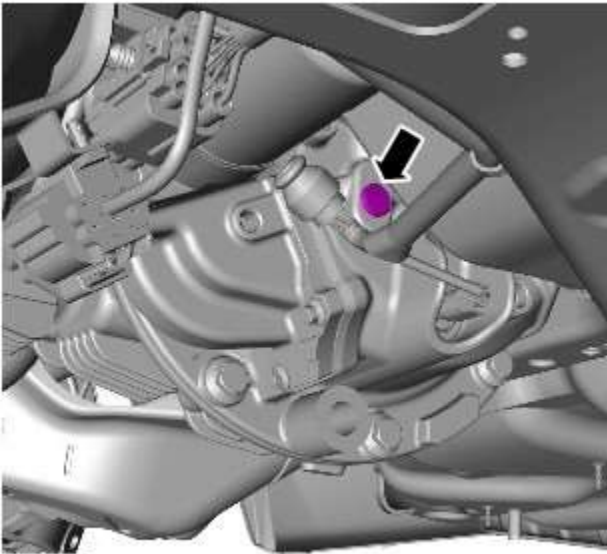


2. CAUTIONS:

 Do not fill the differential with lubricant up to the filler plug. The filler plug is only used to fill the differential with lubricant, and not to act as a level indicator.

 Make sure the correct specification and quantity of oil is used.

- Fill the differential with the correct amount of lubricant.



E128569

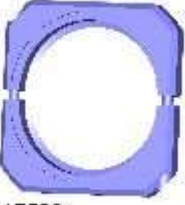
3.

- Clean the filler plug.
- *Torque: 27 Nm*

Rear Drive Axle/Differential - Differential Case TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol


Removal and Installation

Special Tool(s)

 <p>E117586</p>	<p>205-932 Remover, Driveshaft</p>
--	--

Removal

All vehicles


1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.


Raise and support the vehicle.


2. Refer to: [Rear Halfshaft - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-05 Rear Drive Halfshafts, Removal and Installation).

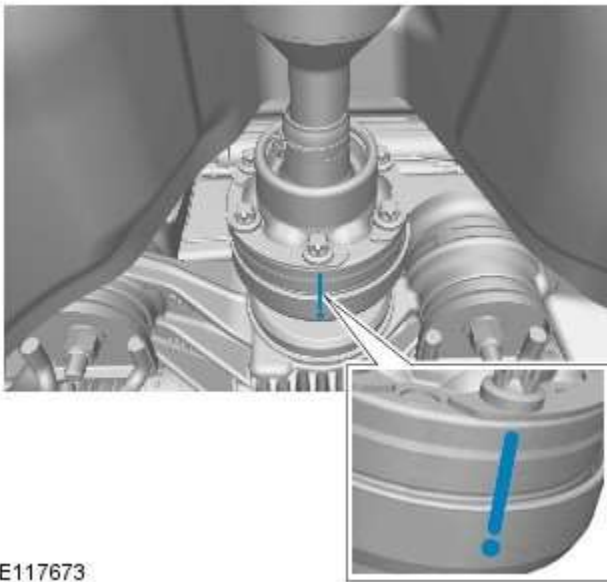
3. Refer to: [Exhaust System](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

4. CAUTIONS:

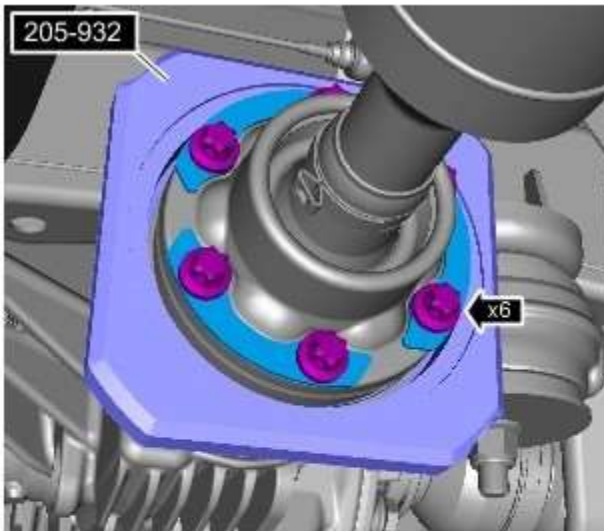
 Do not use the 5mm hole on the differential case flange for the alignment mark.

 Make sure that the driveshaft is supported with suitable retaining straps.

 **NOTE:** Using the 3mm hole on the differential case flange, paint an alignment mark (as indicated) to aid correct installation of the driveshaft to the differential case.





E117673



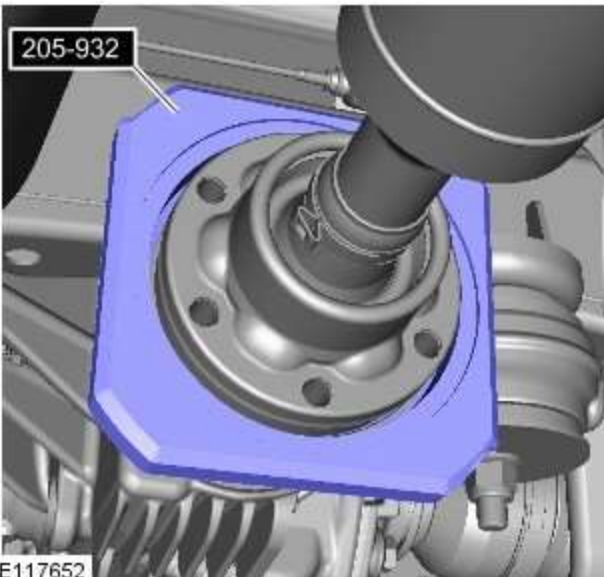
E117651


5. NOTES:

 On vehicles with diesel engine, note the illustrated orientation of the special tool.

 Make sure that the special tool is correctly installed to the recess on the driveshaft.

Special Tool(s): [205-932](#)



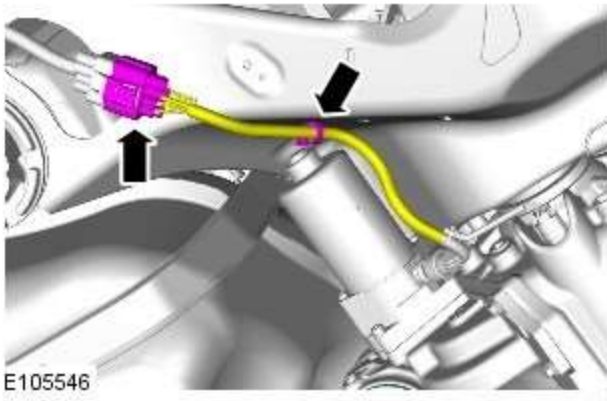
6.  **CAUTION:** Care must be taken not to damage the surrounding components when using the special tool.

 **NOTE:** Using a suitable hammer and drift, make sure that you only hit the corner edges of the special tool to remove the driveshaft.

Special Tool(s): [205-932](#)

Vehicles with supercharger

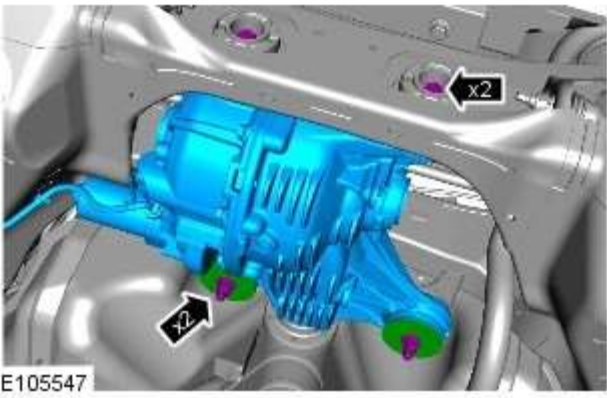
7.



All vehicles

8. Support the rear differential casing.

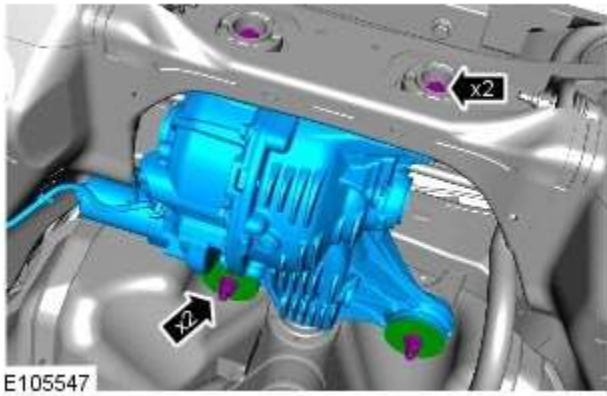
9.



Installation

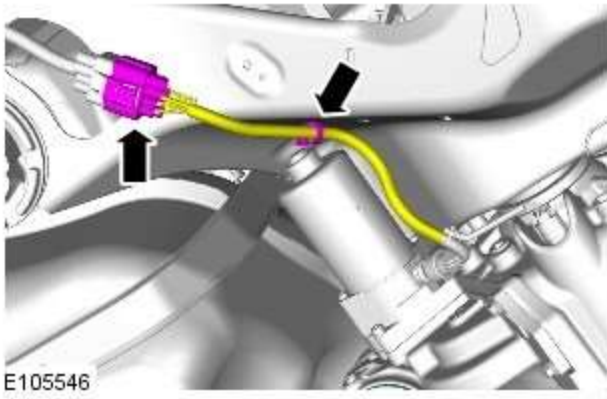
All vehicles

1. Torque:
M14 190 Nm
M12 90 Nm

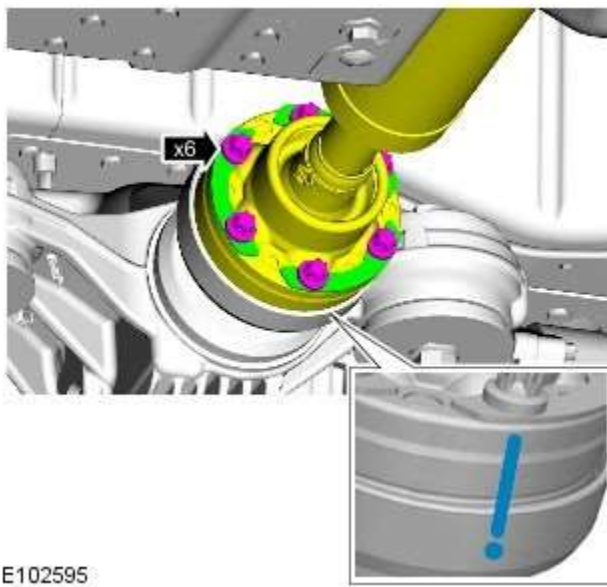



Vehicles with supercharger

2.

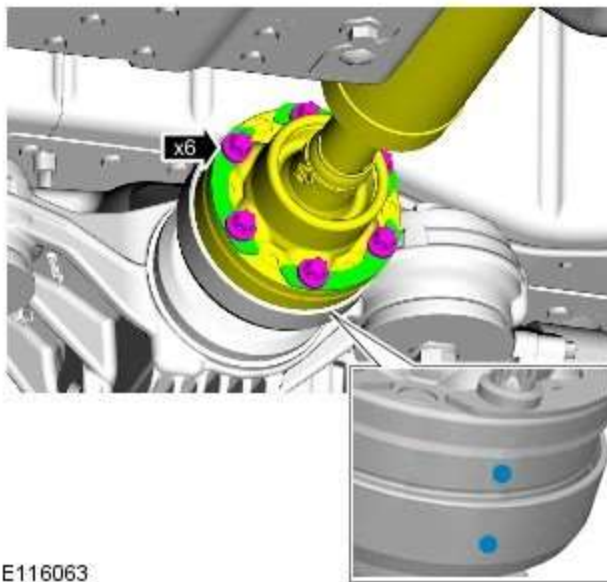


All vehicles





3.  NOTE: Make sure that the alignment mark on the driveshaft is correctly aligned to the alignment mark on the differential case.

Torque: 75 Nm



4. NOTES:

 This step only applies if a new driveshaft is being installed.

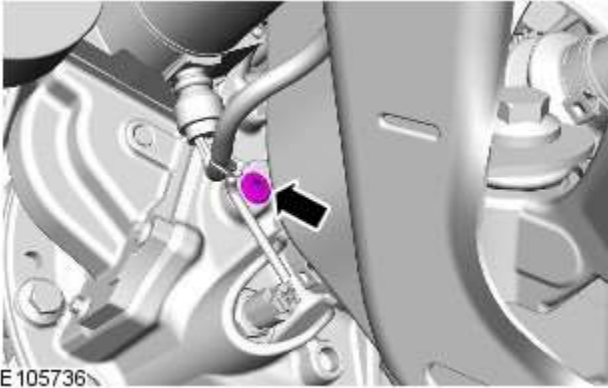
 Using the 3mm hole on the differential case flange and paint alignment mark on the driveshaft (as indicated). Make sure that the alignment marks are correctly aligned.

Torque: 75 Nm

5. Refer to: [Exhaust System](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
6. Refer to: [Rear Halfshaft - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-05 Rear Drive Halfshafts, Removal and Installation).

7. Check and top-up the differential case.



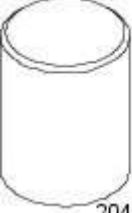


Torque: 30 Nm



Rear Drive Axle/Differential - Differential Front Bushing TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Special Tool(s)

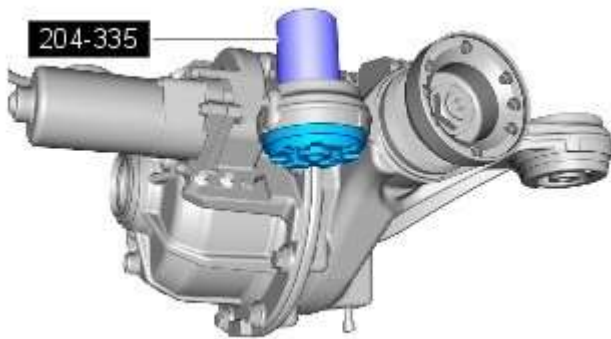
 <p>204-274</p>	<p>204-274 Bush install and removal tool</p>
 <p>204-275</p>	<p>204-275 Bush install and removal tool</p>
 <p>204-335</p>	<p>204-335 Bush install and removal tool</p>
 <p>204-601 E 112037</p>	<p>204-601 Bush install tool</p>
 <p>E52717</p>	<p>303-1121 Installer, Crankshaft Seal</p>

Removal



1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
Raise and support the vehicle.
2. Refer to: [Differential Case - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-02 Rear Drive Axle/Differential, Removal and Installation).

3. *Special Tool(s):* [204-335](#)



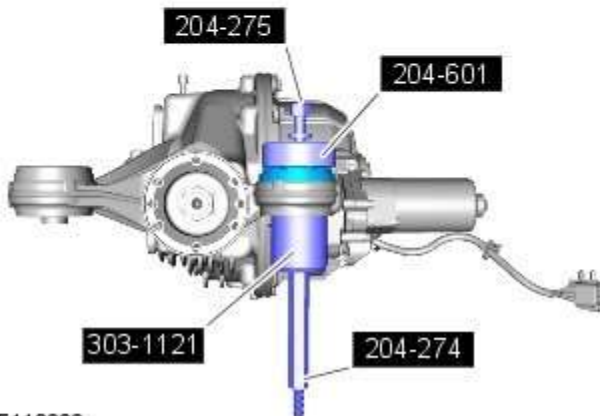
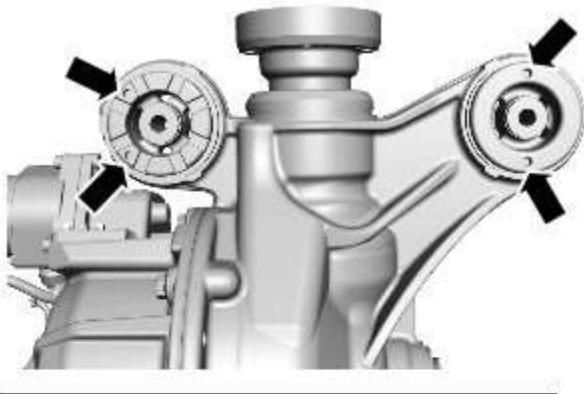
E112221

Installation



1. **NOTE:** Make sure the new bushes are installed in the correct orientation.

Special Tool(s): [204-275](#), [204-601](#), [303-1121](#), [204-274](#)



E112222

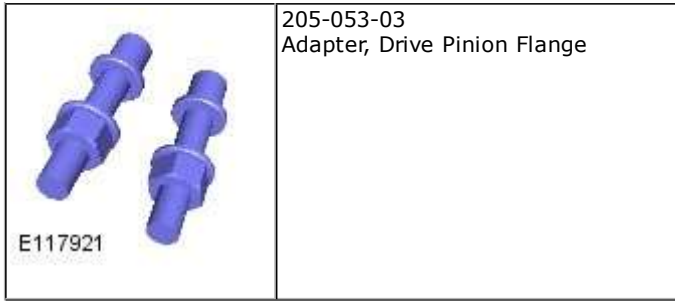
2. Refer to: [Differential Case - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol \(205-02 Rear Drive Axle/Differential, Removal and Installation\)](#).

Rear Drive Axle/Differential - Drive Pinion Seal

Removal and Installation

Special Tool(s)

 <p>204-264</p>	<p>204-264 Pinion Seal Replacer</p>
 <p>E117040</p>	<p>204-265 Remover/Installer, Drive Pinion Seal</p>
 <p>E117041</p>	<p>204-266 Adapter for 204-265</p>
 <p>E117042</p>	<p>204-267 Adapter for 204-265</p>
 <p>204-269</p>	<p>204-269 Flange remover forcing screw</p>
 <p>205-053</p> <p>E54574</p>	<p>205-053 Retainer, Drive Flange</p>



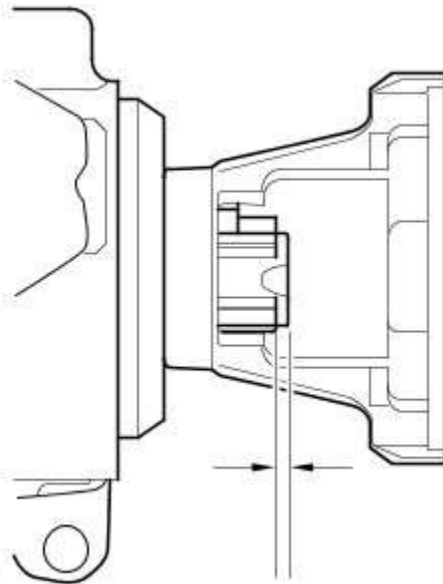
Removal



1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Refer to: Driveshaft - TD4 2.2L Diesel (205-01, Removal and Installation).
Refer to: [Driveshaft - V6 3.0L Petrol](#) (205-01 Driveshaft, Removal and Installation).
Refer to: [Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-01 Driveshaft, Removal and Installation).
Refer to: [Driveshaft - TDV6 3.0L Diesel](#) (205-01 Driveshaft, Removal and Installation).

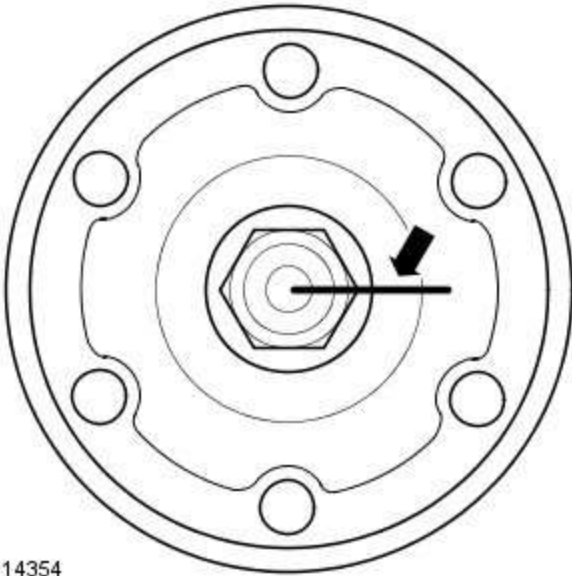


3.  **NOTE:** Measure for installation.

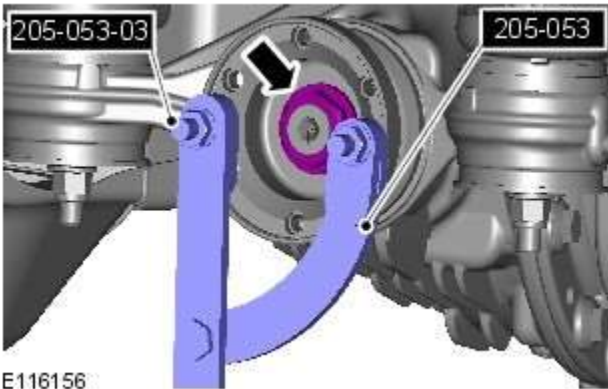
Measure the depth of the pinion nut on the pinion shaft.



- NOTE: Accurately scribe a line to mark the drive pinion shaft to the drive pinion nut and pinion flange.

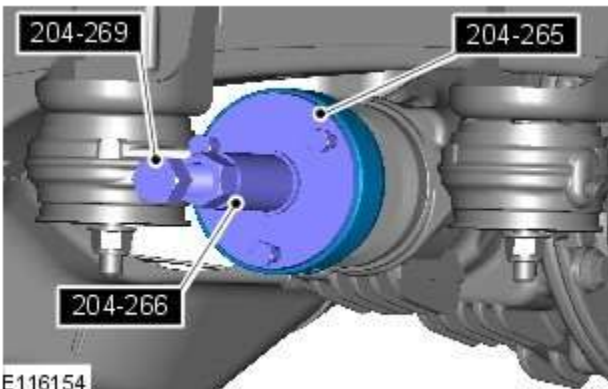


E114354



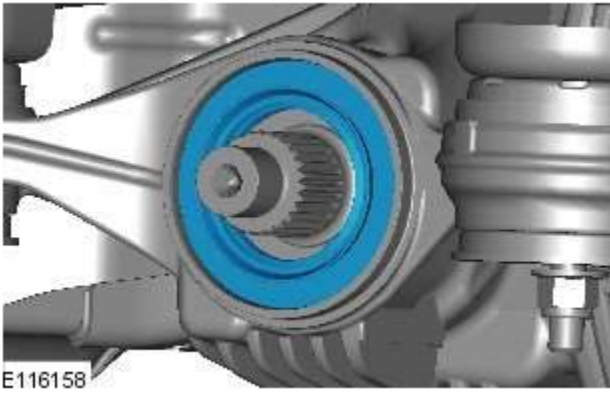
E116156

- Special Tool(s): [205-053](#), [205-053-03](#)



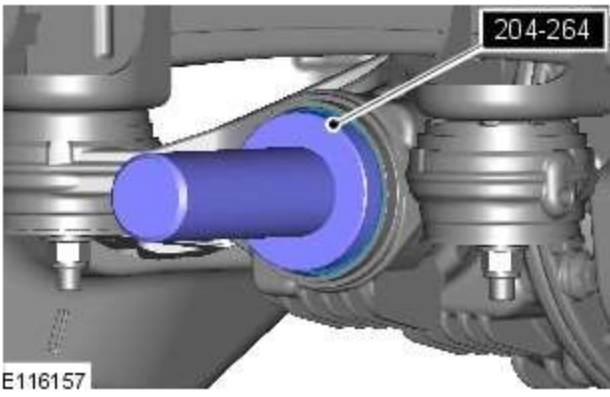
E116154

- Special Tool(s): [204-266](#), [204-265](#), [204-269](#)

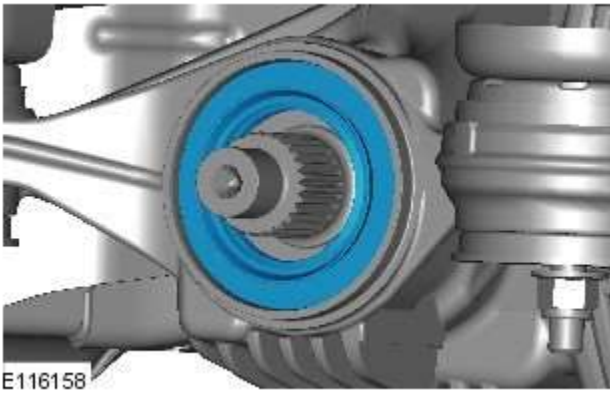


7.  NOTE: Be prepared to collect escaping fluid.

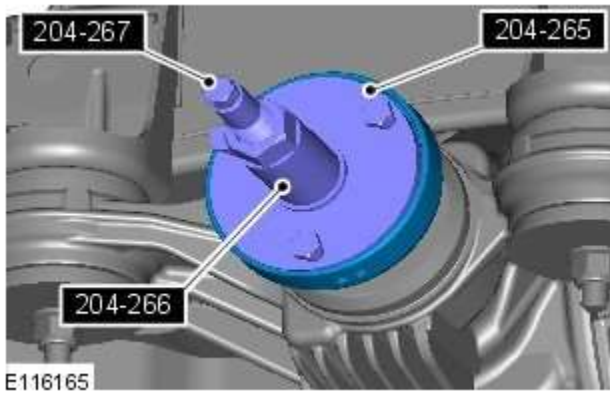
Installation



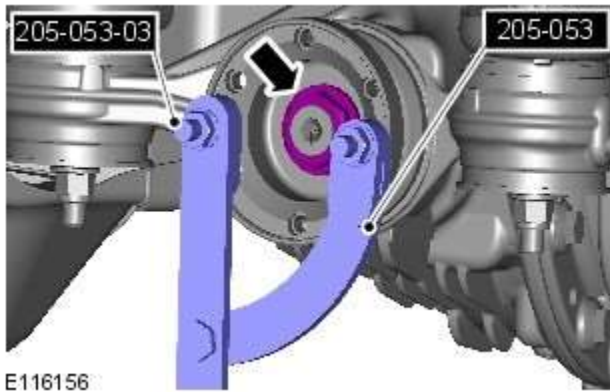
1. *Special Tool(s)*: [204-264](#)



2.




3. *Special Tool(s)*: [204-267](#), [204-266](#), [204-265](#)





4. **CAUTIONS:**

 Make sure the drive pinion flange has no end float and is free to rotate.

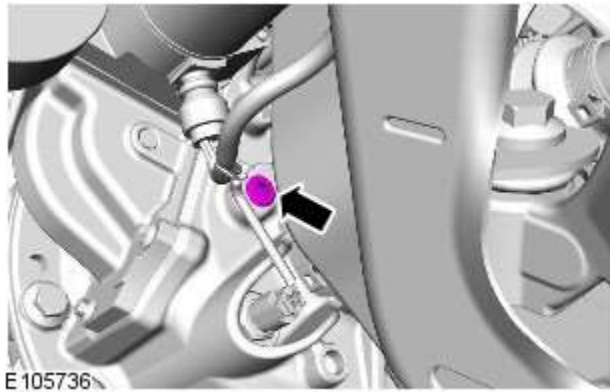
 Make sure that the drive pinion flange scribed mark is aligned and is never tightend short of the scribed mark on the drive pinion shaft and is no more than a maximum of 5 degrees past the scribed mark on the drive pinion shaft.

NOTES:

 Using the special tool, counter hold the drive pinion flange.

 Measure the depth of the pinion nut on the pinion shaft to previous noted depth.

Special Tool(s): [205-053](#), [205-053-03](#)



5. Check and top-up the differential case.

Torque: 34 Nm

6. Refer to: Driveshaft - TD4 2.2L Diesel (205-01, Removal and Installation).
 Refer to: [Driveshaft - V6 3.0L Petrol](#) (205-01 Driveshaft, Removal and Installation).
 Refer to: [Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-01 Driveshaft, Removal and Installation).
 Refer to: [Driveshaft - TDV6 3.0L Diesel](#) (205-01 Driveshaft, Removal and Installation).

Rear Drive Axle/Differential - Differential Locking Motor

Removal and Installation

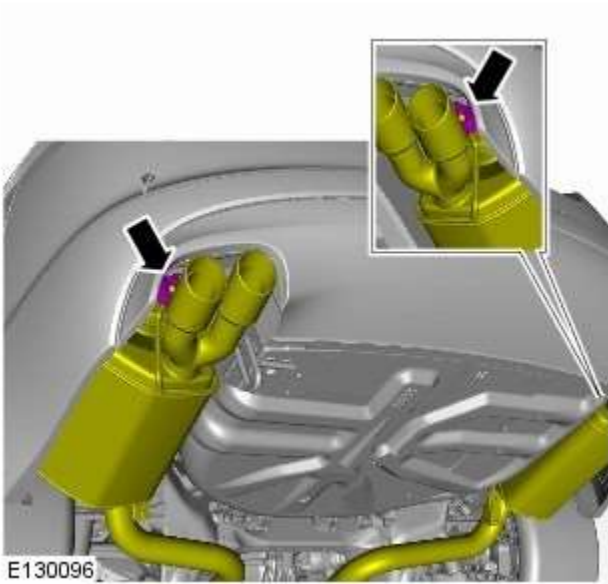
Removal



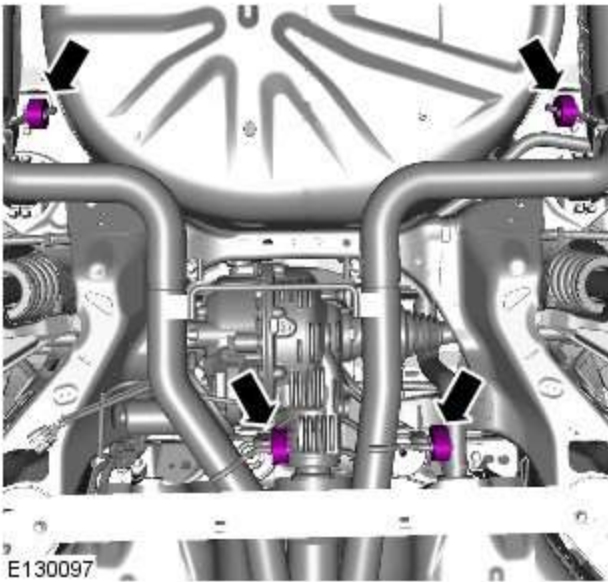
NOTE: Removal steps in this procedure may contain installation details.

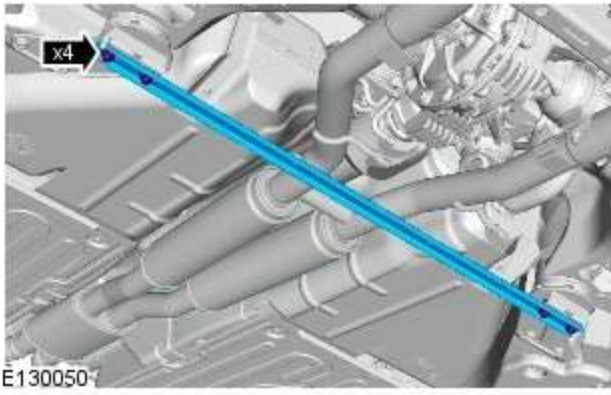
1. Refer to: [Differential Draining and Filling](#) (205-02 Rear Drive Axle/Differential, General Procedures).

2.

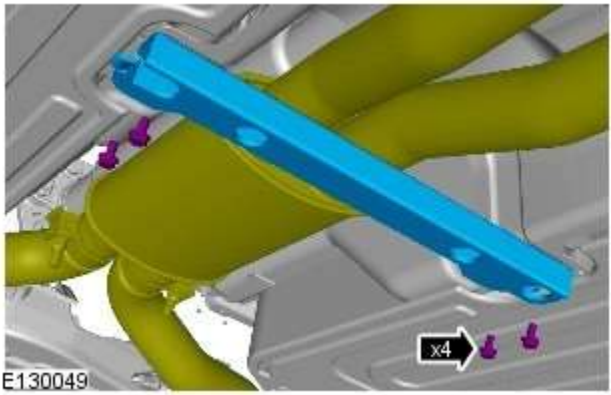



3.

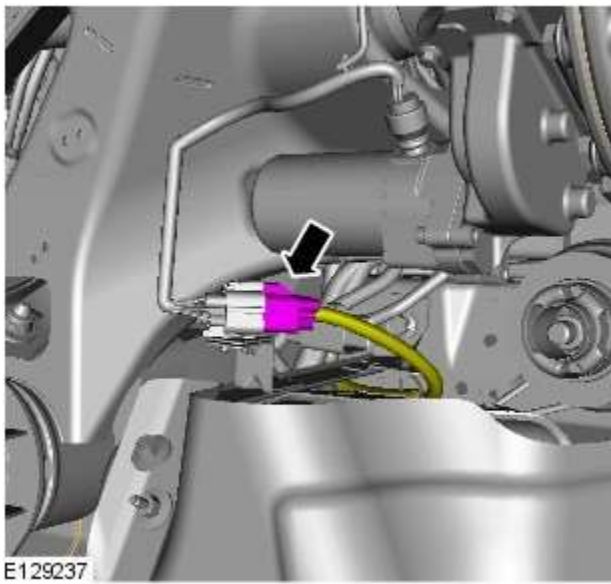




4.

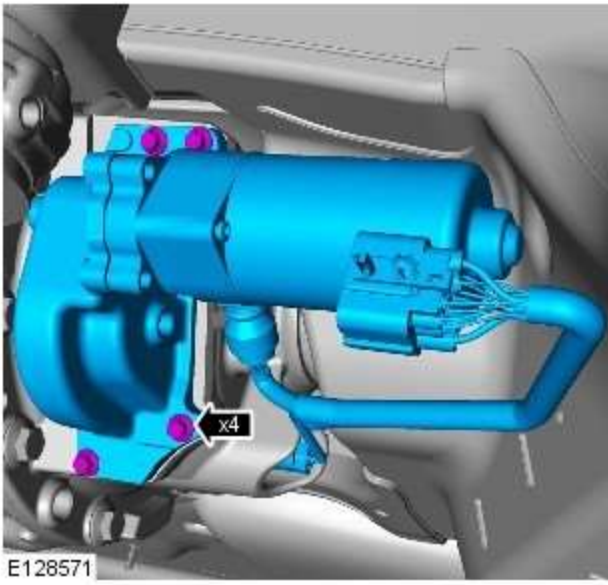


5.  CAUTION: Make sure that the exhaust system is supported with a suitable transmission stand.

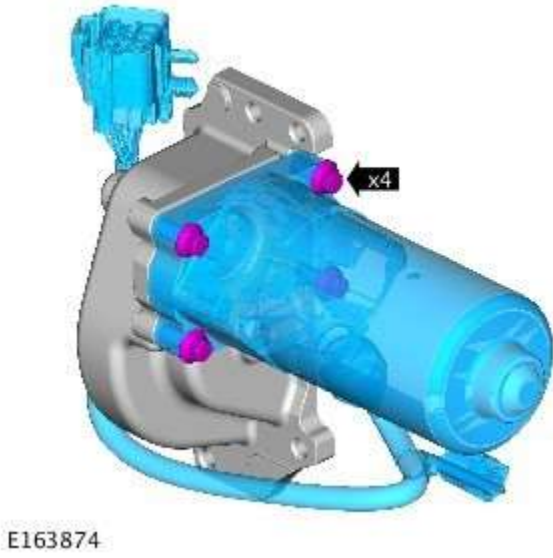


6.

7.

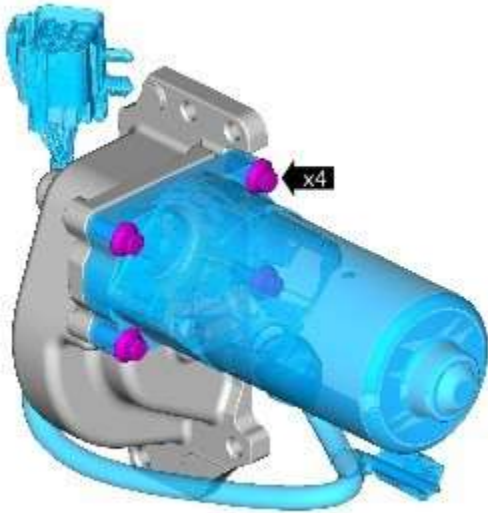


8.

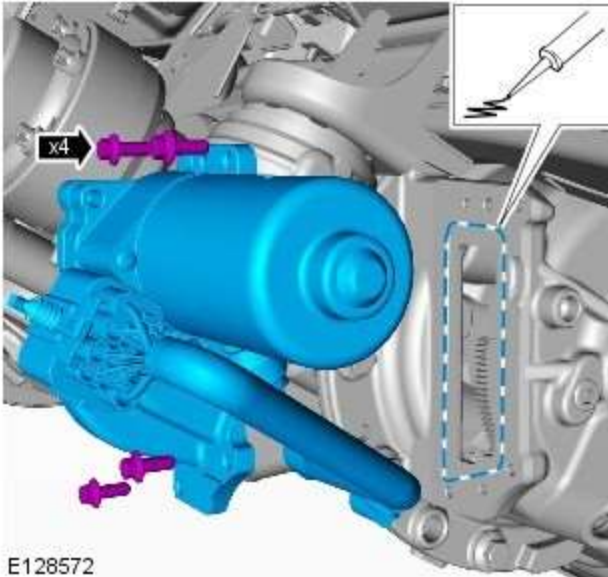


Installation

1. Torque: 11 Nm



E163874



E128572

2. CAUTIONS:



Make sure that the mating faces are clean and free of foreign material.

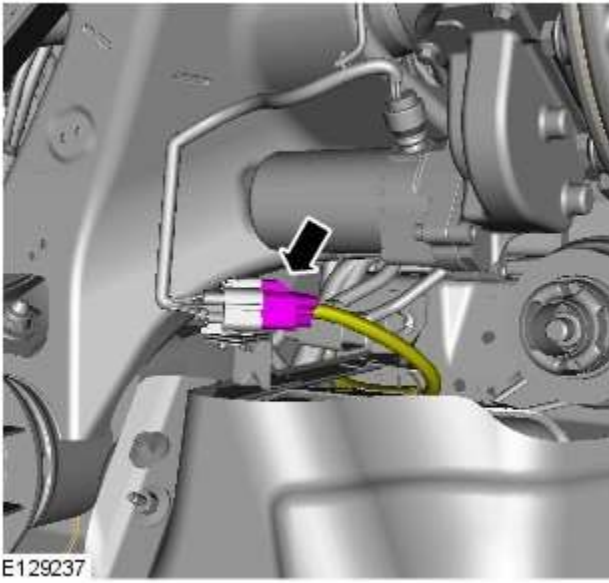


Apply a continuous bead of silicone gasket sealant (Loctite 5999) as shown on the illustration. The application of the sealant must be 4mm diameter. Install the component immediately after applying the sealant without smearing the sealant.



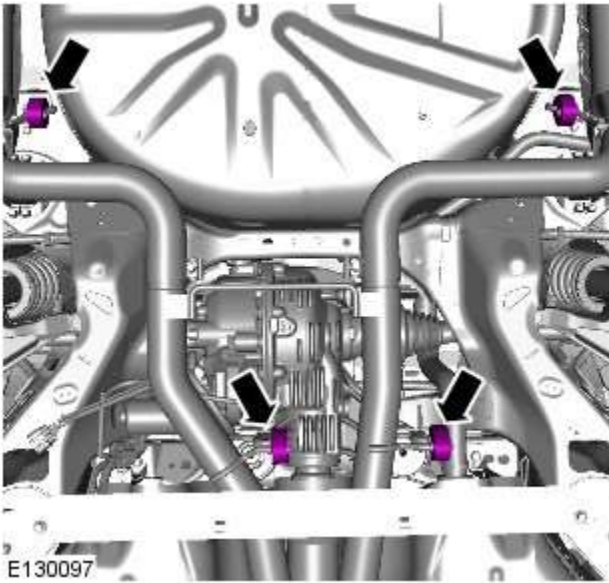
NOTE: New units must be configured using the Programmable Module Installation Routine in the diagnostic tool.

- Torque: 11 Nm
- Apply a suitable amount of approved sealant to one of the mating faces.



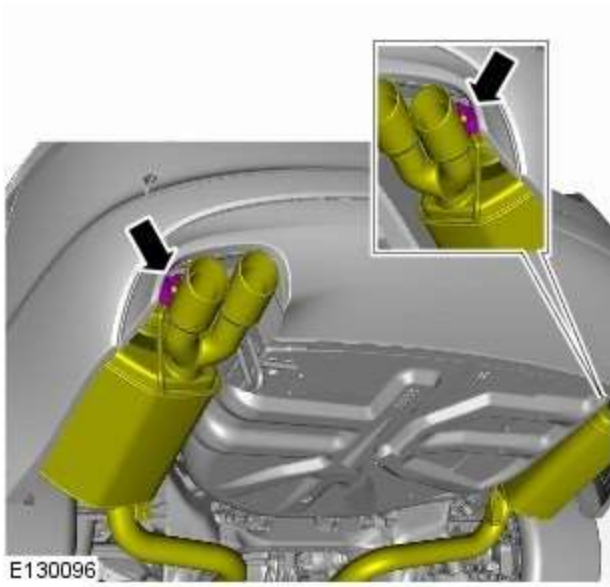
3.

4. Refer to: [Differential Draining and Filling](#) (205-02 Rear Drive Axle/Differential, General Procedures).

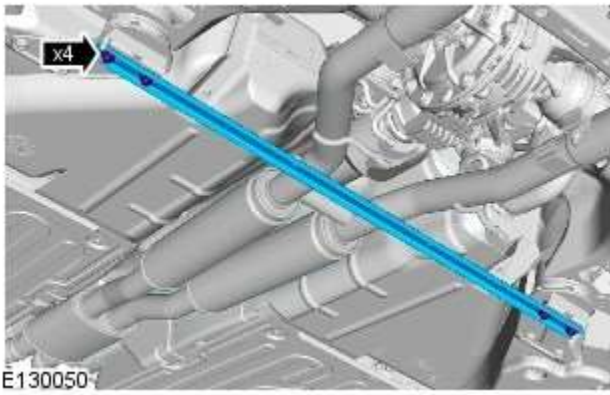


5.

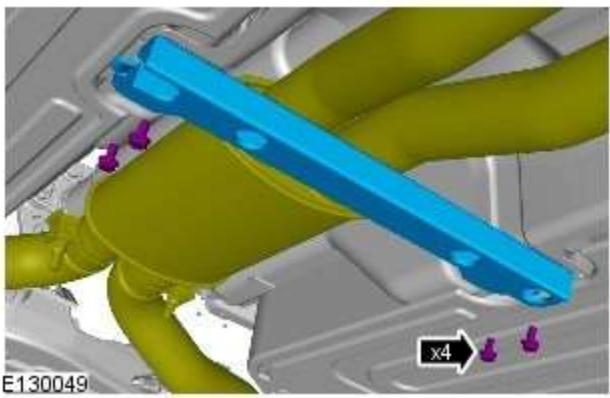
6.



7. Torque: 62 Nm



8. Torque: 25 Nm



Rear Drive Halfshafts -

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Constant velocity (CV) grease	Optimal LN 584 LO

Fill Capacities

Description	Grams
Grease for inner CV joint - all vehicles	140
Grease for outer CV joint - all vehicles	125

Torque Specifications



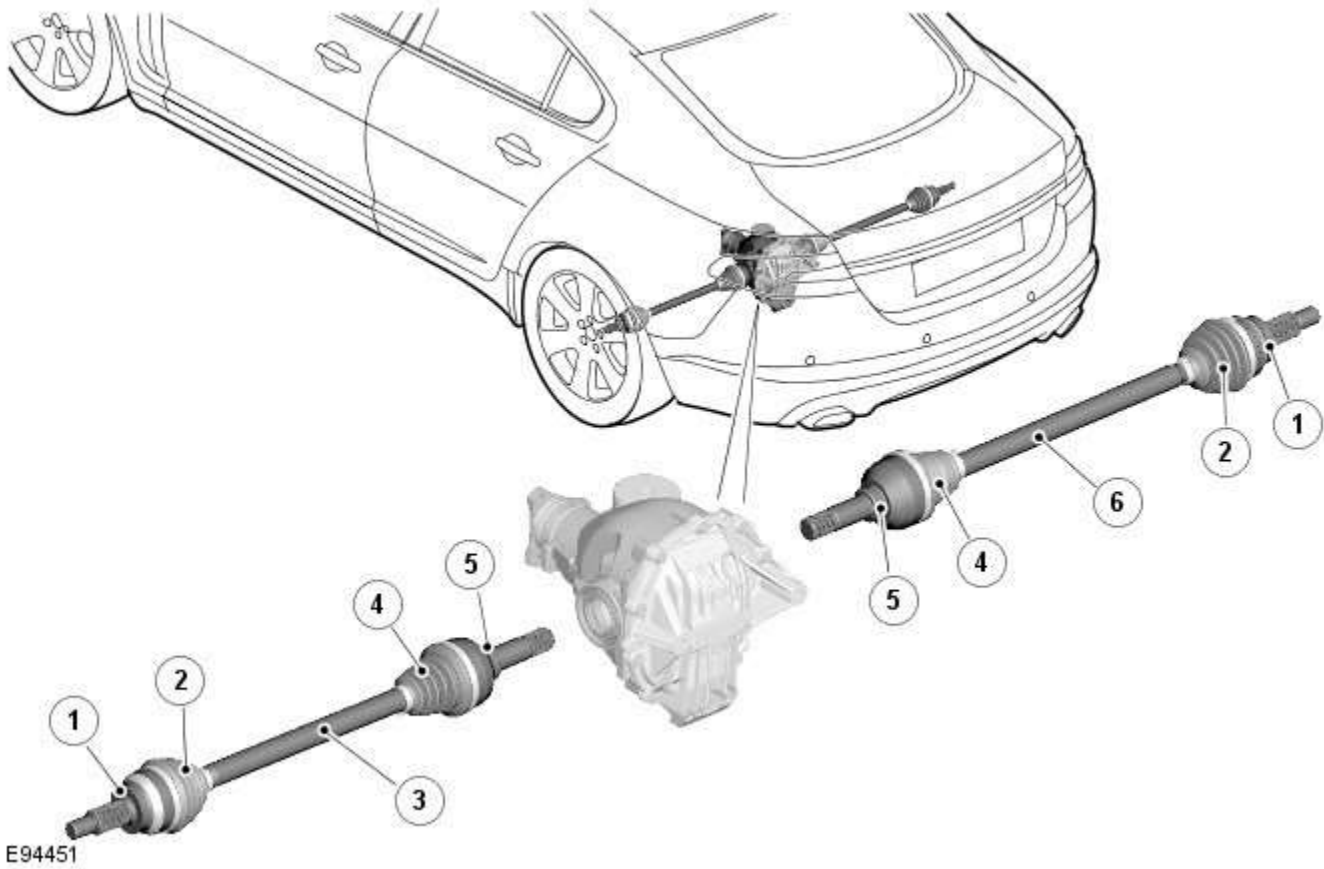
NOTE: Make sure that a new nut is installed.

Item	Nm	lb-ft	lb-in
Halfshaft outer constant velocity joint retaining nut	300	221	-

Rear Drive Halfshafts - Rear Drive Halfshafts - Component Location

Description and Operation

Component Location



Item	Description
1	Outer constant velocity joint
2	Outer constant velocity joint gaiter
3	Left hand halfshaft
4	Inner constant velocity joint gaiter
5	Inner constant velocity joint
6	Right hand halfshaft

Rear Drive Halfshafts - Rear Drive Halfshafts - Overview

Description and Operation

Overview

The CV (constant velocity) joint at each end of the halfshafts meets the angle change requirements due to suspension deflection. The plunge capability of the CV joint accommodates the length change.

Rear Drive Halfshafts - Rear Drive Halfshafts - System Operation and Component Description

Description and Operation

System Operation

Component Description

Rear Drive Halfshafts

The solid-steel halfshafts are of unequal length, with each halfshaft comprising inner and outer CV (constant velocity) joints. The CV joints are the 'ball and socket' type packed with grease and protected by gaiters.

The outer CV joint is an interference fit into the wheel hub and secured by a locking nut. The inner CV joint is a slide fit and is retained in the differential with a spring clip.

Rear Drive Halfshafts - Rear Drive Halfshafts

Diagnosis and Testing


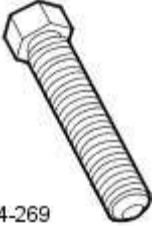
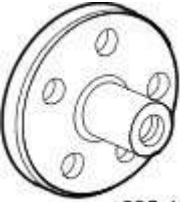
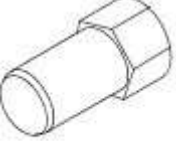


For additional information.

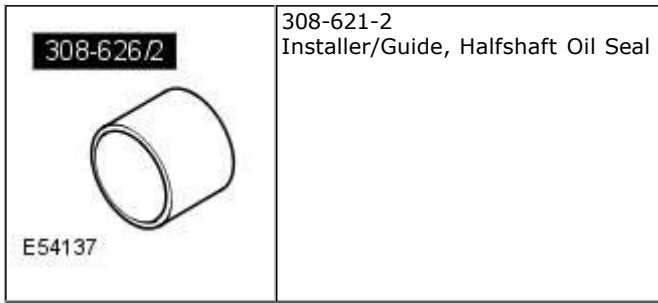
REFER to: [Driveline System](#) (205-00 Driveline System - General Information, Diagnosis and Testing).

Rear Drive Halfshafts - Rear Halfshaft TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Special Tool(s)

 <p>100-012</p> <p>E54135</p>	<p>100-012 Slide Hammer</p>
 <p>204-269</p>	<p>204-269 Flange remover forcing screw</p>
 <p>205-491</p>	<p>205-491 Hub puller</p>
 <p>20549101</p>	<p>205-491-1 Adapter nuts</p>
 <p>308-005</p> <p>E54134</p>	<p>308-005 Remover, Axle oil seal</p>
 <p>308-626/1</p> <p>E54136</p>	<p>308-621-1 Installer, Halfshaft Oil Seal</p>



Removal



1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

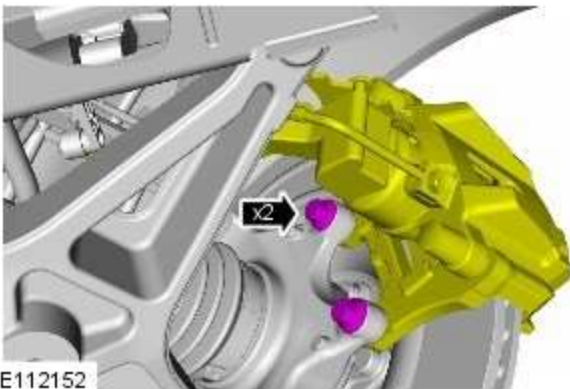
Raise and support the vehicle.

2. Remove the LH rear wheel and tire.

Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).



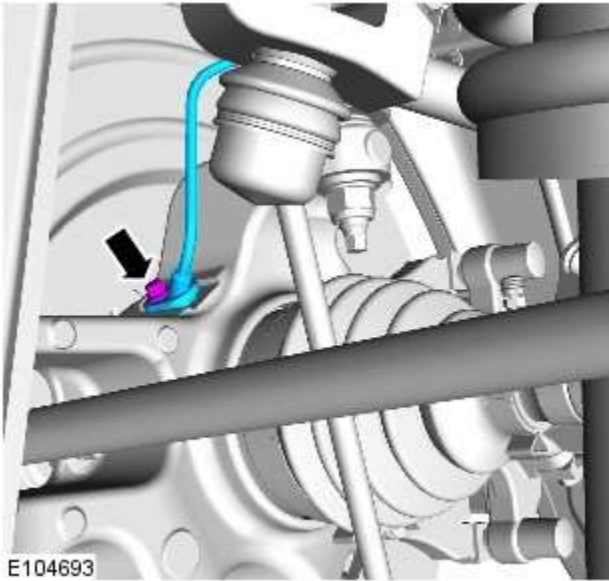
3. With assistance, remove the halfshaft retaining nut, and retain it for the install procedure.



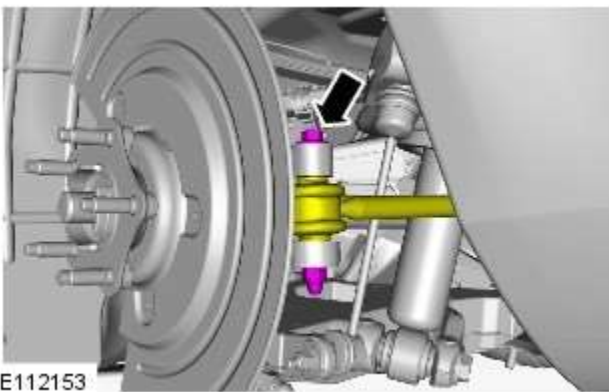
4. Release the brake caliper.



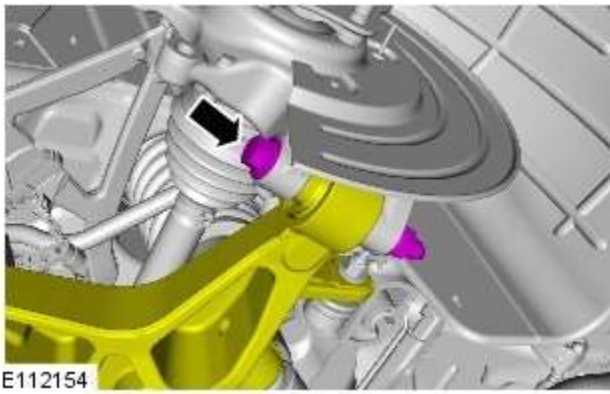
5. Remove the rear brake disc.



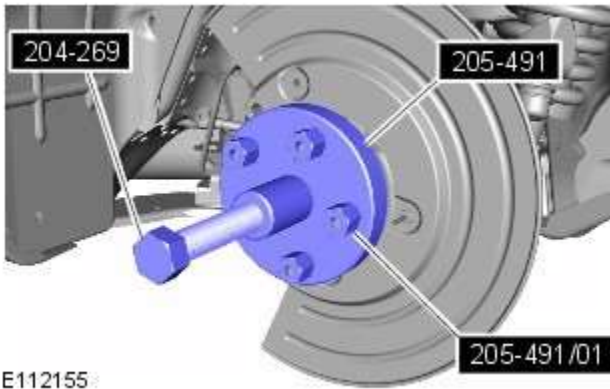
6. Remove the wheel speed sensor.



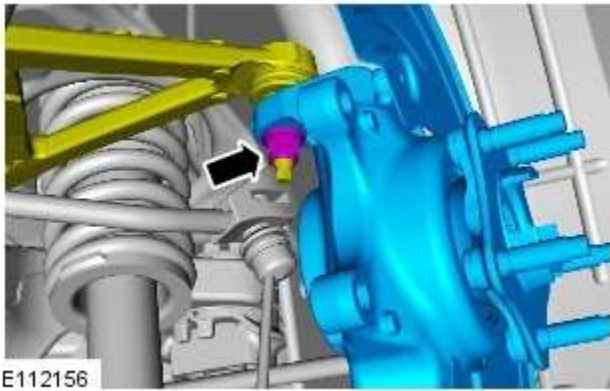
7. Disconnect the toe link.



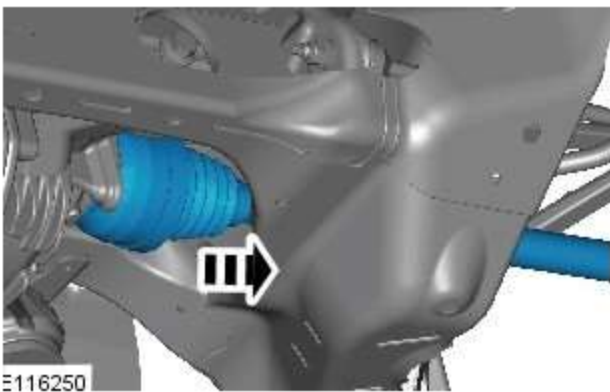
8.



9.




10.




11.

Release the lower arm.

 **CAUTION:** Do not use a hammer to detach the halfshaft from the hub assembly, failure to follow this instruction may result in damage to the halfshaft.

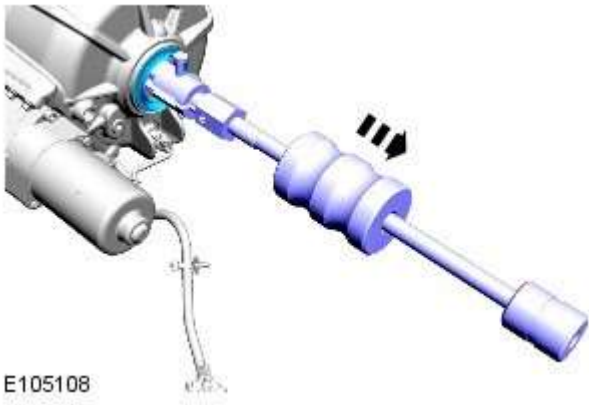
Using the special tools, release the halfshaft from the drive flange.

Special Tool(s): [204-269](#), [205-491-1](#), [205-491](#)

 **NOTE:** Use an additional wrench to prevent the component from rotating.

Remove the wheel knuckle.

Release the halfshaft from the differential.



E105108

12. Remove and discard the halfshaft oil seal.

Special Tool(s): [100-012](#), [308-005](#)

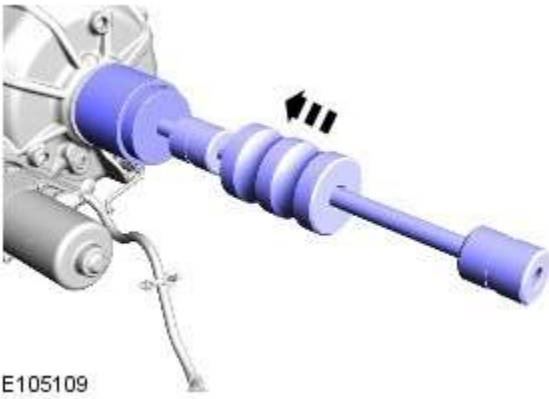
13. Remove and discard the circlip.



E116328

Installation

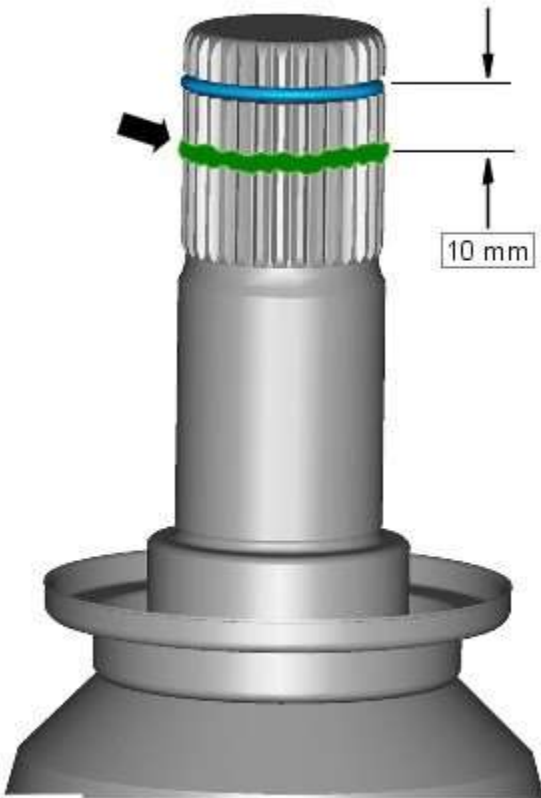
1. Clean the components mating faces.



2. Using the special tool, install a new halfshaft oil seal.

Special Tool(s): [100-012](#), [308-621-1](#), [308-621-2](#)

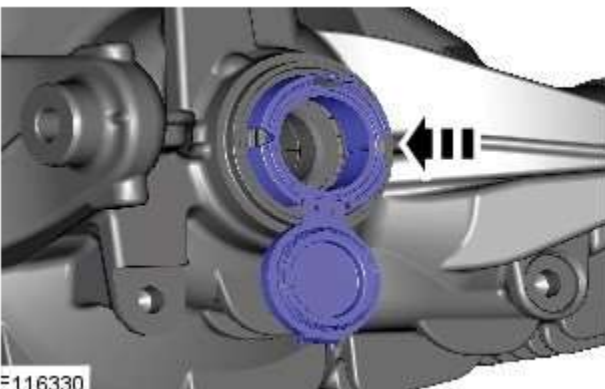
E105109




3.  **CAUTION:** Use Loctite WSK-M2G349-A4 or equivalent, meeting the Jaguar specification.

Install a new circlip.

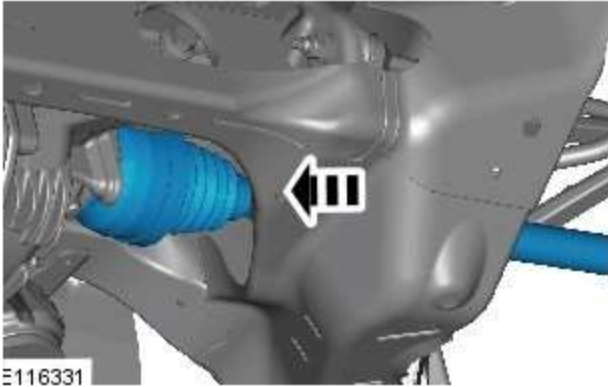
E116329





4.  **CAUTION:** The halfshaft oil seal protector must be left in place, until the halfshaft is fully installed.

Install the halfshaft oil seal protector.

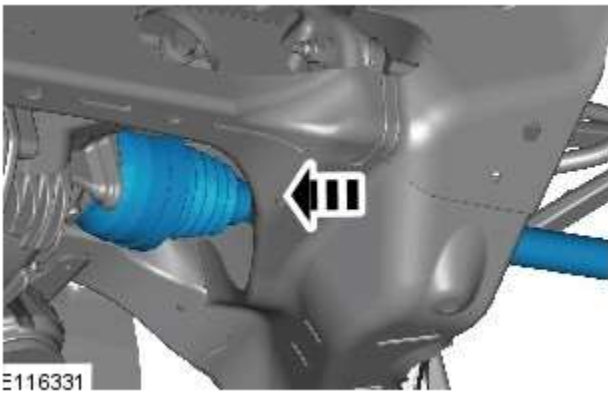
E116330



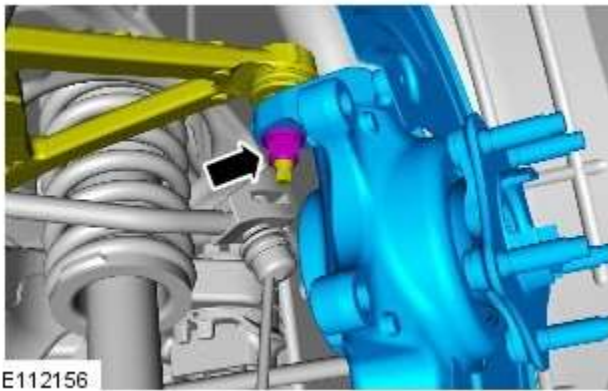
5. CAUTIONS:

-  Do not install the rear halfshaft fully at this stage.
-  Only install the rear halfshaft until the halfshaft splines have past the halfshaft oil seal.

6. Remove and discard the halfshaft oil seal protector.



- 7. CAUTION: Make sure that the rear halfshaft circlip is installed correctly by pulling the halfshaft gently to make sure it is engaged.



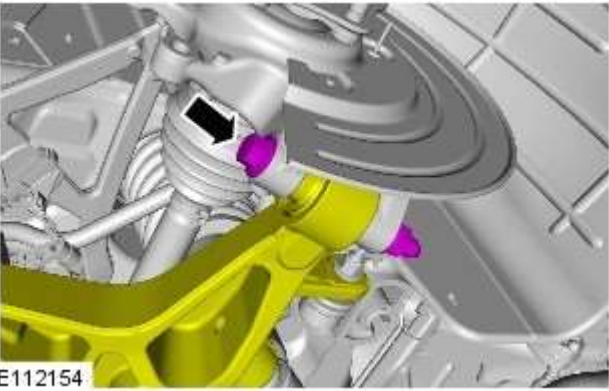
- 8.  CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.


Torque: 90 Nm



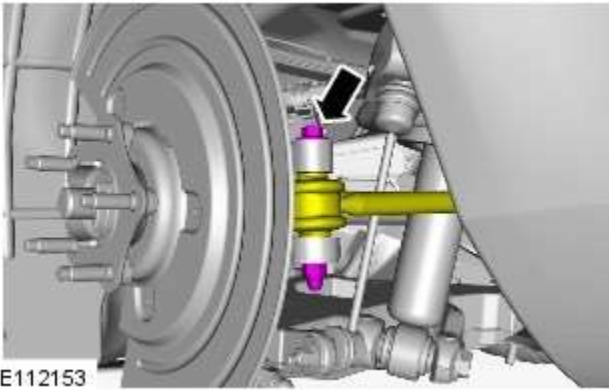
9.  CAUTION: Install the halfshaft nut finger tight.


 NOTE: Do not fully tighten the locking nut at this stage.



10.  CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

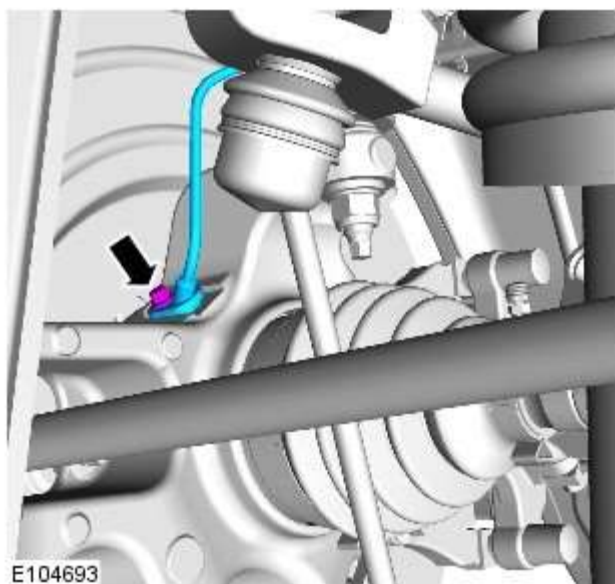
Torque: 150 Nm



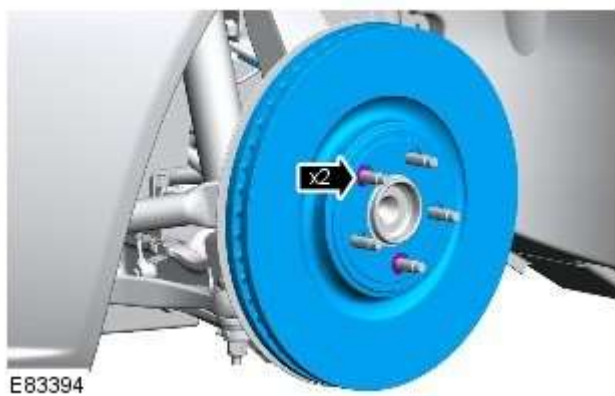
11.  CAUTION: The final tightening of the suspension components must be carried out with the vehicle on its wheels.

Torque: 55 Nm

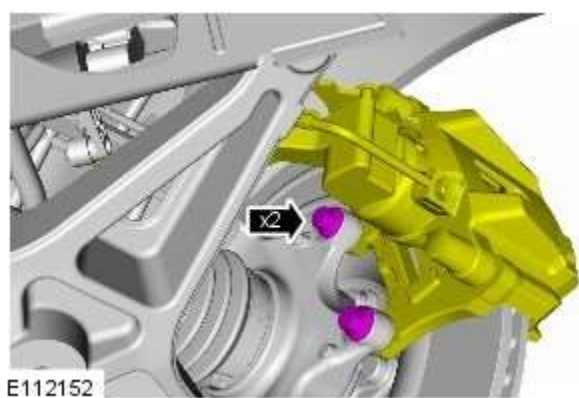
12. Torque: 6 Nm



13. Install the brake disc.




14. Torque: 103 Nm

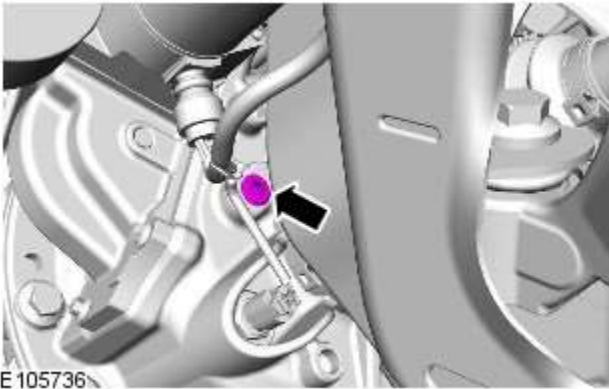




E112151

15.  **CAUTION:** Do not use air tools to install the nut. Failure to follow this instruction may result in damage to the component.

Torque: 300 Nm



E 105736

16. Check and top-up the differential case.


17. Install the LH rear wheel and tire.

Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

Rear Drive Halfshafts - Inner Constant Velocity (CV) Joint Boot

Removal and Installation

Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.


Raise and support the vehicle.

2. Remove the rear halfshaft.
For additional information, refer to: [Rear Halfshaft - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-05 Rear Drive Halfshafts, Removal and Installation).

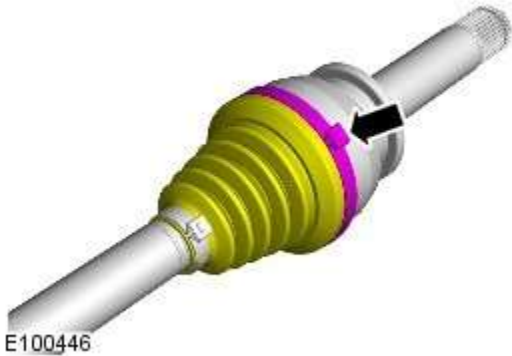


3. **CAUTION:** Use suitable protective covers to protect the halfshaft.

Using a suitable clamp, secure the rear halfshaft.

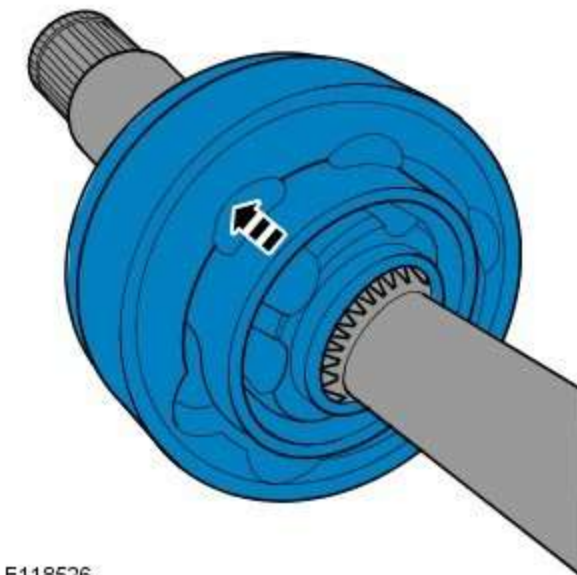
4.  **CAUTION:** Make sure the inner constant velocity (CV) joint is not separated from the halfshaft.

Remove and discard the inner CV joint boot retaining clip.

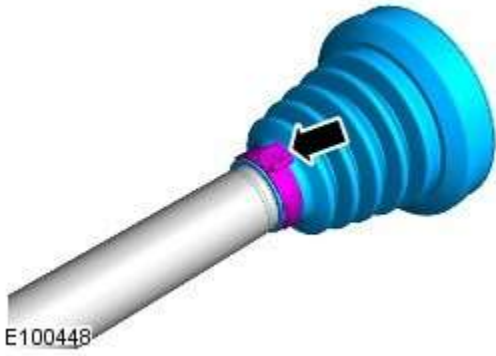


5.  **CAUTION:** Make sure the CV joint ball bearings do not drop out of the CV joint.


Using a suitable tool, remove the inner CV joint.



6. Remove the inner CV joint boot.
 - Remove and discard the retaining clip.

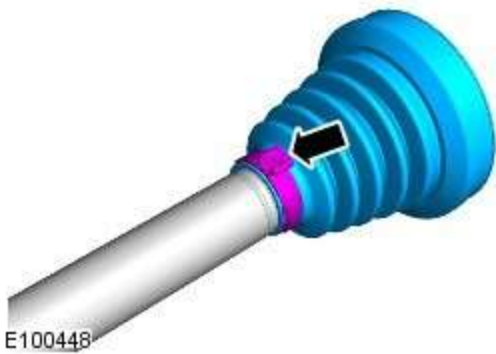


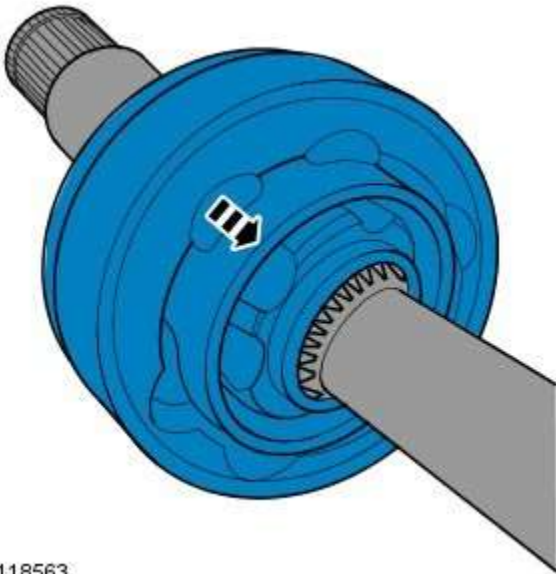
Installation

1.  NOTE: Make sure that the protective sleeve is correctly installed, prior to installing the CV joint boot.



2.  NOTE: Install a new retaining clip.






E118563

3. CAUTIONS:

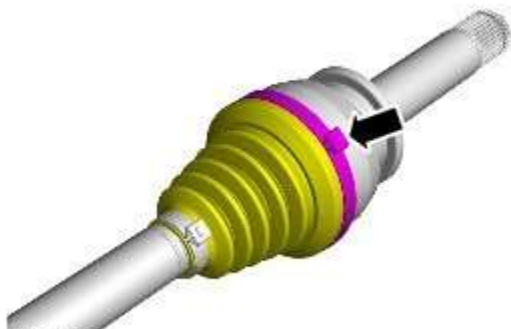
 Only use lubricants meeting the Jaguar specification.

 Make sure the CV joint ball bearings do not drop out of the CV joint.

 NOTE: Clean the constant velocity (CV) joint, removing as much of the old grease as possible.

Install the inner CV joint.

- Fill the CV joint with 40 grams of grease.
- Fill the CV joint boot with 100 grams of grease.



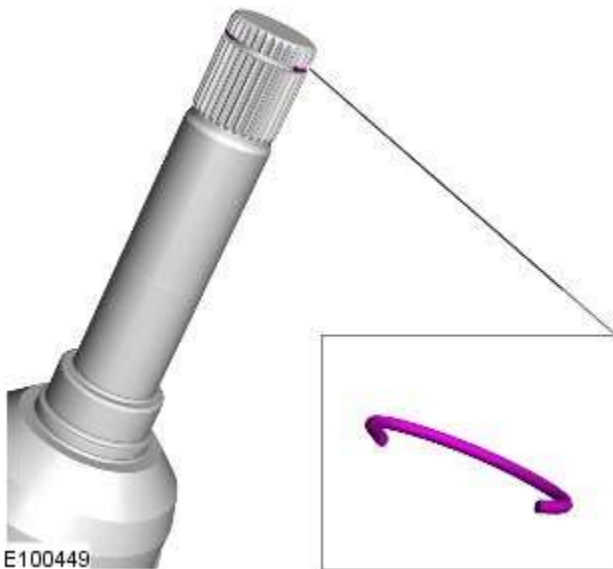
E100446

4. CAUTIONS:

 Make sure the CV joint is not separated from the halfshaft.

 Make sure enough air is present in the CV boot.

Install a new retaining clip.



E100449

5. Install a new retaining clip.

6. Remove the rear halfshaft from the clamp.


7. Install the rear halfshaft.

For additional information, refer to: [Rear Halfshaft - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-05 Rear Drive Halfshafts, Removal and Installation).

Rear Drive Halfshafts - Outer Constant Velocity (CV) Joint Boot

Removal and Installation

Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2.

3. For additional information, refer to: [Inner Constant Velocity \(CV\) Joint Boot](#) (205-05 Rear Drive Halfshafts, Removal and Installation).

4.



E118528

5.



E118524


6.  **CAUTION:** Make sure the CV joint ball bearings do not drop out of

the CV joint.

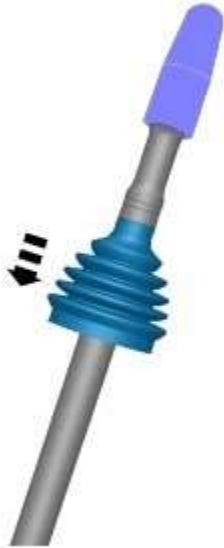
 NOTE: Clean the constant velocity (CV) joint, removing as much of the old grease as possible.

Installation


-  CAUTION: Only use lubricants meeting the Jaguar specification.

 NOTE: Make sure that the protective sleeve is correctly installed, prior to installing the CV joint boot.

- Fill the CV joint with 50 grams of grease.
- Fill the CV joint boot with 85 grams of grease.



E118459

-  CAUTION: Make sure enough air is present in the CV boot.

 NOTE: Install new retaining clips.



E118528

Brake System - General Information -

Lubricants, Fluids, Sealers and Adhesives



CAUTION: Do not use brake fluid ITT Super Dot 4 on 2006my vehicles onwards. Failure to follow this instruction may result in damage to the vehicle.



NOTE: Brake fluid ITT Super Dot 4 has now been superseded by Shell ESL Super Dot 4 which is the Jaguar recommended brake fluid. Shell ESL Super Dot 4 can be used on all model years.

Item	Specification
Brake fluid	Shell ESL Dot 4

Brake Lining and Disc Specifications

Item	Specification
Front brake pad material nominal thickness	13 mm (0.51 in)
Front brake pad material minimum thickness	2 mm (0.08 in)
Rear brake pad material nominal thickness	10.8 mm (0.43 in)
Rear brake pad material minimum thickness	2 mm (0.08 in)
Front brake disc diameter - 3.0L petrol, 3.0L diesel and 4.2L	326 mm (12.8 in)
Front brake disc diameter - 3.0L diesel and 5.0L naturally aspirated	355 mm (14.0 in)
Front brake disc diameter - 5.0L supercharged	380 mm (15.0 in)
New front brake disc nominal thickness - 3.0L petrol 3.0L diesel and 4.2L	30 mm (1.18 in)
New front brake disc nominal thickness - 3.0L diesel and 5.0L naturally aspirated	32 mm (1.26 in)
New front brake disc nominal thickness - 5.0L supercharged	36 mm (1.42 in)
Worn front brake disc minimum thickness - 3.0L petrol and 4.2L	28 mm (1.14 in)
Worn front brake disc minimum thickness - 3.0L diesel and 5.0L naturally aspirated	30 mm (1.18 in)
Worn front brake disc minimum thickness - 5.0L supercharged	34 mm (1.34 in)
Rear brake disc diameter - all vehicles except 5.0L supercharged	326 mm (12.8 in)
Rear brake disc diameter - 5.0L supercharged	376 mm (14.8 in)
New rear brake disc nominal thickness - all vehicles except 5.0L supercharged	20 mm (0.79 in)
New rear brake disc nominal thickness - 5.0L supercharged	26 mm (1.02 in)
Worn rear brake disc minimum thickness - all vehicles except 5.0L supercharged	18 mm (0.72 in)
Worn rear brake disc minimum thickness - 5.0L supercharged	24 mm (0.94 in)
Maximum front brake disc runout (installed)	0.075 mm (0.003 in)
Maximum rear brake disc runout (installed)	0.09 mm (0.004 in)
Maximum front hub face runout (installed)	0.015 mm (0.0006 in)
Maximum rear hub face runout (installed)	0.025 mm (0.0009 in)
Front brake caliper piston diameter - all vehicles except 5.0L supercharged	60 mm (2.36 in)
Front brake sliding caliper double piston diameter - 5.0L supercharged	42 mm (1.66 in)
Rear brake caliper piston diameter	45 mm (1.77 in)
Front brake caliper bleed screw - 3.0L petrol and 4.2L	8 Nm (6 lb-ft)
Front brake caliper bleed screw - 3.0L diesel and 5.0L	14 Nm (10 lb-ft)
Rear brake caliper bleed screw	14 Nm (10 lb-ft)

Brake System - General Information - Brake System

Diagnosis and Testing

Principle of Operation

For a detailed description of the brake system, refer to the relevant Description and Operation sections in the workshop manual. REFER to:

Front Disc Brake (206-03, Description and Operation),
 Front Disc Brake (206-03, Description and Operation),
 Front Disc Brake (206-03, Description and Operation),
 Rear Disc Brake (206-04, Description and Operation),
 Rear Disc Brake (206-04, Description and Operation),
 Rear Disc Brake (206-04, Description and Operation),
[Parking Brake](#) (206-05 Parking Brake and Actuation, Description and Operation),
[Parking Brake](#) (206-05 Parking Brake and Actuation, Description and Operation),
[Parking Brake](#) (206-05 Parking Brake and Actuation, Description and Operation),
[Hydraulic Brake Actuation](#) (206-06 Hydraulic Brake Actuation, Description and Operation),
[Hydraulic Brake Actuation](#) (206-06 Hydraulic Brake Actuation, Description and Operation),
[Hydraulic Brake Actuation](#) (206-06 Hydraulic Brake Actuation, Description and Operation),
[Brake Booster](#) (206-07 Power Brake Actuation, Description and Operation),
[Brake Booster](#) (206-07 Power Brake Actuation, Description and Operation),
 Brake Booster (206-07, Description and Operation).

Inspection and Verification

Visually examine the front and rear wheel and tire assemblies for damage such as uneven wear patterns, tread worn out or sidewall damage. Verify the tires are the same size, type and, where possible, same manufacturer. Replace the damaged wheel or excessively worn tire.

Wheels and tires must be cleared of any foreign matter and tire pressures adjusted to the correct specification.

If the tires exhibit uneven wear or feathering, the cause must be corrected. Check the steering and suspension components for damage or wear and, if necessary, check and adjust front wheel alignment. REFER to: (204-00 Suspension System - General Information)

[Specifications](#) (Specifications),
[Front Toe Adjustment](#) (General Procedures).

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Brake master cylinder • Brake caliper piston(s) • Brake discs • Wheel bearings • Brake pads • Power brake booster • Brake pedal linkage • Brake booster vacuum hose • Tires • Debris 	<ul style="list-style-type: none"> • Parking brake actuator • Parking brake module • Parking brake switch • Damaged or corroded wiring harness • Brake master cylinder fluid level switch

Road Test

Carry out a road test to compare actual vehicle braking performance with the performance standards expected by the driver. The ability of the test driver to make valid comparisons and detect performance deficiencies will depend on experience.

The driver should have a thorough knowledge of brake system operation and accepted general performance guidelines to make good comparisons and detect performance concerns.

An experienced brake technician will always establish a route that will be used for all brake diagnosis road tests. The roads selected will be reasonably smooth and level. Gravel or bumpy roads are not suitable because the surface does not allow the tires to grip the road equally. Crowned roads should be avoided because of the large amount of weight shifted to the low set of wheels on this type of road. Once the route is established and consistently used, the road surface variable can be eliminated from the test results.

Before a road test, obtain a complete description of the customer concerns or suspected condition. From the description, the technician's experience will allow the technician to match possible causes with symptoms. Certain components will be tagged as possible suspects while others will be eliminated by the evidence. More importantly, the customer description can reveal unsafe conditions which should be checked or corrected before the road test. The description will also help form the basic approach to the road test by narrowing the concern to specific components, vehicle speed or conditions.

Begin the road test with a general brake performance check. Keeping the description of the concern in mind, test the brakes at different vehicle speeds using both light and heavy pedal pressure. To determine if the concern is in the front or rear braking system, use the brake pedal and then use the parking brake control. If the condition (pull, vibration, pulsation) occurs only with the parking brake, the concern is in the rear brake system.

If the concern becomes evident during this check, verify it fits the description given before the road test. If the concern is not evident, attempt to duplicate the condition using the information from the description.

If a concern exists, use the Symptom Chart in order to isolate it to a specific sub-system and condition description. From this description, a list of possible sources can be used to further narrow the cause to a specific component or condition.

Symptom Chart

Symptom	Possible Cause	Action
Brakes noisy	<ul style="list-style-type: none"> • Brake pads • Brake discs 	GO to Pinpoint Test A.
Vibration when brakes are applied	<ul style="list-style-type: none"> • Wheels/tires out of balance • Wheel hub nuts loose • Brake caliper mounting bolts loose • Brake pads • Foreign material/scratches/corrosion on brake disc contact surfaces • Excessive brake disc thickness variation • Excessive brake disc runout • Wheel bearing wear or failure • Suspension bushing wear or failure • Steering bushing wear or failure 	GO to Pinpoint Test B.
The brakes pull or drift	<ul style="list-style-type: none"> • Tire pressures/wear • Brake calipers • Brake pads • Brake discs • Wheel alignment adjustment • Wheel bearing • Suspension bushings and ball joints 	GO to Pinpoint Test C.
The pedal feels spongy	<ul style="list-style-type: none"> • Air in brake hydraulic system • Leak in hydraulic system • Brake booster/master cylinder • Brake pads 	GO to Pinpoint Test D.
The pedal goes down fast	<ul style="list-style-type: none"> • Air in brake hydraulic system • Leak in hydraulic system • Brake booster/master cylinder • Brake pads 	GO to Pinpoint Test E.
The pedal goes down slowly	<ul style="list-style-type: none"> • Air in brake hydraulic system • Brake booster/master cylinder 	GO to Pinpoint Test F.
Excessive brake pedal effort required	<ul style="list-style-type: none"> • Brake pads • Brake booster 	GO to Pinpoint Test G.
Brake lockup during light brake pedal force	<ul style="list-style-type: none"> • Brake pads • Brake calipers 	GO to Pinpoint Test H.
Brakes drag	<ul style="list-style-type: none"> • Parking brake control applied/malfunction • Seized parking brake cables • Seized brake caliper slide pins • Seized brake caliper • Brake booster • Pedal gear 	GO to Pinpoint Test I.
Excessive/Erratic brake pedal travel	<ul style="list-style-type: none"> • Hydraulic system • Brake pads Brake discs • Hub and bearing assembly 	GO to Pinpoint Test J.
The red brake warning indicator is always on	<ul style="list-style-type: none"> • Fluid level • Brake master cylinder fluid level sensor • Parking brake control 	Fill the system to specification. Check for leaks. Install a new brake master cylinder fluid reservoir as required. REFER to: Brake Fluid Reservoir (206-06 Hydraulic Brake Actuation, Removal and Installation).

Symptom	Possible Cause	Action
	<ul style="list-style-type: none"> Electrical circuit 	For parking brake control and circuit tests. REFER to: Parking Brake (206-05, Diagnosis and Testing).
Slow or incomplete brake pedal return	<ul style="list-style-type: none"> Brake pedal binding Brake booster/master cylinder 	GO to Pinpoint Test K .

Pinpoint Tests

PINPOINT TEST A : BRAKES NOISY	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: INSPECT BRAKE PADS	
	<p>1 Inspect the condition of the front and rear brake pads. Check for damage to any anti-squeal shims.</p> <p>Are the brake pads OK?</p> <p>Yes GO to A2.</p> <p>No Clean/install new front and rear brake pads as required. REFER to: Brake Pads - Vehicles With: Standard Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads - Vehicles With: High Performance Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads (206-04A Rear Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads - Vehicles With: High Performance Brakes (206-04, Removal and Installation). Re-test vehicle for brake noise.</p>
A2: INSPECT BRAKE DISCS	
	<p>1 Inspect the brake discs for excessive corrosion, wear or disc thickness variation.</p> <p>Does excessive corrosion, wear or disc thickness variation exist?</p> <p>Yes Install new front and rear brake discs and brake pads as required. REFER to: Brake Pads - Vehicles With: Standard Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads - Vehicles With: High Performance Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads (206-04A Rear Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads - Vehicles With: High Performance Brakes (206-04, Removal and Installation), Brake Disc - Vehicles With: Standard Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Disc - Vehicles With: High Performance Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Disc (206-04A Rear Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Disc - Vehicles With: High Performance Brakes (206-04, Removal and Installation). Re-test vehicle for brake noise.</p> <p>No No action required, vehicle is OK.</p>

PINPOINT TEST B : VIBRATION WHEN BRAKES ARE APPLIED	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: ROAD TEST VEHICLE	
	<p>1 Road test the vehicle between 40-80 km/h (25-50 mph) without applying brakes.</p> <p>Is the vibration present?</p> <p>Yes For noise vibration and harshness tests. REFER to: Noise, Vibration and Harshness (NVH) (100-04 Noise, Vibration and Harshness, Diagnosis and Testing).</p> <p>No GO to B2.</p>
B2: CHECK FOR BRAKE VIBRATION	
	<p>1 Road test the vehicle between 40-80 km/h (25-50 mph) with light and medium application on the brake pedal.</p> <p>Is a vibration present?</p> <p>Yes Check the brake caliper mounting bolts and wheel hub nuts and tighten to specification as required. Check the balance of all road wheels and tires and repair as required. Check the brake discs for excessive wear, runout, thickness variation or cracks. Install new brake discs and brake pads as required. GO to B3.</p> <p>No No action required, vehicle is OK.</p>
B3: IS VIBRATION STILL PRESENT UNDER BRAKE APPLICATION?	
	<p>1 Road test the vehicle between 40-80 km/h (25-50 mph) with light and medium application on the brake pedal.</p>

	<p>Is a vibration present?</p> <p>Yes</p> <p>Check for wear or failure of steering gear bushings. Check for wear or failure of steering gear ball joints. Check for wear or failure of front wheel bearings, suspension bushings and ball joints. Check for wear or failure of rear wheel bearings, suspension bushings and ball joints. Refer to relevant section in workshop manual and install new components as required.</p> <p>No</p> <p>No action required, vehicle is OK.</p>
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PINPOINT TEST C : THE BRAKES PULL OR DRIFT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: ROAD TEST VEHICLE	
	<p>1 Road test the vehicle and apply the brake pedal.</p> <p>Does the vehicle pull or drift?</p> <p>Yes</p> <p>GO to C2.</p> <p>No</p> <p>No action required, vehicle is OK.</p>
C2: INSPECT TIRE CONDITION/PRESSURE	
	<p>1 Check for excessive tire wear or incorrect pressures.</p> <p>Are the tires at the correct pressure and in good condition?</p> <p>Yes</p> <p>GO to C3.</p> <p>No</p> <p>Adjust the tire pressures or install new tires if excessively worn. Re-test the system for normal operation.</p>
C3: CHECK CALIPERS	
	<p>1 Check the disc brake caliper pistons and pins for binding, leaking or sticking.</p> <p>Do the disc brake caliper pistons and pins bind, leak or stick?</p> <p>Yes</p> <p>Rectify sticking pins and install new brake calipers as required. REFER to: Brake Caliper - Vehicles With: Standard Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Caliper - Vehicles With: High Performance Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Caliper (206-04A Rear Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Caliper - Vehicles With: High Performance Brakes (206-04, Removal and Installation). Re-test the system for normal operation.</p> <p>No</p> <p>GO to C4.</p>
C4: INSPECT BRAKE DISCS	
	<p>1 Check the brake discs for excessive damage, thickness variation or runout. REFER to: Brake Disc Runout Check (206-00 Brake System - General Information, General Procedures).</p> <p>Does excessive damage or runout exist?</p> <p>Yes</p> <p>Install new brake discs and brake pads as required. Re-test the system for normal operation.</p> <p>No</p> <p>GO to C5.</p>
C5: INSPECT THE FRONT HUB AND WHEEL BEARING ASSEMBLY	
	<p>1 Check the front hub and wheel bearing assembly.</p> <p>Are the wheel bearings OK?</p> <p>Yes</p> <p>GO to C6.</p> <p>No</p> <p>Install new wheel bearings as required. REFER to: Front Wheel Bearing and Wheel Hub - V6 3.0L Petrol (204-01 Front Suspension, Removal and Installation). Re-test the system for normal operation.</p>
C6: CHECK SUSPENSION BUSHINGS AND BALL JOINTS.	
	<p>1 Check all suspension bushings and ball joints.</p> <p>Are the suspension bushings and ball joints OK?</p> <p>Yes</p> <p>GO to C7.</p> <p>No</p> <p>Install new front suspension bushings and ball joints as required. Install new rear suspension bushings and ball joints as required. Refer to the relevant section in the workshop manual.</p>
C7: CHECK VEHICLE ALIGNMENT	
	<p>1 Check the vehicle alignment. REFER to: Front Subframe - 2.7L Diesel (502-00, Removal and Installation), Front Subframe - V6 3.0L Petrol (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation), Front Subframe - 4.2L (502-00, Removal and Installation).</p>

	<p>Is the alignment within specification?</p> <p>Yes No action is required, vehicle is OK.</p> <p>No Adjust the alignment as required. REFER to: Front Subframe - 2.7L Diesel (502-00, Removal and Installation), Front Subframe - V6 3.0L Petrol (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation), Front Subframe - 4.2L (502-00, Removal and Installation).</p>
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PINPOINT TEST D : THE PEDAL FEELS SPONGY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CHECK FOR SPONGY PEDAL (ENGINE OFF)	
	1 Check for a firm brake pedal.
	Is the brake pedal effort and brake pedal travel normal?
	Yes No action is required, vehicle is OK.
	No GO to D2.
D2: CHECK BRAKE PEDAL RESERVE (ENGINE OFF)	
	1 Pump the brake pedal 10 times and hold on the final application.
	Does the brake pedal feel firm on final application?
	Yes GO to D3.
	No Bleed the brake system. REFER to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures).
D3: CHECK BRAKE PEDAL RESERVE (ENGINE ON)	
	1 With engine running at idle speed.
	2 Apply the brake pedal lightly three or four times.
	3 Wait 15 seconds for the vacuum to recover.
	4 Push down on the brake pedal until it stops moving downward or an increased resistance to the brake pedal travel occurs.
	5 Hold the brake pedal in the applied position while increasing the engine speed to 2000 revs/min.
	6 Release the accelerator pedal.
	Does the brake pedal move downward as the engine speed returns to idle?
	Yes GO to D4.
	No Check the vacuum to brake booster.
D4: CHECK BRAKE FLUID LEVEL	
	1 Check the brake master cylinder reservoir fluid level.
	Is the fluid level OK?
	Yes Bleed the brake system. REFER to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures). Re-test the system for normal operation.
	No Check for leaking brake system and rectify as required. Add fluid and bleed the brake system. REFER to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures). Re-test the system for normal operation.

PINPOINT TEST E : THE PEDAL GOES DOWN FAST

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: ROAD TEST VEHICLE	
	1 Road test the vehicle and apply the brake pedal.
	Is the brake pedal effort and brake pedal travel normal?
	Yes No action required, vehicle is OK.
	No GO to E2.
E2: CHECK BRAKE PEDAL TRAVEL-PRESSURIZE SYSTEM	
	1 Pump the brake pedal rapidly (five times).
	Does the brake pedal travel build up and then hold?
	Yes Bleed the brake system. REFER to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures). Re-test the system for normal operation.
	No GO to E3.
E3: CHECK FOR BRAKE SYSTEM LEAKS	

	<p>1 Check for external brake system leaks. For additional information, refer to brake master cylinder component test in this section.</p>
	<p>Is there a leak present?</p> <p>Yes Repair as necessary, add fluid and bleed brake system. REFER to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures). Re-test the system for normal operation.</p> <p>No No action required, system is OK.</p>

PINPOINT TEST F : THE PEDAL GOES DOWN SLOWLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: ROAD TEST VEHICLE - CHECK BRAKE PEDAL OPERATION	
	<p>1 Check if the condition occurs during actual stopping application by applying the brake pedal while the vehicle is moving.</p>
	<p>Does the condition occur when the vehicle is moving?</p> <p>Yes GO to F2.</p> <p>No GO to F3.</p>
F2: CHECK FOR BRAKE SYSTEM LEAKS	
	<p>1 Check for external brake system leaks. For additional information, refer to brake master cylinder component test in this section.</p>
	<p>Are there any external brake system leaks?</p> <p>Yes Rectify as necessary. Add fluid and bleed the brake system. REFER to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures). Re-test the system for normal operation.</p> <p>No GO to F3.</p>
F3: CARRY OUT A BRAKE MASTER CYLINDER BYPASS TEST	
	<p>1 Test for brake master cylinder bypass condition. Refer to Brake master cylinder component test in this section.</p>
	<p>Has a concern been identified?</p> <p>Yes Install a new brake master cylinder, add fluid and bleed the brake system. REFER to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures). Re-test the system for normal operation.</p> <p>No No action required, system is OK.</p>

PINPOINT TEST G : EXCESSIVE BRAKE PEDAL EFFORT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: CHECK BRAKE PADS	
	<p>1 Check the brake pads for wear, contamination, correct installation, damage and type.</p>
	<p>Has a concern been identified?</p> <p>Yes Correctly install or install new brake pads as required. REFER to: Brake Pads - Vehicles With: Standard Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads - Vehicles With: High Performance Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads (206-04A Rear Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads - Vehicles With: High Performance Brakes (206-04, Removal and Installation). Re-test the system for normal operation.</p> <p>No GO to G2.</p>
G2: CHECK VACUUM	
	1 Disconnect the vacuum hose from the brake booster.
	2 Connect a vacuum/pressure tester to the vacuum hose.
	3 Run the engine at normal operating temperature.
	4 Record the vacuum reading.
	<p>Is the reading 40.5 kPa (12 in-Hg) or greater?</p> <p>Yes GO to G3.</p> <p>No Locate and rectify the source of low vacuum. Re-test the system for normal operation.</p>
G3: INSPECT SYSTEM	
	1 Switch the engine off.
	2 Reconnect the vacuum hose.

	3 Inspect the brake booster, rubber grommet, and all vacuum plumbing for cracks, holes, damaged connections, or missing clamps.
	4 Pump the brake pedal several times to exhaust the vacuum. Push down on the brake pedal and hold.
	Does the brake pedal move down when the engine is started? Yes Vacuum system is OK. No GO to G4.
G4: CHECK POWER BRAKE BOOSTER VALVE	
	1 Check the brake booster valve. For additional information, refer to Brake Booster component test in this section.
	Is the power brake booster valve OK? Yes Check the brake booster. For additional information, refer to Brake Booster component test in this section. Install a new brake booster as required. REFER to: Brake Booster (206-07 Power Brake Actuation, Removal and Installation), Brake Booster - RHD (206-07, Removal and Installation). Re-test the system for normal operation. No Install a new brake booster valve. Re-test the system for normal operation.

PINPOINT TEST H : BRAKE LOCKUP DURING LIGHT BRAKE PEDAL FORCE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: TEST BRAKE LOCKUP	
	1 Road test the vehicle and apply the brake pedal lightly.
	Do the brakes lockup? Yes GO to H2. No No action required, vehicle is OK.
H2: INSPECT BRAKE PADS	
	1 Inspect brake pads for contamination, correct installation, damage and type.
	Has a concern been identified? Yes Correctly install or install new brake pads as required. REFER to: Brake Pads - Vehicles With: Standard Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads - Vehicles With: High Performance Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads (206-04A Rear Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Pads - Vehicles With: High Performance Brakes (206-04, Removal and Installation). Re-test the system for normal operation. No GO to H3.
H3: INSPECT BRAKE CALIPERS	
	1 Inspect brake calipers for binding, leaking or sticking.
	Has a concern been identified? Yes Correctly install or install new brake calipers as required. REFER to: Brake Caliper - Vehicles With: Standard Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Caliper - Vehicles With: High Performance Brakes (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Caliper (206-04A Rear Disc Brake - V6 3.0L Petrol, Removal and Installation), Brake Caliper - Vehicles With: High Performance Brakes (206-04, Removal and Installation). Re-test the system for normal operation. No No action required, vehicle is OK.

PINPOINT TEST I : BRAKES DRAG

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I1: ROAD TEST VEHICLE	
	1 Road test the vehicle and apply the brakes.
	Are the brakes functioning correctly? Yes No action required, vehicle is OK. No GO to I2.
I2: CHECK BRAKE CALIPERS	
	1 Check the front and rear calipers pistons and pins for binding, leaking or sticking.

	<p>Do the disc brake caliper pistons and pins bind, leak or stick?</p> <p>Yes Inspect the brake calipers and parking brake cables. Install new components as required. Re-test the system for normal operation.</p> <p>No GO to I3.</p>
I3: CHECK BRAKE BOOSTER	
	1 Check the brake booster connecting rod alignment and travel.
	<p>Is the connecting rod OK?</p> <p>Yes Vehicle is OK.</p> <p>No Install a new brake booster as required. REFER to: Brake Booster (206-07 Power Brake Actuation, Removal and Installation), Brake Booster - RHD (206-07, Removal and Installation). Re-test the system for normal operation.</p>

PINPOINT TEST J : EXCESSIVE/ERRATIC BRAKE PEDAL TRAVEL

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J1: TEST ON ROUGH ROAD	
	1 Road test the vehicle on rough road conditions.
	2 Apply the brakes slowly.
	<p>Is the brake pedal effort and brake pedal travel normal?</p> <p>Yes No action required, vehicle is OK.</p> <p>No GO to J2.</p>
J2: CHECK BRAKE FLUID LEVEL	
	1 Check the brake master cylinder reservoir fluid level.
	<p>Is the fluid level OK?</p> <p>Yes GO to J3.</p> <p>No Check brake master cylinder reservoir sealing points. For additional information, refer to Brake master cylinder component test in this section. Add brake fluid and bleed the brake system. REFER to: Brake System Bleeding (206-00 Brake System - General Information, General Procedures). Re-test the system for normal operation.</p>
J3: CHECK BRAKE PEDAL RESERVE	
	1 Run engine at idle speed.
	2 Apply the brake pedal lightly three or four times.
	3 Wait 15 seconds for the vacuum to replenish.
	4 Push down on the brake pedal until it stops moving downward or an increased resistance to the brake pedal travel occurs.
	5 Hold the brake pedal in the applied position while increasing the engine speed to 2000 revs/min.
	6 Release the accelerator pedal.
	<p>Does the brake pedal move downward as the engine speed returns to idle?</p> <p>Yes GO to J4.</p> <p>No Check the vacuum to the brake booster.</p>
J4: CHECK THE FRONT WHEEL BEARING ASSEMBLY	
	1 Check the front wheel bearing assembly.
	<p>Are the front wheel bearings loose/damaged?</p> <p>Yes Tighten to specification or install a new front wheel bearing as required. REFER to: Front Wheel Bearing and Wheel Hub - V6 3.0L Petrol (204-01 Front Suspension, Removal and Installation). Re-test the system for normal operation.</p> <p>No Check the front brake discs for thickness variances.</p>

PINPOINT TEST K : SLOW OR INCOMPLETE BRAKE PEDAL RETURN

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
K1: CHECK FOR BRAKE PEDAL RETURN	
	1 Run the engine at idle while making several brake applications.
	2 Pull the brake pedal rearward with approximately 44.5 N (10lb) force.
	3 Release the brake pedal and measure the distance to the toe board.
	4 Make a hard brake application.
	5 Release the brake pedal and measure the brake pedal to toe board distance. The brake pedal should return to its original position.

	Does the brake pedal return to its original position? Yes No action required, vehicle is OK. No GO to K2.
K2: CHECK FOR BRAKE PEDAL BINDING	
1	Disconnect the brake booster from the brake pedal. Check the brake pedal to ensure free operation.
	Is the brake pedal operating freely? Yes Install a new brake booster as required. REFER to: Brake Booster (206-07 Power Brake Actuation, Removal and Installation), Brake Booster - RHD (206-07, Removal and Installation). Re-test the system for normal operation. No Repair or install new brake pedal. Re-test the system for normal operation.

Component Tests

Brake Booster

1. Check all hoses and connections. All unused vacuum connectors should be capped. Hoses and their connections should be correctly secured and in good condition with no holes and no collapsed areas. Inspect the valve on the brake booster for damage.
2. Check the hydraulic brake system for leaks or low fluid.
3. With the automatic transmission in PARK, stop the engine and apply the parking brake. Pump the brake pedal several times to exhaust all vacuum in the system. With the engine switched off and all vacuum in the system exhausted, apply the brake pedal and hold it down. Start the engine. If the vacuum system is operating, the brake pedal will tend to move downward under constant foot pressure. If no motion is felt, the vacuum booster system is not functioning.
4. Remove the vacuum hose from the brake booster. Manifold vacuum should be available at the brake booster end of the hose with the engine at idle speed and the automatic transmission in PARK. Make sure that all unused vacuum outlets are correctly capped, hose connectors are correctly secured and vacuum hoses are in good condition. When it is established that manifold vacuum is available to the brake booster, connect the vacuum hose to the brake booster and repeat Step 3. If no downward movement of the brake pedal is felt, install a new brake booster.
5. Operate the engine for a minimum of 10 seconds at a fast idle. Stop the engine and allow the vehicle to stand for 10 minutes. Then, apply the brake pedal with approximately 89 N (20lb) of force. The pedal feel (brake application) should be the same as that noted with the engine running. If the brake pedal feels hard (no power assist), install a new valve and then repeat the test. If the brake pedal still feels hard, install a new brake booster. If the brake pedal movement feels spongy, bleed the brake system.
REFER to: [Brake System Bleeding](#) (206-00 Brake System - General Information, General Procedures).

Brake Master Cylinder

Usually, the first and strongest indicator of anything wrong in the brake system is a feeling through the brake pedal. In diagnosing the condition of the brake master cylinder, check pedal feel as evidence of a brake concern. Check for brake warning lamp illumination and the brake fluid level in the brake master cylinder reservoir.

Normal Conditions

The following conditions are considered normal and are not indications that the brake master cylinder is in need of repair.

- Modern brake systems are designed to produce a pedal effort that is not as hard as in the past. Complaints of light pedal efforts should be compared to the pedal efforts of another vehicle of the same model and year.
- The fluid level will fall with brake pad wear.

Abnormal Conditions

Changes in the brake pedal feel or brake pedal travel are indicators that something could be wrong in the brake system. The diagnostic procedure and techniques use brake pedal feel, warning indicator illumination and low brake fluid level as indicators to diagnosing brake system concerns. The following conditions are considered abnormal and indicate that the brake master cylinder is in need of repair:



NOTE: Prior to carrying out any diagnosis, make sure the brake system warning indicator is functional.

- Brake pedal goes down fast. This could be caused by an external or internal leak.
- Brake pedal goes down slowly. This could be caused by an internal or external leak.
- Brake pedal is low or feels spongy. This condition may be caused by no fluid in the brake master cylinder, reservoir cap vent holes clogged or air in the hydraulic system.
- Brake pedal effort is excessive. This may be caused by a bind or obstruction in the pedal/linkage, a faulty non-return valve, booster or insufficient booster vacuum.
- Rear brakes lock up during light pedal force. This may be caused by damaged brake pads, a partially applied parking brake, a damaged ABS sensor or bearing failure.
- Brake pedal effort erratic. This condition could be caused by the brake booster or incorrectly installed brake pads.
- Brake warning indicator is on. This may be caused by low fluid level or float assembly damaged.

Non Pressure Leaks

Any reduced fluid volume in the brake master cylinder reservoir may be caused by two types of none pressure external leaks.

Type 1: An external leak may occur at the brake master cylinder reservoir cap because of incorrect positioning of the gasket and cap. Reposition cap and gasket.

Type 2: An external leak may occur at the brake master cylinder reservoir mounting seals. Repair such a leak by installing new seals and make sure that the brake master cylinder reservoir retaining bolt is correctly installed.

Brake System - General Information - Brake Disc Runout Check

General Procedures

Check

1. Remove the wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
2. Install all the wheel nuts and tighten equally to 20 Nm (15 lb.ft).
 - Make sure that the brake disc is fully seated against the hub face.
3. Install a dial test indicator gauge and holding fixture to a suitable mounting point.



4. **NOTE:** If the runout is outside specification, check the hub face runout.

Using the dial test indicator, measure the inner and outer faces of the brake disc. For additional information, refer to: (206-00 Brake System - General Information)

[Specifications - 3.0L NA V6 - AJ27](#) (Specifications),
[Specifications - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (Specifications).

1. Position the gauge so that it contacts the disc 10 mm (0.4 in) from the outer edge.
 2. Slowly rotate the hub/disc assembly. Note the reading.
5. If a front hub runout check is required, remove the front brake disc. For additional information, refer to:
 - [Brake Disc - Vehicles With: Standard Brakes](#) (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation),
 - [Brake Disc - Vehicles With: Standard Brakes](#) (206-03B Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation),
 - [Brake Disc - Vehicles With: High Performance Brakes](#) (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation),
 - [Brake Disc - Vehicles With: High Performance Brakes](#) (206-03B Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
 6. If a rear hub runout check is required, remove the rear brake disc. For additional information, refer to:
 - [Brake Disc](#) (206-04A Rear Disc Brake - V6 3.0L Petrol, Removal and Installation),
 - [Brake Disc - Vehicles With: High Performance Brakes](#) (206-04B Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation),
 - [Brake Disc - Vehicles With: Standard Brakes](#) (206-04B Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).



7. **NOTE:** The hub surface should be free from dirt and corrosion. Do not use abrasive cloths to clean hub faces.

Using the dial test indicator, measure the hub face runout.

1. Position the gauge so that it contacts the mounting tube between the stud and the chamfer.
2. Slowly rotate the hub and note the runout. For additional information, refer to the specification chart.
 - If the front hub runout exceeds the specifications, install a new hub, brake disc and recheck. For additional information, refer to: (204-01 Front Suspension)
[Front Wheel Bearing and Wheel Hub - V6 3.0L Petrol](#) (Removal and Installation),

[Front Wheel Bearing and Wheel Hub - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (Removal and Installation).

- If the rear hub runout exceeds the specifications, install a new hub, brake disc and recheck.
For additional information, refer to: [Rear Wheel Bearing](#) (204-02 Rear Suspension, Removal and Installation).

8. If the front hub face is within specification, install a new brake disc. For additional information, refer to:
[Brake Disc - Vehicles With: Standard Brakes](#) (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation),
[Brake Disc - Vehicles With: Standard Brakes](#) (206-03B Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation),
[Brake Disc - Vehicles With: High Performance Brakes](#) (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation),
[Brake Disc - Vehicles With: High Performance Brakes](#) (206-03B Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
If the rear hub face is within specification, install a new disc.

9. Install the wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

Brake System - General Information - Brake System Bleeding

General Procedures

CAUTIONS:



The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.




Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.



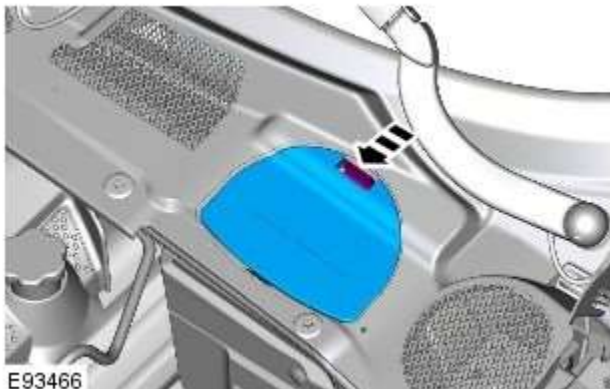
NOTE:

All vehicles

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.


Raise and support the vehicle.

2. Check that the brake fluid lines are secure and that there are no signs of a brake fluid leak. If a brake fluid leak is detected, investigate and rectify the cause of the leak before bleeding the brakes.



3. Remove the brake master cylinder cover.
 - Carefully release the clip.



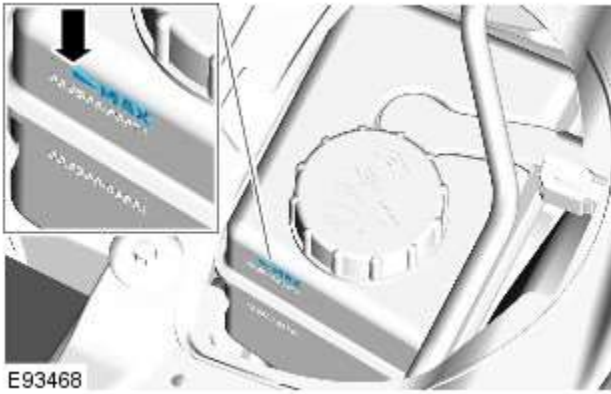
4.  **WARNING:** Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

Remove the brake fluid reservoir cap.

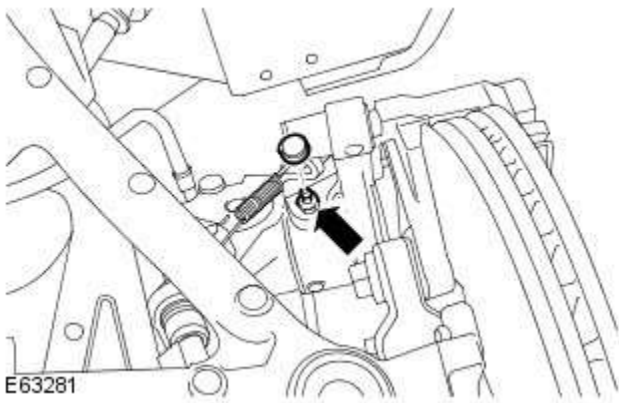
Fill the brake fluid reservoir to the MAX mark.



5.

All vehicles

6. Install the bleed tube to the right hand rear brake caliper bleed screw and immerse the free end of the bleed tube in a bleed jar, containing a small quantity of approved brake fluid.
 - Remove the bleed screw caps.



7. Loosen the bleed screw by one-half to three-quarters of a turn.



8. **CAUTION:** The brake fluid reservoir must remain full with new, clean brake fluid at all times during bleeding.



NOTE: If the bleed tube used, does not have a one way valve the bleed screw will need to be closed before the brake pedal is returned to the rest position. Then opened again and the procedure repeated for each pedal application.

With assistance, depress the brake pedal steadily through its full stroke and allow it to return to the rest position. Repeat the procedure until brake fluid, clean and air-free flows into the bleed jar.



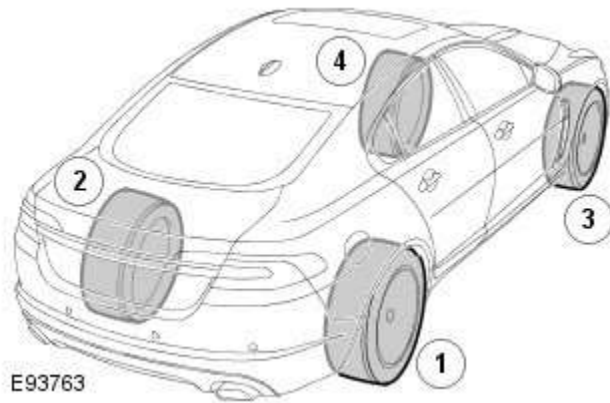
9. **CAUTION:** Make sure the bleed screw cap is installed after bleeding. This will prevent corrosion to the bleed screw.

With the brake pedal fully depressed, tighten the bleed screw.

- Vehicles with standard brakes: Tighten the front caliper bleed screw to 8 Nm.
- Vehicles with high performance brakes: Tighten the front caliper bleed screw to 14 Nm.
- Tighten the rear bleed screw to 14 Nm.

10. Fill the brake fluid reservoir to the MAX mark.

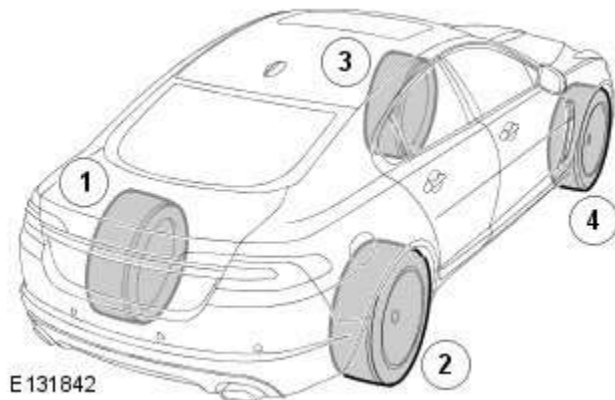
Left-hand drive vehicles



11.  **WARNING:** Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

Repeat the brake bleeding procedure for each brake caliper, following the above sequence.

Right-hand drive vehicles



12.  **WARNING:** Braking efficiency may be seriously impaired if an incorrect bleed sequence is used.

Repeat the brake bleeding procedure for each brake caliper, following the above sequence.

All vehicles

13. Fill the brake fluid reservoir to the MAX mark.
14. Apply the brakes and check for leaks.
15. Install the brake fluid reservoir cap.
16. Install the brake master cylinder cover.
 - Carefully secure the clip.

Brake System - General Information - Front Brake Disc Runout Check - With Wheel On Vehicles With: High Performance Brakes

General Procedures

1. NOTES:



Some variation in the illustrations may occur, but the essential information is always correct.



RH illustration shown, LH similar



All measurements must taken with the wheel installed.



2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise the front of the vehicle.

3. Mount the DTI [Dial Test Indicator \(DTI\) gauge](#) to the bolt as shown with tool 100-053.

4. Make sure the DTI is securely mounted.





5. Position the DTI probe 5 mm from the outer edge of the disc.
 - Zero DTI and rotate road wheel one complete revolution to measure disc runout.



6. Position the DTI probe in the centre of the disc.
 - Zero DTI and rotate road wheel one complete revolution to measure disc runout.



E141873

7. Position the DTI probe 5 mm from the inner edge of the disc.
 - Zero DTI and rotate road wheel one complete revolution to measure disc runout.

8.  **NOTE: The disc runout limit is 0.075 mm.**

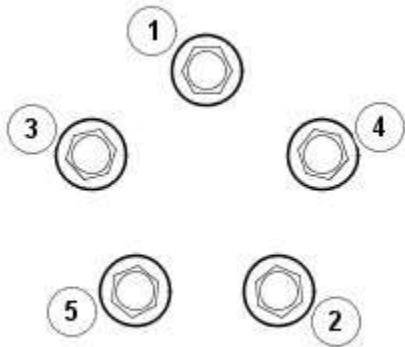
If the disc runout exceeds the limit check the hub drive flange and bearing runout.

For additional information, refer to: [Front Wheel Bearing and Wheel Hub Runout Check - Vehicles With: High Performance Brakes \(204-00 Suspension System - General Information, General Procedures\)](#).

9. If hub runout is within the limit replace the brake disc.

10. Install the wheel.

- Tighten the road wheel nuts in sequence as shown above to the following:
- Stage 1: 4 Nm.
- Stage 2: 60 Nm.
- Stage 3: 125 Nm.



E74593

11. Re-check the disc runout as detailed above.



12. Remove DTI and install the bait. 90 Nm.

Brake System - General Information - Rear Brake Disc Runout Check - With Wheel On

General Procedures

1. NOTES:



Some variation in the illustrations may occur, but the essential information is always correct.



RH illustration shown, LH similar.



All measurements must be taken with the wheel installed.



2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise the rear of the vehicle.

3. Modify tool 100-053 with an M8 bolt and nut as shown.



E141870

4. Mount the DTI [Dial Test Indicator \(DTI\) gauge](#) on the tool as shown.



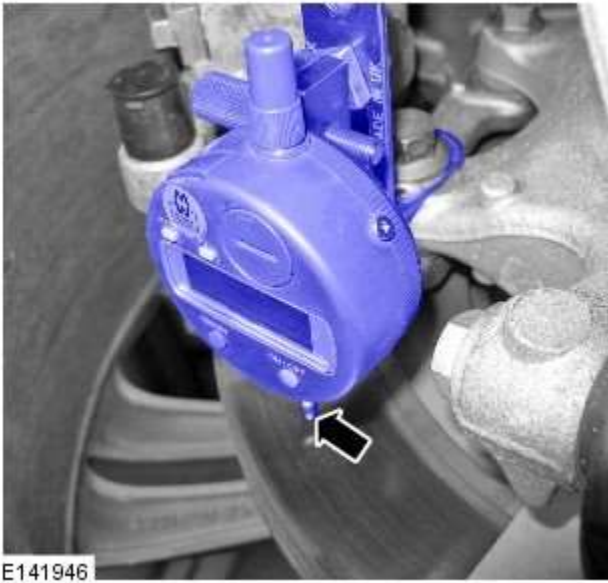
E141869



- Securely mount the DTI on the bottom calliper mounting bolt, a spacer washer maybe required under the tool.



- Position the DTI probe 5 mm from the outer edge of the disc.
 - Zero DTI and rotate road wheel one complete revolution to measure disc runout.



7. Position the DTI probe in the centre of the disc.
 - Zero DTI and rotate road wheel one complete revolution to measure disc runout.



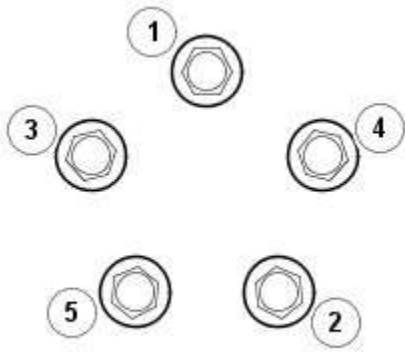
8. Position the DTI probe 5 mm from the inner edge of the disc.
 - Zero DTI and rotate road wheel one complete revolution to measure disc runout.

9.  **NOTE: The disc runout limit is 0.09 mm.**

If the disc runout exceeds the limit check the hub drive flange and bearing runout.

For additional information, refer to: [Rear Wheel Bearing and Wheel Hub Runout Check - Vehicles With: High Performance Brakes \(204-00 Suspension System - General Information, General Procedures\)](#).

10. If hub runout is within the limit replace the brake disc.



E74593

11. Install the wheel.

- Tighten the road wheel nuts in sequence as shown to the following:
- Stage 1: 4 Nm.
- Stage 2: 60 Nm.
- Stage 3: 125 Nm.

12. Re-check the disc runout as detailed above.



E141948

13. Remove DTI and install the bolt. 103 Nm.

Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol -

Description	Nm	lb-ft	lb-in
Brake caliper anchor plate retaining bolts	115	85	-
Brake caliper retaining bolts	58	43	-
Brake hose retaining bolt	42	31	-

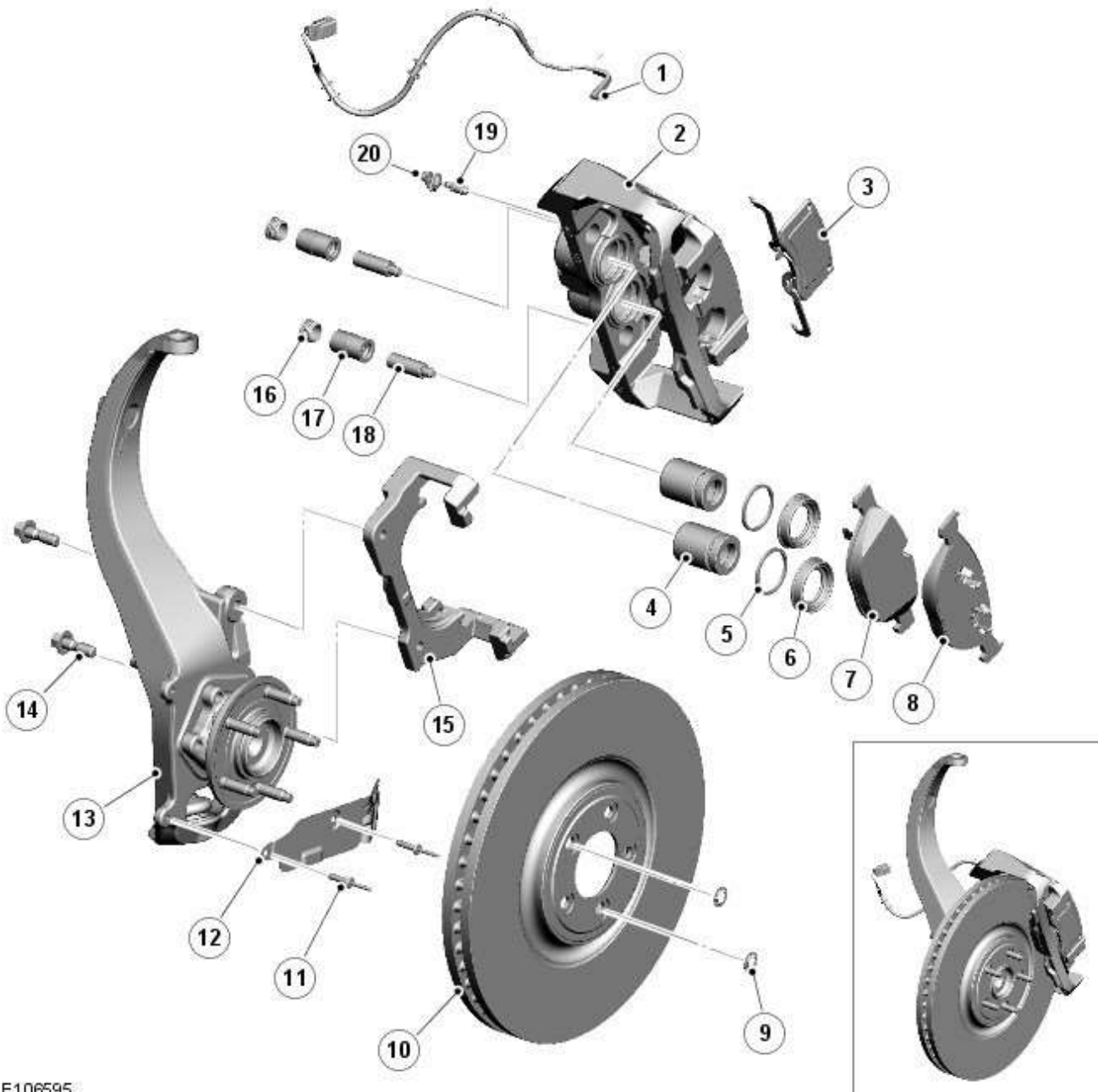
Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Front Disc Brake - Component Location

Description and Operation



NOTE: LH (left-hand) installation shown, RH (right-hand) installation similar.

Performance Brakes - 5.0L Supercharger V8 Vehicles



E106595

Item	Description
1	Brake pad wear sensor
2	Caliper body
3	Anti-rattle spring
4	Piston (2 off)
5	Piston seal (2 off)
6	Piston dust cover (2 off)
7	Inboard brake pad
8	Outboard brake pad
9	Retaining washer (2 off)
10	Brake disc
11	Rivet (2 off)
12	Heat shield
13	Front wheel knuckle/hub and bearing assembly
14	Caliper bolt (2 off)
15	Caliper carrier
16	Guide pin dust cover (2 off)
17	Guide pin bush (2 off)
18	Guide pin (2 off)
19	Bleed screw
20	Bleed screw dust cap

Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Front Disc Brake - Overview

Description and Operation

OVERVIEW

Performance Brakes - 5.0L Supercharger V8 Vehicles

The performance front braking system features ventilated brake discs with dual piston sliding calipers. The discs are 380 mm (14.96 in.) diameter x 36 mm (1.42 in.) thick.

The brake disc is manufactured from cast iron. The disc is retained on the wheel hub by two retaining washers and the wheel nuts.

A brake pads wear sensors is fitted to the [LH](#) front brake.

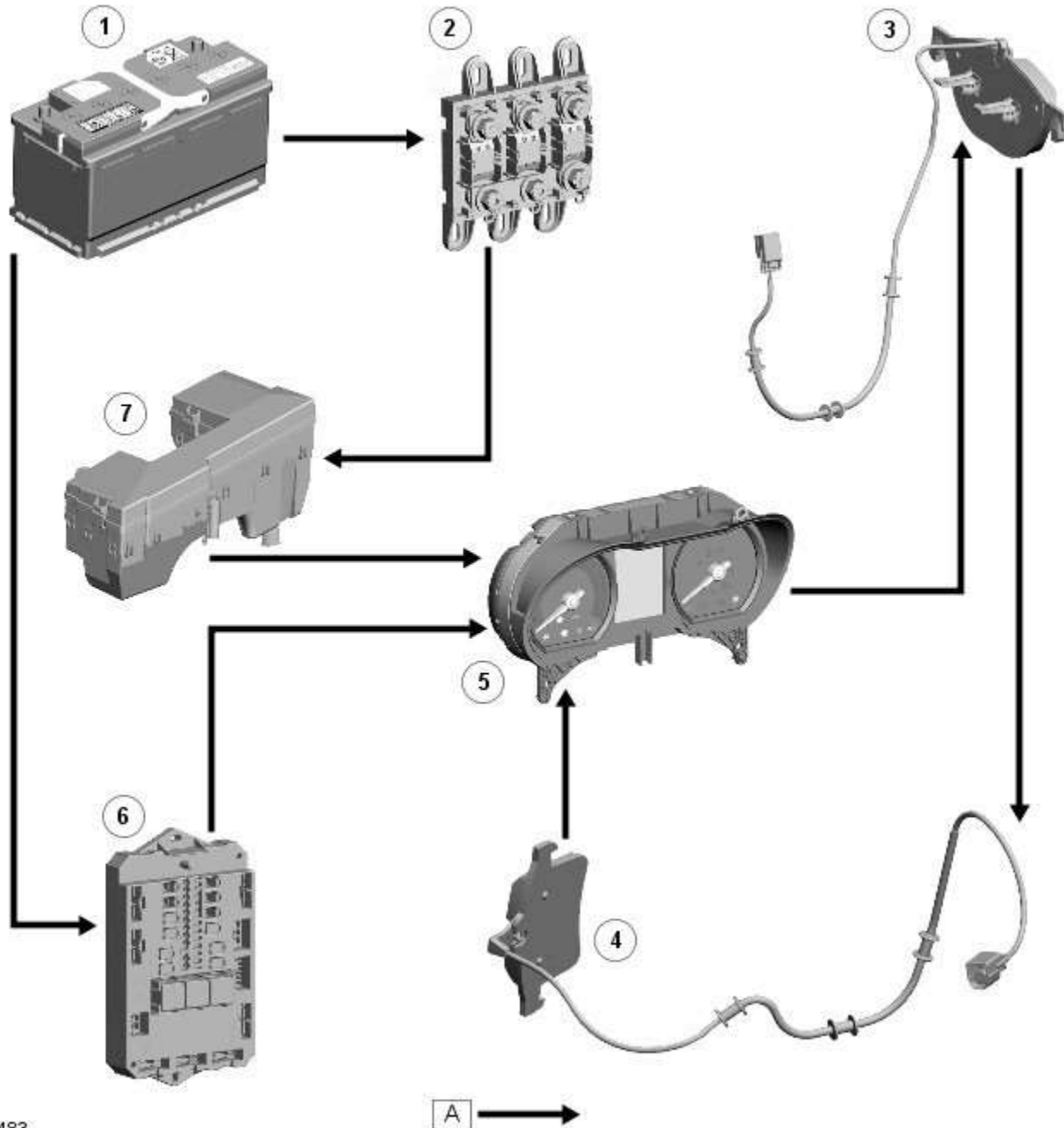
Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Front Disc Brake - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired



E113483

Item	Description
1	Battery
2	Megafuse (250 A)
3	Front brake pad wear sensor
4	Rear brake pad wear sensor
5	Instrument cluster
6	CJB (central junction box)
7	Power distribution box

System Operation

BRAKE CALIPERS

When hydraulic pressure is supplied to the caliper, the pistons extend to force the inner pad against the brake disc. The caliper reacts and slides along two guide pins to bring the outer pad into contact with the brake disc.

BRAKE PAD WEAR SENSORS

When a brake pad incorporating a brake pad wear sensor is approximately 75% worn, the sensor wire within the pad material is worn through and the brake pad wear sensor goes open circuit. When the instrument cluster detects the open circuit, it illuminates the amber [LED \(light emitting diode\)](#) in the brake warning indicator, displays an appropriate warning in the message center and sounds a warning chime.

Refer to: [Instrument Cluster](#) (413-01 Instrument Cluster, Description and Operation).



NOTE: A new pad wear sensor lead must be fitted whenever the brake pads are changed, irrespective of the brake pad warning sensor being triggered.

Component Description

BRAKE CALIPERS

Each caliper is mounted within a fixed carrier that is secured to the front wheel knuckle with two bolts. The inboard brake pad of the [LH \(left-hand\)](#) brake incorporates a wear sensor.

Each outboard brake pad is installed with a pressed steel anti-rattle spring. On [SC \(supercharger\)](#) vehicles, a badge with the 'R' symbol is formed on the anti-rattle spring.

BRAKE PAD WEAR SENSORS

The brake pad wear sensor is wired in series with a wear sensor on the [RH \(right-hand\)](#) rear brake and the instrument cluster. If the thickness of one of the brake pads connected to a wear sensor decreases to a predetermined limit, the instrument cluster illuminates the brake warning indicator.

Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Brake Caliper Vehicles With: High Performance Brakes

Removal and Installation

Removal



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.



NOTE: Removal steps in this procedure may contain installation details.



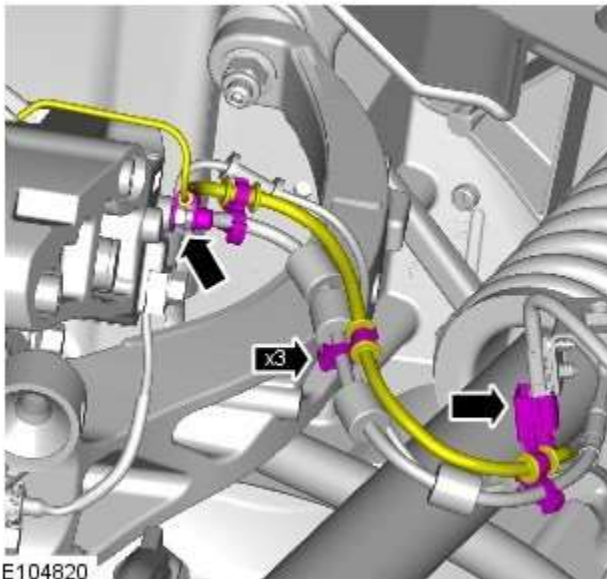
1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

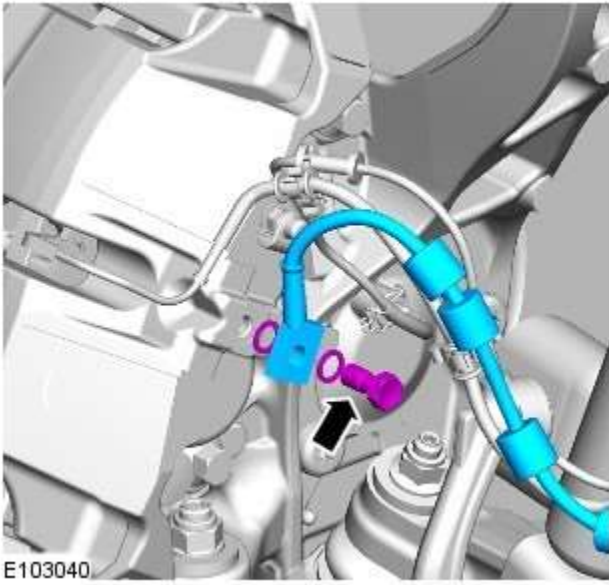
Raise and support the vehicle.

2. Remove the left-hand front wheel and tire.

Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).


3.






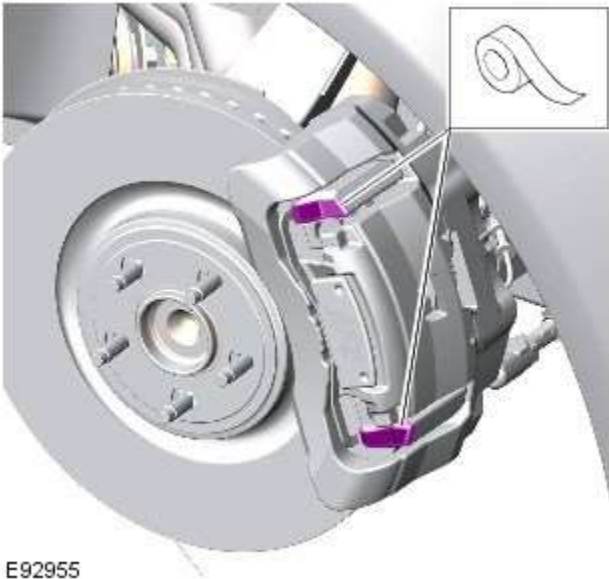
4.  **CAUTION:** Always plug any open connections to prevent contamination.

NOTES:

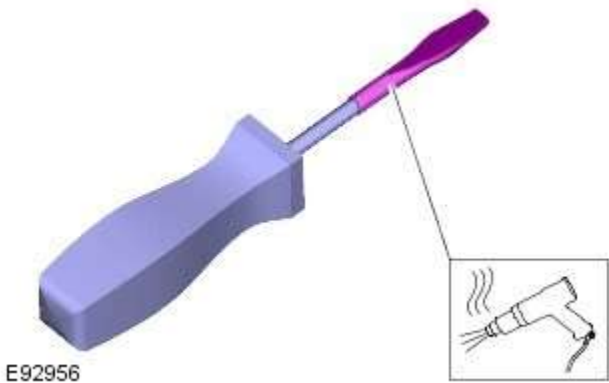
 To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.

 Left-hand shown, right-hand similar.

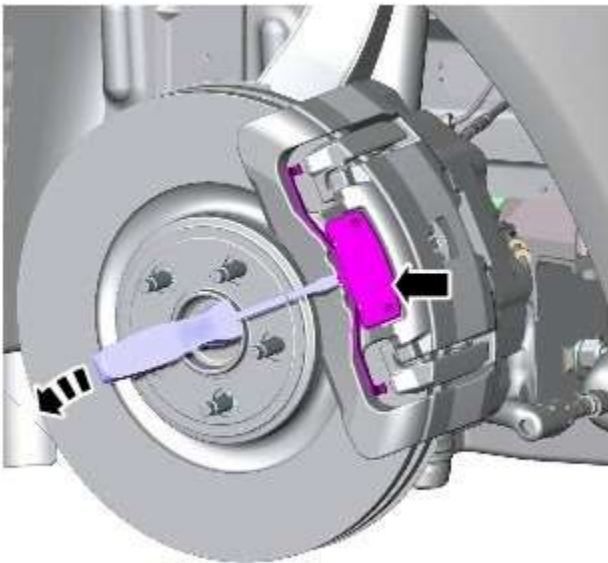
 Remove and discard the two sealing washers.




5.  **NOTE:** Left-hand shown, right-hand similar.



- 6.

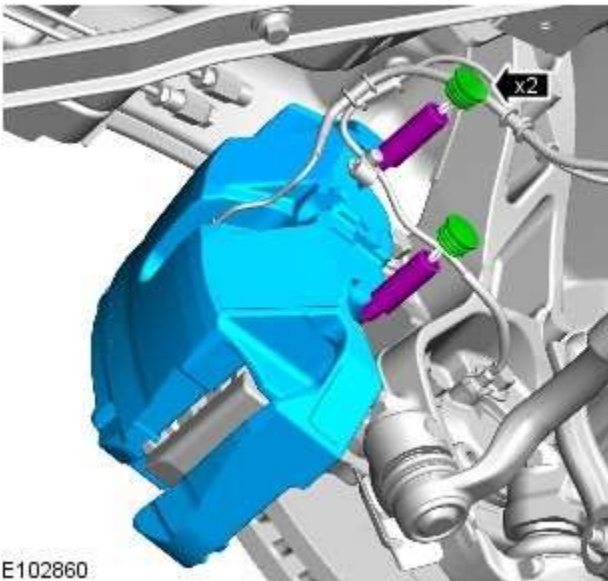


E92957


7.  **CAUTION:** Removal of the clips is a delicate procedure, damage will occur if any force is used.

 **NOTE:** Left-hand shown, right-hand similar.

- Lever the anti-rattle spring in the center of the spring until either side is released.

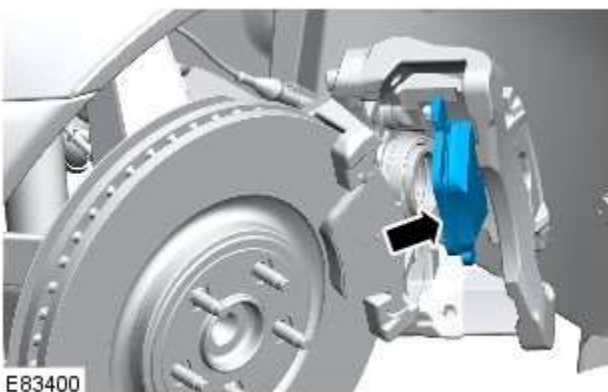


E102860

8.  **WARNING:** If the brake caliper piston seal is damaged a new brake caliper must be installed.

 **CAUTION:** Do not allow the brake caliper to hang on the brake hose.

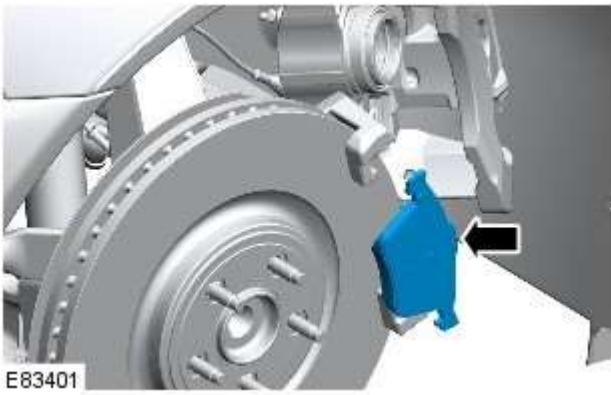
 **NOTE:** Left-hand shown, right-hand similar.



E83400


9.  **NOTE:** Left-hand shown, right-hand similar.


- Release the clip.



10.  NOTE: Left-hand shown, right-hand similar.

Installation

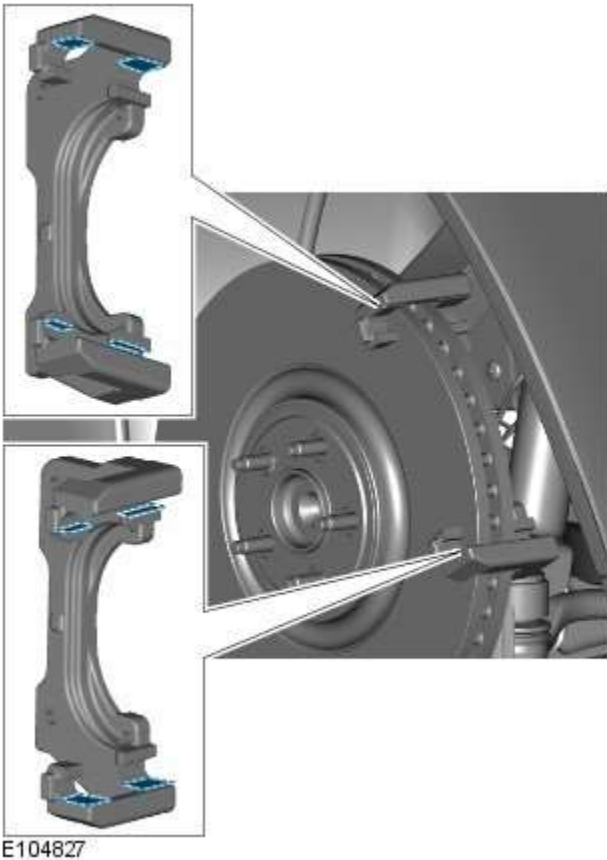
1.  WARNING: Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

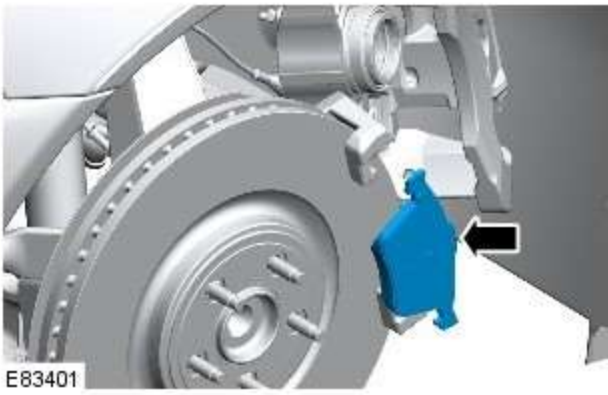
 CAUTION: As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir to overflow.

Press the piston into the caliper housing.

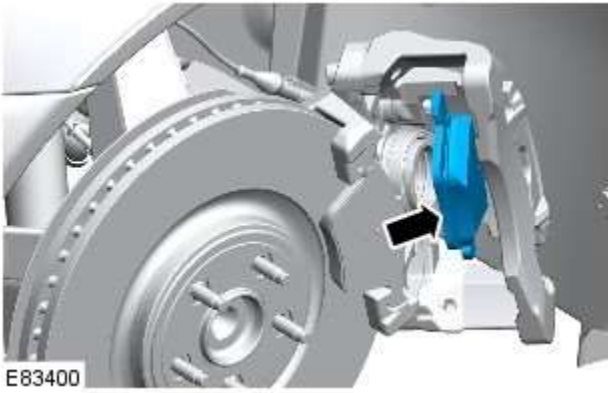
2.

- Apply grease C2C-39930 to the areas indicated.

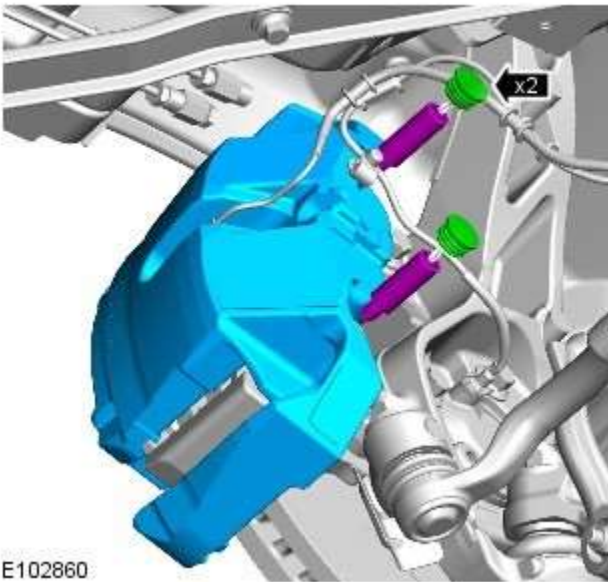





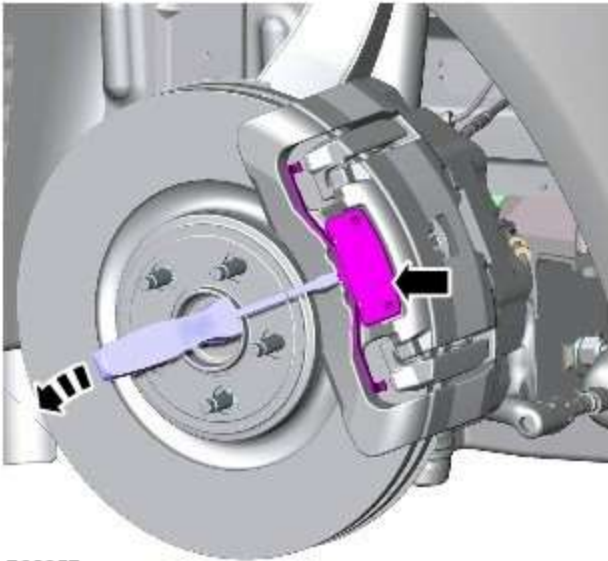
3.  NOTE: Left-hand shown, right-hand similar.



4.  NOTE: Left-hand shown, right-hand similar.



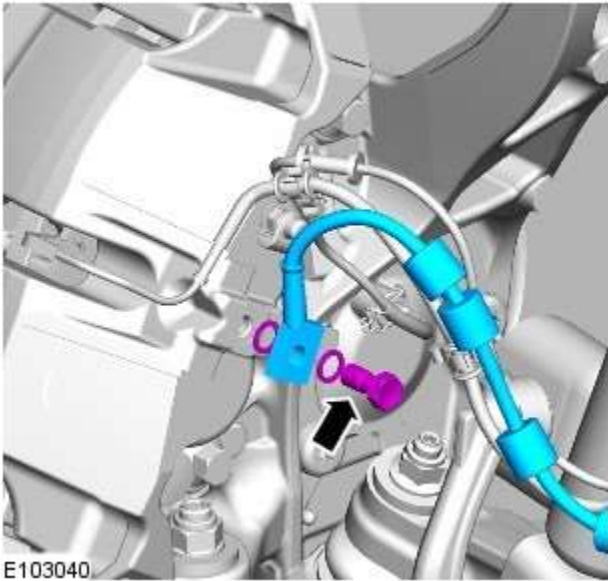
5.  NOTE: Left-hand shown, right-hand similar.
• Torque: 58 Nm



E92957

6.  NOTE: Left-hand shown, right-hand similar.

- Secure the bottom arm of the anti-rattle spring under the bottom anchor bracket of the caliper.
- Compress the upper spring arm into the correct position, under the upper anchor bracket, whilst retaining the logo plate.
- Using the screw-driver, tap the central locating tag into the locked position.




E103040


7. CAUTIONS:

 Always plug any open connections to prevent contamination.

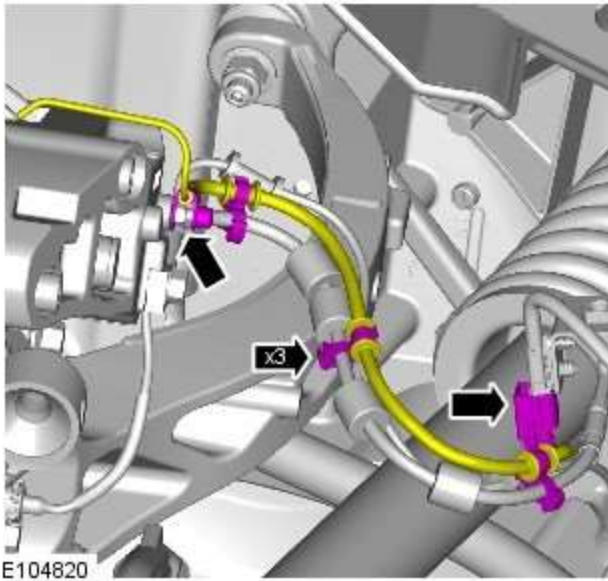
 Make sure new sealing washers are installed.

NOTES:

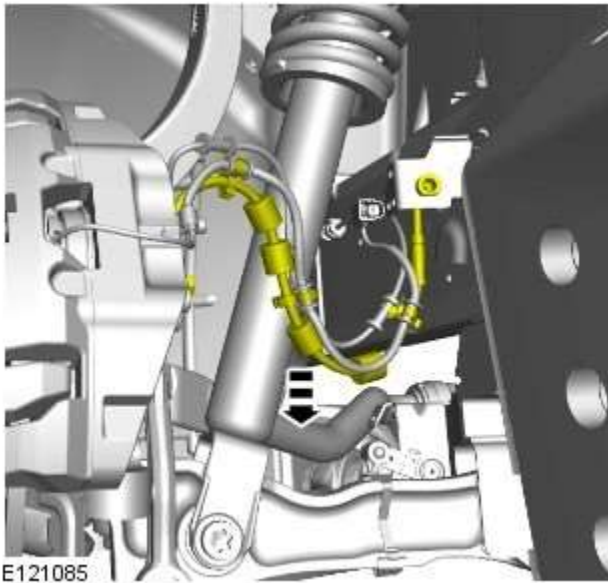
 To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.

 Left-hand shown, right-hand similar.

Torque: 42 Nm



8.



9. CAUTIONS:



Make sure that the road wheels are in the straight ahead position.



Make sure that excessive force is not used. Failure to follow this instruction may result in damage to the vehicle.



Make sure that the brake hose is not twisted and is correctly located.

- Pull downwards at the position shown.

10. Refer to: [Brake System Bleeding](#) (206-00 Brake System - General Information, General Procedures).

11. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Brake Disc Vehicles With: High Performance Brakes

Removal and Installation

Removal



CAUTION: Brake discs must be renewed in pairs.



NOTE: Removal steps in this procedure may contain installation details.

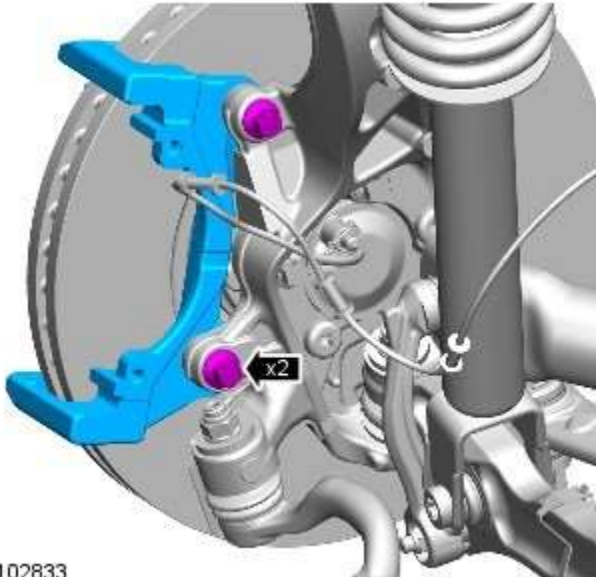


1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

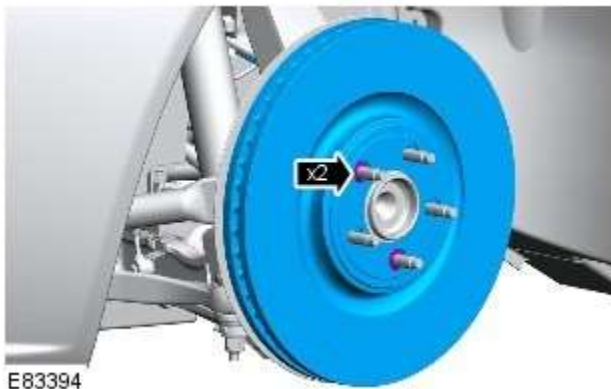
2. Refer to: [Brake Pads - Vehicles With: High Performance Brakes](#) (206-03B Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

3. Torque: 115 Nm



E102833

4.
 - Remove the 2 clips.
 - Clean the components mating faces.



E83394

5. Repeat the above procedure on the opposite side.

Installation

1. To install, reverse the removal procedure.

Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Brake Pads Vehicles With: High Performance Brakes

Removal and Installation

Removal



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.



NOTE: Removal steps in this procedure may contain installation details.

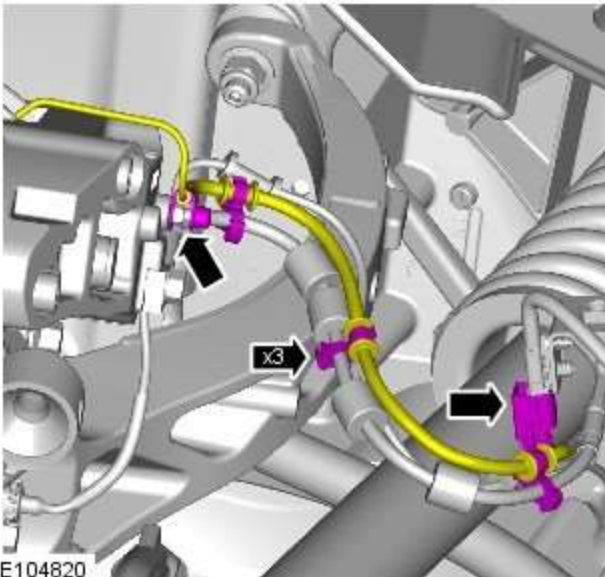


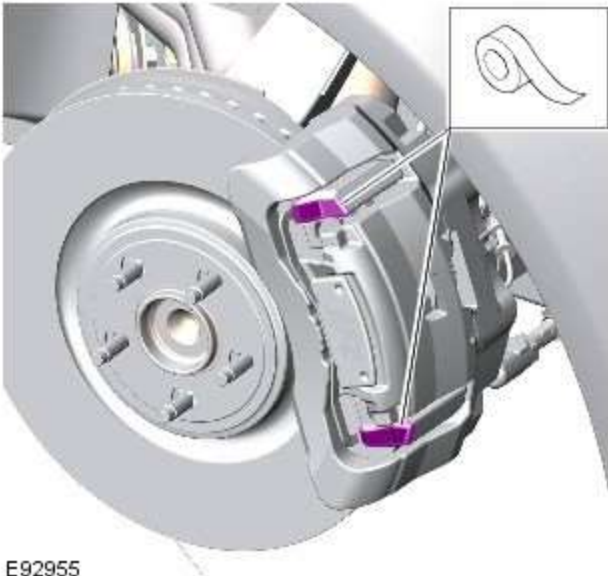
1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

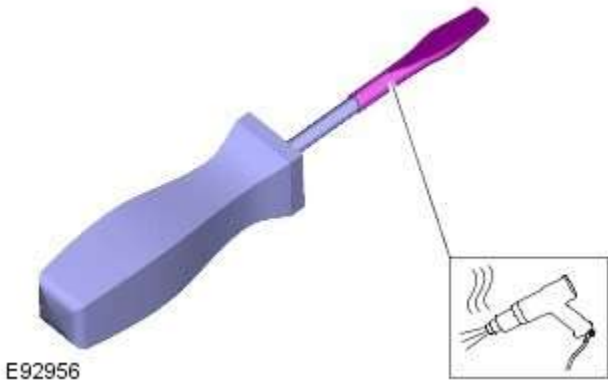
3.





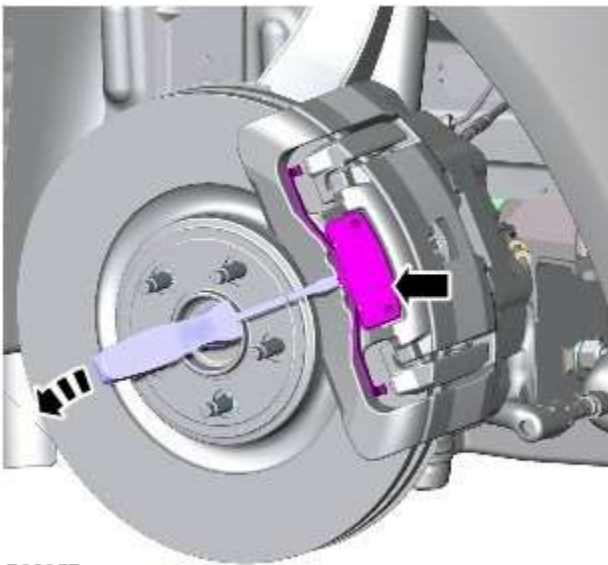
E92955

4.  NOTE: Left-hand shown, right-hand similar.




E92956

5.

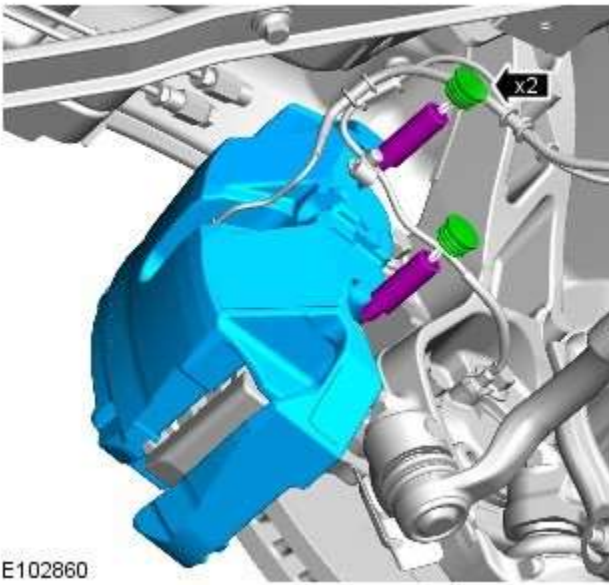



E92957

6.  CAUTION: Removal of the clips is a delicate procedure, damage will occur if any force is used.

 NOTE: Left-hand shown, right-hand similar.

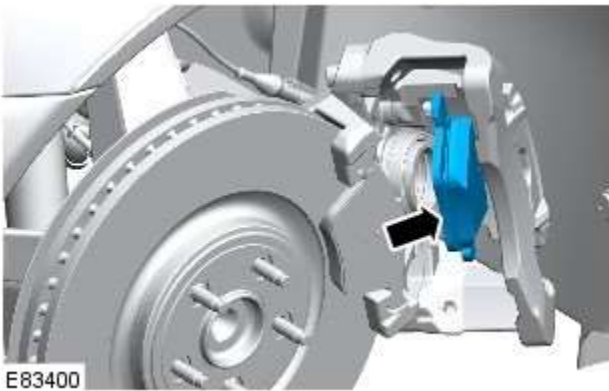
- Lever the anti-rattle spring in the center of the spring until either side is released.



7.  **WARNING:** If the brake caliper piston seal is damaged a new brake caliper must be installed.

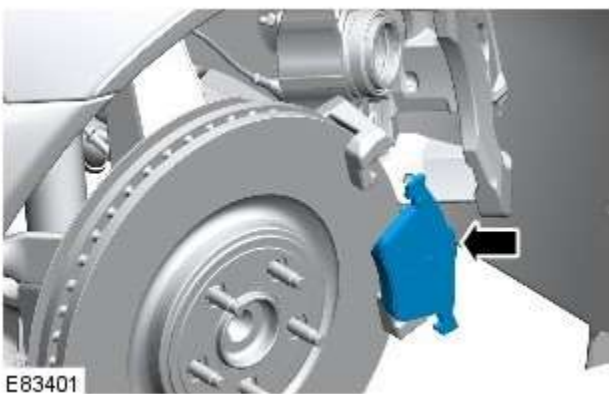
 **CAUTION:** Do not allow the brake caliper to hang on the brake hose.

 **NOTE:** Left-hand shown, right-hand similar.



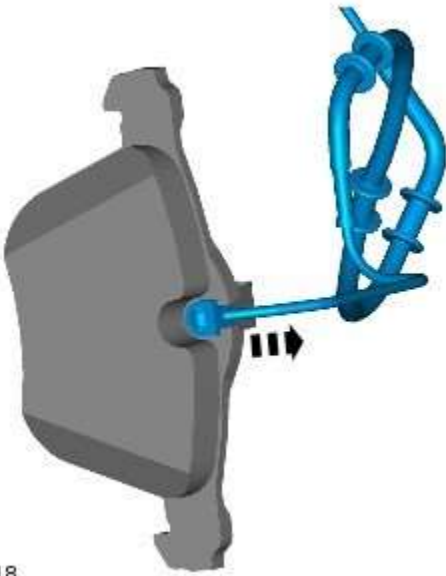
8.  **NOTE:** Left-hand shown, right-hand similar.

- Release the clip.



9.  **NOTE:** Left-hand shown, right-hand similar.


10.




E104818

11. Repeat the above procedure on the opposite side.

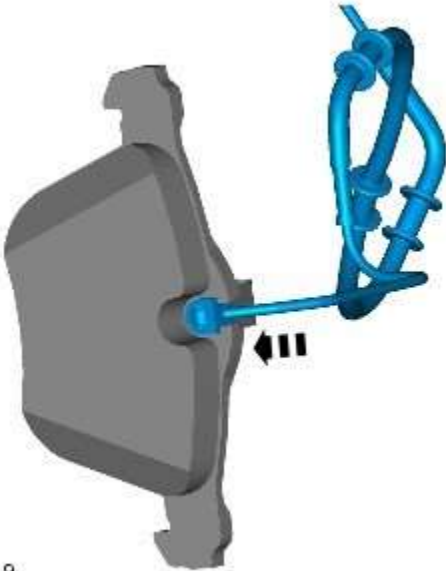
Installation

1.  **WARNING:** Do not use compressed air to clean brake components. Dust from friction materials can be harmful if inhaled.

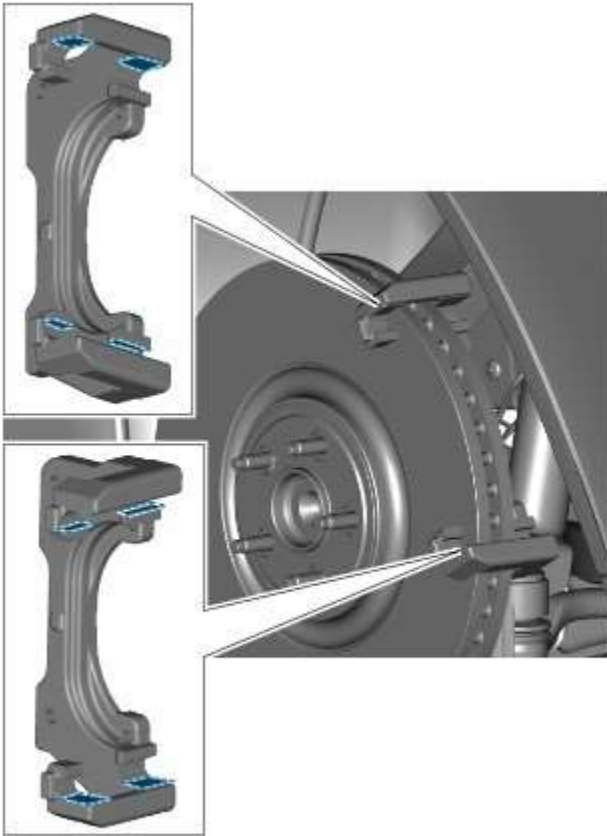
 **CAUTION:** As the piston is pushed back into the caliper housing, the brake fluid level in the reservoir will rise. Do not allow the reservoir to overflow.

Press the piston into the caliper housing.

2.

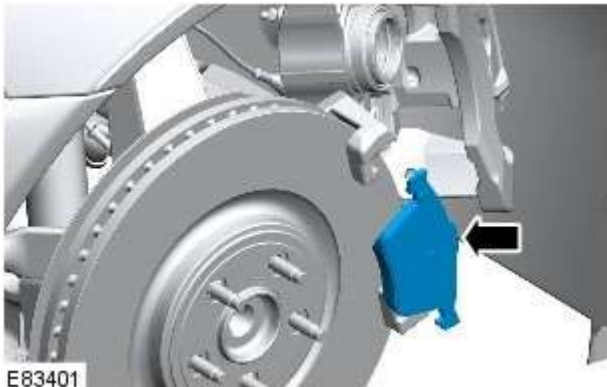


E104819




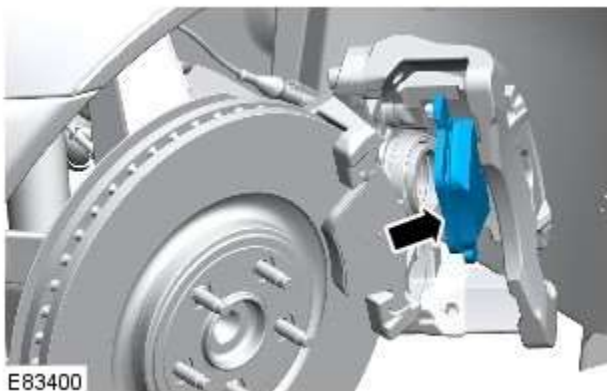
E104827

- 3.
- Apply grease C2C-39930 to the areas indicated.



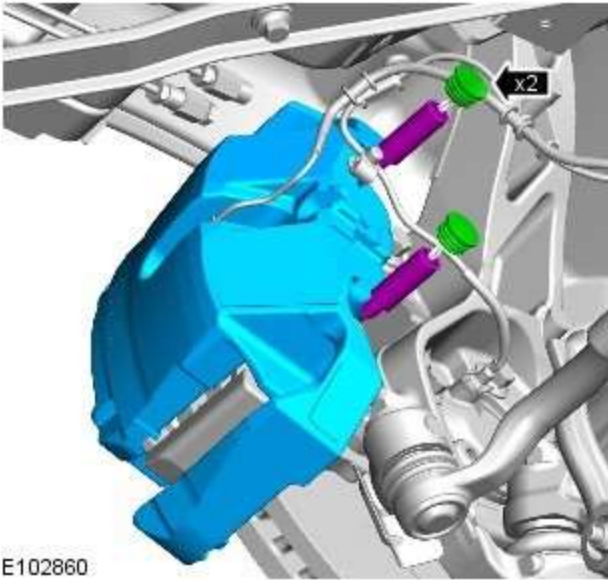
E83401

4.  NOTE: Left-hand shown, right-hand similar.




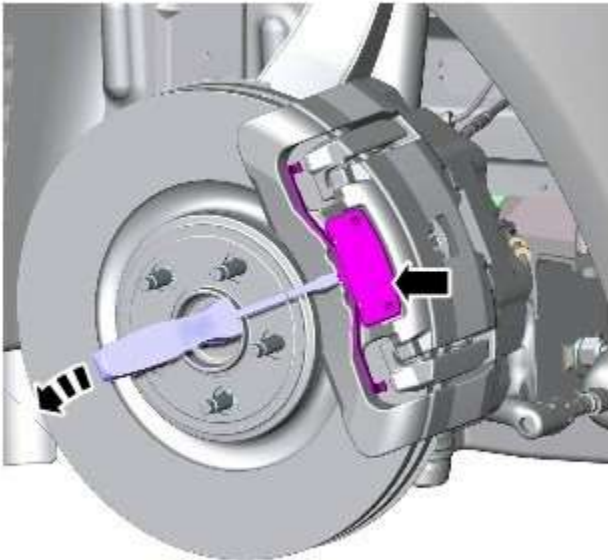
E83400

5.  NOTE: Left-hand shown, right-hand similar.




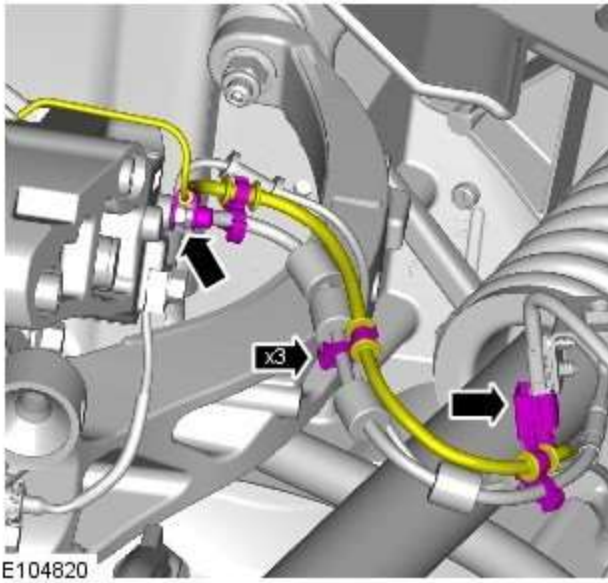
E102860

6.  NOTE: Left-hand shown, right-hand similar.
- Torque: 58 Nm

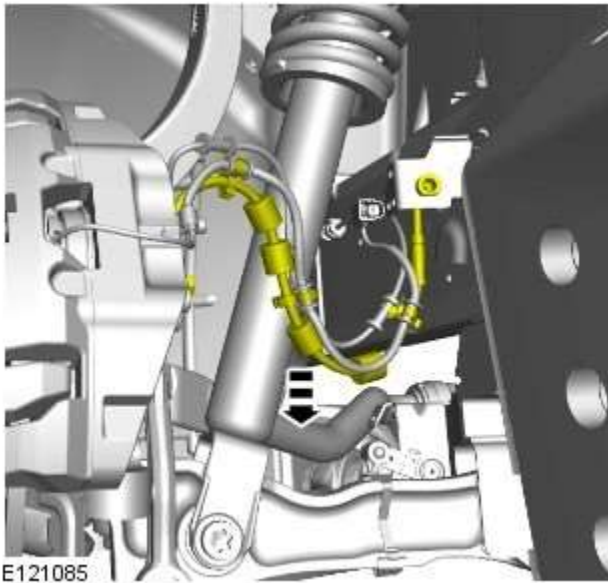


E92957

7.  NOTE: Left-hand shown, right-hand similar.
- Secure the bottom arm of the anti-rattle spring under the bottom anchor bracket of the caliper.
 - Compress the upper spring arm into the correct position, under the upper anchor bracket, whilst retaining the logo plate.
 - Using the screw-driver, tap the central locating tag into the locked position.



8.



9. CAUTIONS:



Make sure that the road wheels are in the straight ahead position.



Make sure that excessive force is not used. Failure to follow this instruction may result in damage to the vehicle.



Make sure that the brake hose is not twisted and is correctly located.

- Pull downwards at the position shown.


10. Repeat the above procedure on the opposite side.

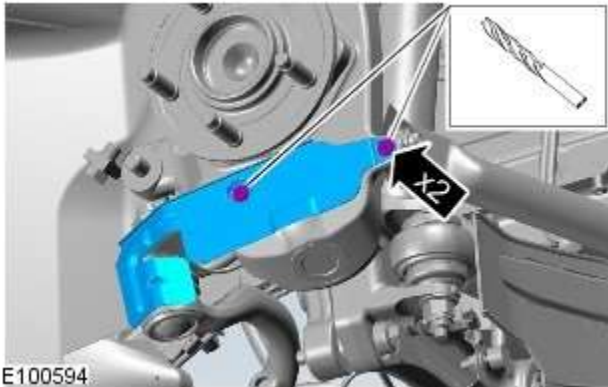
11. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

Front Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Brake Disc Shield Vehicles With: High Performance Brakes

Removal and Installation

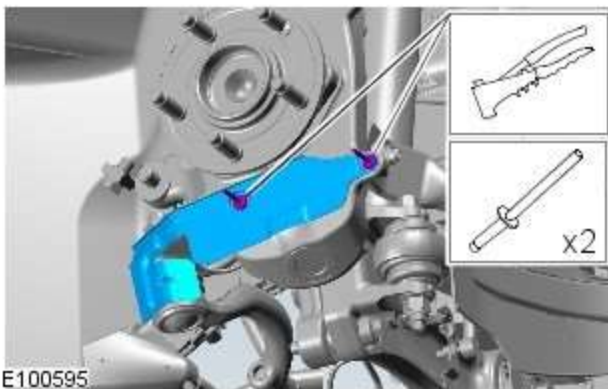
Removal

1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Remove the front brake disc.
For additional information, refer to: [Brake Disc - Vehicles With: High Performance Brakes](#) (206-03A Front Disc Brake - V6 3.0L Petrol, Removal and Installation).



3. Remove the brake disc shield.
 - Remove the 2 rivets.

Installation



1. To install, reverse the removal procedure.
 - Install the rivets.

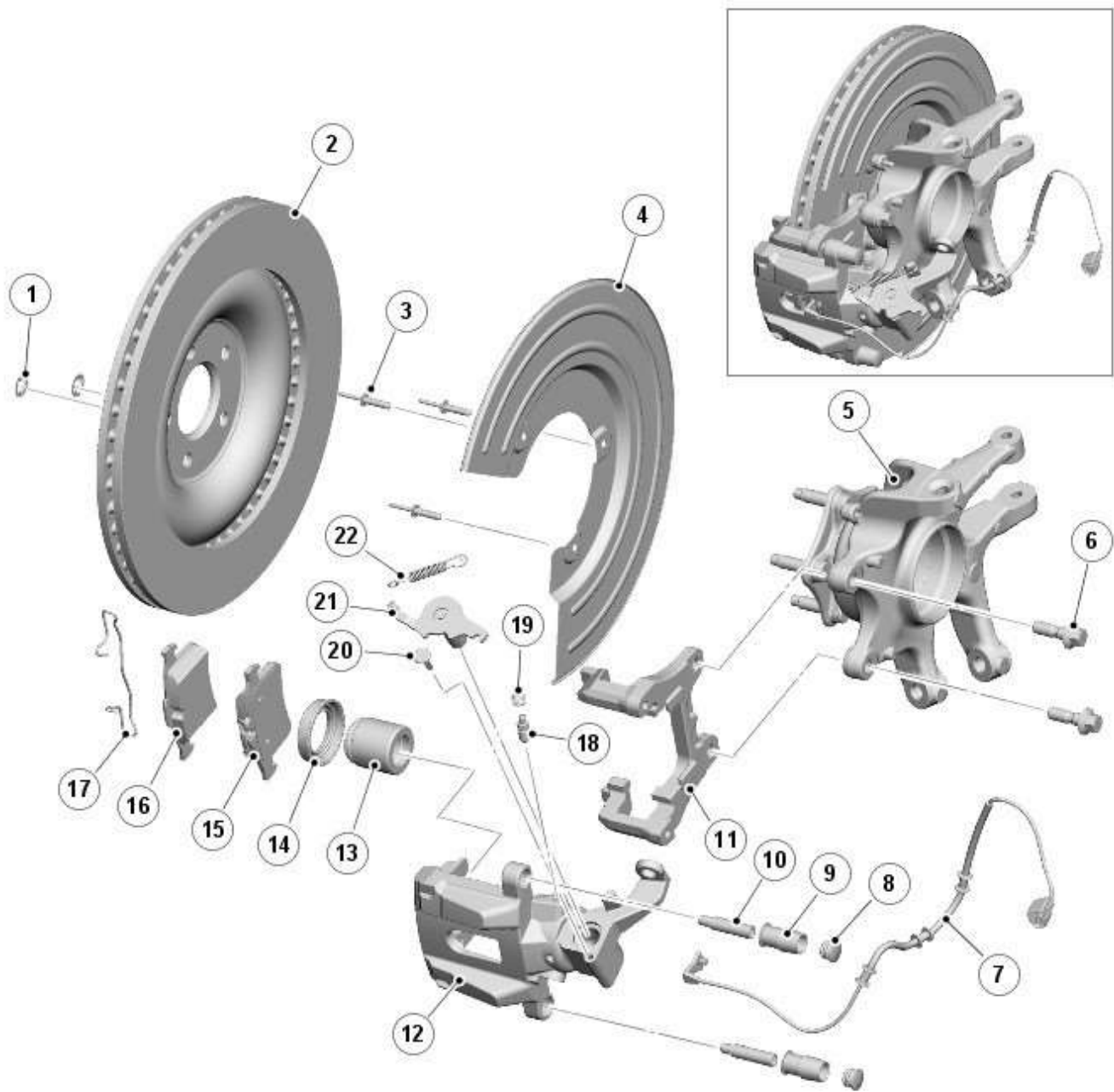
Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol -**Torque Specifications**

Description	Nm	lb-ft	lb-in
Brake hose to brake caliper	42	31	-
Brake caliper anchor plate	103	76	-
Brake caliper retaining bolts	28	21	-
Brake caliper logo badge retaining bolts - Vehicles with high performance brakes	10	7	-

Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Rear Disc Brake - Component Location

Description and Operation

Performance Brakes - 5.0L Supercharger V8



E131983

Item	Description
1	Retaining washer (2 off)
2	Brake disc
3	Rivet (3 off)
4	Brake dust shield
5	Rear wheel knuckle/hub and bearing assembly
6	Caliper carrier bolt (2 off)
7	Brake pad wear sensor
8	Guide pin dust cover (2 off)
9	Guide pin bush (2 off)
10	Guide pin (2 off)
11	Caliper carrier
12	Brake caliper housing
13	Piston
14	Piston dust cover
15	Inboard brake pad and shim
16	Outboard brake pad
17	Anti-rattle spring
18	Bleed screw
19	Bleed screw dust cap
20	Knurled pin
21	Parking brake lever
22	Parking brake return spring

Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Rear Disc Brake - Overview

Description and Operation

OVERVIEW

The standard and performance rear braking systems feature ventilated brake discs and aluminum, single piston, sliding calipers. The brake discs are:

- 326 mm (12.83 in.) diameter x 20 mm (0.79 in.) thick on standard brakes (the same as on base brakes).
- 376 mm (14.8 in.) diameter x 26 mm (1.02 in.) thick on performance brakes.

The brake disc is manufactured from cast iron. The brake disc is retained on the wheel hub by two washers and the wheel nuts.

A brake pad wear sensor is fitted to the [RH \(right-hand\)](#) rear brake.

Also incorporated into each rear brake caliper carrier is the parking brake mechanism.
Refer to: [Parking Brake](#) (206-05 Parking Brake and Actuation, Description and Operation).

After any work on the rear brakes, the parking brake must be re-calibrated.
Refer to: [Parking Brake](#) (206-05 Parking Brake and Actuation, Description and Operation).

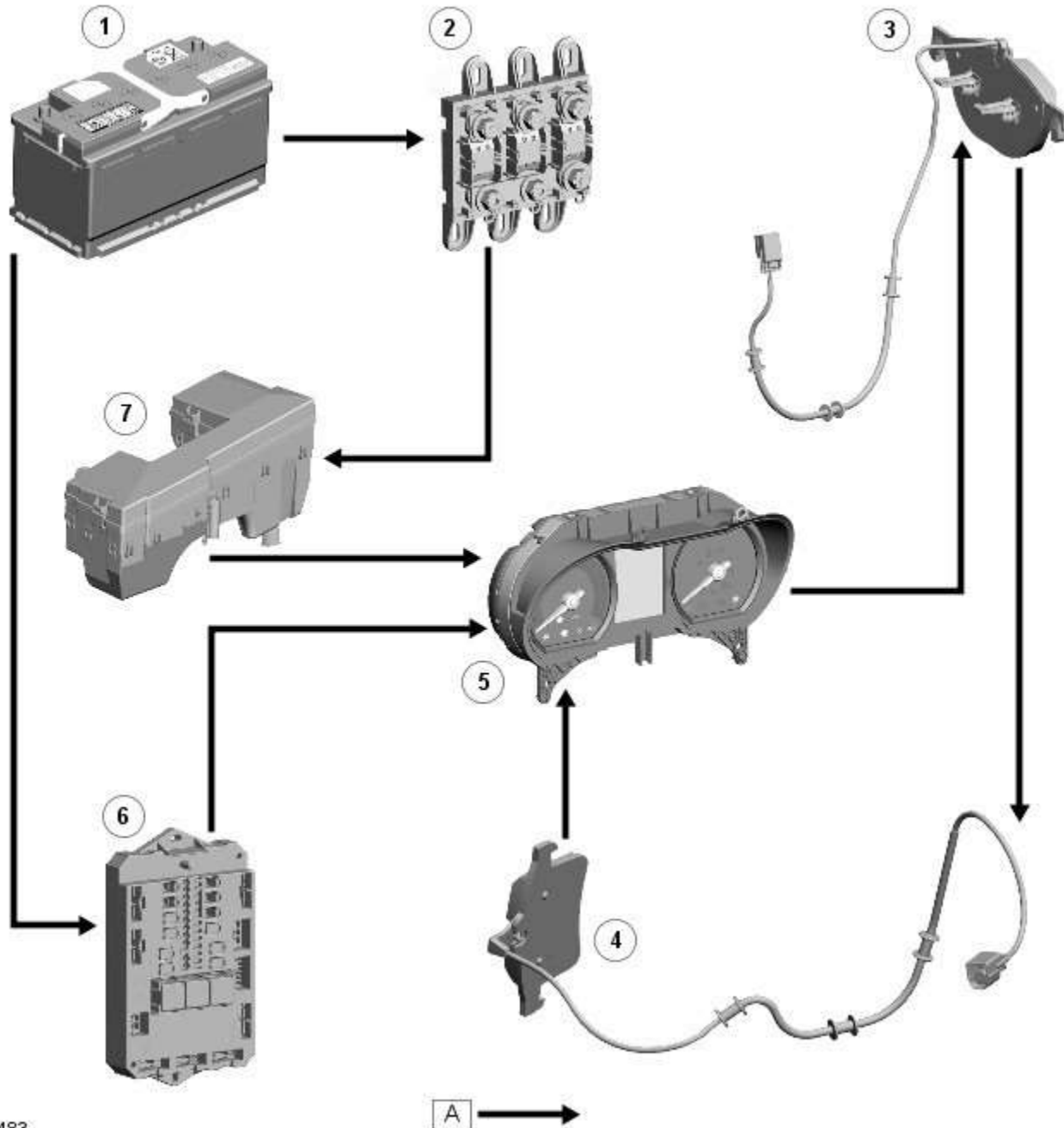
Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Rear Disc Brake - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired



E113483

Item	Description
1	Battery
2	Megafuse (250 A)
3	Front brake pad wear sensor
4	Rear brake pad wear sensor
5	Instrument cluster
6	CJB (central junction box)
7	Power distribution box

System Operation

BRAKE CALIPERS

When hydraulic pressure is supplied to the caliper, the pistons extend to force the inner pad against the brake disc. The caliper reacts and slides along two guide pins to bring the outer pad into contact with the brake disc.

BRAKE PAD WEAR SENSORS

When a brake pad incorporating a brake pad wear sensor is approximately 75% worn, the sensor wire within the pad material is worn through and the brake pad wear sensor goes open circuit. When the instrument cluster detects the open circuit, it illuminates the amber **LED (light emitting diode)** in the brake warning indicator, displays an appropriate warning in the message center and sounds a warning chime.

Refer to: [Instrument Cluster](#) (413-01 Instrument Cluster, Description and Operation).



NOTE: A new pad wear sensor lead must be fitted whenever the brake pads are changed, irrespective of the brake pad warning sensor being triggered.

Component Description

BRAKE CALIPERS

Each caliper is mounted within a fixed carrier that is secured to the rear wheel knuckle with two bolts. Each outboard brake pad is installed with a wire anti-rattle spring.

The brake calipers on **SC (supercharger)** vehicles are painted and also include a logo badge, secured with two screws, which must be removed in order to change the brake pads.

The inboard brake pad of the **RH (right-hand)** brake incorporates a wear sensor.

BRAKE PAD WEAR SENSORS

The brake pad wear sensor is wired in series with a wear sensor on the **LH (left-hand)** front brake and the instrument cluster. If the thickness of one of the brake pads connected to a wear sensor decreases to a predetermined limit, the instrument cluster illuminates the brake warning indicator.

Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Brake Caliper Vehicles With: High Performance Brakes

Removal and Installation

Removal



WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.



NOTE: Removal steps in this procedure may contain installation details.



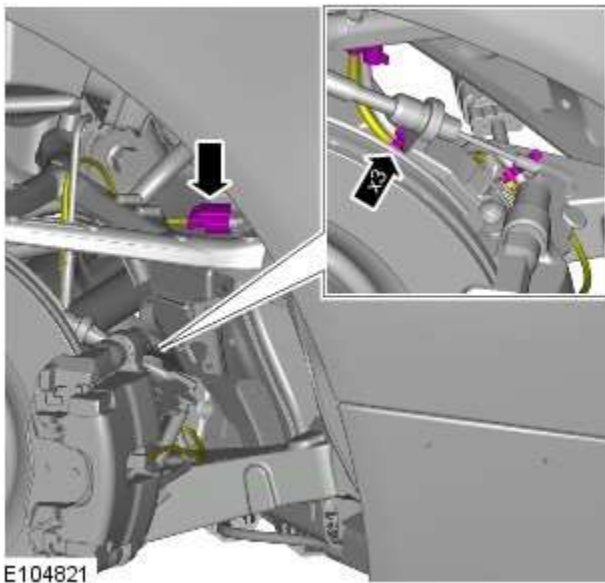
1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

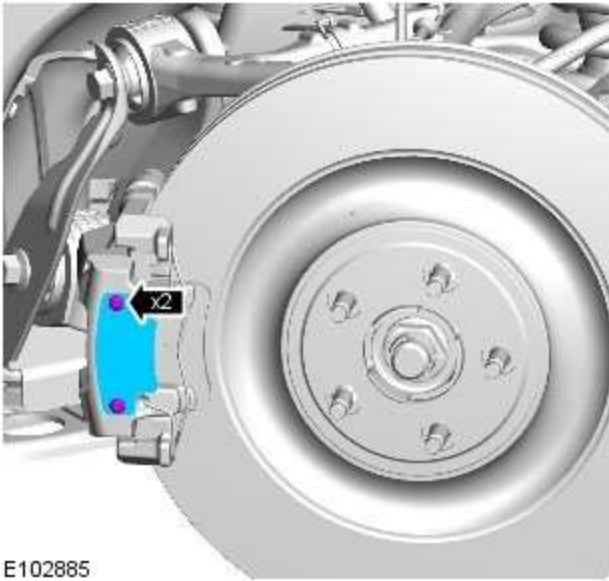
Raise and support the vehicle.

2. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

3. Refer to: [Parking Brake Cable Tension Release](#) (206-05 Parking Brake and Actuation, General Procedures).

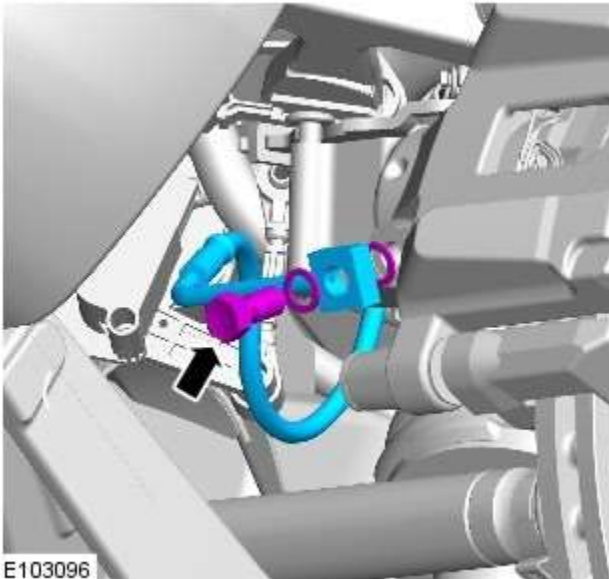
4.









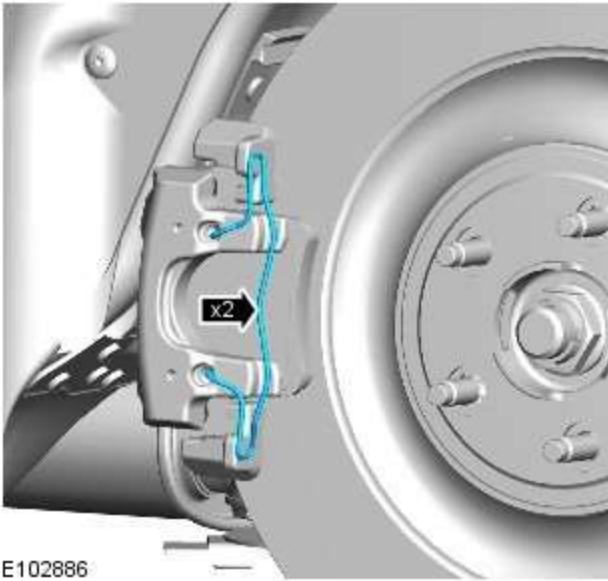
E102885


5.  NOTE: Left-hand shown, right-hand similar.
Torque: 10 Nm

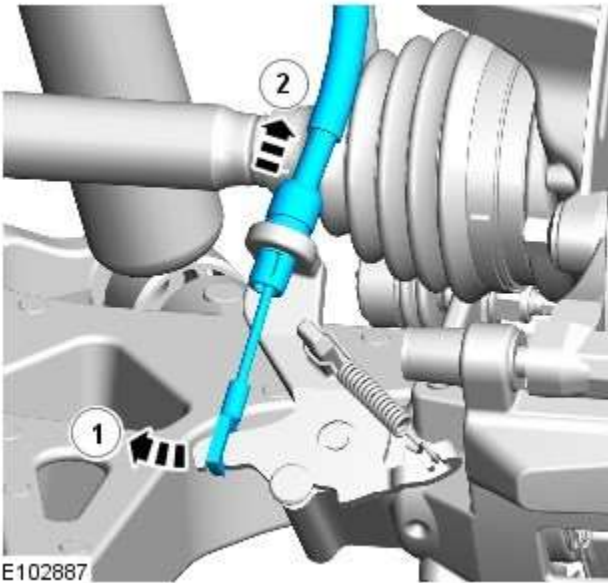



E103096

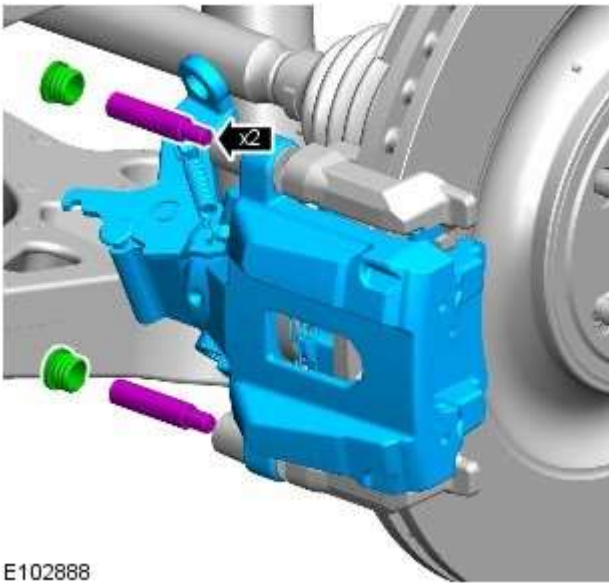
6. CAUTIONS:
-  Always plug any open connections to prevent contamination.
 -  If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.
- NOTES:
-  To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.
 -  Left-hand shown, right-hand similar.
- Torque: 42 Nm




7.  NOTE: Left-hand shown, right-hand similar.
- Release the 2 clips.



8.  NOTE: Left-hand shown, right-hand similar.
- Release the clip.



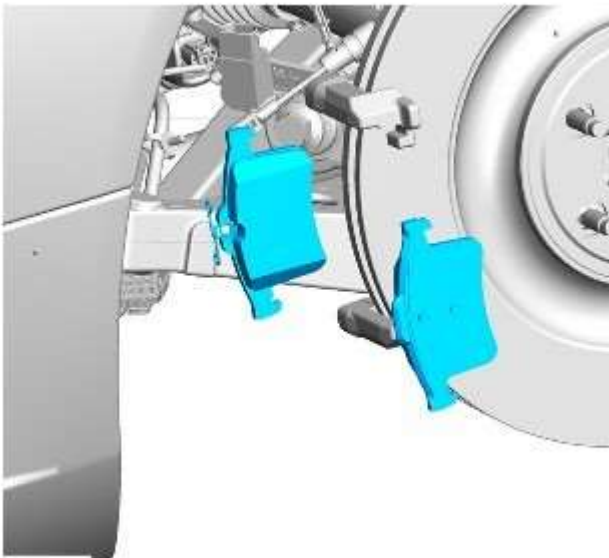
E102888

9.  **WARNING:** If the brake caliper piston seal is damaged a new brake caliper must be installed.

 **CAUTION:** Do not allow the brake caliper to hang on the brake hose.

 **NOTE:** Left-hand shown, right-hand similar.

Torque: 28 Nm



E102889

10.  **NOTE:** Left-hand shown, right-hand similar.

Installation

1. To install, reverse the removal procedure.
2. Refer to: [Brake System Bleeding](#) (206-00 Brake System - General Information, General Procedures).

Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Brake Disc Vehicles With: High Performance Brakes

Removal and Installation

Removal



CAUTION: Brake discs must be renewed in pairs.

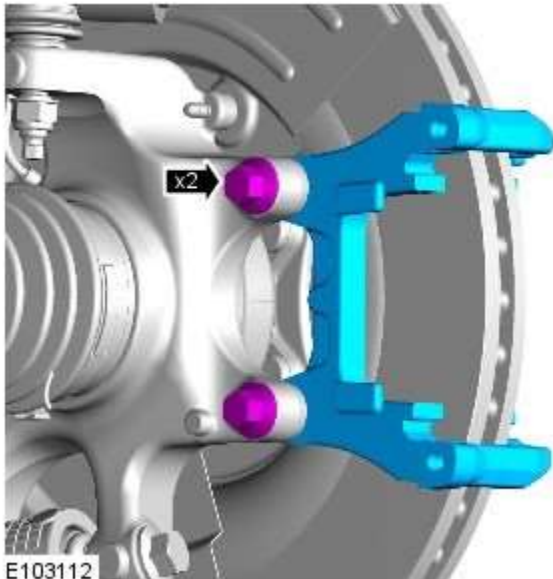


NOTE: Removal steps in this procedure may contain installation details.

1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Refer to: [Brake Pads - Vehicles With: High Performance Brakes](#) (206-04B Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).



- Torque: 103 Nm

3.



- Remove the 2 clips.
- Clean the components mating faces.

4.



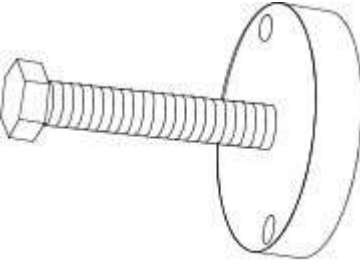
Installation

1. To install, reverse the removal procedure.

Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Brake Pads Vehicles With: High Performance Brakes

Removal and Installation

Special Tool(s)

 <p>206-080</p>	<p>206-080 Brake caliper piston retractor tool</p>
 <p>206-081</p>	<p>206-081 Brake caliper piston retractor tool</p>
 <p>303-588</p>	<p>303-588 Remover, Crankshaft Pulley/Damper</p>

Removal

WARNINGS:



Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.



Do not allow dirt or foreign liquids to enter the reservoir. Use only new brake fluid of the correct specification from airtight containers. Do not mix brands of brake fluid as they may not be compatible.



Brake pads must be renewed in axle sets only, otherwise braking efficiency may be impaired.



CAUTION: Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

NOTES:



Only extraction bolt from special tool 303-588 is used.



Removal steps in this procedure may contain installation details.



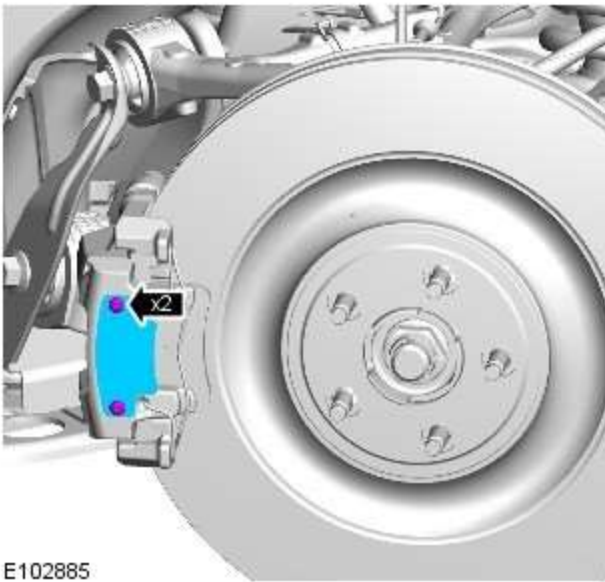
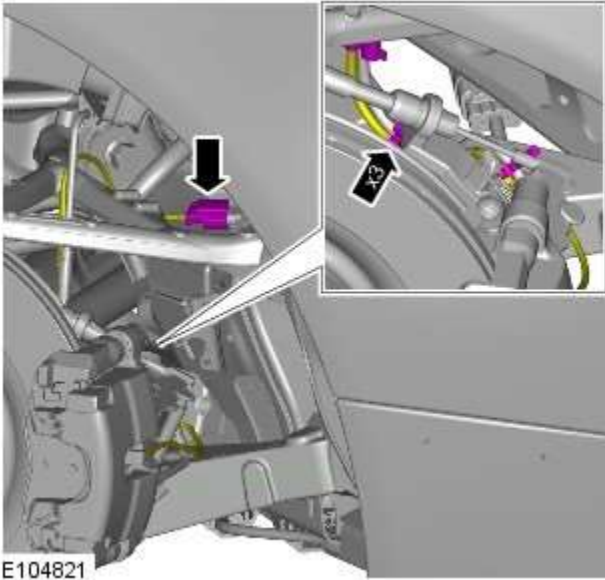
- WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

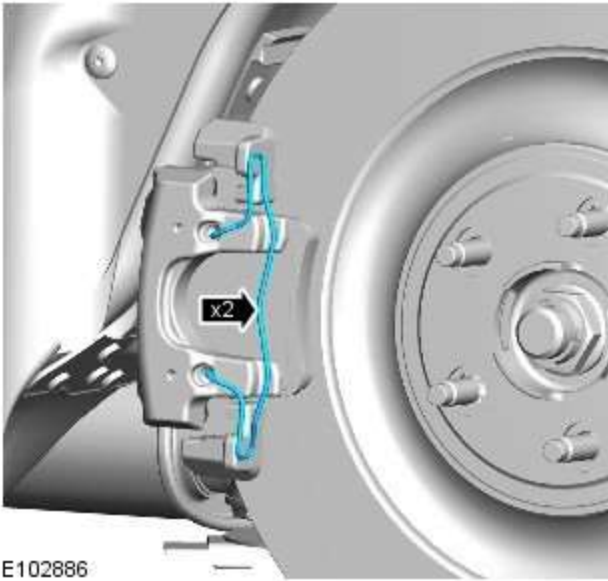
2. Refer to: Wheel and Tire (204-04, Removal and Installation).


3. Refer to: Parking Brake Cable Tension Release (206-05, General Procedures).

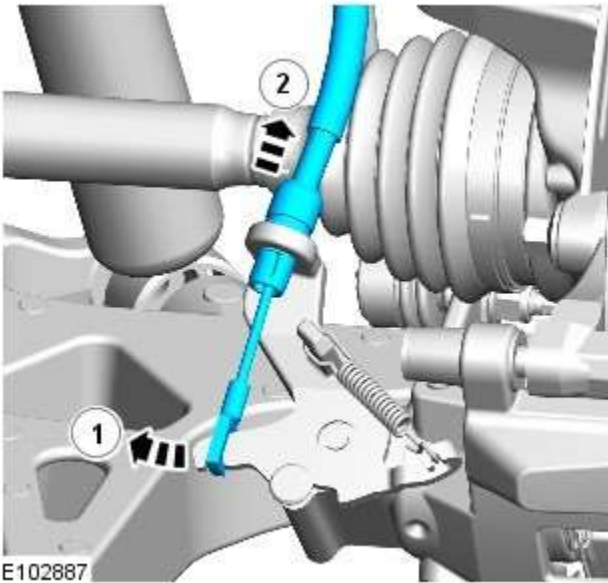
4.




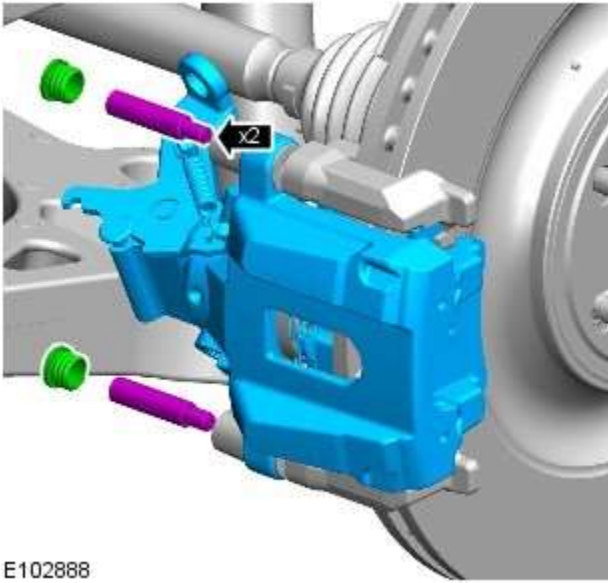
5.  NOTE: Left-hand shown, right-hand similar.
Torque: 10 Nm



6.  NOTE: Left-hand shown, right-hand similar.
- Release the 2 clips.



7.  NOTE: Left-hand shown, right-hand similar.
- Release the clip.



E102888



8. **WARNING:** If the brake caliper piston seal is damaged a new brake caliper must be installed.

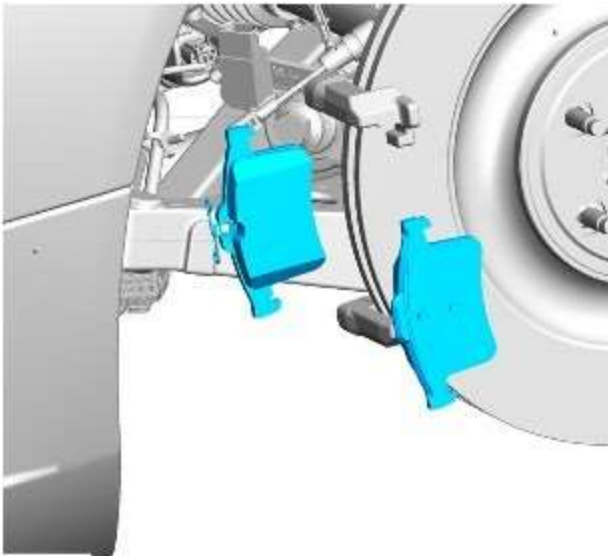


- CAUTION:** Do not allow the brake caliper to hang on the brake hose.



- NOTE:** Left-hand shown, right-hand similar.

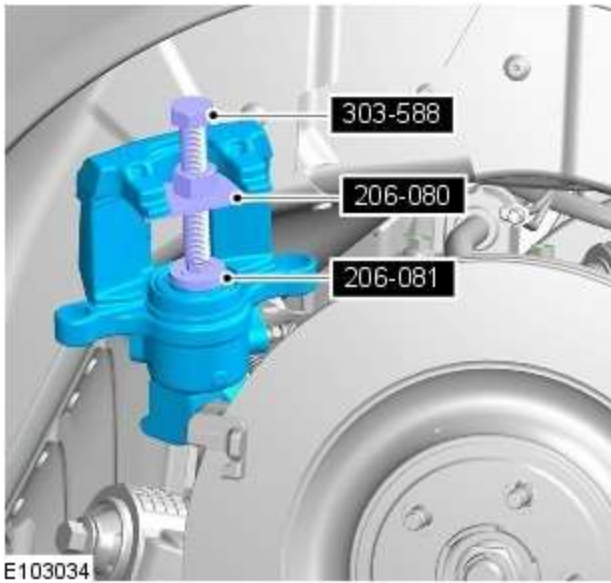
Torque: 28 Nm




E102889



9. **NOTE:** Left-hand shown, right-hand similar.



10.  NOTE: Left-hand shown, right-hand similar.

- *Special Tool(s)*: [303-588](#)
- *Special Tool(s)*: [206-080](#)
- *Special Tool(s)*: [206-081](#)
- Using the special tools, fully retract the brake caliper piston.



11.

12. Repeat the above procedure on the opposite side.

Installation



1. NOTE: The brake pad wear sensor retaining tang must be installed to the sensor prior to installation to the brake pad.

2. To install, reverse the removal procedure.

3. Repeat the above procedure on the opposite side.

Rear Disc Brake - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Brake Disc Shield

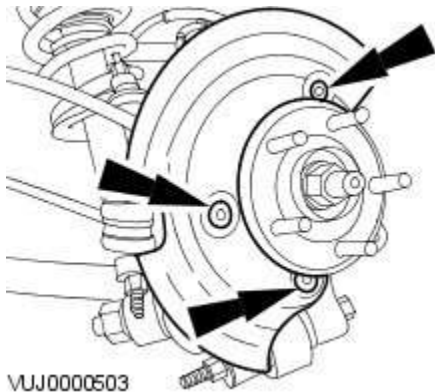
Removal and Installation

Removal



WARNING: Make sure to support the vehicle with axle stands.

1. Raise and support the body.
2. Remove the brake disc.
For additional information, refer to: [Brake Disc](#) (206-04A Rear Disc Brake - V6 3.0L Petrol, Removal and Installation).
3. Remove the brake disc shield.
 - Drill out the 3 rivets



VUJ0000503

Installation

1. To install, reverse the removal procedure.

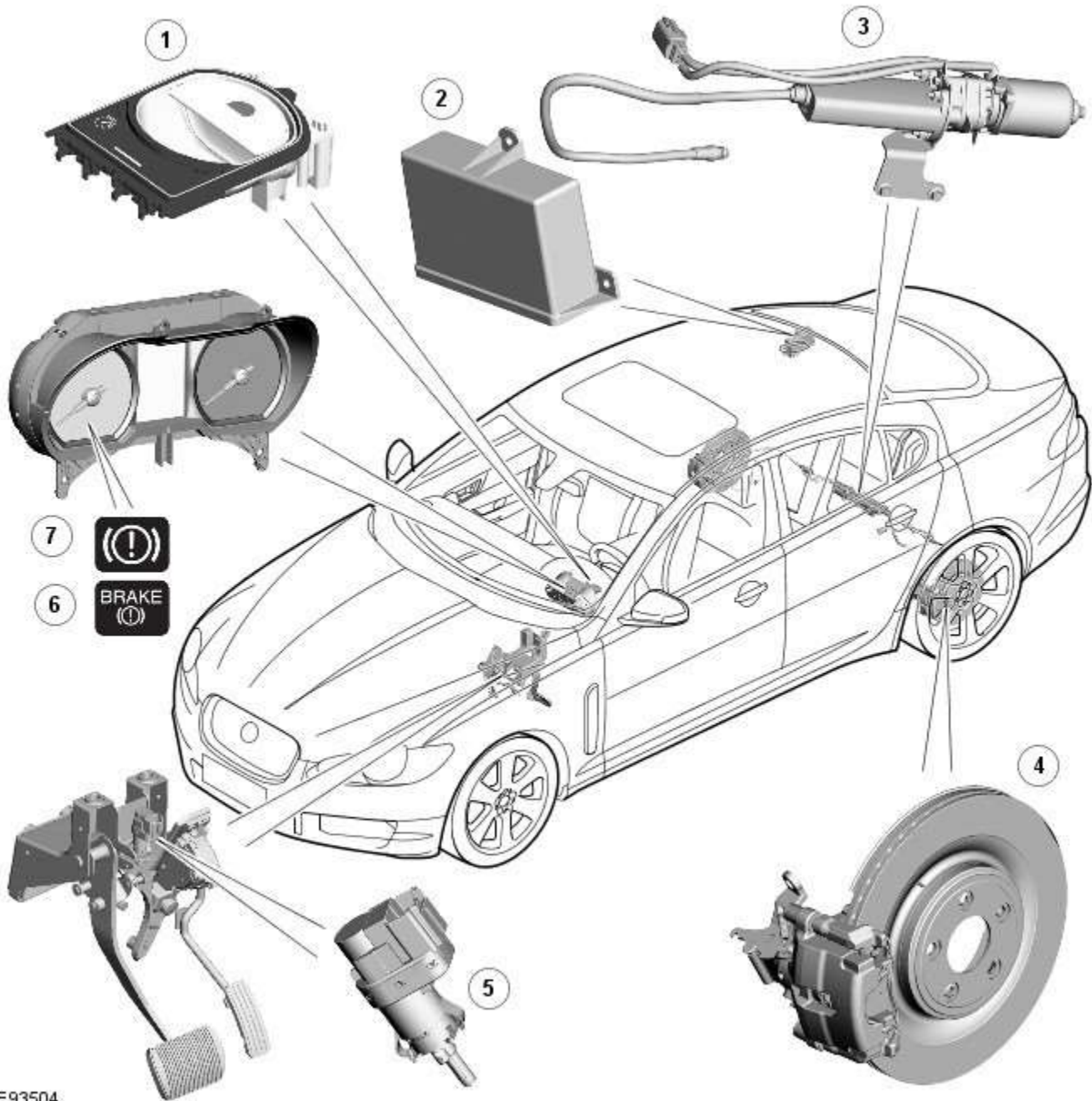
Parking Brake and Actuation -

Description	Nm	lb-ft	lb-in
Parking brake module retaining bolts	4	-	35
Parking brake release actuator retaining bolts	20	15	-

Parking Brake and Actuation - Parking Brake - Component Location

Description and Operation

Component Location



E93504

Item	Description
1	Parking brake switch
2	EPB (electronic parking brake) module
3	Parking brake actuator
4	Caliper and disc assemblies (2 off)
5	Stoplamp switch
6	Brake warning indicator - NAS vehicles
7	Brake warning indicator (all except NAS (North American Specification) vehicles)

Parking Brake and Actuation - Parking Brake - Overview

Description and Operation

Overview

The parking brake is an electrically actuated system that operates on the rear brake calipers. Two cables are connected to the rear brake calipers, and act directly on the same pistons used for normal, hydraulic rear brake actuation. Refer to: Rear Disc Brake (206-04, Description and Operation).

The parking brake is controlled by the EPB (electronic parking brake) module. In response to commands from the driver through the parking brake switch, the EPB module controls operation of the parking brake actuator. The actuator adjusts the tension of the brake cables to apply and release the rear brake calipers. Features of the parking brake include:

- Manual apply.
- Manual release.
- Automatic release.

A service mode is also available and must be activated using the Jaguar approved diagnostic system. This allows the decoupling of the components and prevention of damage to the actuator. When in service mode all switch functions will be inhibited.

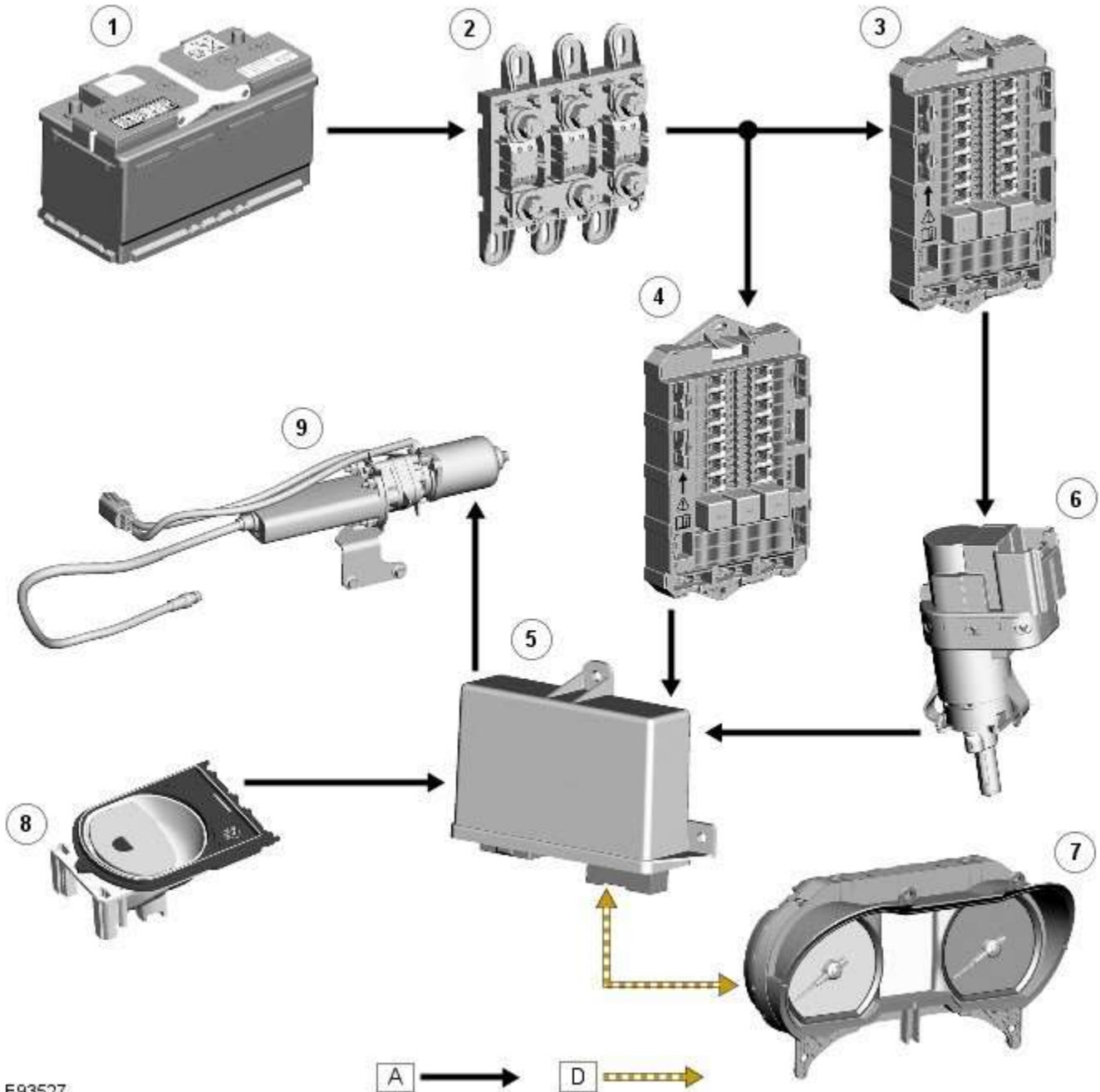
Parking Brake and Actuation - Parking Brake - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus.



E93527

Item	Description
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	RJB (rear junction box)
5	EPB module
6	Stoplamp switch

7	Instrument cluster
8	Parking brake switch
9	Parking brake actuator

System Operation

Static Apply

The EPB module receives a vehicle speed signal from the [ABS \(anti-lock brake system\)](#) module on the high speed [CAN](#) bus. If the parking brake switch is pulled to the 'Apply' position and vehicle speed is less than 2 mph (3 km/h), the EPB module will instigate its 'Static Apply' mode and drive the actuator to apply full parking brake force to the rear wheels.

The EPB module monitors the current drawn by the actuator and compares this to information held within its configuration software to determine when full braking force has been applied.

Dynamic Apply

There are two 'Dynamic Apply' modes; low speed dynamic and high speed dynamic. The low speed dynamic mode operates at speeds between 2 mph (3 km/h) and 20 mph (32 km/h). The high speed dynamic mode operates at speeds above 20 mph (32 km/h).

If the parking brake switch is pulled up to the 'Apply' position and vehicle speed is within the low speed dynamic range, the EPB module drives the actuator to apply full parking brake force to the rear wheels.

If the parking brake switch is pulled up to the 'Apply' position and vehicle speed is within the high speed dynamic range, the EPB module will apply braking force to the rear wheels at a slower rate until full braking load is reached or the switch is released. The rate with which braking force is applied is controlled by the EPB module, which monitors both current drawn by the actuator and positional information from the actuator hall sensor and compares this to information held within its configuration software.

Drive Away Release

The EPB module will initiate its 'Drive Away Release' function and automatically release the parking brake if the following conditions are detected:

- The engine is running.
- Drive , or reverse is selected.
- Positive throttle movement is detected.

The EPB module receives messages of gear selector position and throttle angle over the high speed [CAN](#) bus from the [TCM \(transmission control module\)](#) and the [ECM \(engine control module\)](#) respectively.

Release from Park

The EPB module will initiate its 'Release from Park' function and automatically release the parking brake if the gear selector is moved from Park to any position except Neutral.

Repairs

Before carrying out any work on the parking brake system, the Jaguar approved diagnostic system must be connected and the 'parking brake unjam' routine run. The routine can be found in the 'Vehicle Configuration' area, under the 'Set-up and Configuration' menu. After any work has been carried out on the parking brake, the system will require resetting.



CAUTION: Do not use the 'Emergency Release' tool to allow work to be carried out on the parking brake. Work can only be carried out on the parking brake system after the 'parking brake unjam' routine has been run.

Resetting

If the electrical supply is disconnected from the EPB module, the actuator will lose its position memory. On battery re-connection and ignition on, 'APPLY FOOT AND PARK BRAKE' will be displayed in the instrument cluster message center indicating the parking brake requires resetting.

Refer to: Parking Brake (206-05, Diagnosis and Testing).

Operating Voltages

The EPB module will only operate the actuator if the power supply from the battery is between 9 V and 16 V. At any voltage within this range, the actuator is able to fully tighten and release the brake cables. If the power supply falls outside of the range, a fault code is stored in the EPB module and can be retrieved using the Jaguar approved diagnostic system.

Component Description

Parking Brake Switch



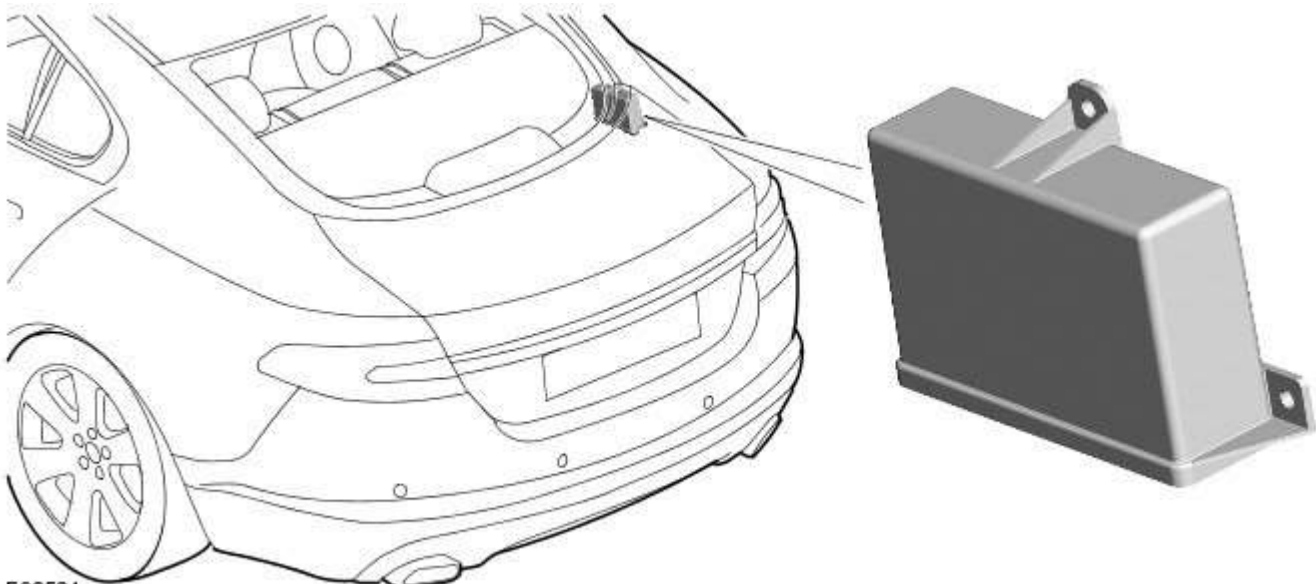
E93523

The parking brake switch is mounted in the floor console, rearward of the rotary gear selector. The switch has 3 states:

- Apply: When the switch is pulled up to apply the parking brake.
- Release: When the switch is pushed down to release the parking brake.
- Neutral: The central default position. The switch returns to this position regardless of parking brake status.

The parking brake switch contains a pair of micro-switches for both the apply and release actions. The EPB module provides an individual hardwired electrical feed to each of the four micro-switches plus a single ground connection, allowing it to constantly monitor switch status.

EPB Module

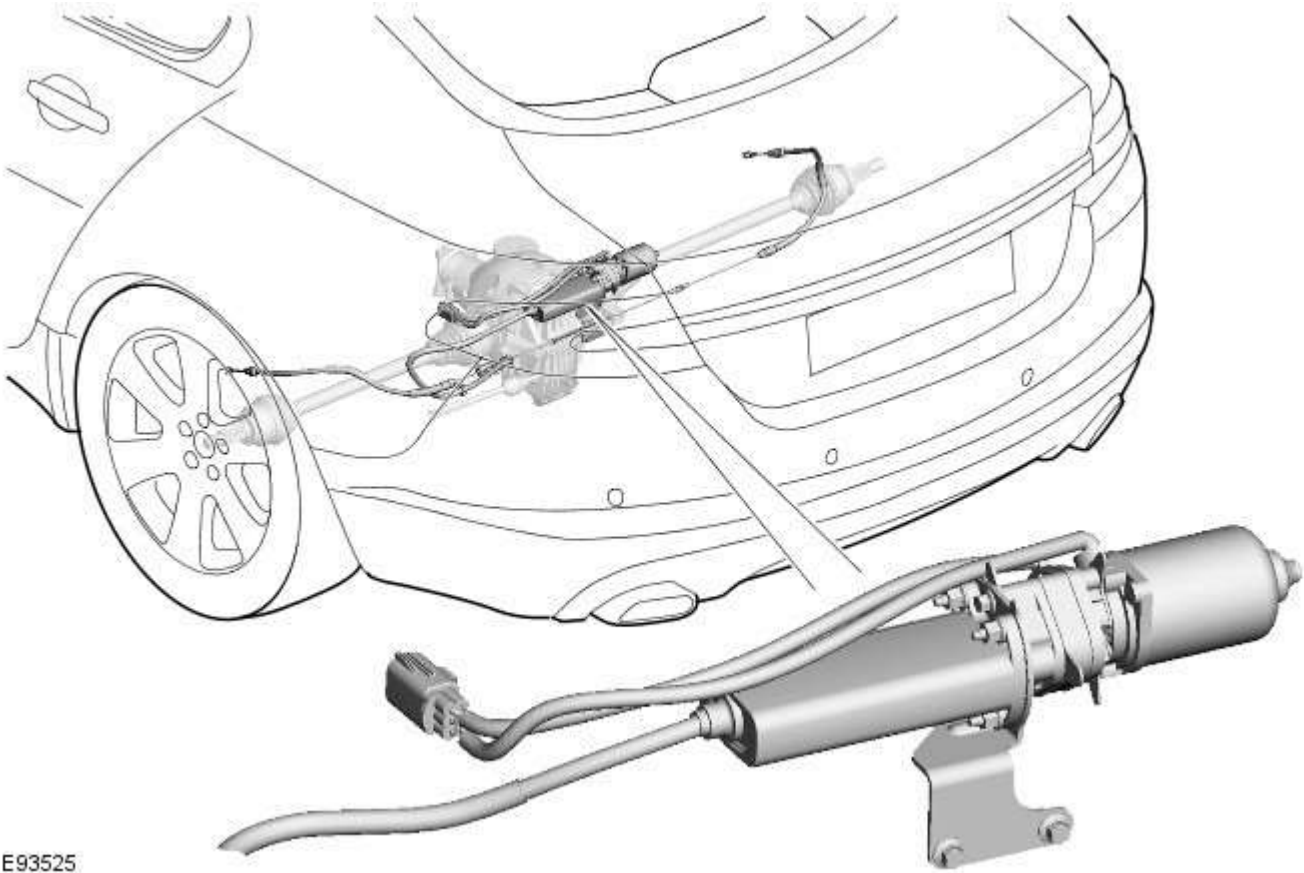


E93524

The EPB module is mounted in the luggage compartment on the **RH (right-hand)** side quarter panel and is connected to the vehicle's electrical wiring by two multiplugs. The EPB module is also connected to the high speed **CAN** bus, allowing it to communicate with other vehicle systems.

The EPB module monitors the condition of the parking brake switch through a series of hardwired electrical connections and controls operation of the parking brake actuator accordingly.

Parking Brake Actuator

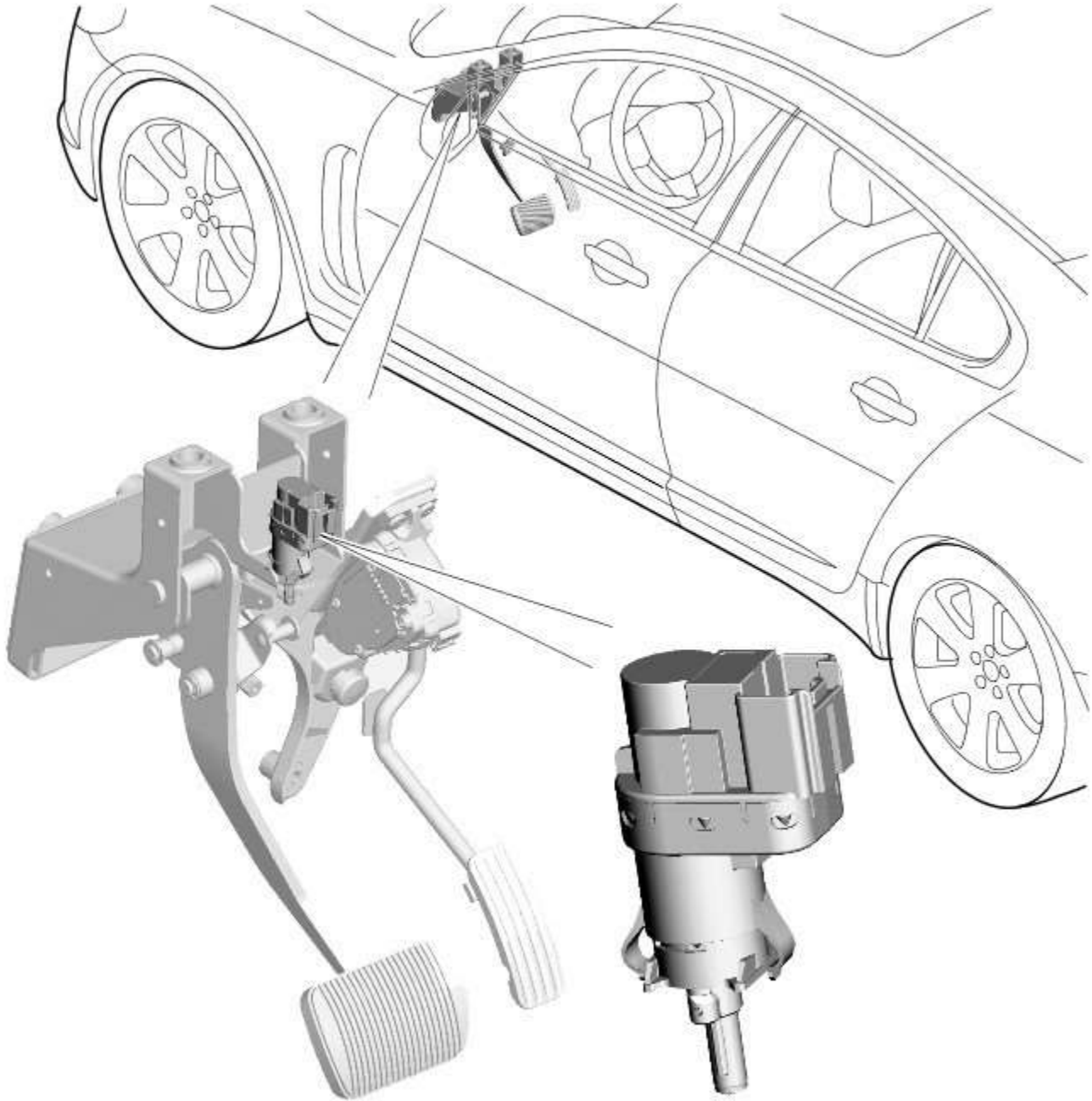


E93525

The parking brake actuator is mounted on the rear cross beam, underneath the vehicle. Operation of the actuator is controlled by the EPB module in response to parking brake switch requests from the driver.

A Hall sensor is located within the actuator and provides positional information back to the EPB module. The principle function of the Hall sensor is to ensure the actuator fully releases the parking brake when a static release request is made. The signal provided by the Hall sensor is compared to configuration information contained within the EPB module software to determine when a full release has been carried out.

Stoplamp Switch



E93526

The stoplamp switch is mounted on the brake pedal box. One of the prerequisites for releasing the parking brake is that the foot brake is applied. The EPB module is able to determine the position of the footbrake by monitoring the status of the stoplamp switch via a hardwired electrical connection.

The stoplamp switch also forms part of:

- The [ABS](#).
Refer to: [Anti-Lock Control - Stability Assist](#) (206-09 Anti-Lock Control - Stability Assist, Description and Operation).
- The speed control system. For additional information, refer to:
Speed Control (310-03A, Description and Operation),
Speed Control (310-03B, Description and Operation),
Speed Control (310-03C, Description and Operation).

Instrument Cluster

Depending on market specification, the instrument cluster may contain a red and an amber brake warning indicator, or only a red brake warning indicator. The functionality of the warning indicators is shown in the table below.

Indicator	Status	Details
Red	Illuminated	Parking brake applied
Red	Flashing	Parking brake electrical failure
Amber	Illuminated	Parking brake electrical failure

If a parking brake failure warning indicator is active, the message 'CANNOT APPLY PARK BRAKE' or 'PARK BRAKE FAULT' will also appear in the instrument cluster message center. If the vehicle is moving with the parking brake applied, the message 'PARK BRAKE ON' will appear in the message center accompanied by a chime from the instrument cluster.

Refer to: [Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

Parking Brake and Actuation - Parking Brake

Diagnosis and Testing

Principle of Operation

For a detailed description of the Parking Brake operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (206-05 Parking Brake and Actuation)

[Parking Brake](#) (Description and Operation),
[Parking Brake](#) (Description and Operation),
[Parking Brake](#) (Description and Operation).

Parking Brake Calibration

The parking brake system must be calibrated whenever the battery has been disconnected or has been in a state of discharge, or repairs have been carried out to the rear service or parking brake system.



NOTE: If new rear brake pads have been installed, pressure must be applied to the brake pedal a minimum of five times prior to calibration of the parking brake system.

To calibrate the parking brake system:

1. Place gear selector lever in 'P' Park position.
2. Release parking brake cable tension to service position.
REFER to: [Parking Brake Cable Tension Release](#) (206-05 Parking Brake and Actuation, General Procedures).
3. Set the ignition status to 'ON'.
4. Apply and hold the footbrake then pull up the parking brake switch.
5. To release the parking brake, apply and hold the footbrake then release and press down the parking brake switch.

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Parking brake cable • Parking brake actuator • Brake caliper • Brake pads • Stabilizer bar drop link caps 	<ul style="list-style-type: none"> • Fuse(s) • Wiring harness/electrical connectors • Check for bent/corroded pins • Parking brake switch • Parking brake module

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident check the system for any logged Diagnostic Trouble Codes (DTCs) and proceed to the DTC Index , alternatively, verify the customer concern and refer to the Symptom Chart.

Symptom Chart

Symptom	Possible Cause	Action
The parking brake will not engage or release (with no parking brake warning message)	<ul style="list-style-type: none"> • Cables fouled, trapped or damaged • Cables incorrectly routed or installed • Rear lining wear • Service brake incorrectly adjusted following lining change • Caliper malfunction 	<ul style="list-style-type: none"> • Check the rear and primary cables for correct installation and damage • Inspect the rear brake linings for wear • Re-calibrate the parking brake, refer to the calibration procedure • Check the rear service brake for correct installation and operation

Symptom	Possible Cause	Action
The parking brake will not engage or release (with parking brake warning message)	<ul style="list-style-type: none"> • Cables fouled, trapped or damaged • Cables incorrectly routed or installed • Rear lining wear • Actuator malfunction • Caliper malfunction 	<ul style="list-style-type: none"> • Check the rear and primary cables for correct installation and damage • Inspect the rear brake linings for wear • Re-calibrate the parking brake, refer to the calibration procedure • Check the rear service brake for correct installation and operation
No communication with the parking brake module	<ul style="list-style-type: none"> • Fuse • Module off Bus • CAN network error • Parking brake module fault 	<ul style="list-style-type: none"> • Check fuses • Ensure battery is fully charged and in serviceable condition. Check battery voltage at parking brake module • Check CAN network using manufacturer approved diagnostic system
'Park brake Fault' displayed on message center with associated warning lamps	<ul style="list-style-type: none"> • Parking brake system fault 	<ul style="list-style-type: none"> • Check the parking brake module for DTCs and refer to DTC Index
Brakes drag	<ul style="list-style-type: none"> • Parking brake not re-calibrated after battery has been disconnected or has been in a state of discharge, or repairs have been carried out to the rear service or parking brake system • Service brake system fault 	<ul style="list-style-type: none"> • Re-calibrate parking brake, refer to the calibration procedure • Check the service brake for correct operation

DTC Index


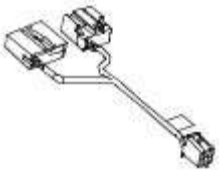
For a list of diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00.

REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Electric Parking Brake \(PBM\)](#) (100-00 General Information, Description and Operation).

Parking Brake and Actuation - Parking Brake Cable Tension Release

General Procedures

Special Tool(s)

 <p>206-082</p>	<p>Electric parking brake release tool 206-082. Only to be used for EMERGENCY brake release</p>
 <p>E69907</p>	<p>Electric parking brake release tool link lead 206-082-01. Only to be used for EMERGENCY brake release</p>



WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.



- WARNING:** Always use Jaguar approved diagnostic equipment to release the cable tension, when carrying out repair operations on the electric park brake which require cable tension release.

Connect the Jaguar approved diagnostic equipment to release the electric parking brake cable tension.

- Follow the on-screen instructions.



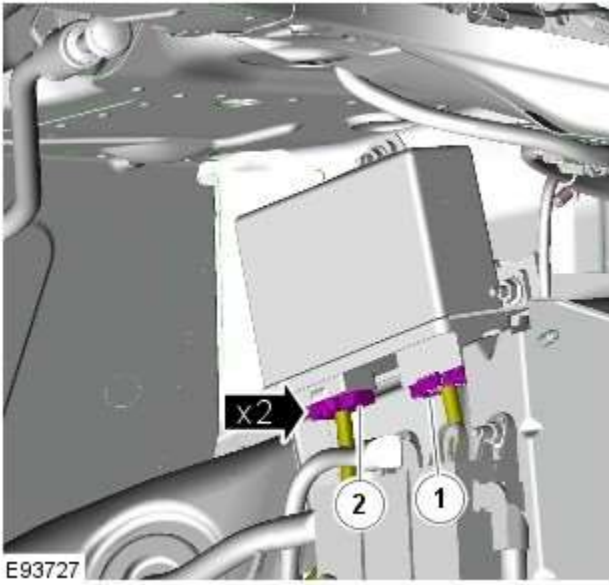
- WARNING:** The procedure below should only be used in emergency situations, to release the electric park brake. All calibration of the parking brake system will be lost, and the parking brake will need to be re-calibrated to function correctly.



NOTE: The tools shown must only be used in the event of an emergency.

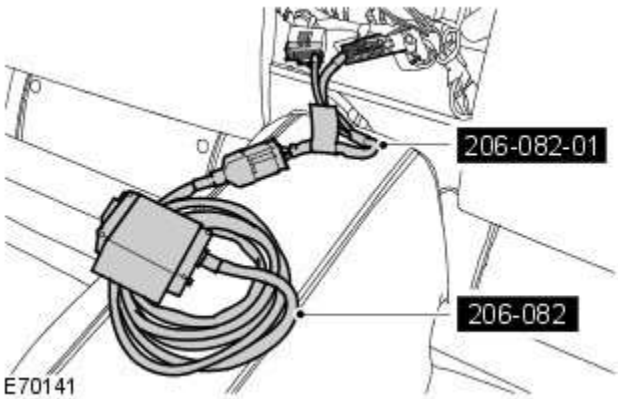
Remove the RH loadspace trim panel.


For additional information, refer to: [Loadspace Trim Panel RH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



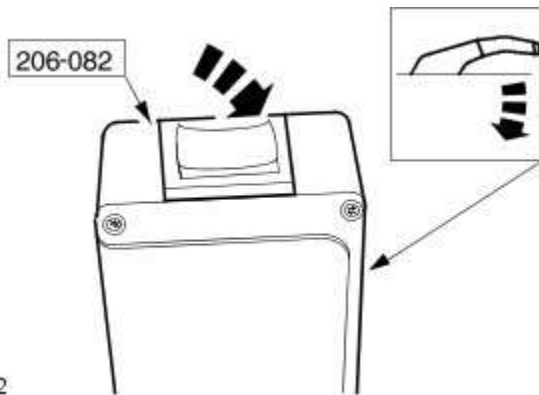
3. **WARNING:** Failure to follow this instruction may result in a diagnostic trouble code (DTC) being generated.

Disconnect the 2 electrical connectors from the parking brake module, in the sequence illustrated.



4.  **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.

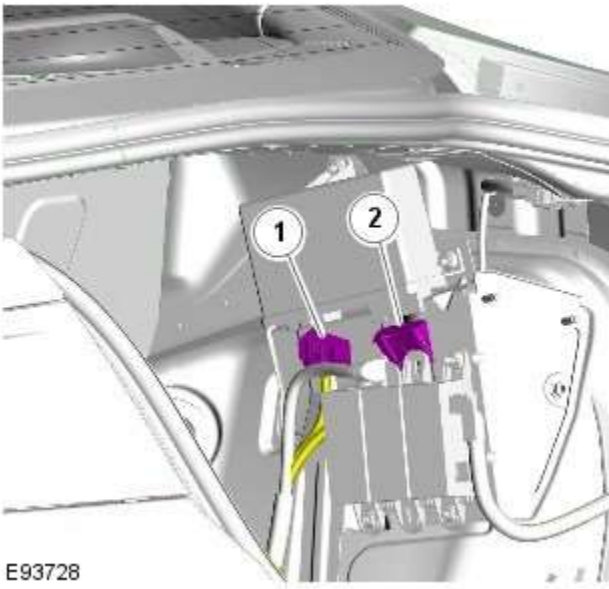
Connect the special tool to the parking brake module.



5. Release the parking brake cable tension.
 - An audible 'click', signals complete parking brake cable tension release.

6. Remove the special tool and carry out any necessary repairs on the system.

7. Connect the electrical connectors in the sequence shown.



E93728

8. Install the RH loadspace trim panel.
For additional information, refer to: [Loadspace Trim Panel RH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



9. **WARNING:** Calibrate the electric park brake using Jaguar approved diagnostic equipment. If Jaguar approved diagnostic equipment is not available disconnect the battery for approximately 30 seconds, the vehicle will then prompt the driver to carry out the calibration procedure as per the vehicle hand book on re-connection.

Calibrate the electric park brake.

Parking Brake and Actuation - Parking Brake Cable LH TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal



WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Parking Brake Cable Tension Release](#) (206-05 Parking Brake and Actuation, General Procedures).

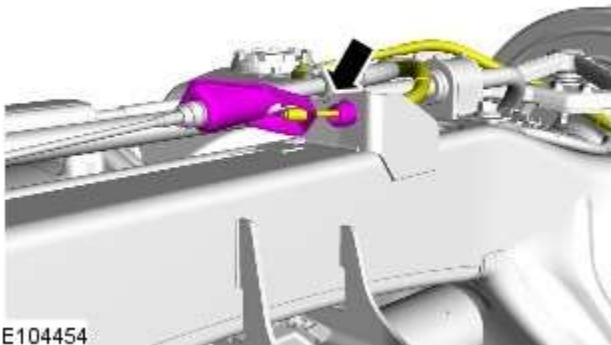


2. **WARNING:** Make sure to support the vehicle with axle stands.

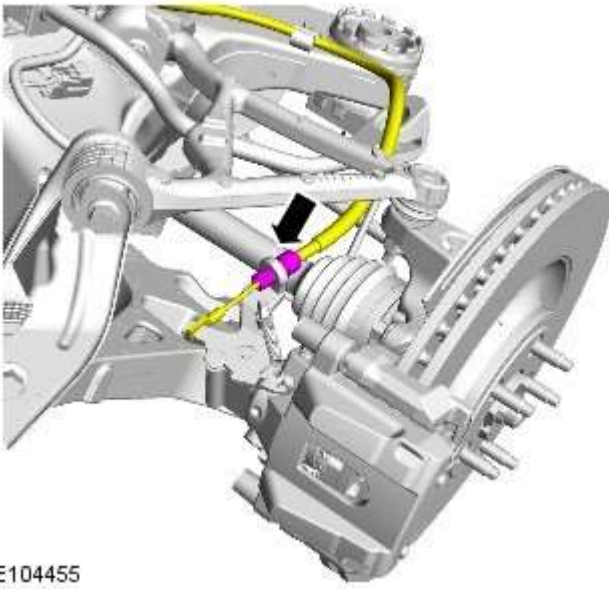
Raise and support the vehicle.


3. Refer to: [Rear Subframe - TDV6 3.0L Diesel](#) (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).
Refer to: [Rear Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

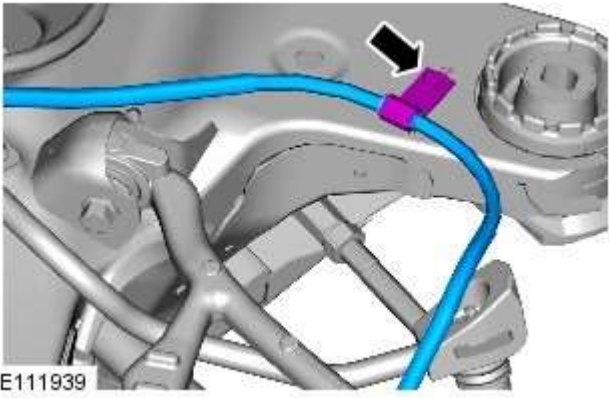
4.



E104454



5.  NOTE: Note the fitted position.



6. Torque: 20 Nm

Installation

1. To install, reverse the removal procedure.

Parking Brake and Actuation - Parking Brake Cable RH TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal



WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Parking Brake Cable Tension Release](#) (206-05 Parking Brake and Actuation, General Procedures).

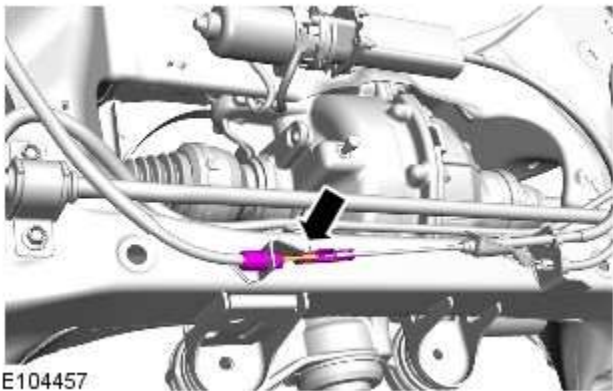


2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

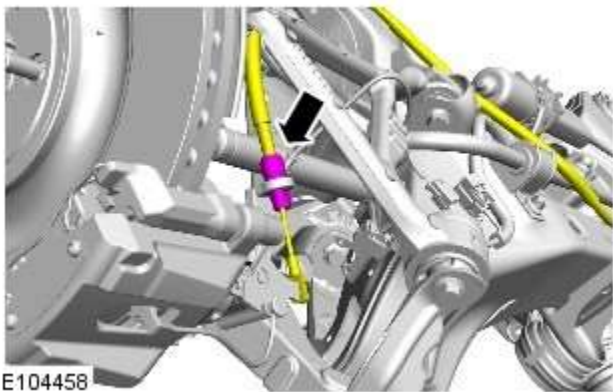
3. Refer to: [Rear Subframe - TDV6 3.0L Diesel](#) (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).
Refer to: [Rear Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

4.



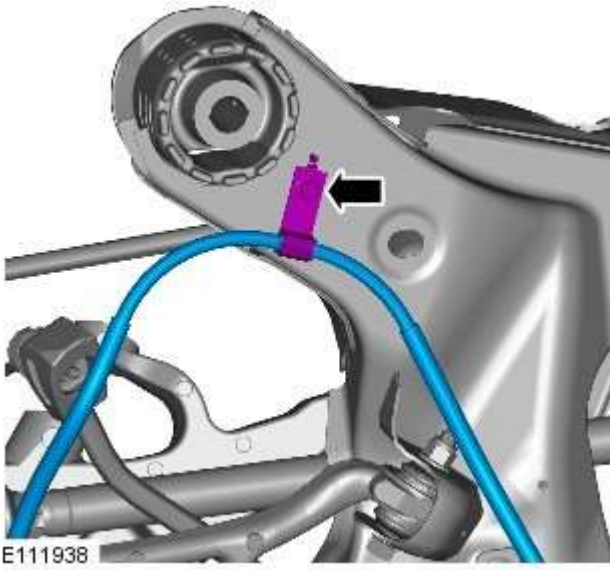
E104457

5.  **NOTE:** Note the fitted position.



E104458

6. *Torque: 20 Nm*



Installation

1. To install, reverse the removal procedure.

Parking Brake and Actuation - Parking Brake Module

Removal and Installation

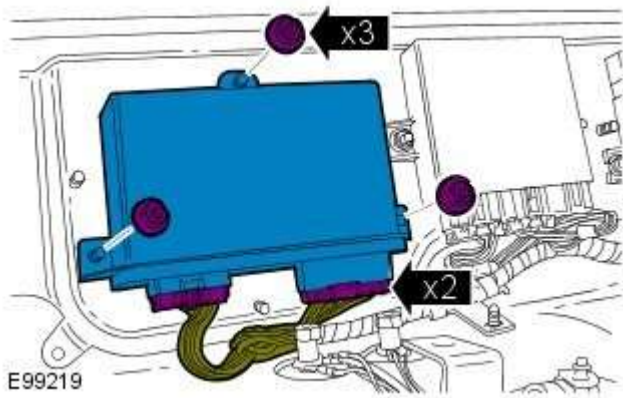
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Loadspace Trim Panel RH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Torque: 4 Nm



Installation

1. To install, reverse the removal position
2. Configure the electronic parking brake (EPB) using the diagnostic tool.

Parking Brake and Actuation - Parking Brake Switch

Removal and Installation

Removal

NOTES:




The parking brake switch is part of the transmission control switch (TCS) assembly and therefore can not be serviced separately.



Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Transmission Control Switch \(TCS\)](#) (307-05A Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol, Removal and Installation).

Installation

1.  CAUTION: Make sure that all diagnostic trouble codes (DTCs) have been removed after the road test.

To install, reverse the removal procedure.

Parking Brake and Actuation - Parking Brake Release Actuator

Removal and Installation

Removal



WARNING: Failure to release the tension and calibrate the electric parking brake during rear parking brake related service procedures, could cause the parking brake to function incorrectly or become inoperative.

1. Refer to: [Parking Brake Cable Tension Release](#) (206-05 Parking Brake and Actuation, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.

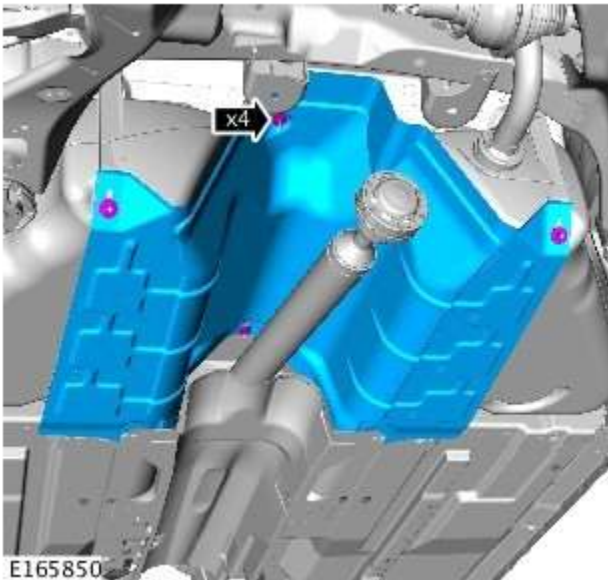
Raise and support the vehicle.

3. Remove the differential case.

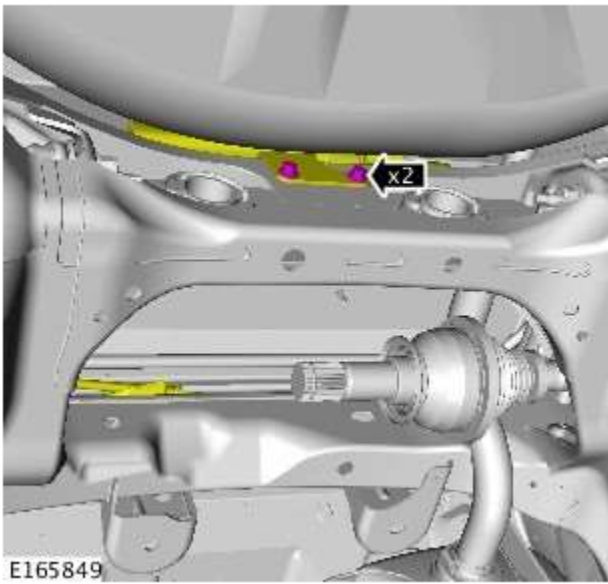
Refer to: [Differential Case - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-02 Rear Drive Axle/Differential, Removal and Installation).

Refer to: [Differential Case - TD4 2.2L Diesel/TDV6 3.0L Diesel](#) (205-02, Removal and Installation).

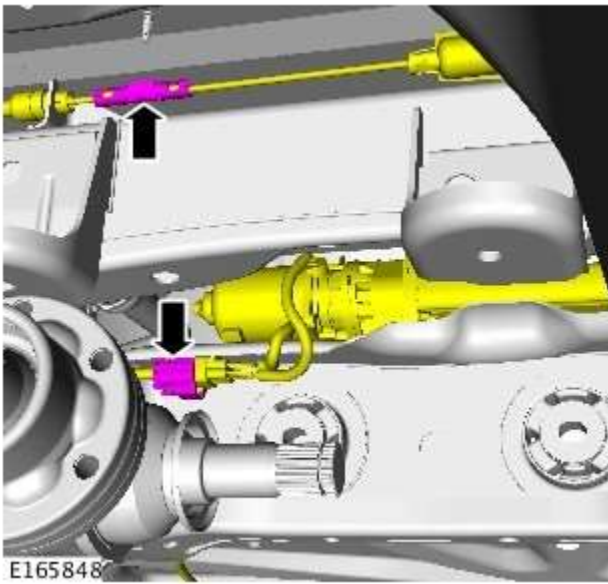
4. Torque: 7 Nm

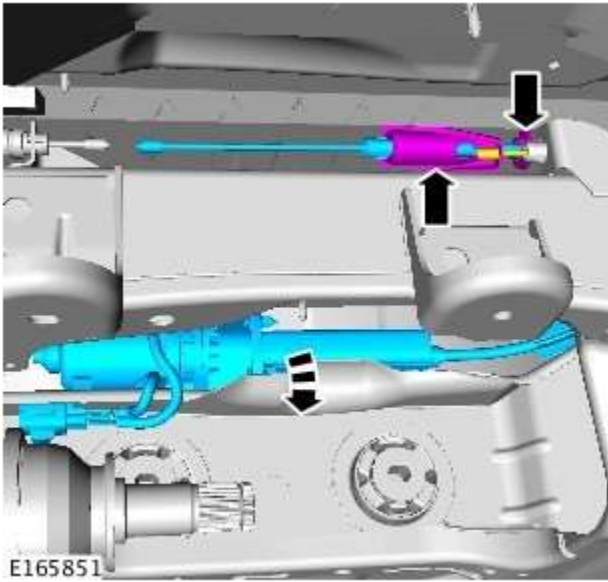


5. Torque: 20 Nm



6.

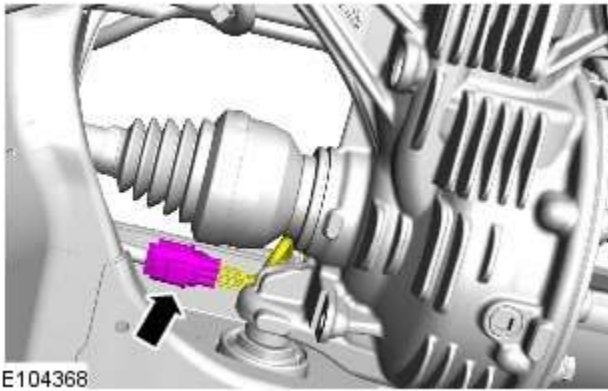




7.

Installation

1. To install, reverse the removal procedure.



2. CAUTION: Make sure the wiring harness is correctly routed to avoid contact with the halfshaft. Failure to follow this instruction may result in damage to the component.



3. CAUTION: Calibrate the electric park brake using Jaguar approved diagnostic system. If the Jaguar approved diagnostic system is not available disconnect the battery for approximately 30 seconds, the vehicle will then prompt the driver to carry out the calibration procedure as per the vehicle hand book on re-connection.

Calibrate the electric parking brake (EPB) using the diagnostic tool.

Hydraulic Brake Actuation -

Lubricants, Fluids, Sealers and Adhesives



CAUTION: Do not use brake fluid ITT Super Dot 4 on 2006my vehicles onwards. Failure to follow this instruction may result in damage to the vehicle.



NOTE: Brake fluid ITT Super Dot 4 has now been superseded by Shell ESL Super Dot 4 which is the Jaguar recommended brake fluid. Shell ESL Super Dot 4 can be used on all model years.

Item	Specification
Brake fluid	Shell ESL Dot 4

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake master cylinder to brake booster retaining nuts.	25	18	-
HCU to brake master cylinder brake tubes	17	13	-
Brake master cylinder reservoir retaining bolts	4	-	35

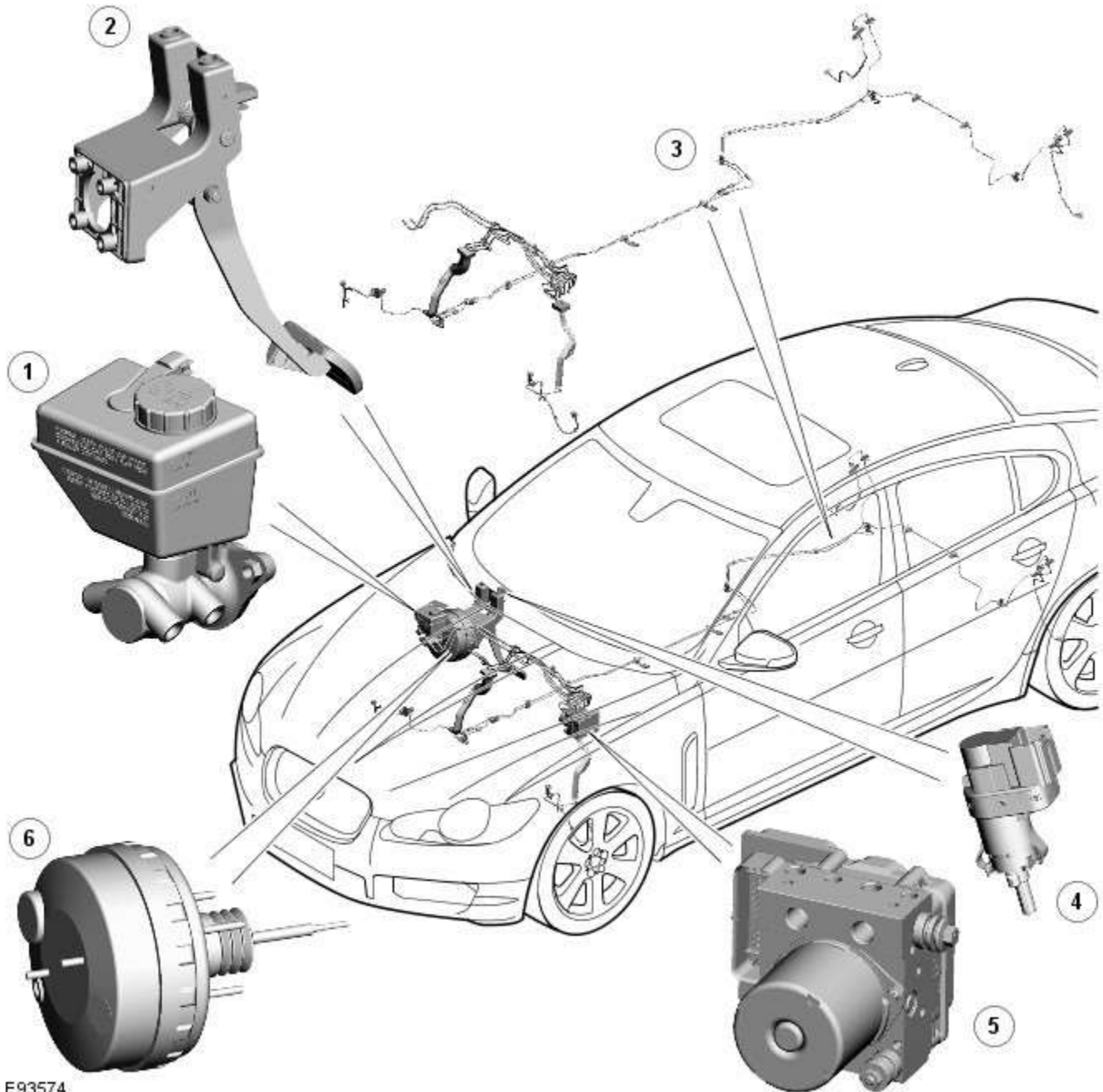
Hydraulic Brake Actuation - Hydraulic Brake Actuation - Component Location

Description and Operation



NOTE: RHD (right-hand drive) installation shown, LHD (left-hand drive) installation similar.

Component Location



E93574

Item	Description
1	Brake master cylinder and fluid reservoir
2	Brake pedal
3	Brake pipes
4	Stoplamp switch
5	ABS (anti-lock brake system) module/ HCU (hydraulic control unit)
6	Brake booster

Hydraulic Brake Actuation - Hydraulic Brake Actuation - Overview

Description and Operation

Overview

The hydraulic brake system is a diagonally split dual line system. The system consists of a brake pedal, vacuum brake booster, brake master cylinder assembly, [HCU \(hydraulic control unit\)](#), hydraulic pipes and brake hoses.

Brake pipes from the master cylinder supply pressure to the brake calipers at the four corners of the vehicle via the [HCU](#). Braided steel hoses are used to connect the brake pipes to the front and rear brake calipers.

Hydraulic Brake Actuation - Hydraulic Brake Actuation - System Operation and Component Description

Description and Operation

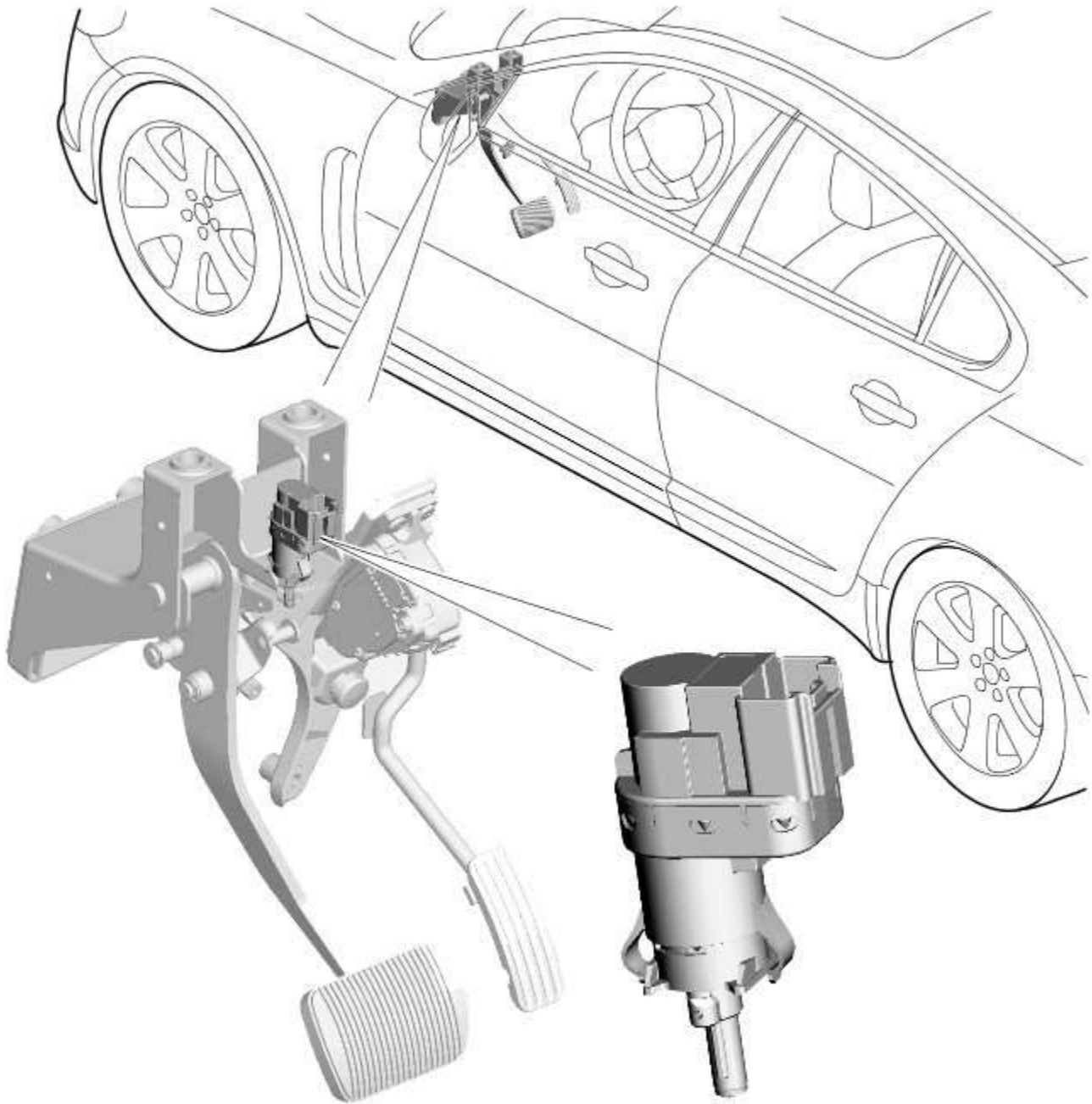
System Operation

When the brake pedal is pressed, the front push rod in the brake booster pushes the master cylinder primary piston along the bore of the housing. This produces pressure in the primary pressure chamber which, in conjunction with the primary spring, overcomes the secondary spring and simultaneously moves the secondary piston along the bore. The initial movement of the pistons away from the piston stops closes the primary and secondary center valves in the master cylinder. Further movement of the pistons then pressurizes the fluid in the primary and secondary chambers and thus the brake circuits. The fluid in the chambers behind the pistons is unaffected by the movement of the pistons and can flow unrestricted through the inlet ports between the chambers and the reservoir.

Pressurized fluid enters the [HCU \(hydraulic control unit\)](#), which is mounted on the front of the [ABS \(anti-lock brake system\)](#) module. The [HCU](#) modulates the supply of pressurized fluid to the brakes under control of the [ABS](#) module. Refer to: [Anti-Lock Control - Stability Assist](#) (206-09 Anti-Lock Control - Stability Assist, Description and Operation).

Component Description

Brake Pedal

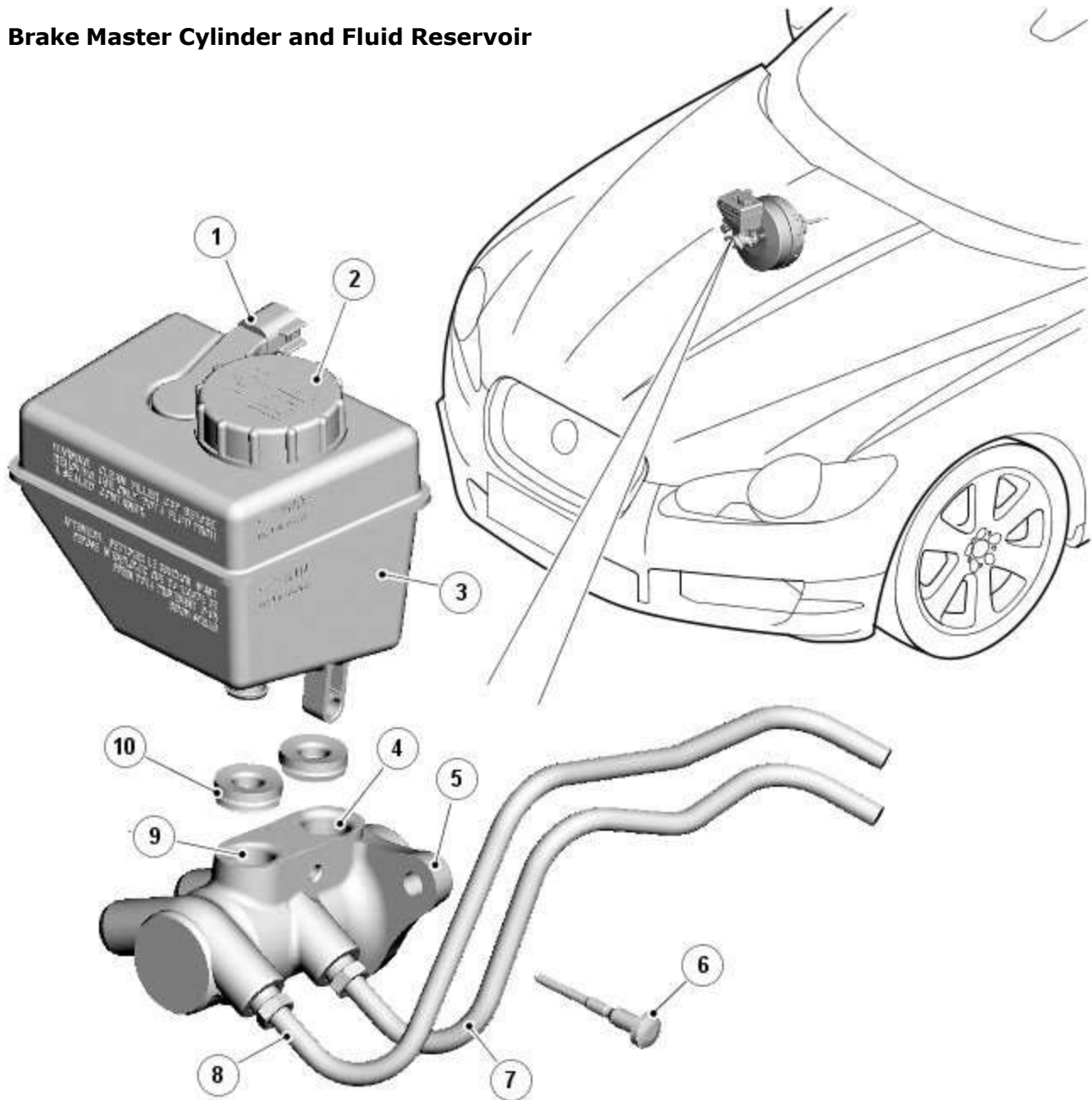


E93526

The brake pedal is mounted to a bracket attached to the rear side of the engine bulkhead. The bracket also contains the accelerator pedal. A clevis pin connects the brake pedal to the input push rod of the brake booster and master cylinder assembly.

The stoplamp switch is mounted in the brake pedal bracket and is operated by the brake pedal.

Brake Master Cylinder and Fluid Reservoir



E93575

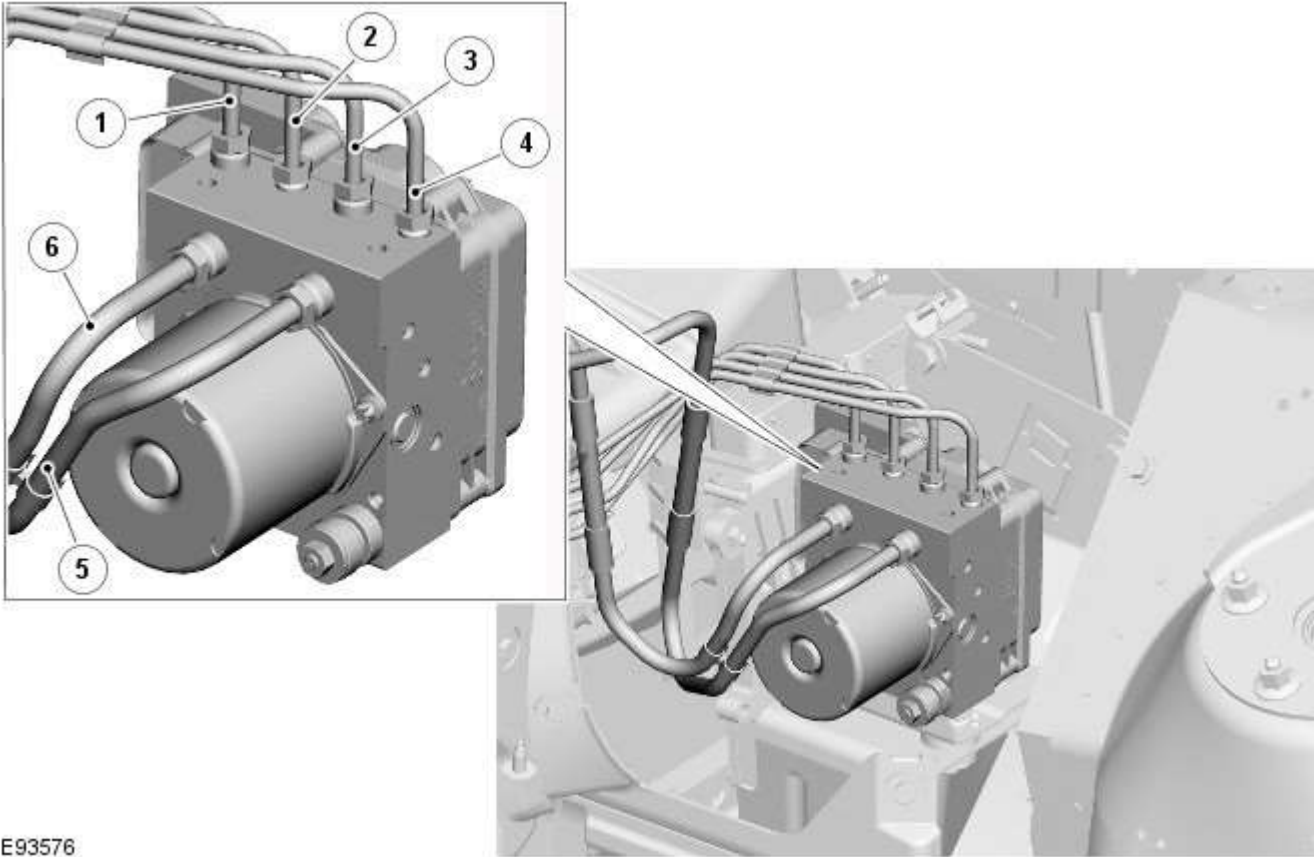
Item	Description
1	Brake fluid level switch electrical connector
2	Brake fluid reservoir cap
3	Brake fluid reservoir
4	Primary circuit inlet port
5	Brake master cylinder
6	Torx bolt
7	Primary circuit outlet
8	Secondary circuit outlet
9	Secondary circuit inlet port
10	Reservoir to master cylinder seal (2 off)

The brake booster and master cylinder assembly is fitted in the engine compartment. The brake master cylinder housing consists of two hydraulic chambers containing two pistons in tandem. The primary piston (adjacent to the brake booster) produces pressure for the primary braking circuit and this pressure acts on the secondary piston and hence creates pressure in the secondary circuit. A brake fluid reservoir is mounted on top of the master cylinder to provide a supply of brake fluid to the brake system. The reservoir cap is fitted with a brake fluid level switch.

Brake Fluid Level Switch

The brake fluid level switch is located in the fluid reservoir and is hardwired to the instrument cluster. When the level of fluid in the reservoir reaches a predetermined low level, the switch contacts close and provide a signal feed back to the instrument cluster. On receipt of the signal, the brake fluid red warning indicator will illuminate and 'BRAKE FLUID LOW' will be displayed in the message center.

ABS Module



E93576

Item	Description
1	LH (left-hand) front brake
2	RH (right-hand) rear brake
3	LH rear brake
4	RH front brake
5	Primary circuit inlet port
6	Secondary circuit inlet port

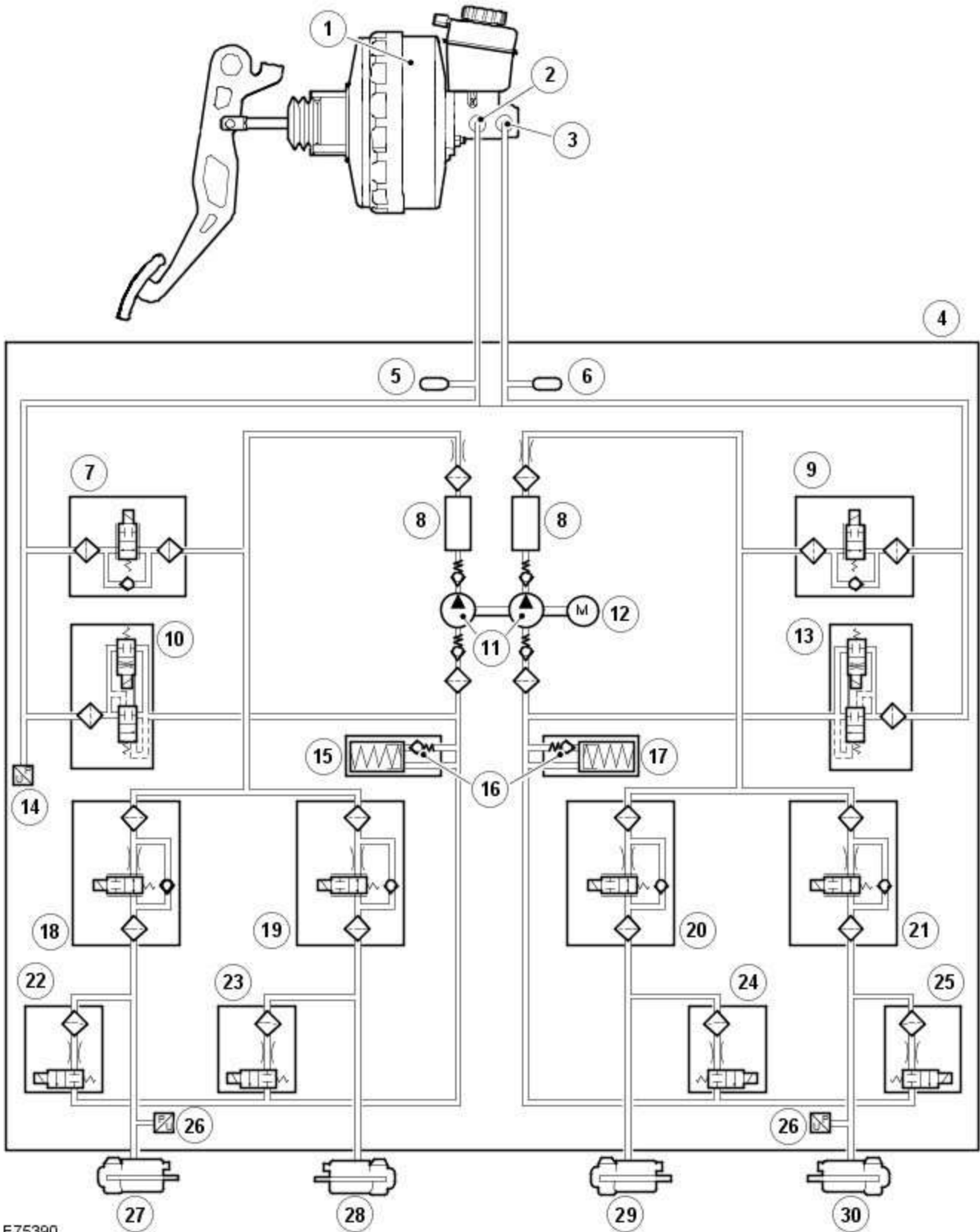
The [ABS](#) module is located in the passenger side, rear engine bay and incorporates the [HCU](#). The [HCU](#) is a four channel unit that modulates the supply of hydraulic pressure to the brakes under control of the [ABS](#) module.

The primary and secondary outlets of the master cylinder are connected to the primary and secondary circuits within the [HCU](#). The primary circuit in the [HCU](#) has separate outlet ports to the [RH](#) front and [LH](#) rear brakes. The secondary circuit in the [HCU](#) has separate outlet ports to the [LH](#) front and [RH](#) rear brakes.



CAUTION: The ABS module and the HCU are a single unit and must not be separated.

HCU Schematic Diagram



E75390

Item	Description
1	Brake booster
2	Primary circuit
3	Secondary circuit
4	HCU

5	Pulsation damper
6	Pulsation damper
7	Separation valve
8	Damping chambers
9	Separation valve
10	Shuttle valve
11	Hydraulic pumps
12	Motor
13	Shuttle valve
14	Pressure sensor - all vehicles
15	Low pressure accumulator
16	Check valve
17	Low pressure accumulator
18	Inlet valve
19	Inlet valve
20	Inlet valve
21	Inlet valve
22	Outlet valve
23	Outlet valve
24	Outlet valve
25	Outlet valve
26	Pressure sensors - vehicles fitted with adaptive speed control only
27	RH front brake
28	LH rear brake
29	RH rear brake
30	LH front brake

Hydraulic Brake Actuation - Hydraulic Brake Actuation

Diagnosis and Testing

For additional information.

REFER to: [Brake System](#) (206-00 Brake System - General Information, Diagnosis and Testing).

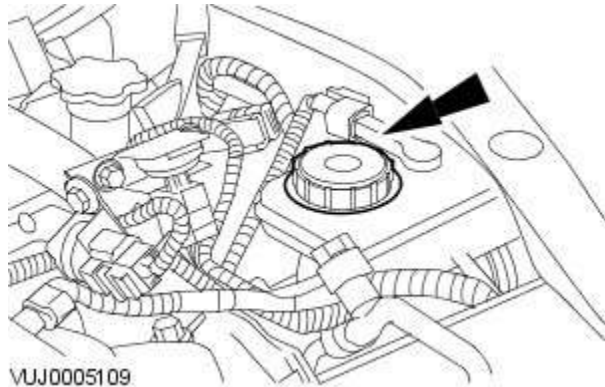
Hydraulic Brake Actuation - Brake Fluid Reservoir

Removal and Installation

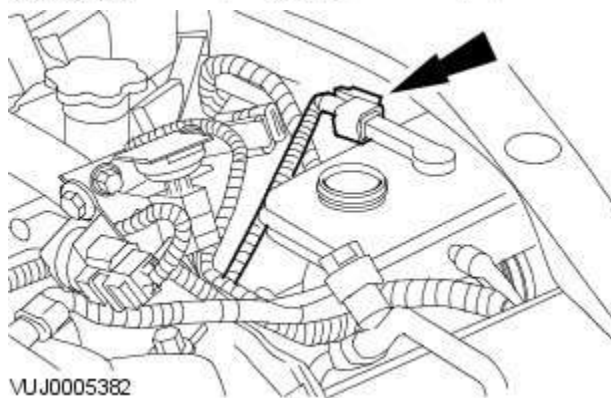
Removal



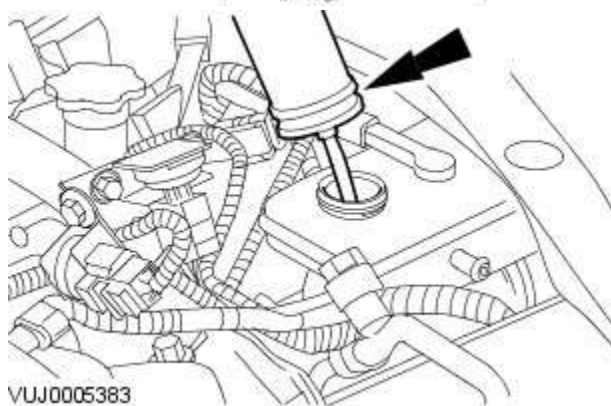
CAUTION: If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.



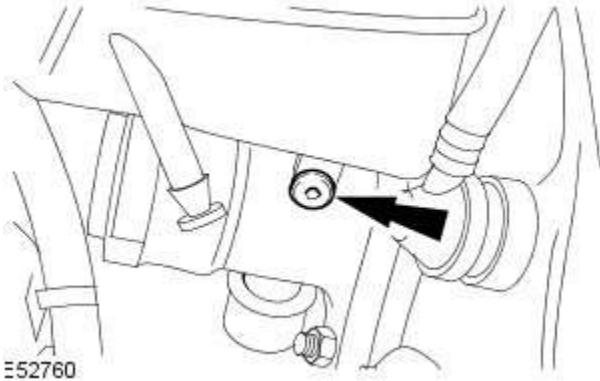
1. Remove the brake fluid reservoir cap.



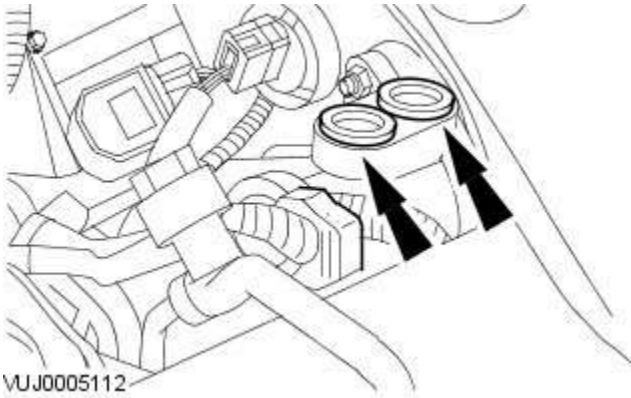
2. Disconnect the brake fluid level electrical connector.



3. Using a suitable suction device drain the brake fluid reservoir.



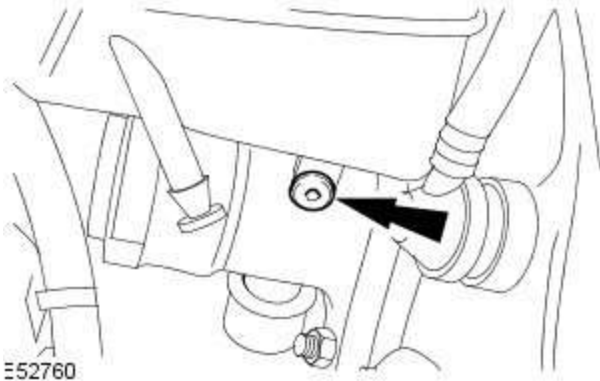
4. Remove the brake fluid reservoir.



5. Remove and discard the O-ring seals.

- Remove and discard the O-ring seals.

Installation




1. To install, reverse the removal procedure.


- Tighten to 8 Nm.
- Fill the brake fluid reservoir to the MAX mark.

Hydraulic Brake Actuation - Brake Master Cylinder

Removal and Installation

Removal

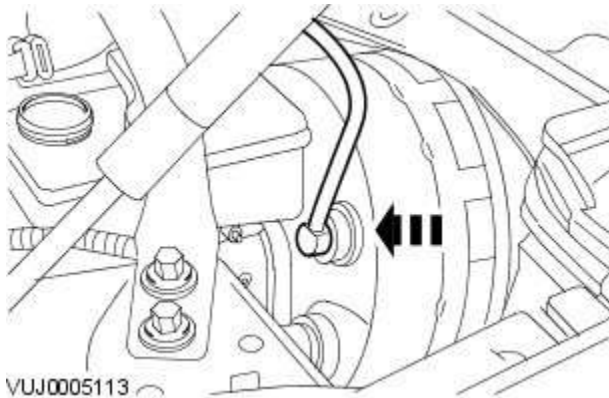
1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Remove the cowl vent screen.
For additional information, refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).


3.  **CAUTION:** Brake fluid will damage paint finished surfaces. If spilled, immediately remove the fluid and clean the area with water.

Remove the brake fluid reservoir.

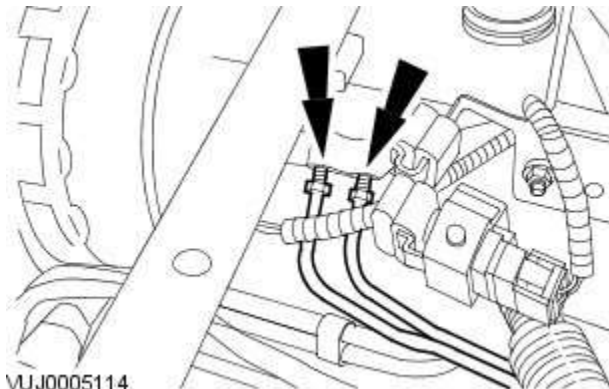
For additional information, refer to: [Brake Fluid Reservoir](#) (206-06 Hydraulic Brake Actuation, Removal and Installation).

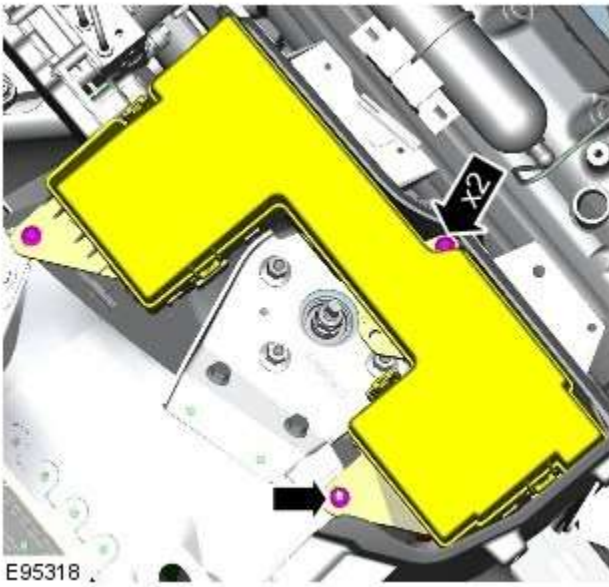
4. Remove the brake booster vacuum line from the brake vacuum pump.



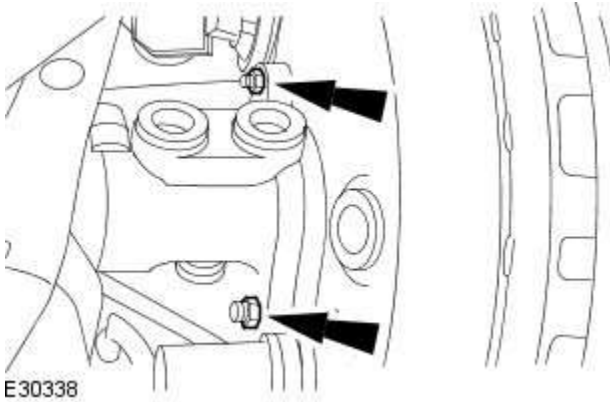
5.  **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.

Disconnect the master cylinder brake pipes.



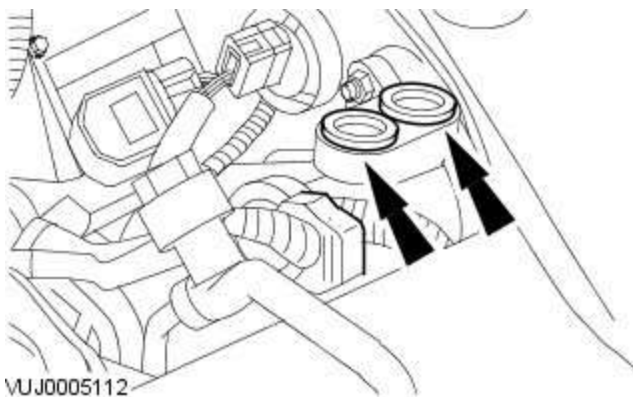


6. Release the fuse box.

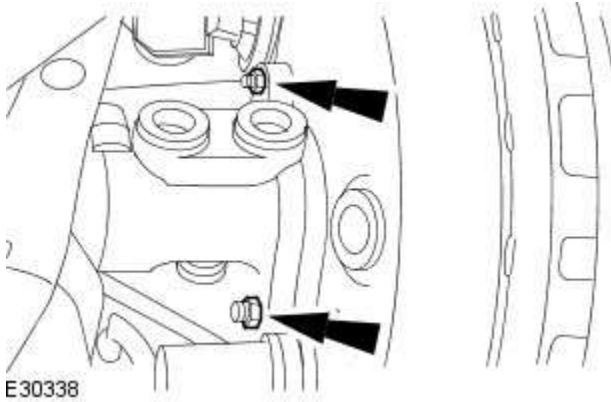


7. Remove the brake master cylinder.

Installation

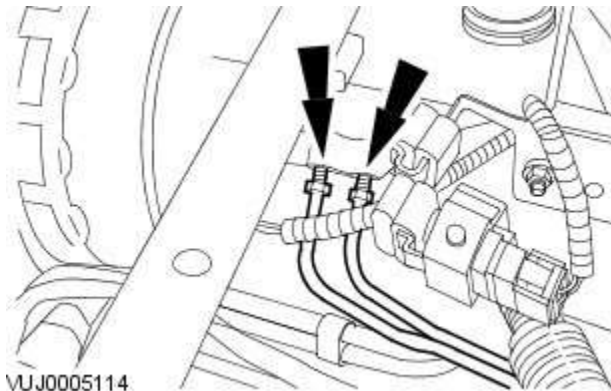


1. To install, reverse the removal procedure.
 - Install new O-ring seals.



E30338

2. Tighten to 25 Nm.



VUJ0005114

3. Tighten to 17 Nm.

4. Bleed the brake system.
For additional information, refer to: [Brake System Bleeding](#) (206-00 Brake System - General Information, General Procedures).

Power Brake Actuation -

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake booster retaining nuts - all vehicles	25	18	-
Exhaust gas recirculation valve coolant pipe - vehicles with 3.0L Diesel	9	-	80
Brake vacuum pump nut - vehicles with 3.0L Diesel	23	17	-
Brake vacuum pump threaded stud - vehicles with 3.0L Diesel	13	10	-
Brake vacuum pump bolts - vehicles with 3.0L Diesel	23	17	-
Brake vacuum pump bolts - vehicles with 5.0L	12	9	-

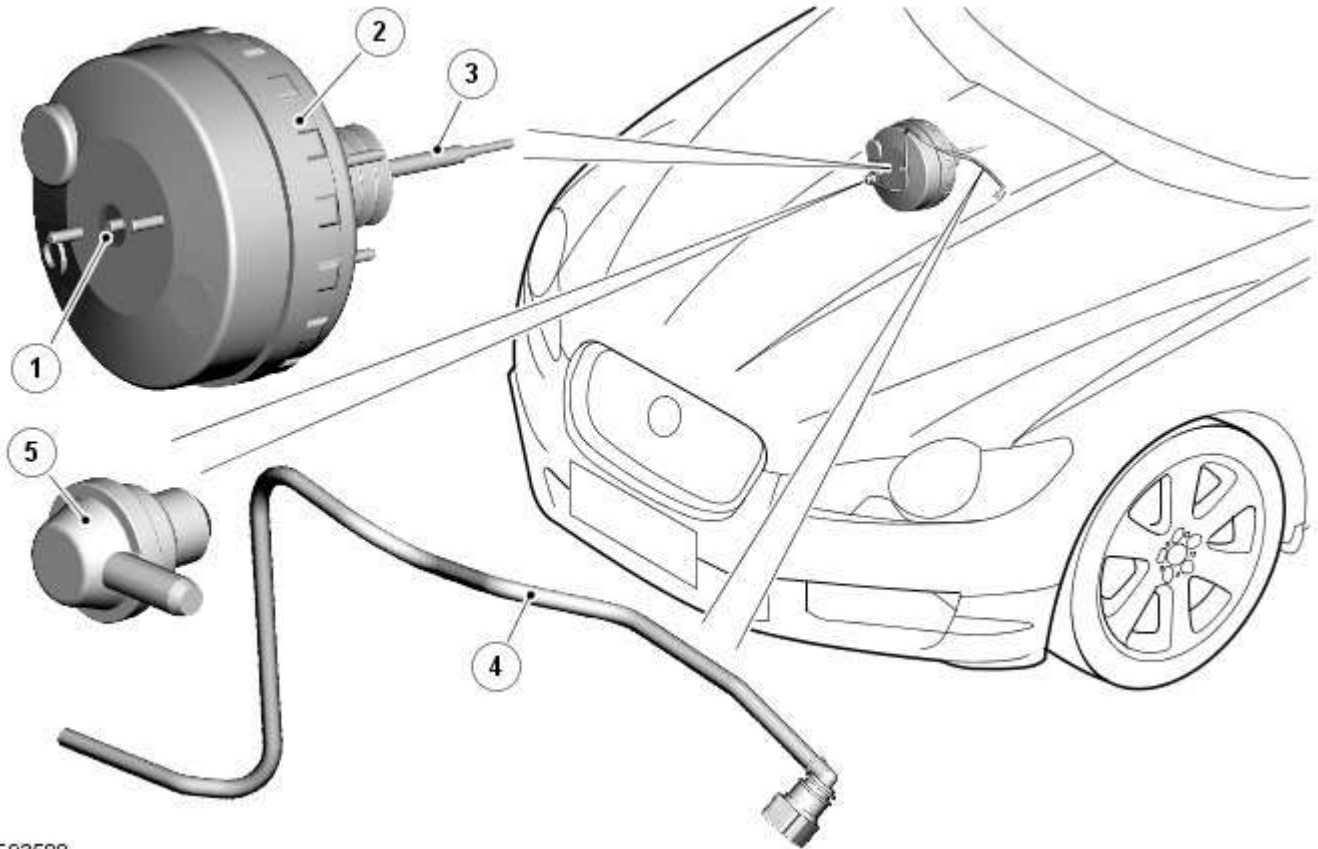
Power Brake Actuation - Brake Booster - Component Location

Description and Operation



NOTE: RHD (right-hand drive) installation shown, LHD (left-hand drive) installation similar.

Component Location



E93588

Item	Description
1	Output pushrod
2	Brake booster
3	Input pushrod
4	Vacuum pipe
5	Non return valve

Power Brake Actuation - Brake Booster - Overview

Description and Operation

Overview

Power assistance for the braking system is provided by a vacuum brake booster. The unit increases the input load by a ratio of 6.2 : 1 and is secured to the driver's side of the engine compartment bulkhead by four studs and nuts.

The booster and master cylinder assembly is fitted in the engine compartment. A two piece plastic vacuum pipe connects the brake booster to the inlet manifold to provide the necessary vacuum to the booster. The connection into the brake booster has a non return valve to maintain the vacuum level in the booster and also prevent fuel vapor from entering the brake booster.

The input push rod within the brake booster is connected to the brake pedal lever. Initially, any effort applied by the driver is increased by pedal ratio which is transferred to the input push rod. This load is further increased by the booster. The increased load is applied to the primary piston of the master cylinder via the output pushrod of the booster. Hydraulic pressure in the master cylinder is then applied to the brakes.

Refer to: [Hydraulic Brake Actuation](#) (206-06 Hydraulic Brake Actuation, Description and Operation).

Power Brake Actuation - Power Brake System

Diagnosis and Testing

For additional information.

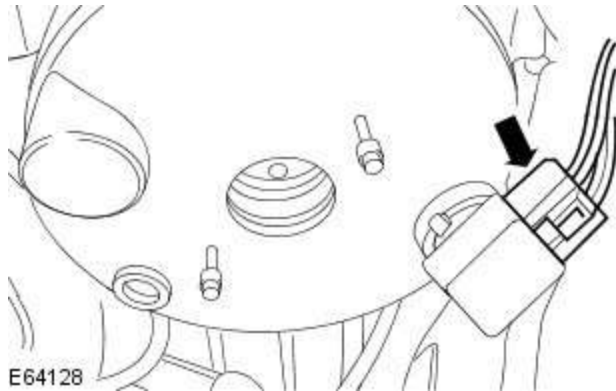
REFER to: [Brake System](#) (206-00 Brake System - General Information, Diagnosis and Testing).

Power Brake Actuation - Brake Booster

Removal and Installation

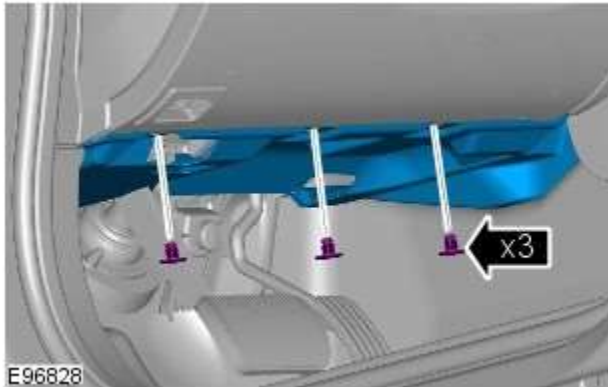
Removal

1. Remove the brake master cylinder.

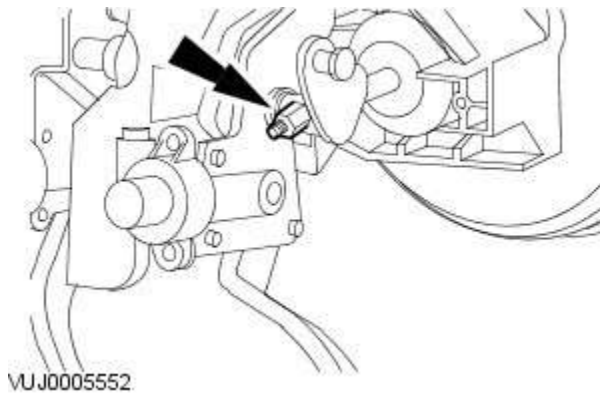


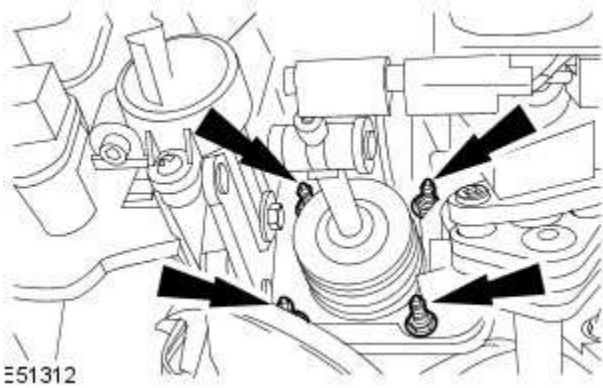
2. Disconnect the brake booster vacuum electrical connector.

3. Remove the lower trim panel.

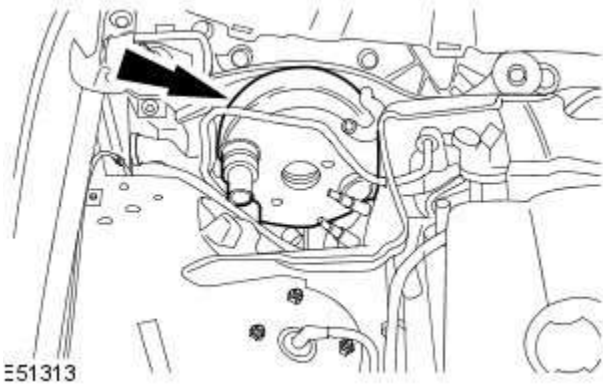


4. Remove the retaining nut.



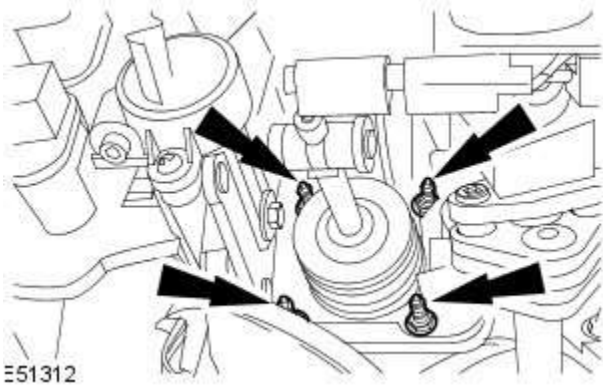



5. Remove the brake booster retaining nuts.

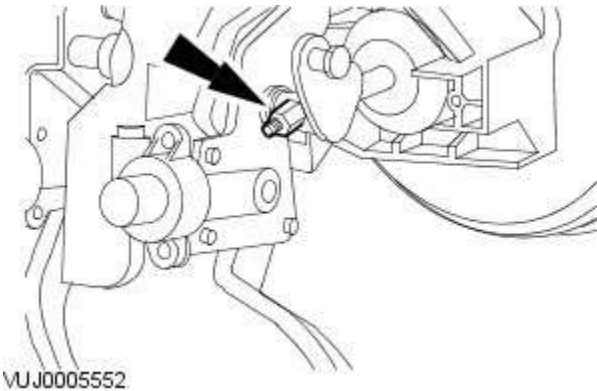


6. Remove the brake booster.

Installation



1.  **NOTE:** Replace the brake booster/pedal box gasket.
To install, reverse the removal procedure.
 - Tighten to 25 Nm.



2. Tighten to 3 Nm.

Power Brake Actuation - Brake Vacuum Pump V8 5.0L Petrol/V8 S/C 5.0L

Petrol

Removal and Installation


Removal



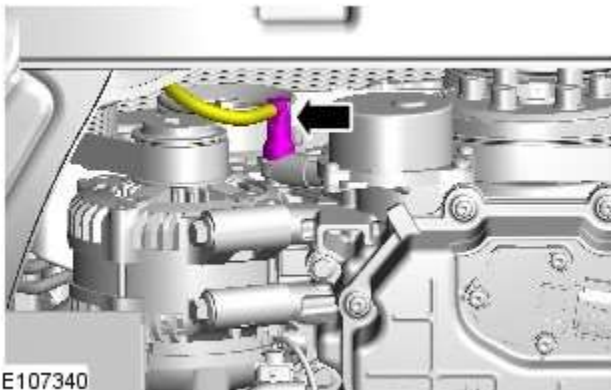
CAUTION: Make sure that all openings are sealed. Use new blanking caps.



NOTE: Removal steps in this procedure may contain installation details.

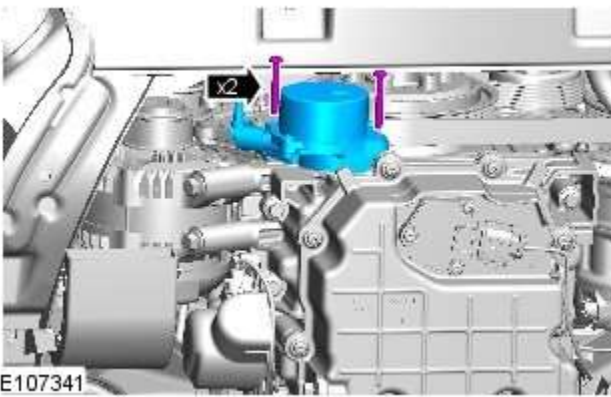
1.  **WARNING:** Make sure to support the vehicle with axle stands. Raise and support the vehicle.
2. Refer to: Engine Oil Draining and Filling (303-01, General Procedures).

3.




4.  **CAUTION:** Be prepared to collect escaping oil.

Torque: 12 Nm






E147623

5.  NOTE: Remove and discard the O-ring seal.

Installation

1.  NOTE: Install a new O-ring seal. To install reverse the removal procedure.
2. Start engine and check the brake booster operation.

Anti-Lock Control - Stability Assist -**Lubricants, Fluids, Sealers and Adhesives**

Item	Specification
Brake fluid	Shell ESL Dot 4

Torque Specifications

Description	Nm	lb-ft	lb-in
Brake master cylinder primary pressure transducer	30	22	-
Brake tubes to hydraulic control unit (HCU)	17	13	-
Rear wheel speed sensor retaining bolt	6	-	53
Yaw rate sensor and accelerometer retaining nuts	7	-	62
Hydraulic control unit (HCU) retaining bolts	8	-	71
Steering wheel rotation sensor retaining screws	4	-	35
Steering column to lower shroud retaining screws	3	-	27

Anti-Lock Control - Stability Assist - Anti-Lock Control - Stability Assist -

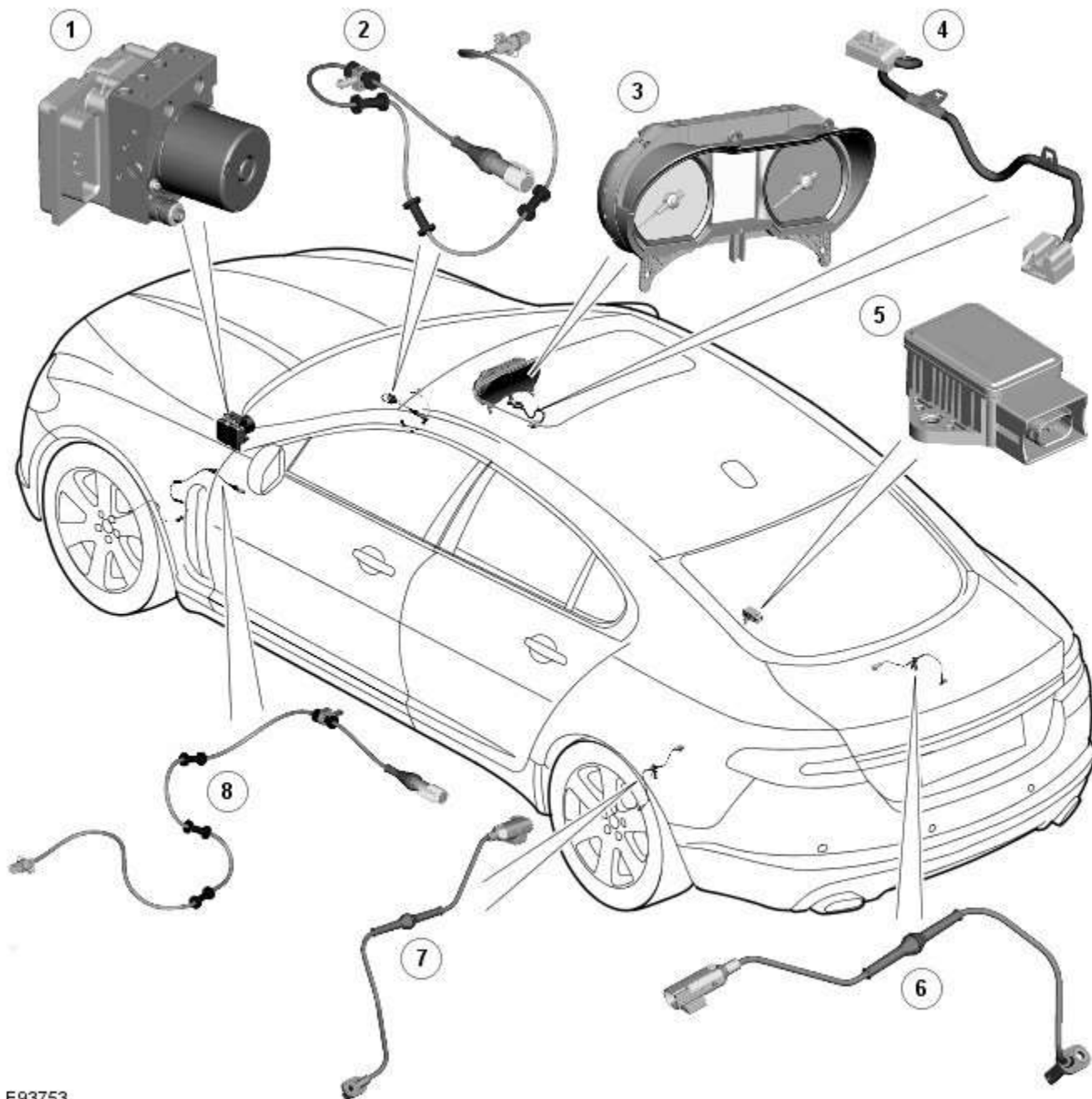
Component Location

Description and Operation



NOTE: RHD (right-hand drive) installation shown, LHD (left-hand drive) installation similar.

Component Location



E93753

Item	Description
1	ABS (anti-lock brake system) module
2	RH (right-hand) front wheel speed sensor
3	Instrument cluster
4	Steering angle sensor
5	Yaw rate and lateral acceleration sensor
6	RH rear wheel speed sensor
7	LH (left-hand) rear wheel speed sensor
8	LH front wheel speed sensor

Anti-Lock Control - Stability Assist - Anti-Lock Control - Stability Assist -

Overview

Description and Operation

Overview

The [ABS \(anti-lock brake system\)](#) and DSC (dynamic stability control) system features a Bosch modulator, which is an integrated four-channel [HCU \(hydraulic control unit\)](#) and [ABS](#) module. The unit is located in the rear of the engine compartment on the passenger side, and is installed in the brake hydraulic circuit between the brake master cylinder and the four brake calipers.

The [ABS](#) module is connected to the high speed [CAN \(controller area network\)](#) bus, and actively interacts with other vehicle system control modules and associated sensors to receive and transmit current vehicle operating information.

When required, the [ABS](#) module will actively intervene and operate the [HCU](#) during braking or vehicle maneuvers to correct the vehicle attitude, stability, traction or speed. During incidents of vehicle correction, the [ABS](#) module may also request the [ECM \(engine control module\)](#) to control engine power in order to further stabilize and correct the vehicle.

To provide full system functionality, the [ABS](#) and DSC system comprise the following components:

- DSC switch.
- Four wheel speed sensors.
- Steering angle sensor.
- Yaw rate and lateral acceleration sensor.
- Stoplamp switch.
- Instrument cluster indicator lamps.
- Integrated [ABS](#) module and [HCU](#).
- Brake booster vacuum sensor (3.0L vehicles only).

Two variants of [ABS](#) module are available, Bosch ESP®8.1 and Bosch ESP®plus8.1. The Bosch ESP®plus8.1 system is fitted to vehicles with ACC (adaptive cruise control) and incorporates a new feature to Jaguar known as 'electronic brake prefill'.

Electronic brake prefill, senses any rapid throttle lift off, activating a small brake hydraulic pressure build-up of approximately 3 to 5 bar (43.5 to 72.5 lbf/in²) in anticipation of the brakes being applied. This application produces a quicker brake pedal response and consequently slightly shorter stopping distances. When the [ECM](#) detects rapid throttle lift off it signals the [ABS](#) module which controls the [HCU](#) to apply a low brake pressure to assist in a quicker brake application.



NOTE: All vehicles with ACC are supported by the Bosch ESP®plus8.1 system.

The [ABS](#) provides the following brake functions that are designed to assist the vehicle or aid the driver:

- [ABS](#).
- DSC, including Trac DSC.
- CBC (corner brake control).
- [EBD \(electronic brake force distribution\)](#).
- ETC (electronic traction control).
- [EBA \(emergency brake assist\)](#).
- EDC (engine drag-torque control).
- Understeer control.
- Electronic brake prefill (vehicles with ACC only).
- Brake vacuum assist (3.0L vehicles only).

All the brake functions listed are automatically active when the ignition is in power mode and the engine is running. The DSC system can be selected to off using the DSC switch.



WARNING: Although the vehicle is fitted with DSC, it remains the drivers responsibility to drive safely according to the prevailing conditions.

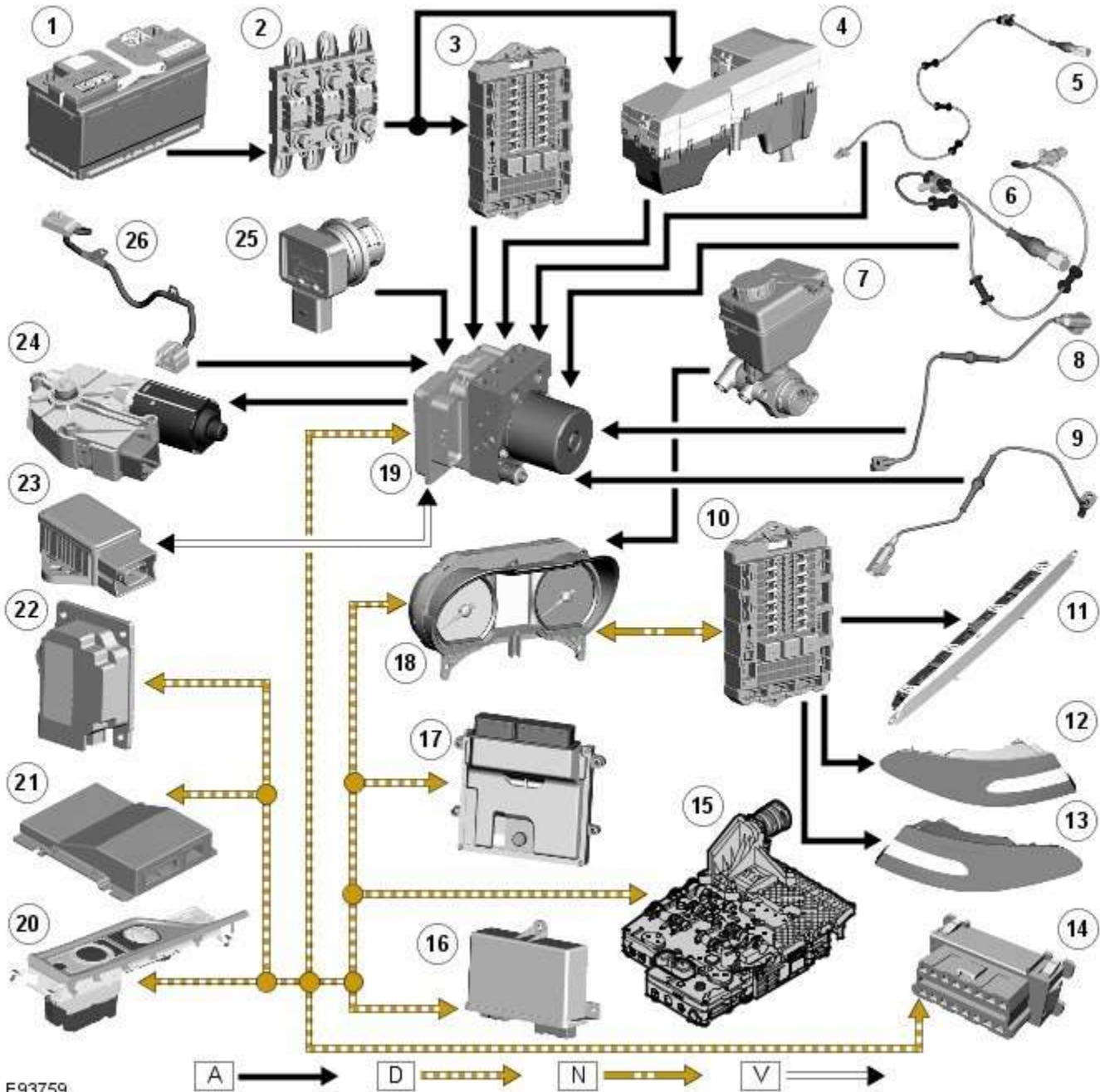
Anti-Lock Control - Stability Assist - Anti-Lock Control - Stability Assist - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus; **N** = Medium speed CAN bus; **V** = Private CAN bus.



E93759

Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse)
3	CJB (central junction box)
4	EJB (engine junction box)
5	LH (left-hand) front wheel speed sensor

6	RH (right-hand) front wheel speed sensor
7	Brake fluid level switch
8	LH rear wheel speed sensor
9	RH rear wheel speed sensor
10	RJB (rear junction box)
11	High mounted stop lamp
12	LH stop lamp
13	RH stop lamp
14	Diagnostic socket
15	TCM (transmission control module)
16	Electronic parking brake module
17	ECM (engine control module)
18	Instrument cluster
19	ABS (anti-lock brake system) module
20	JaguarDrive selector module
21	Adaptive damping control module
22	Adaptive speed control module
23	Yaw rate and lateral acceleration sensor
24	Roof opening panel motor/module
25	Brake booster vacuum sensor (3.0L vehicles only)
26	Steering angle sensor

System Operation

Anti-Lock Brake System

[ABS](#) controls the speed of all road wheels to ensure optimum wheel slip when braking at the adhesion limit. The wheels are prevented from locking to retain effective steering control of the vehicle.

The brake pressures are modulated separately for each wheel. Rear brake pressures are controlled to maintain rear stability on split friction surfaces.

Dynamic Stability Control

DSC (dynamic stability control) uses brakes and powertrain torque control to assist in maintaining the yaw stability of the vehicle. While the ignition is energized the DSC function is permanently enabled, unless selected off using the DSC switch.

DSC enhances driving safety in abrupt maneuvers and in under-steer or over-steer situations that may occur in a bend. The [ABS](#) module monitors the yaw rate and lateral acceleration of the vehicle, steering input and individual wheel speeds, then selectively applies individual brakes and signals for powertrain torque adjustments to reduce under-steer or over-steer conditions.

In general:

- In an under-steer situation the inner wheels are braked to counteract the yaw movement towards the outer edge of the bend.
- In an over-steer situation the outer wheels are braked to prevent the rear end of the vehicle from pushing towards the outer edge of the bend.

The [ABS](#) module monitors the tracking stability of the vehicle using inputs from the wheel speed sensors, the steering angle sensor, and the yaw rate and lateral acceleration sensor. The tracking stability is compared with stored target data. Whenever the tracking stability deviates from the target data, the [ABS](#) module intervenes by applying the appropriate control strategy.

The following interactions occur in an intervention situation:

- High speed [CAN](#) signal to the [ECM](#), to reduce engine torque.
- Application of braking to the appropriate corner of the vehicle.

Trac DSC

TracDSC is an alternative setting of DSC with reduced system interventions. With TracDSC engaged, traction may be somewhat increased, although stability may be reduced compared to normal DSC. TracDSC is intended for use only on dry tarmac, by suitably experienced drivers and should not be selected for other surfaces or by drivers with insufficient skill and training to operate the vehicle safely with the TracDSC function engaged.

The less restrictive TracDSC setting may be preferred, for example, by expert drivers engaged in high performance driving on dry Tarmac surfaces such as tracks and circuits.

Switching between DSC and Trac DSC:

- Press and hold the DSC switch for less than 10 seconds.
- The message center will temporarily display either **Trac DSC** or **DSC ON**.
- The warning indicator in the instrument panel will illuminate while Trac DSC is selected.
- The warning indicator will flash when DSC or Trac DSC is active.



NOTE: If cruise control is engaged, it will automatically disengage if DSC activates.

Refer to: Speed Control (310-03 Speed Control - 2.7L V6 - TdV6, Description and Operation).

Corner Brake Control

CBC (corner brake control) influences the brake pressures, below and within DSC and [ABS](#) thresholds, to counteract the yawing moment produced when braking in a corner. CBC produces a correction torque by limiting the brake pressure on one side of the vehicle.

Electronic Brake Force Distribution

[EBD](#) (electronic brake force distribution) limits the brake pressure applied to the rear wheels. When the brakes are applied, the weight of the vehicle transfers forwards, reducing the ability of the rear wheels to transfer braking effort to the road surface. This may cause the rear wheels to slip and make the vehicle unstable.

[EBD](#) uses the [ABS](#) braking hardware to automatically optimize the pressure to the rear brakes, below the point where [ABS](#) is normally invoked.



NOTE: Only the rear brakes are controlled by the [EBD](#) function.

Electronic Traction Control

ETC (electronic traction control) attempts to optimize forward traction by reducing engine torque, or by applying the brake of a spinning wheel until traction is regained.

ETC is activated if an individual wheel speed is above that of the vehicle reference speed (positive slip) and the brake pedal is not pressed. The brake is applied to the spinning wheel, allowing the excess torque to be transmitted to the non-spinning wheel through the drive line. If necessary, the [ABS](#) module also sends a high speed [CAN](#) bus message to the [ECM](#) to request a reduction in engine torque.

When the DSC function is selected off using the DSC switch, the braking and engine torque reduction features are both disabled, except when the JaguarDrive control is in winter mode. When the JaguarDrive control is in winter mode, selecting the DSC function off retains the braking and engine torque reduction features, but reduces intervention levels compared to DSC and Trac DSC modes.

Emergency Brake Assist

[EBA](#) (emergency brake assist) assists the driver in emergency braking situations by automatically increasing the applied braking effort. The [ABS](#) module invokes [EBA](#) when:

- The brake pedal is rapidly pressed.
- The brake pedal is pressed hard enough to bring the front brakes into [ABS](#) operation.

When the brake pedal is rapidly pressed, the [ABS](#) module increases the hydraulic pressure to all of the brakes until the threshold for [ABS](#) operation is reached. This action applies the maximum braking effort for the available traction. The [ABS](#) module monitors for the sudden application of the brakes, using inputs from the brake pedal switch and from the pressure sensor within the [HCU](#) (hydraulic control unit). With the brake pedal pressed, if the rate of increase of hydraulic pressure exceeds the predetermined limit, the [ABS](#) module invokes emergency braking.

When the brake pedal is pressed hard enough to bring the front brakes into [ABS](#) operation, the [ABS](#) module increases the hydraulic pressure to the rear brakes up to the [ABS](#) threshold.

[EBA](#) operation continues until the driver releases the brake pedal, sufficiently for the hydraulic pressure in the [HCU](#) to drop below a threshold value stored in the [ABS](#) module.

Engine Drag-Torque Control

EDC (engine drag-torque control) prevents wheel slip caused by any of the following: A

- sudden decrease in engine torque when the accelerator is suddenly released.
- A downshift using the Jaguar sequential shift function on automatic transmission vehicles.

When the [ABS](#) module detects the onset of wheel slip without the brakes being applied, the [ABS](#) module signals the [ECM](#) via the high speed [CAN](#) bus to request a momentary increase in engine torque.

Understeer Control

Understeer Logic Control is a proactive system which monitors the vehicle for understeer by comparing signals from the yaw rate and lateral acceleration sensor with signals from the steering angle sensor and wheel speed sensors.

When the [ABS](#) module detects the onset of understeer, the [ABS](#) module signals the [ECM](#) via the high speed [CAN](#) bus to request a decrease in engine torque. At the same time the [ABS](#) module will control the [HCU](#) to apply brake pressure to the relevant wheels to correct the understeer.

Electronic Brake Prefill (Vehicles With ACC Only)

Electronic brake prefill (Bosch ESP®plus8.1), senses any rapid throttle lift off, activating a small brake hydraulic pressure build-up of approximately 3 to 5 bar (43.5 to 72.5 lbf/in²) in anticipation of the brakes being applied.

This application produces a quicker brake pedal response and consequently slightly shorter stopping distances. The system supports vehicles with ACC (adaptive cruise control).

When the [ABS](#) module detects rapid throttle lift off (from the signals received from the [ECM](#) over the high speed [CAN](#) bus), it controls the [HCU](#) to apply a low brake pressure to assist in a quicker brake application.

Brake Vacuum Assist (3.0L Vehicles Only)

Operation of Brake Vacuum Assist generally occurs at the beginning of an ignition cycle when brake booster vacuum levels are low; refer to Brake Booster Vacuum sensor, below.

Brake vacuum assist operation will be recognized by the driver experiencing a vibrating brake pedal and slight modulator noise. This will be similar to that experienced when [ABS](#) system is operating.

As the engine warms up, Brake Vacuum Assist operation will become less frequent. However, it can become more active when vacuum levels are low due to driving at high-altitudes, or during frequent heavy-braking.

Noise levels during Brake Vacuum Assist may vary with initial system activity being the loudest observed. In some circumstances initial activity may be interpreted as a 'thump' noise, particularly if there is no immediate and significant Brake Vacuum Assist functionality.

In this circumstance system behavior is normal and should not be a cause for fault investigation.

Component Description

Dynamic Stability Control Switch



Item	Description
1	DSC switch

The DSC switch is mounted in the floor console adjacent to the JaguarDrive selector.

DSC becomes active whenever the engine is running. A momentary press of the switch allows the driver to toggle between the standard DSC settings and the optimized 'Trac DSC' settings. The message 'Trac DSC' or 'DSC on' will temporarily be displayed in the instrument cluster message center. The amber DSC warning indicator in the instrument cluster remains illuminated while 'Trac DSC' is selected.

The DSC can be switched off by pressing and holding the switch for more than 10 seconds.

In each case the message 'DSC OFF' will be displayed in the instrument cluster message center to confirm DSC has been switched off. The amber DSC warning indicator in the instrument cluster will remain illuminated. The system can be switched back on again by simply pressing and releasing the switch. The message 'DSC ON' will then temporarily appear in the instrument cluster message center to confirm the system is on.



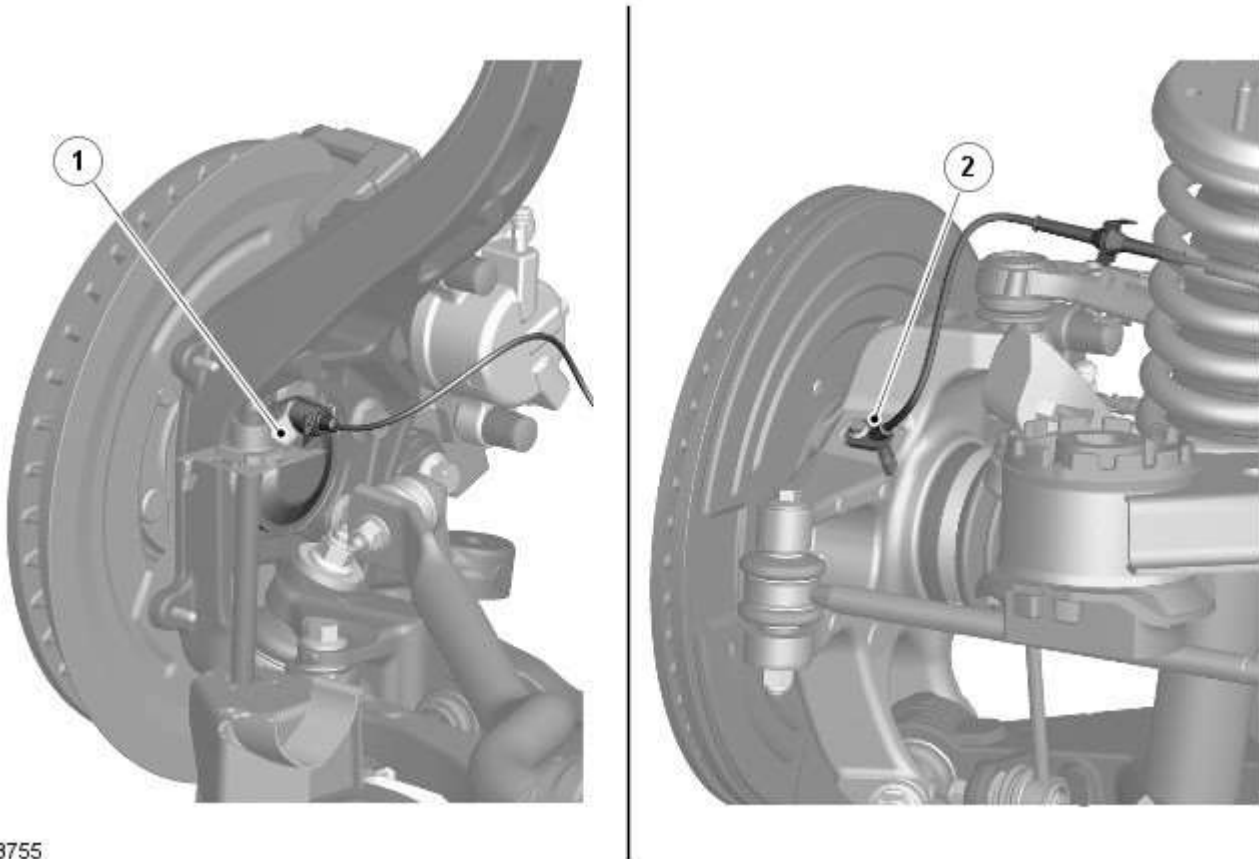
NOTE: Switch requests may be delayed if the switch is pressed while a DSC operation is taking place. The switch request will be displayed in the instrument cluster but the [ABS](#) module will not initiate any stability changes until it is safe to do so.

If a fault is detected with the DSC switch, the [ABS](#) module defaults to the 'DSC ON' setting and any switch requests are ignored.



WARNING: It is recommended that when using snow chains, Trac DSC is switched off and JaguarDrive control winter mode is selected.

Wheel Speed Sensors



E93755

Item	Description
1	Front wheel speed sensor
2	Rear wheel speed sensor

An active wheel speed sensor is installed in each wheel hub to provide the [ABS](#) module with a rotational speed signal from each road wheel. The head of each front wheel speed sensor is positioned close to a magnetic encoder ring incorporated into the inboard seal of the wheel bearing. The head of each rear wheel speed sensor is positioned close to a magnetic encoder ring incorporated into the rear wheel bearing assembly. Each encoder ring contains 46 north and south poles. A fly lead connects each sensor to the vehicle harness.

The wheel speed sensors each have a signal and a return connection with the [ABS](#) module. When the ignition is ON the [ABS](#) module supplies a signal feed to the wheel speed sensors and monitors the return signals. Any rotation of the road wheels induces current fluctuations in the return signals, which are converted into individual wheel speeds and overall vehicle speed by the [ABS](#) module.

The [ABS](#) module broadcasts the individual wheel speeds and the vehicle speed on the high speed [CAN](#) bus for use by other

systems, although vehicle speed information to the roof opening panel motor/module is a hardwired connection.

If a wheel speed sensor fault is detected by the [ABS](#) module, 'ABS FAULT' will be displayed in the instrument cluster message center and an amber warning indicator will illuminate.

Refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

As the wheel speed sensors are active devices, a return signal is available when the road wheels are not rotating. This enables the [ABS](#) module to check the condition of the speed sensors while the vehicle is stationary.

Steering Angle Sensor



The steering angle sensor measures the steering wheel angle and the rate of change of the steering wheel angle. These measurements are received by the [ABS](#) module and broadcast on the high speed [CAN](#) bus for use by other systems.

The steering angle sensor is mounted on the steering column upper shroud mounting bracket, immediately behind the multifunction switches, and is secured by 2 screws. A fly lead connects the sensor to the passenger compartment wiring harness via a 4 pin multiplug.

The sensor is housed in a 'U' shaped plastic casing and contains two offset [LED \(light emitting diode\)](#)s facing two detectors.

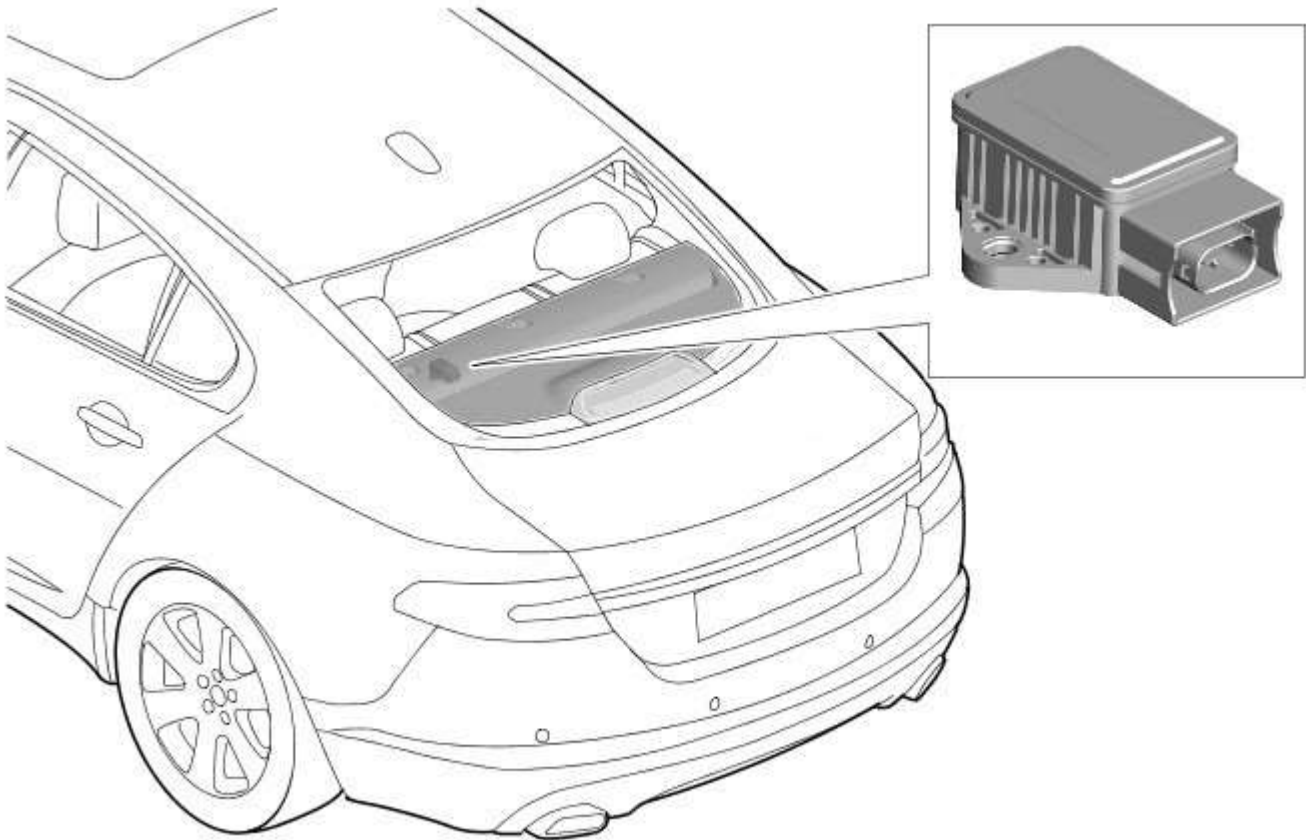
An encoder ring is mounted on the inner steering column shaft and intersects the [LEDs](#) and detectors. The encoder ring contains 60 slots which break and restore the light beams between the [LEDs](#) and the detectors as the steering wheel is

rotated. The [ABS](#) module is able to determine the direction of rotation of the steering wheel by monitoring when the light beams change state. The [LEDs](#) and detectors are mounted in such a way that only one beam will change state, either to broken or restored, at any one time.

The center (straight ahead) position of the steering wheel has to be learned by the [ABS](#) module every time the ignition is switched ON. The steering angle sensor is unable to determine the center position so inputs from the yaw rate and lateral acceleration sensor and wheel speed signals are also used by the [ABS](#) module to help it perform this process. If extreme weather conditions are present, for example ice causing extreme wheel spin or understeer/oversteer, the [ABS](#) module may not be able to determine the center position of the steering wheel. In this situation 'DSC NOT AVAILABLE' will be displayed in the instrument cluster message center and the amber warning indicator will illuminate. Refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

'DSC NOT AVAILABLE' will also be displayed if the [ABS](#) module detects a steering angle sensor fault. The amber warning indicator will illuminate until the fault is rectified.

Yaw Rate and Lateral Acceleration Sensor



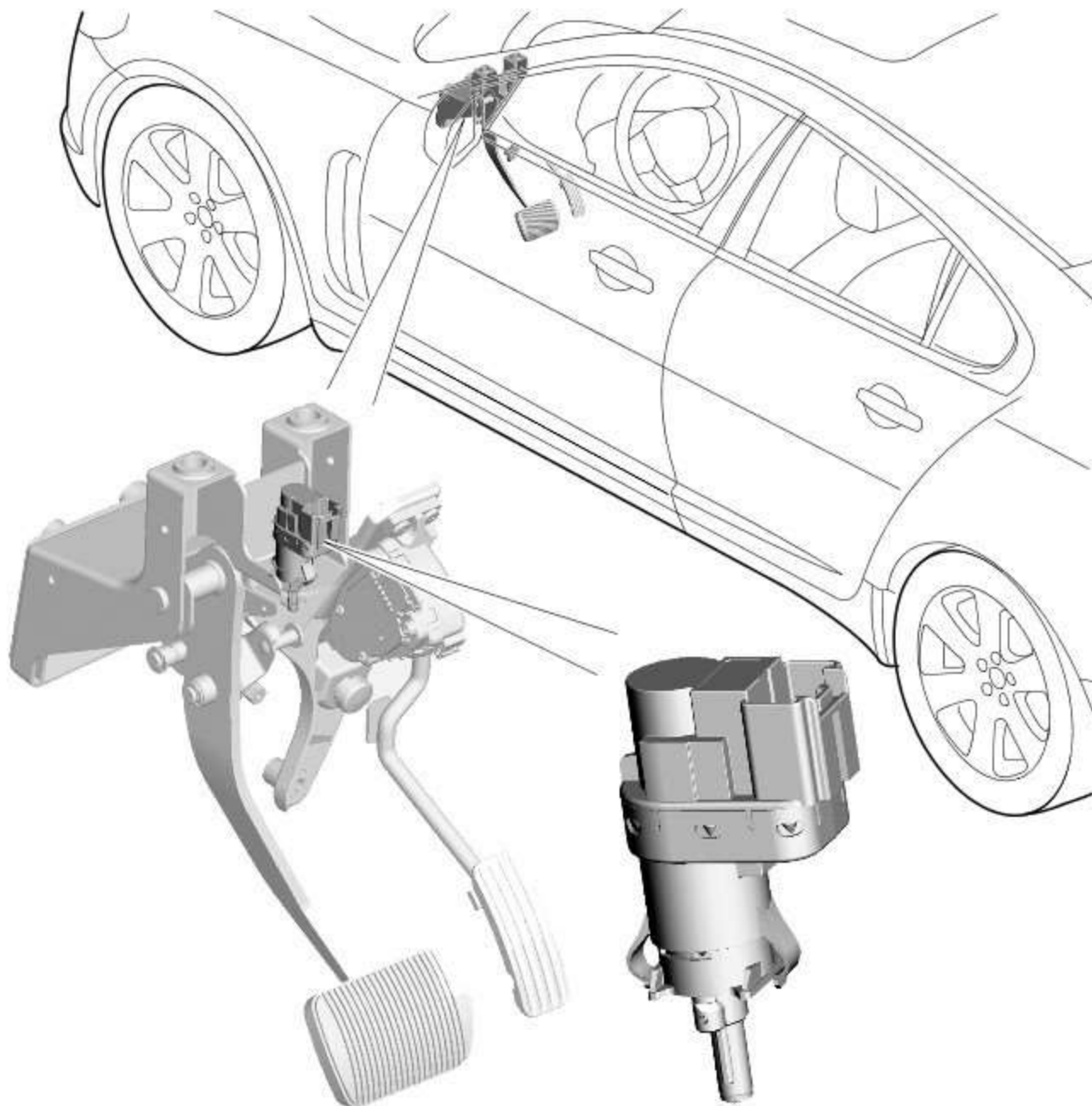
E93757

The yaw rate and lateral acceleration sensor is mounted on the rear parcel shelf. The sensor is secured by two screws and connects to the vehicle wiring via a four pin multiplug.

When the ignition is ON, the sensor receives a power feed from the [CJB](#). The ground path for the sensor is located behind the left hand rear seat back. The sensor measures the yaw rate and lateral acceleration of the vehicle, providing values to the [ABS](#) module via a dedicated, private high speed [CAN](#) bus connection. The [ABS](#) module broadcasts these values on the high speed [CAN](#) bus for use by other systems.

If a sensor fault is detected by the [ABS](#) module, 'DSC NOT AVAILABLE' will be displayed in the instrument cluster message center and the amber warning indicator will illuminate. Refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

Stoplamp Switch



E93526

The stoplamp switch is mounted on the brake pedal box and is connected to the vehicle harness via a four pin multiplug.

When the brake pedal is pressed, the switch contacts close. This allows a hard wired signal feed to be sent to the [ECM](#). A stoplamp switch status message is then sent from the [ECM](#) to the [ABS](#) module on the high speed [CAN](#) bus. The [ABS](#) module is then able to control braking force accordingly in conjunction with the [HCU](#).

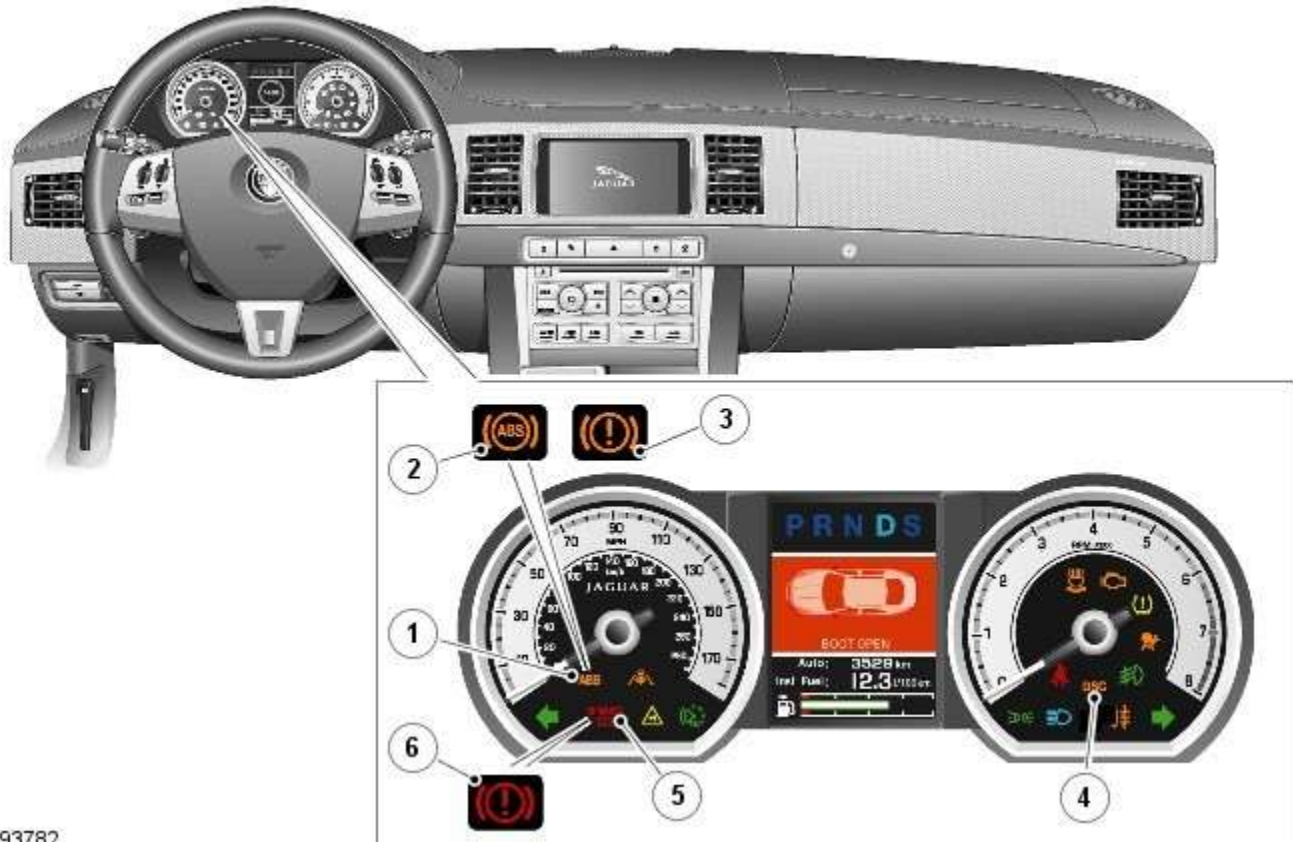


NOTE: The stoplamp switch also forms part of the speed control system.

For additional information, refer to:

Speed Control (310-03 Speed Control - 2.7L V6 - TdV6, Description and Operation),
Speed Control (310-03 Speed Control - 3.0L NA V6 - AJ27, Description and Operation),
Speed Control (310-03 Speed Control - 4.2L NA V8 - AJV8/4.2L SC V8 - AJV8, Description and Operation).

Instrument Cluster Warning Indicators



E93782

Item	Description
1	ABS warning indicator (USA only)
2	ABS warning indicator (Canada and Mexico only)
3	ABS warning indicator (all except USA, Canada and Mexico)
4	DSC warning indicator
5	Brake warning indicator (USA only)
6	Brake warning indicator (all except USA)

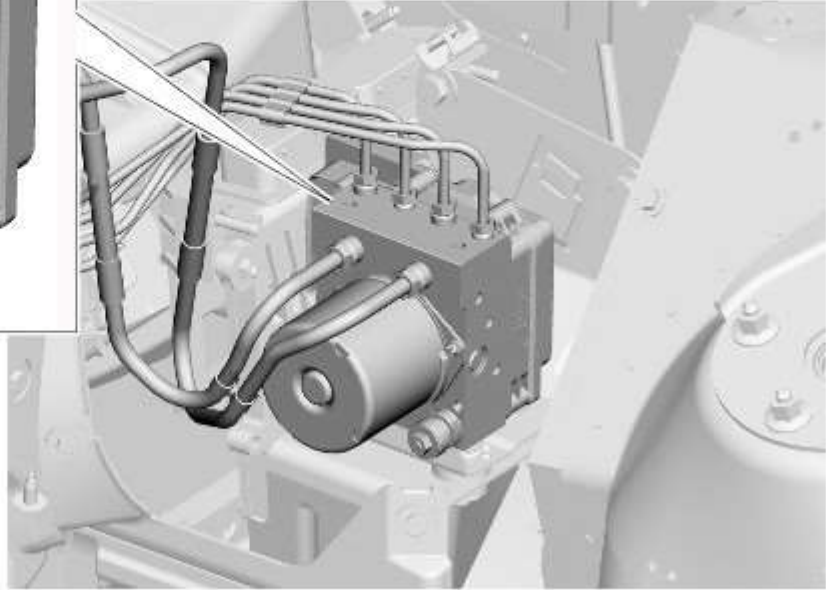
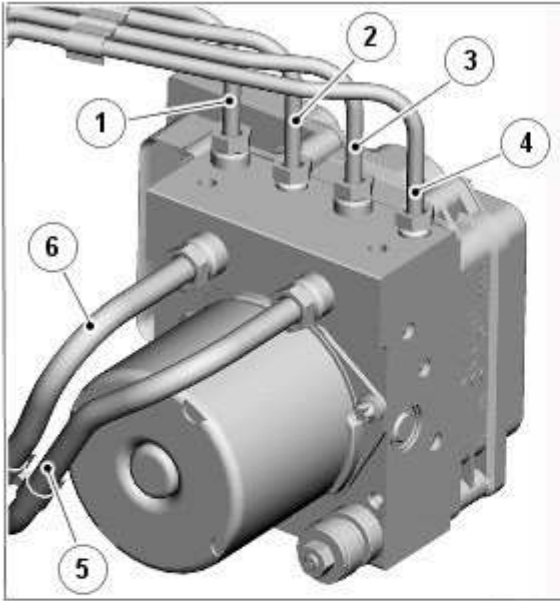
The instrument cluster and message center contains warning indicators and warning messages to display the operating status of the anti-lock control - stability assist functions. The warning indicators and messages provide a visual notification of either a system warning or information indication to the driver. There are three warning indicators on the instrument cluster, which vary dependant on market, and several types of message relating to the anti-lock control - stability assist functions. The DSC OFF message is accompanied by an audible warning.

The following anti-lock control - stability assist warning indicators are installed in the instrument cluster:

- An amber [ABS](#) warning indicator.
- A red brake warning indicator.
- An amber DSC warning indicator.

Refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation) / Information and Message Center (413-08 Information and Message Center, Description and Operation).

ABS Module



E93576

Item	Description
1	LH front brake
2	RH rear brake
3	LH rear brake
4	RH front brake
5	Primary inlet
6	Secondary inlet

The [ABS](#) module is located in the passenger side, rear engine bay and incorporates the [HCU](#). The module is mounted on the rear face of the [HCU](#), which it uses to control all braking and stability functions by modulating hydraulic pressure to the individual wheel brakes.

Two types of [ABS](#) modules are available; one for vehicles with standard Speed Control, one for vehicles fitted with Adaptive Speed Control.

If an [ABS](#) modulator fault is detected, 'ABS FAULT' will be displayed in the instrument cluster message center and the amber warning indicator will illuminate.

Refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).



CAUTION: The [ABS](#) module and the [HCU](#) comprise a single unit and must not be separated.

Hydraulic Control Unit

The [HCU](#) is a four channel unit, secured to a mounting bracket located in the passenger side, rear engine bay. The [HCU](#) modulates the supply of hydraulic pressure to the brakes under the control of the [ABS](#) module.

Refer to: [Hydraulic Brake Actuation](#) (206-06 Hydraulic Brake Actuation, Description and Operation).

Anti-Lock Control - Stability Assist - Anti-Lock Control - Stability Assist

Diagnosis and Testing

Principle of Operation

For a detailed description of the Anti-Lock Control - Stability Assist system, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (206-09 Anti-Lock Control - Stability Assist)

[Anti-Lock Control - Stability Assist](#) (Description and Operation),
[Anti-Lock Control - Stability Assist](#) (Description and Operation),
[Anti-Lock Control - Stability Assist](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Confirm if the Anti-Lock Brake System (ABS) warning light was illuminated, or still is.



NOTE: An intermittent fault may allow the warning light to go off. This does not necessarily mean the fault is not present. Some warnings will appear to clear when the ignition is cycled. This is often because the warning has flagged as a result of one of the vehicle's on-board diagnostic routines having run to detect the fault. If the same routine is not run when the ignition status is set to **ON**, the warning will not re-flag until the routine does run.

3. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Brake fluid level • Vacuum system • Wheel speed sensor installation • Wheel speed sensor air gap • Magnetic pulse wheel(s) (damaged/contaminated) • Steering angle sensor • Yaw rate sensor and accelerometer cluster installation • Incorrect wheel or tire size 	<ul style="list-style-type: none"> • Warning light operation • Fuses • Wheel speed sensors • Connectors/Pins • Harnesses • Steering wheel rotation sensor • Yaw rate sensor and accelerometer cluster • Booster pressure sensor • Hydraulic Control Unit (HCU)

4. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
5. If the cause is not visually evident check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Anti-Lock Braking System \(ABS\)](#) (100-00 General Information, Description and Operation).

Anti-Lock Control - Stability Assist - Anti-Lock Brake System (ABS) Module

Removal and Installation

Removal



1. **NOTE:** The anti-lock braking system (ABS) module mounted to the hydraulic control unit (HCU) cannot be serviced separately. If the ABS module requires replacement, the unit must be replaced as a complete assembly.

Remove the HCU.

For additional information, refer to: Hydraulic Control Unit (HCU) (206-09, Removal and Installation).

Installation

1. Install the HCU.
For additional information, refer to: Hydraulic Control Unit (HCU) (206-09, Removal and Installation).

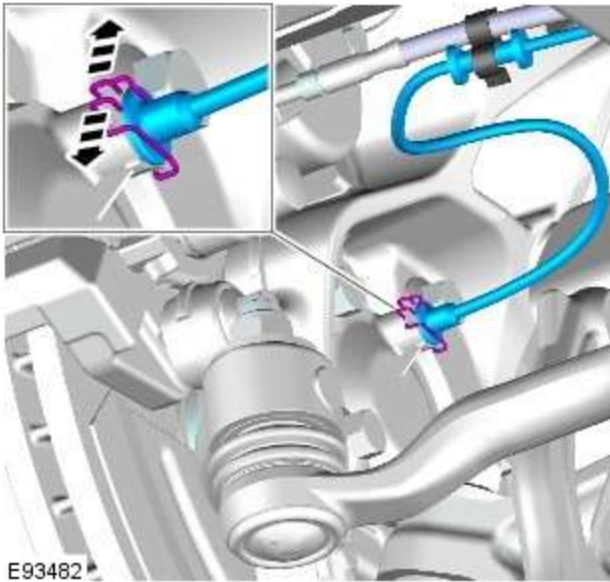
Anti-Lock Control - Stability Assist - Front Wheel Speed Sensor

Removal and Installation

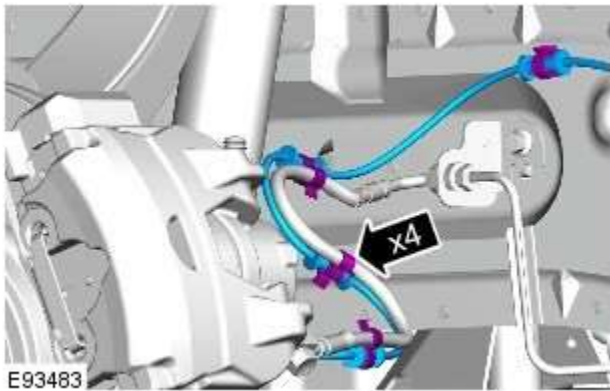
Removal



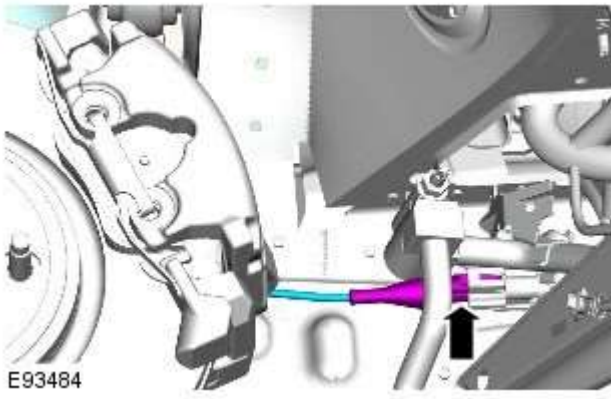
1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).



3.  **NOTE:** LH illustration shown, RH is similar.



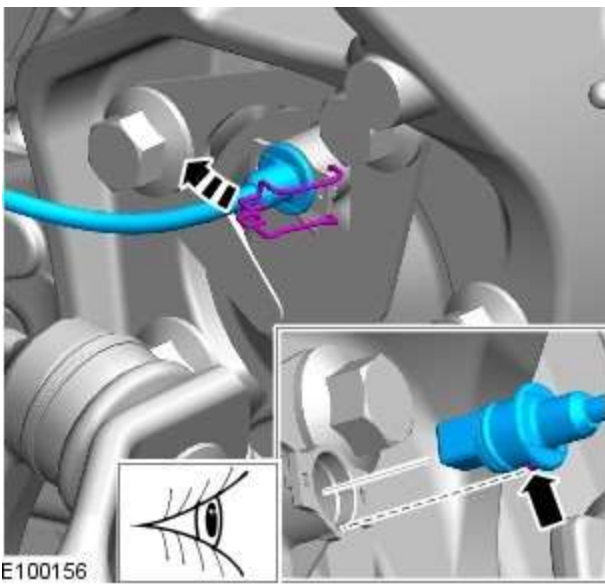
4.  **NOTE:** LH illustration shown, RH is similar.



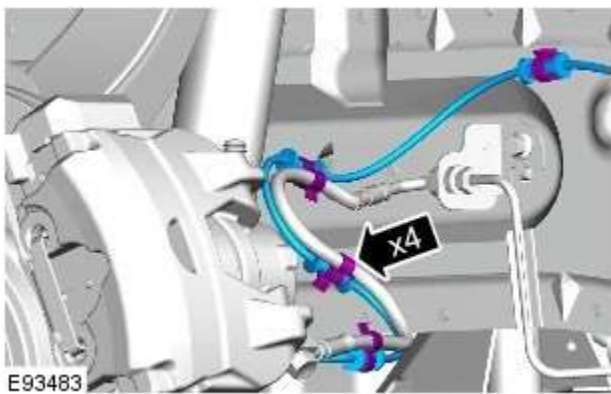
5.  **CAUTION:** Note the fitted position of the component prior to removal.

 **NOTE:** LH illustration shown, RH is similar.

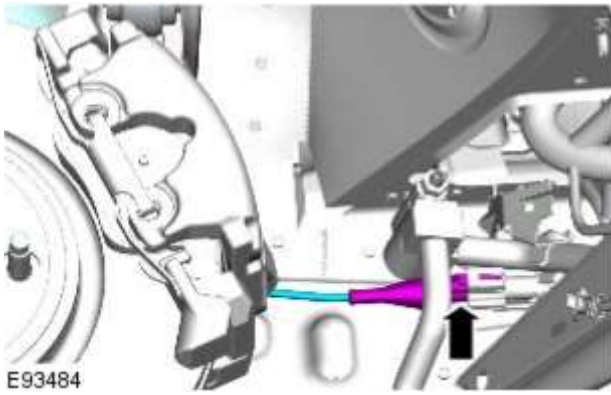
Installation



- 
1. **NOTE:** LH illustration shown, RH is similar.



2.  **NOTE:** LH illustration shown, RH is similar.




3. **NOTE:** LH illustration shown, RH is similar.

Anti-Lock Control - Stability Assist - Hydraulic Control Unit (HCU)

Removal and Installation

Special Tool(s)

 <p>JDS9013</p>	<p>Brake pedal hold down tool JDS9013</p>
--	---

Removal

All vehicles

1. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect \(414-01 Battery, Mounting and Cables, General Procedures\)](#).


Left-hand drive vehicles

2. Remove the secondary bulkhead RH panel.
For additional information, refer to: [Secondary Bulkhead Panel RH - 3.0L NA V6 - AJ27](#) (501-02 Front End Body Panels, Removal and Installation).

Right-hand drive vehicles

3. Remove the secondary bulkhead LH panel.
For additional information, refer to: [Secondary Bulkhead Panel LH - 3.0L NA V6 - AJ27](#) (501-02 Front End Body Panels, Removal and Installation).

All vehicles

4.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

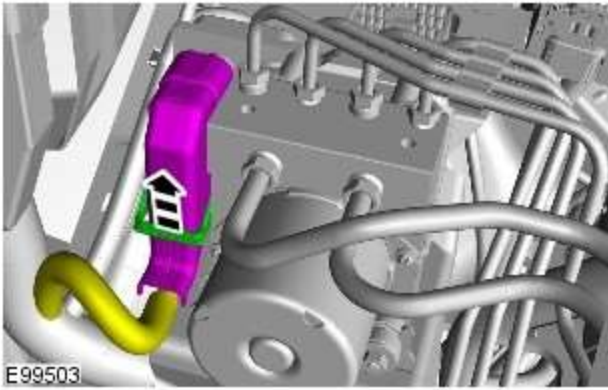
5. Connect brake bleed pipes and bottles to the left-hand front and the left-hand rear brake caliper bleed nipples and loosen the brake caliper bleed nipples.



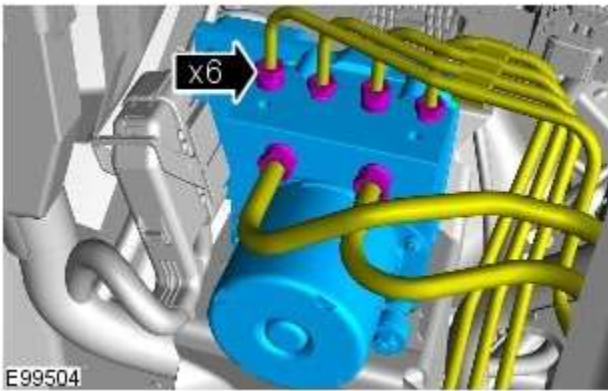
6. **NOTE:** To prevent the loss of brake fluid, using the special tool apply the brake pedal and set to 40mm (1.6 in) below the rest position.

Using the special tool, press and hold the brake pedal.

7. Remove the bleed pipes and bottles.
 - Tighten the left-hand front brake caliper bleed nipple.
 1. For vehicles with supercharger: Tighten to 14Nm.
 2. For vehicles without supercharger: Tighten to 8 Nm.
 - Tighten the left-hand rear brake caliper bleed nipple.
 1. All vehicles: Tighten to 14 Nm.
 - Disconnect and remove the brake bleed pipes and bottles.
 - Install the bleed nipple dust caps.



8. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.
- Disconnect the hydraulic control unit (HCU) electrical connector.



9. CAUTIONS:

Make sure that all openings are sealed. Use new blanking caps.

If brake fluid is spilt on the paintwork, the affected area must be immediately washed down with cold water.

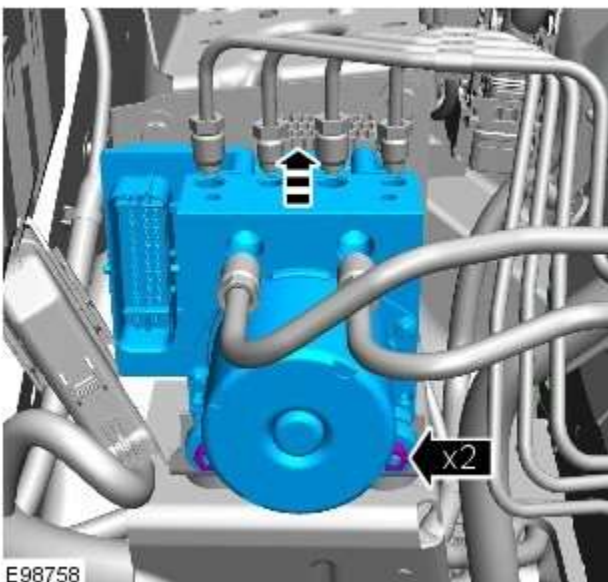
NOTES:

Some fluid spillage is inevitable during this operation.

Note the position of the components prior to removal.

Some variation in the illustrations may occur, but the essential information is always correct.

Disconnect the 6 brake pipe unions.



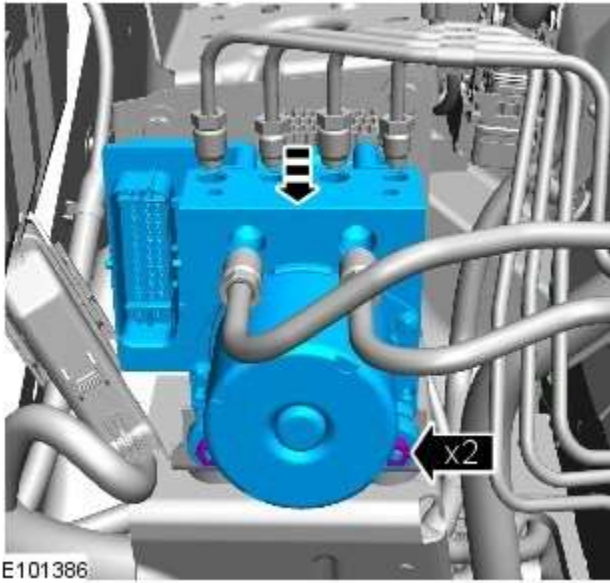
10. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Remove the HCU.

- Loosen but do not remove the 2 nuts.
- Lift and remove the HCU.

Installation

All vehicles



1. CAUTION: If accidentally dropped or knocked install a new hydraulic control unit (HCU) and module.

NOTES:



Make sure the HCU locating grommet is correctly seated in the bracket before installing the ABS module.



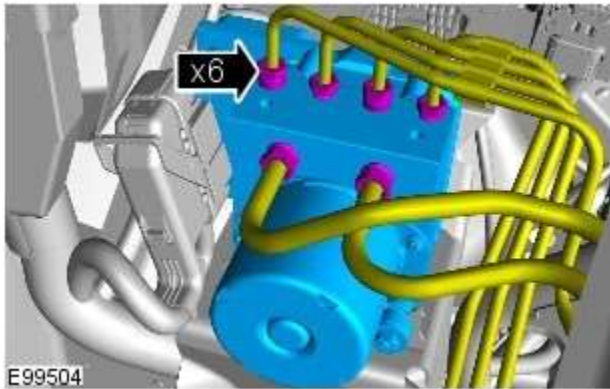
Make sure the HCU locating pin is correctly located in the grommet, and the 2 isolators are fully seated in the bracket slots.



Some variation in the illustrations may occur, but the essential information is always correct.

Install the HCU to the retaining bracket.

- Tighten to 8 Nm.



2. CAUTIONS:



Make sure that the area around the component is clean and free of foreign material.



Make sure that these components are installed to the noted removal position.

NOTES:



Remove and discard the blanking caps.



Some variation in the illustrations may occur, but the essential information is always correct.

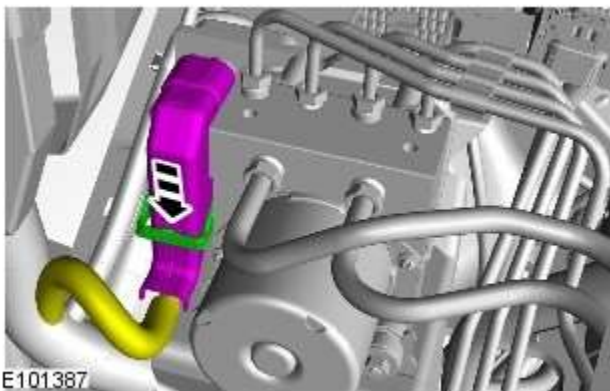
Connect the brake pipe unions.

- Tighten to 17 Nm.



3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Connect the HCU electrical connector.



4. Remove the special tool.

5. Bleed the brake system.
For additional information, refer to: [Brake System Bleeding](#) (206-00 Brake System - General Information, General Procedures).

Left-hand drive vehicles

6. Install the secondary bulkhead RH panel.
For additional information, refer to: [Secondary Bulkhead Panel RH - 3.0L NA V6 - AJ27](#) (501-02 Front End Body Panels, Removal and Installation).

Right-hand drive vehicles

7. Install the secondary bulkhead LH panel.
For additional information, refer to: [Secondary Bulkhead Panel LH - 3.0L NA V6 - AJ27](#) (501-02 Front End Body Panels, Removal and Installation).

All vehicles

8. Connect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
9. Using the diagnostic tool, configure the new HCU.

Anti-Lock Control - Stability Assist - Rear Wheel Speed Sensor

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



The ignition must be switched off.



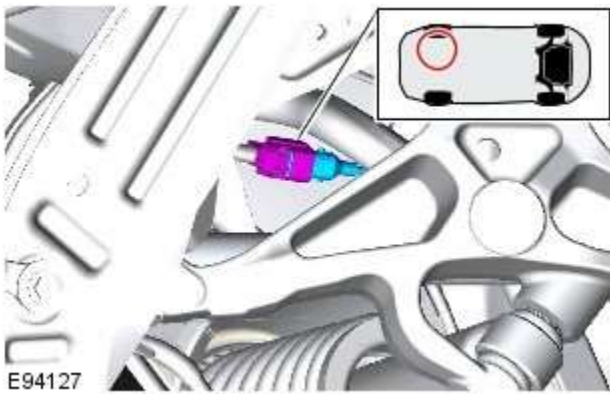
Some variation in the illustrations may occur, but the essential information is always correct.

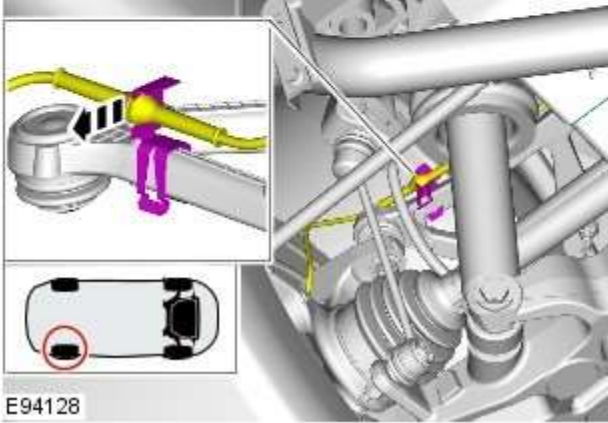
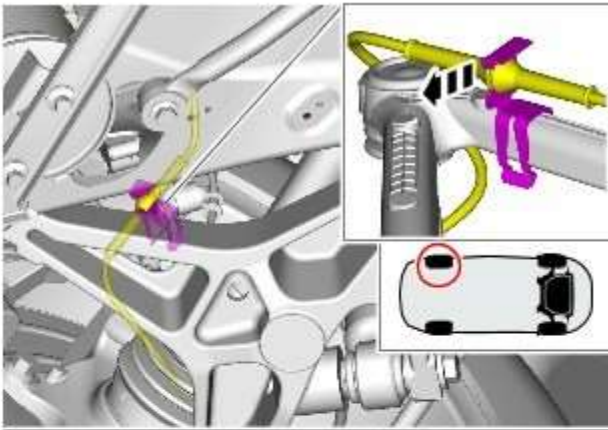


1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Disconnect the wheel speed sensor electrical connector.





E94128

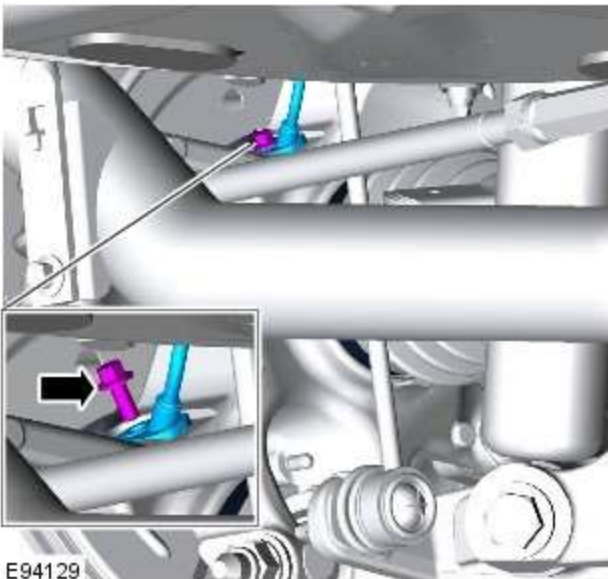


3. **CAUTION:** Make sure that the harness retaining bracket is not removed. Failure to follow this instruction may result in damage to the harness.



NOTE: Note the orientation of the clip.

Release the wiring harness grommet.



E94129

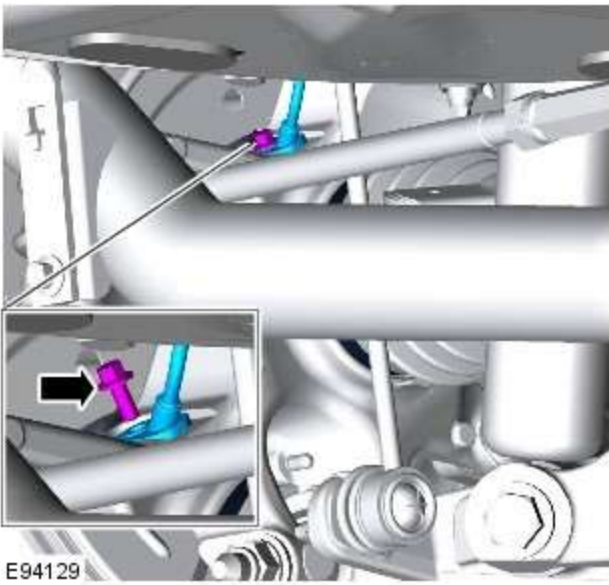



4. **CAUTION:** Note the fitted position of the component prior to removal.

Remove the wheel speed sensor.

- Remove the retaining bolt.
- Release the wheel speed sensor.

Installation



1.  NOTE: Make sure that the component is installed to the position noted on removal.

To install, reverse the removal procedure.

- Tighten to 6 Nm.

Anti-Lock Control - Stability Assist - Steering Wheel Rotation Sensor

Removal and Installation

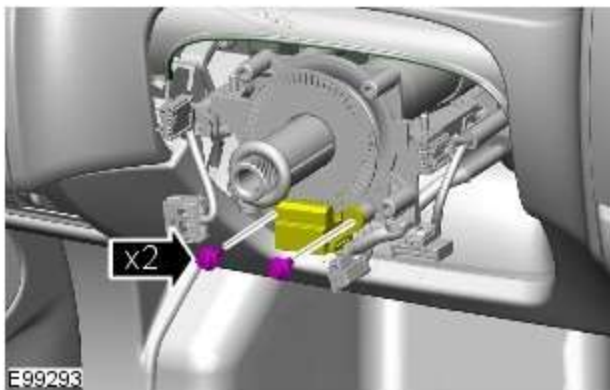
Removal



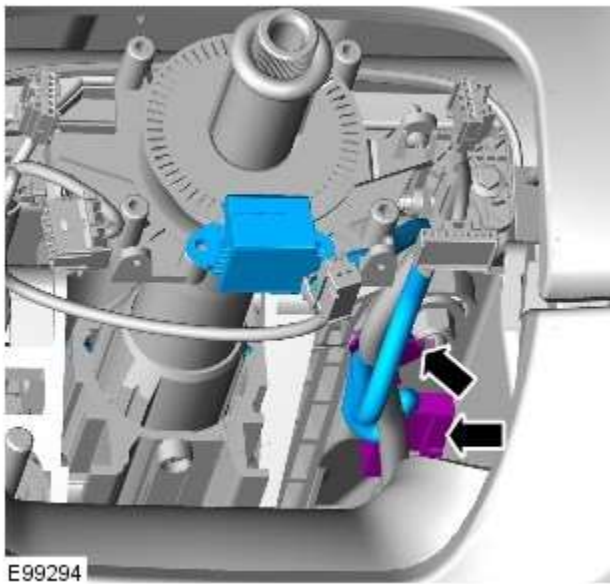
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Clockspring](#) (501-20B Supplemental Restraint System, Removal and Installation).

3.



4.



Installation

1. To install, reverse the removal procedure.

Anti-Lock Control - Stability Assist - Yaw Rate Sensor and Accelerometer

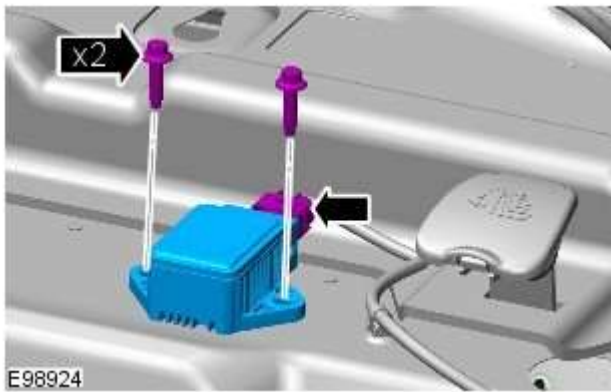
Removal and Installation

Removal

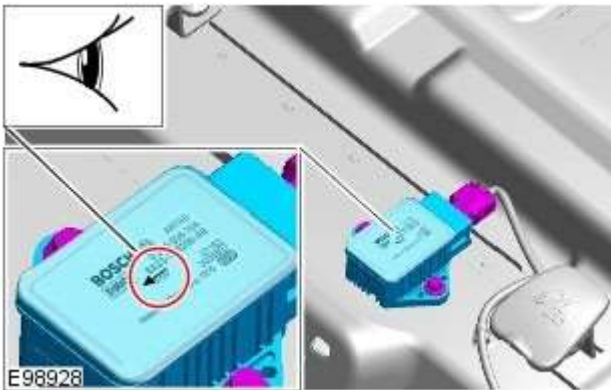



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Parcel Shelf](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



3. Torque: 6 Nm



4.  CAUTION: Make sure that all diagnostic trouble codes (DTCs) have been removed after the road test.



NOTE: Make sure that this component is installed to the noted removal position.

Installation

1. To install, reverse the removal procedure.

Steering System - General Information -

Steering Linkage Specifications

Steering Linkage Free Play	Measurement (mm)	Measurement (in)
Free play (measured at the steering wheel rim)	0-6	0-0.24

Power Steering Pump Specifications

Item	Specification
Power steering pump relief pressure	106-114 bar

Lubricants, Fluids, Sealers and Adhesives

Item	Specification
Power steering fluid	Dexron 3

Steering System - General Information - Steering System

Diagnosis and Testing

Principle of Operation

For a detailed description of the steering system operation, refer to the relevant Description and Operation sections of the workshop manual. REFER to:

[Power Steering](#) (211-02 Power Steering, Description and Operation),
[Power Steering](#) (211-02 Power Steering, Description and Operation),
[Power Steering](#) (211-02 Power Steering, Description and Operation),
[Steering Linkage](#) (211-03 Steering Linkage, Description and Operation),
[Steering Linkage](#) (211-03 Steering Linkage, Description and Operation),
[Steering Linkage](#) (211-03 Steering Linkage, Description and Operation),
[Steering Column](#) (211-04 Steering Column, Description and Operation),
[Steering Column](#) (211-04 Steering Column, Description and Operation),
[Steering Column](#) (211-04 Steering Column, Description and Operation),
[Steering Column Switches](#) (211-05 Steering Column Switches, Description and Operation),
[Steering Column Switches](#) (211-05 Steering Column Switches, Description and Operation),
[Steering Column Switches](#) (211-05 Steering Column Switches, Description and Operation).

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Tire condition/pressure • Fluid level • Leaks • Security, condition and correct installation of suspension components • Security, condition and correct installation of steering system components 	<ul style="list-style-type: none"> • Fuses • Harnesses for damage/corrosion • Electrical connector(s) • Damaged/corroded pins



CAUTION: If a steering gear assembly is returned under warranty with leaking output shaft seals, but there is also damage to the steering gear boot/boots the steering gear warranty will be invalid. This is due to the steering gear output shaft seals being damaged due to foreign materials entering the steering gear boot and damaging the steering gear output shaft seals thereafter.

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom and refer to the symptom chart.

Symptom Charts



WARNING: It is not possible to CHECK the torque of a patchlock bolt, if the torque is suspected to be low, the bolt must be REMOVED/DISCARDED and a new bolt MUST be INSTALLED and torque to the correct value.



NOTE: If the module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

Fluid Leakage







NOTE: Confirm the location of the fluid leak. CLEAN the area of the leak, inspect the area and confirm the exact position. Ensure the fluid is not from another system on the vehicle.


Symptom	Possible Causes	Action
<ul style="list-style-type: none"> • Power steering fluid leakage 	<ul style="list-style-type: none"> • Overfilled system 	<ul style="list-style-type: none"> • Correct the fluid level as required
	<ul style="list-style-type: none"> • Steering gear 	<ul style="list-style-type: none"> • Check and install new steering gear as required, refer to the new module/component installation note at the top of the Symptom Charts

Symptom	Possible Causes	Action
	<ul style="list-style-type: none"> Damaged fluid cap/reservoir 	<ul style="list-style-type: none"> Check and install a new fluid cap/reservoir as required
	<ul style="list-style-type: none"> Loose or damaged hoses and fittings O-ring or Dowty seals 	<ul style="list-style-type: none"> Tighten the hose connection or latch plate fixing to the recommended torque. REFER to: Specifications (211-00 Steering System - General Information, Specifications). Check and install new components as required Install new O-ring or Dowty seals as required
	<ul style="list-style-type: none"> Fluid cooler 	<ul style="list-style-type: none"> Check and install a new fluid cooler as required, refer to the new module/component installation note at the top of the Symptom Charts
	<ul style="list-style-type: none"> Power steering pump 	<ul style="list-style-type: none"> Check and install a new power steering pump as required, refer to the new module/component installation note at the top of the Symptom Charts



Functional


Symptom	Possible Causes	Action
<ul style="list-style-type: none"> Steering wheel misalignment 	<ul style="list-style-type: none"> Steering not correctly centred 	<ul style="list-style-type: none"> Check the steering alignment. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
<ul style="list-style-type: none"> Excessive free play at steering wheel (refer to the Steering Linkage Inspection and Backlash (Free play) Check in this section) 	<ul style="list-style-type: none"> Steering wheel loose 	<ul style="list-style-type: none"> Check and tighten the steering wheel retaining bolt as required. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
	<ul style="list-style-type: none"> Excess play in the steering linkage 	<ul style="list-style-type: none"> Check and install new components as required
	<ul style="list-style-type: none"> Steering gear not correctly adjusted (causing excessive backlash) 	<p> CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty</p> <ul style="list-style-type: none"> Check and install a new steering gear as required, refer to the new module/component installation note at the top of the Symptom Charts
	<ul style="list-style-type: none"> Lower steering column universal joint pinch bolts loose 	<ul style="list-style-type: none"> Check and tighten the lower steering column pinch bolts as required. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
	<ul style="list-style-type: none"> Excessive wear in steering column universal joints 	<ul style="list-style-type: none"> Check and install a new steering column or steering column lower shaft as required, refer to the new module/component installation note at the top of the Symptom Charts
	<ul style="list-style-type: none"> Steering gear mounting bolts loose or damaged 	<ul style="list-style-type: none"> Check/tighten and install new steering gear mounting bolts as required. REFER to: Specifications (211-00 Steering System - General Information, Specifications).

Symptom	Possible Causes	Action
	<ul style="list-style-type: none"> Wear in steering gear tie-rod end ball joints 	<ul style="list-style-type: none"> Check and install new tie-rod ends as required, refer to the new module/component installation note at the top of the Symptom Charts
	 <p>NOTE: Inner ball joint wear is rare. The steering gear installed to all Jaguar vehicles has a spring loaded pinion to ensure the correct level of engagement between the rack and pinion. This play is optimized with the steering gear in the central position and should not be confused with inner ball joint wear. Check for vertical motion in the inner ball joint with the steering gear in the central position.</p> <ul style="list-style-type: none"> Wear in steering gear inner ball joints 	<ul style="list-style-type: none"> Check and install new steering gear as required, refer to the new module/component installation note at the top of the Symptom Charts
	<ul style="list-style-type: none"> Wear in suspension ball joints/bushings 	<ul style="list-style-type: none"> Check and install new components as required
<ul style="list-style-type: none"> Veer under braking 	<ul style="list-style-type: none"> Steering gear not correctly adjusted 	 <p>CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty</p> <ul style="list-style-type: none"> Check and install a new steering gear as required, refer to the new module/component installation note at the top of the Symptom Charts
	<ul style="list-style-type: none"> Contamination of brake pads and discs 	<ul style="list-style-type: none"> Check and rectify the source of the contamination and install new brake pads and discs as required, refer to the new module/component installation note at the top of the Symptom Charts
	<ul style="list-style-type: none"> Seized front brake caliper slide pins or piston Damaged brake discs 	<ul style="list-style-type: none"> Check and rectify sticking slide pins and install new calipers as required, refer to the new module/component installation note at the top of the Symptom Charts Check and install new brake discs as required, refer to the new module/component installation note at the top of the Symptom Charts
<ul style="list-style-type: none"> Vehicle pulls to one side when driving on a level surface 	<ul style="list-style-type: none"> Uneven tire wear Incorrect tire pressure 	<ul style="list-style-type: none"> For information on diagnosis of uneven tire wear. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing). Check and adjust tire pressures as required. REFER to: Specifications (204-04 Wheels and Tires, Specifications).
	<ul style="list-style-type: none"> Incorrect geometry settings 	 <p>NOTE: Dealerships must keep a copy of the BEFORE and AFTER geometry figures with job card for future reference</p> <ul style="list-style-type: none"> Check and adjust geometry as required. REFER to: (204-00



Symptom	Possible Causes	Action
		Suspension System - General Information) Camber and Caster Adjustment (General Procedures), Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures).
	<ul style="list-style-type: none"> • Vehicle is unevenly loaded or overloaded 	<ul style="list-style-type: none"> • Notify the customer of incorrect vehicle loading
	<ul style="list-style-type: none"> • Steering gear is not correctly adjusted 	 CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty <ul style="list-style-type: none"> • Check and install a new steering gear as required, refer to the new module/component installation note at the top of the Symptom Charts
	<ul style="list-style-type: none"> • Loose, damaged or worn front suspension components 	<ul style="list-style-type: none"> • Check/tighten and install new front suspension components as required. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
	<ul style="list-style-type: none"> • Loose, damaged or worn rear suspension components 	<ul style="list-style-type: none"> • Check/tighten and install new rear suspension components as required. REFER to: Specifications (204-00 Suspension System - General Information, Specifications).
	<ul style="list-style-type: none"> • Incorrect brake operation 	<ul style="list-style-type: none"> • For information on diagnosis of the brake system. REFER to: Brake System (206-00 Brake System - General Information, Diagnosis and Testing).
	<ul style="list-style-type: none"> • Incorrect underbody alignment 	<ul style="list-style-type: none"> • Set underbody alignment referring to the Removal and Installation procedures in section 502-00 of the workshop manual for instruction
<ul style="list-style-type: none"> • Vehicle wanders from side to side when driven straight ahead and the steering wheel is held in a firm position 	<ul style="list-style-type: none"> • Incorrect tire pressure or tire size 	<ul style="list-style-type: none"> • Check and adjust the tire pressures as required. REFER to: Specifications (204-04 Wheels and Tires, Specifications). <ul style="list-style-type: none"> • Check and install a new tire as required
	<ul style="list-style-type: none"> • Vehicle is unevenly or excessively loaded 	<ul style="list-style-type: none"> • Notify the customer of incorrect vehicle loading
	<ul style="list-style-type: none"> • Incorrect toe adjustment 	<ul style="list-style-type: none"> • Check and adjust as required. REFER to: (204-00 Suspension System - General Information) Camber and Caster Adjustment (General Procedures), Front Toe Adjustment (General Procedures), Rear Toe Adjustment (General Procedures).

Noise

Symptom	Possible Causes	Action
<ul style="list-style-type: none"> Continuous noise 	<ul style="list-style-type: none"> Low power steering fluid level 	<ul style="list-style-type: none"> Check for leaks and rectify as required. For further information refer to the symptom charts for leakage in this section. Fill power steering fluid reservoir to correct level
	 <p>NOTE: Look for small air bubbles visible in the fluid, air may also get trapped in the hydraulic system</p> <ul style="list-style-type: none"> Air in hydraulic system 	<ul style="list-style-type: none"> Bleed the power steering system. REFER to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures).
	<ul style="list-style-type: none"> Power steering pipe/hose in contact with the vehicle body 	<ul style="list-style-type: none"> Check and reposition, or install new IF damaged/deformed, power steering pipe/hose
	<ul style="list-style-type: none"> Power steering pipe/hose restricted or twisted 	<ul style="list-style-type: none"> Check and clear restriction to pipe/hose Reposition power steering pipe/hose. Install new pipe/hose IF permanently damaged/deformed
	<ul style="list-style-type: none"> Power steering pump mounting bolts loose 	<ul style="list-style-type: none"> Tighten the power steering pump mounting bolts to the correct torque. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
<ul style="list-style-type: none"> Noise gets worse when system is loaded 	 <p>NOTE: Refer to the power steering pressure check in this section</p> <ul style="list-style-type: none"> Low power steering fluid level <ul style="list-style-type: none"> Aerated fluid Low power steering pump pressure 	<ul style="list-style-type: none"> Check and fill power steering fluid reservoir to correct level <ul style="list-style-type: none"> Bleed the power steering system. REFER to: Power Steering System Bleeding (211-00 Steering System - General Information, General Procedures). Check power steering pump pressure. If the pump pressure is low, install a new power steering pump
<ul style="list-style-type: none"> Front End Accessory Drive (FEAD) belt squeal 	<ul style="list-style-type: none"> FEAD belt incorrectly tensioned or glazed 	<ul style="list-style-type: none"> Check FEAD belt tension Check FEAD belt condition and install a new belt as required
<ul style="list-style-type: none"> Chirp noise from the steering pump when a load is applied 	<ul style="list-style-type: none"> Loose or worn FEAD belt 	<ul style="list-style-type: none"> Check FEAD belt tension Check FEAD belt condition and install a new belt as required
<ul style="list-style-type: none"> Scrape/grind noise from behind steering wheel while steering 	<ul style="list-style-type: none"> Steering column shroud foul condition or clockspring 	<ul style="list-style-type: none"> Correctly install the steering column shroud to eliminate the foul condition Install a new clockspring as required
	<ul style="list-style-type: none"> Foreign objects 	<ul style="list-style-type: none"> Remove foreign objects from between steering column shroud and steering wheel/steering column rotating components
<ul style="list-style-type: none"> Click 	<ul style="list-style-type: none"> Clockspring or steering column multifunction switch LH 	<ul style="list-style-type: none"> Correctly install and install new components as required
	<ul style="list-style-type: none"> Loose universal joint pinch bolt 	<ul style="list-style-type: none"> Install a new universal joint pinch bolt and tighten to correct specification. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
<ul style="list-style-type: none"> Squeak 	<ul style="list-style-type: none"> Steering column shroud joints 	<ul style="list-style-type: none"> Apply Krytox spray to steering column shroud joints
	<ul style="list-style-type: none"> Clockspring 	<ul style="list-style-type: none"> Install new clockspring as required

Symptom	Possible Causes	Action
<ul style="list-style-type: none"> • Knock 	<ul style="list-style-type: none"> • Loose fixings (universal joint pinch bolt and steering column fixings) 	<ul style="list-style-type: none"> • Tighten fixings to correct specification. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
<ul style="list-style-type: none"> • Rattle 	<ul style="list-style-type: none"> • Foreign objects 	<ul style="list-style-type: none"> • Remove foreign objects from between steering column shroud and steering wheel/steering column rotating components
	<ul style="list-style-type: none"> • Loose fixings 	<ul style="list-style-type: none"> • Tighten steering column fixings to correct specification. REFER to: Specifications (211-00 Steering System - General Information, Specifications).
<ul style="list-style-type: none"> • Noise while adjusting column 	<ul style="list-style-type: none"> • Electric motor/solenoid 	 NOTE: Before carrying out repairs/replacement, assess column adjustment noise levels against other vehicles of the same model <ul style="list-style-type: none"> • Install new components as required
	<ul style="list-style-type: none"> • Motor spindle/lead screw 	<ul style="list-style-type: none"> • Lubricate lead screw

Vibration

Symptom	Possible Causes	Action
<ul style="list-style-type: none"> • Wheel Fight (Kick Back) - condition where roughness is felt in the steering wheel by the driver when the vehicle is driven over rough surfaces 	<ul style="list-style-type: none"> • Loose or worn steering components/bushings 	 CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty. <ul style="list-style-type: none"> • Tighten and install new steering components/bushings as required
	<ul style="list-style-type: none"> • Loose or worn suspension components/bushings 	<ul style="list-style-type: none"> • Tighten and install new suspension components/bushings as required
<ul style="list-style-type: none"> • Nibble (Shimmy) - condition where oscillation of the steering wheel occurs (not vertical which is Shake). This is driven by road wheel imbalance 	<ul style="list-style-type: none"> • Road wheel and tire condition 	<ul style="list-style-type: none"> • Check for wheel and tire damage. Install new components as required • Check for tire uniformity. Install new tire(s) as required
	<ul style="list-style-type: none"> • Road wheel imbalance 	<ul style="list-style-type: none"> • Check and adjust road wheel balance as required
<ul style="list-style-type: none"> • Shake - condition where vertical vibration of the steering wheel/column occurs (not oscillation which is Nibble) 	 NOTE: Vibration smooths out after several miles of driving <ul style="list-style-type: none"> • Road wheel imbalance due to tire flat-spotting 	<ul style="list-style-type: none"> • Ensure tires installed are to Jaguar specification. Install new tires as required • Check and adjust tire pressures to correct specification

Component Tests

Steering Linkage Inspection and Backlash (Free play) Check



CAUTION: Steering gear boots must be handled carefully to avoid damage. Use new clamps when installing steering gear boots.

Inspect the boots for cuts, deterioration, twisting or distortion. Check the steering gear boots to make sure they are tight. Install new boots or clamps as required.



NOTE: The following steps must be carried out with assistance.

1. With the wheels in the straight ahead position, gently turn the steering wheel to the left and the right to check for free play.

- Free play should be between 0 and 6 mm (0 and 0.24 in) at the steering wheel rim. If the free play exceeds this limit, either the ball joints are worn, the lower steering column joints are worn or the backlash of the steering gear is excessive.



CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty.

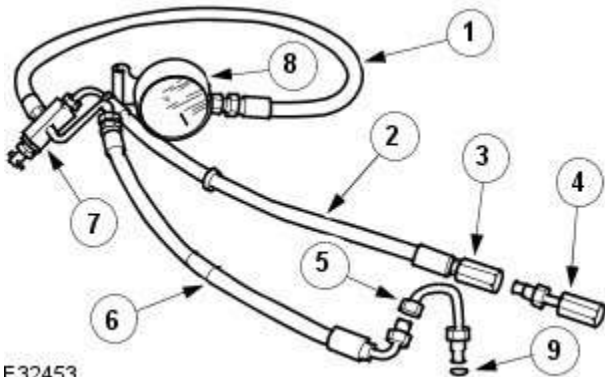
- The backlash of the steering gear cannot be adjusted, install a new steering gear if excessive backlash is diagnosed.
- Grasp the steering wheel firmly and move it up and down and to the left and right without turning the wheel to check for column bearing wear, steering wheel or steering column.

Power Steering Fluid Condition Check

- Run the engine for 2 minutes.
- Check the power steering fluid system level.
- Observe the color and the odor. The color under normal circumstances should be dark reddish, not brown or black.
- Using a suitable clean syringe extract a suitable amount of fluid from the reservoir.
- Allow the fluid to drip onto a facial tissue and examine the stain.
- If evidence of solid material is found, the power steering fluid system should be drained for further inspection.
- If fluid contamination or steering component failure is confirmed by the sediment in the power steering fluid system, refer to Steering Fault Diagnosis by Symptom Charts in this section.

Power Steering Pressure Test

Test Equipment



E32453

Item	Part Number	Description
1	211-011	Pressure Gauge Hose
2	211-011-08	Pump Return Hose
3	211-011-07	Pump Return Hose Connector
4	211-011-03/2	Test Equipment to High Pressure Hose Adaptor
5	211-011-03/1	Pump High Pressure Outlet to Hose Adaptor
6	211-011-02	Pump Adaptor to Control Valve Hose
7	211-011-01	Control Valve
8	211-011	Pressure Gauge
9	-	'O' Ring Seal

The measurement of the maximum system pressure, (which is governed by the pressure relief valve) is achieved by inserting the Service Tool (pressure gauge and adaptors) into the fluid circuit of the power steering system. Run the engine at idle speed, turn the steering from lock to lock and read the maximum pressure recorded on the gauge.

Installing Test Equipment

To install the pressure test equipment:

- Place a suitable drain tray below the power steering pump.
- Install a hose clamp on the reservoir to pump hose prior to disconnecting any hoses, to avoid unnecessary loss of fluid.
- Disconnect the hose from the power steering pump high pressure outlet.
- Install the pump outlet to hose adaptor (5). Do not omit the 'O' ring seal (9).
- Connect the power steering pump adaptor to control valve hose (6) of the test equipment.
- Install the adaptor (4) in the high pressure hose previously removed from the power steering pump outlet.
- Connect the connector (3) of the test equipment hose (2) to the adaptor (4).
- Remove the hose clamp from the reservoir hose.
- Start the engine to check the system pressure.

With the control valve (7) OPEN and the engine idling, the following system pressures may be checked:

- During turning when static (dry parking pressure).
- When the steering is held on full lock (maximum system pressure or pressure relief).
- With the steering at rest (idle pressure or back pressure).

CAUTIONS:



To avoid excessive heating of the power steering pump when checking the pressure, do not close the valve for more than 5 seconds maximum.



When checking the pump pressure DO NOT drive the vehicle with the test equipment installed.

With the control valve (7) CLOSED the power steering pump maximum output pressure can be checked.

Removing Test Equipment

To remove the test equipment:

- Install a hose clamp on the reservoir to power steering pump hose.
- Removing the test equipment is a reversal of the installation instructions.
- Install a new 'O' ring seal (9) to the power steering pump high pressure outlet to hose connection.
- Install the original hose to the power steering pump.
- Remove the clamp from the reservoir to the power steering pump hose.
- Top-up the reservoir fluid.
- Bleed the power steering system.
REFER to: [Power Steering System Bleeding](#) (211-00 Steering System - General Information, General Procedures).

Description of Terms

General Steering System Noises

Boom

Rhythmic sound like a drum roll or distant thunder. May cause pressure on the ear drum.

Buzz

Low-pitched sound, like a bee. Usually associated with vibrations.

Chatter

Rapidly repeating metallic sound.

Chuckle

Rapid noise that sounds like a stick against the spokes of a spinning bicycle wheel.

Chirp

High pitched rapidly repeating sound, like chirping birds.

Click

Light sound, like a ball point pen being clicked.

Click/Thump

Heavy metal-to-metal sound, like a hammer striking steel.

Grind

Abrasive sound, like a grinding wheel or sandpaper rubbing against wood.

Groan/Moan

Continuous, low-pitched humming sound.

Groan/Howl

Low, guttural sound, like an angry dog.

Hiss

Continuous sound like air escaping from a tire valve.

Hum

Continuous sound of varying frequencies, like a wire humming in the wind.

Knock

Heavy, loud repeating sound like a knock on a door.

Ping

Similar to knock, except at higher frequency.

Rattle

A sound suggesting looseness, such as marbles rolling around in a can.

Roar

Deep, long, prolonged sound like an animal, or winds and ocean waves.

Rumble

Low, heavy continuous sound like that made by wagons or thunder.

Scrape

Grating noise like one hard plastic part rubbing against another.

Squeak

High-pitched sound like rubbing a clean window.

Squeal

Continuous, high-pitched sound like running finger nails across a chalkboard.

Tap

Light, hammering sound like tapping pencil on edge of table. May be rhythmic or intermittent.

Whirr/Whine

High-pitched buzzing sound, like an electric motor or drill.

Whistle

Sharp, shrill sound, like wind passing a small opening.

Specific Steering System Noise Types**Belt Squeal**

Belt squeal is a high frequency air-borne noise generated by slippage of the ribbed Vee belt on the power steering pump pulley. Squeal increases with system loading and at full lock.

Clonk

Clonk is a structure-borne noise heard as a loose-sounding rattle or vibration coming from the steering column. Clonk can be identified by driving and turning over cobblestones, rough roads, or high frequency bumps such as 25-50 mm tall tar strips. Clonk requires a tie-rod load impact.

Column Knock

Column knock is a loose-sounding rattle or vibration generated by the steering column shaft contacting other portions of the column assembly. The noise is both audible and tactile. Column knock is generated by driving over cobblestones or rough pavement. It is not necessary to turn the steering wheel to create this noise.

Column Rattle

Column rattle is a metallic sounding noise created when applying a highly impulsive force to the steering wheel. Column rattle is often used to combine the more general group of column noises including clonk and column knock. Column rattle noises can be caused by clonk, knock, loose column components, bonus parts etc. A series of parked, straight-line driving, and cornering tests should be carried out to isolate the source/sources.

Grinding/Scrape

Grinding is a low frequency noise in the column when the steering wheel is turned. It is generally caused by interference

between moving components such as the steering wheel to steering column shroud.

Grunt (Squawk/Whoop)

Grunt is a 'honking' sound elicited when coming off one of the steering stops. Grunt is generally excited during parking manoeuvres with a low to medium speed steering input.

Hiss (Swish)

Hiss or Valve Hiss is a high-frequency sound coming from the steering gear when the system is loaded. It is a rushing or 'swish' noise that doesn't change frequency with RPM. Hiss is the general noise generated by the flow of hydraulic fluid through restrictions in the steering system. Restrictions include the rotary steering valve, power steering tubes, connectors, tuning orifices, etc. Hiss can be air-borne and structure-borne, but the structure-borne path through the steering intermediate shaft is usually dominant.

Moan (Groan)

Moan is the general structure-borne noise of the steering system. Moan is primarily transmitted to the driver via the body structure through the pump mount, engine mounts, power steering lines and power steering brackets. On some vehicles, moan is a loud humming noise, often present when the wheel is turned and the system is loaded. It may change frequency with engine RPM and if the system is loaded or unloaded.

Steering Gear Knock (Steering Gear Slap)



CAUTION: DO NOT attempt to adjust the steering gear yoke. Failure to follow this instruction will invalidate the steering gear warranty.

Steering gear knock is a rattle sound and steering wheel vibration caused by separation of the steering gear and pinion while driving over bumps. It is a structure-borne noise transmitted through the intermediate shaft and column. Steering gear knock can also be heard as a 'thump' or impact noise that occurs with the vehicle stationary when the steering wheel is released from a loaded position and allowed to return to rest. Noise occurs with the engine on or off.

Rattles

Rattles are noises caused by knocking or hitting of components in the steering system. Steering rattles can occur in the engine compartment, the suspension, or the passenger compartment. Rattles can be caused by loose components, movable and flexible components, and improper clearances.

Squeaks/Scrapes

Squeaks/Scrapes are noises due to friction or component rubbing anywhere in the steering system. Squeaks/Scrapes have appeared in steering linkages and joints, in column components and in column and steering wheel trim.

Weep

Weep is an air-borne noise, occasionally generated when turning the steering across lock at a constant rate. When present on a vehicle the noise, once initiated can often be maintained across a large proportion of the available steering movement.

Whistle

Whistle is similar to hiss but is louder and of a higher frequency. It is also more of a pure tone noise than hiss. Whistle is air-borne and is generated by a high flow rate of hydraulic fluid through a small restriction.

Zip

Zip noise is the air-borne noise generated by power steering pump cavitation when power steering fluid does not flow freely through the suction hose from the reservoir to the pump. Zip primarily occurs during cold weather at start-up.

Steering System Vibrations and Harshness

Buzz

Buzz is a tactile rotary vibration felt in the steering wheel when steering inputs are slow. Buzz can also be called a grinding feel and it is closely related to grunt and is caused by high system gain with low damping. Buzz is generally excited during parking manoeuvres with low to medium speed steering input.

Buzz (Electrical)

A different steering buzz can be caused by pulse width modulated (PWM) electric actuators used in variable assist steering systems. This buzz is felt by turning the ignition key to run without starting the engine and holding onto the steering wheel. In extreme cases, the buzz can be felt with the engine running also.

Column/Steering Wheel Shake

Column shake is a low frequency vertical vibration excited by primary engine vibrations.

Nibble (Shimmy)

Steering nibble is a rotary oscillation or vibration of the steering wheel, which can be excited at a specific vehicle speed. Nibble is driven by wheel and tire imbalance exciting a suspension recession mode, which then translates into steering gear travel and finally steering wheel nibble.

Shudder (Judder)

Shudder is a low frequency oscillation of the entire steering system (tire, wheels, steering gear and linkage, etc.) when the vehicle is steered during static-park or at low speeds. Shudder is very dependent on road surface.

Torque/Velocity Variation (Phasing/Effort Cycling)

Steering wheel torque variation occurring twice in one revolution is normally as a result of problems with the lower steering column (intermediate shaft), but foul conditions generally result in either constant stiffness or single point stiffness. Depending upon the orientation of the joints, the steering can feel asymmetric (torque falling off in one direction and rising in the other) or else it can simply have pronounced peaks and troughs as the steering moves from lock to lock.

Wheel Fight (Kick Back)

Wheel fight is excess feedback of sudden road forces through the steering system and back to the driver. It is evaluated at all vehicle speeds over cobblestones, rough roads, and potholes. The tires, wheels, and suspension generate forces into the steering systems. Steering friction, hydraulic damping, hydraulic compliance, mechanical compliance, steering ratio, and assist gain all affect how much is transmitted to the driver.

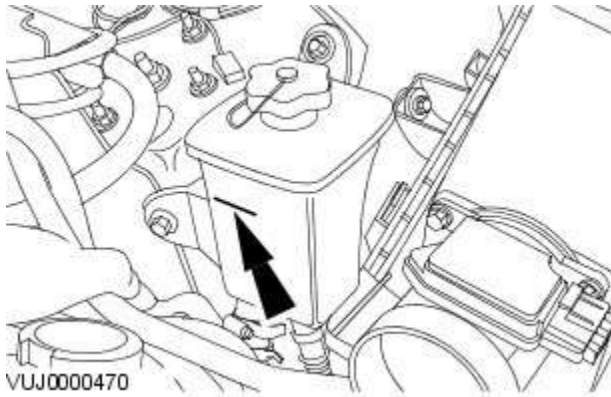
Steering System - General Information - Power Steering System Bleeding

General Procedures



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Clean power steering fluid reservoir around the filler cap and fluid indicator.
 - Check the power steering fluid, if aerated, wait until fluid is free from bubbles then top-up reservoir to UPPER level mark with recommended fluid.



2. CAUTION: Fluid must always be present in the reservoir during bleeding.

Remove the filler cap and fill to the MAX level mark.

- Install the reservoir filler cap.

3. Start the engine and allow to run for 10 seconds, stop the engine.
 - Check the power steering fluid, if aerated, wait until fluid is free from bubbles then top-up reservoir to UPPER level mark with recommended fluid.



4. CAUTION: Do not hold steering on full lock for longer than 10 seconds.

Start the engine and turn steering fully lock to lock, stop the engine.

- Check and top-up power steering fluid level.

5. Start and run the engine for 2 minutes, turn the steering fully lock to lock.
 - Check and top-up power steering fluid level.

Steering System - General Information - Power Steering System Flushing

General Procedures

NOTES:

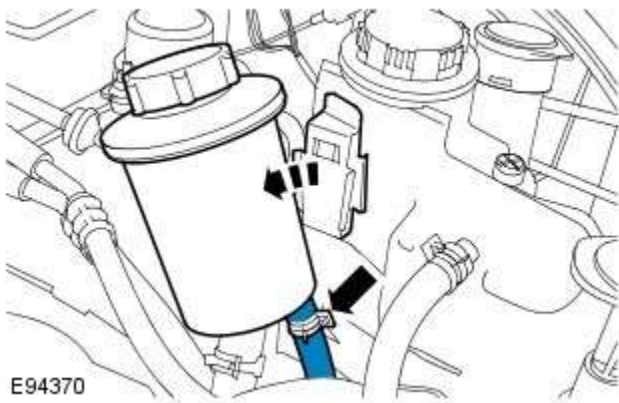


If heavy steering or contamination within the power steering system is found, it is necessary to carry out the system flush procedure as detailed below. If any components have been replaced in the power steering system the procedure below must be carried out in full.



Some variation in the illustrations may occur, but the essential information is always correct.

1. Remove the power steering fluid reservoir cap.
2. Using a suitable syringe, remove the power steering fluid from the power steering fluid reservoir.



3.  **CAUTION:** Be prepared to collect escaping fluids.



NOTE: Note the orientation of the clip.

Detach the power steering fluid reservoir.

- Detach but do not remove the power steering fluid reservoir.
- Release the power steering fluid return hose from the power steering fluid reservoir.
- If a quick release coupling is fitted to the power steering return hose, release the power steering fluid return hose from the coupling by removing the clip.

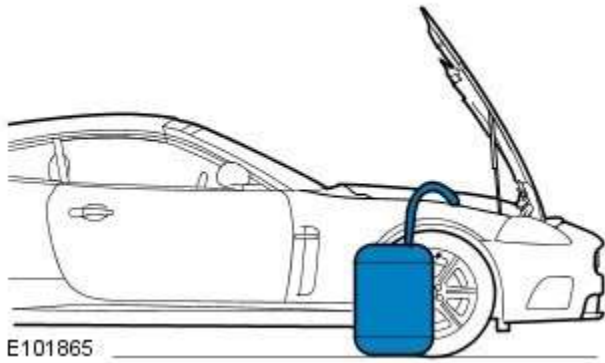


4.  **CAUTION:** Be prepared to collect escaping fluids.




NOTE: Make sure that all openings are sealed. Use new blanking caps.

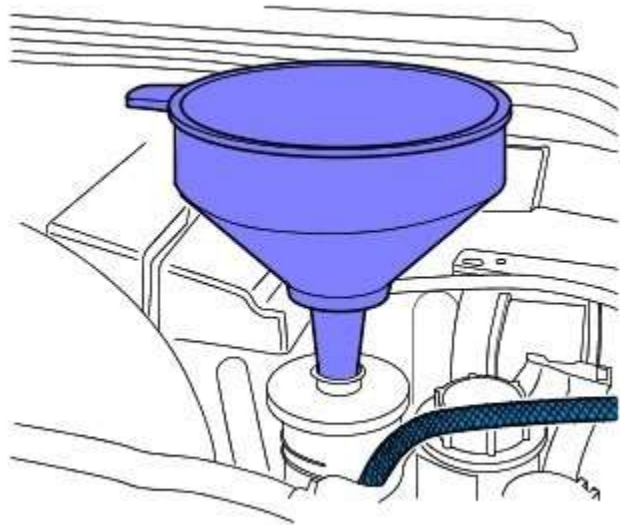
Using a suitable blanking cap, cap the power steering reservoir return pipe.




5.  CAUTION: Be prepared to collect escaping fluids.


 NOTE: Make sure the extended pipe is not kinked or twisted and is correctly secured with hose clips.

Attach a suitable pipe to the power steering return hose to allow the fluid to drain.



6. NOTES:

 The suitable funnel should have the a capacity of 4 litres and O-ring seal

 The suitable funnel must be tightly sealed to the power steering fluid reservoir to avoid fluid leakage.

Install a suitable funnel onto the power steering fluid reservoir.



7. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle with the wheels just clear of the ground.

8. CAUTIONS:

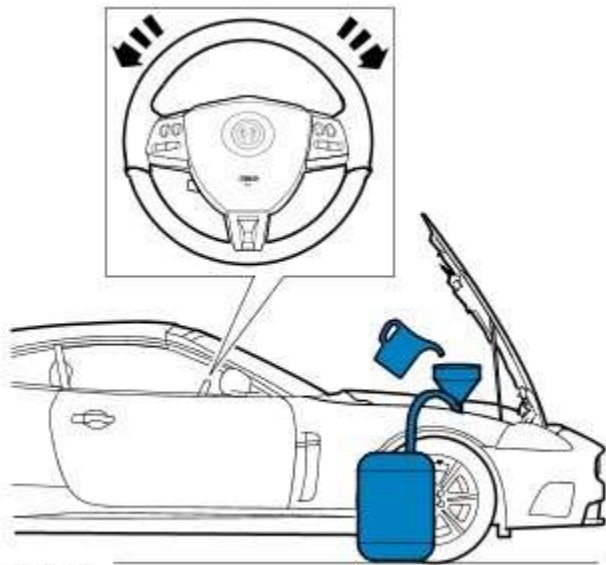


Steps 8 and 9 must be carried out within 2 - 3 seconds of each other. Failure to follow this instruction may result in damage to the power steering system.



Be prepared to collect escaping fluids.


Using the suitable funnel, top up the power steering system with the specified fluid. Make sure the fluid level is maintained at two thirds full in the funnel.




E119674

9. CAUTIONS:

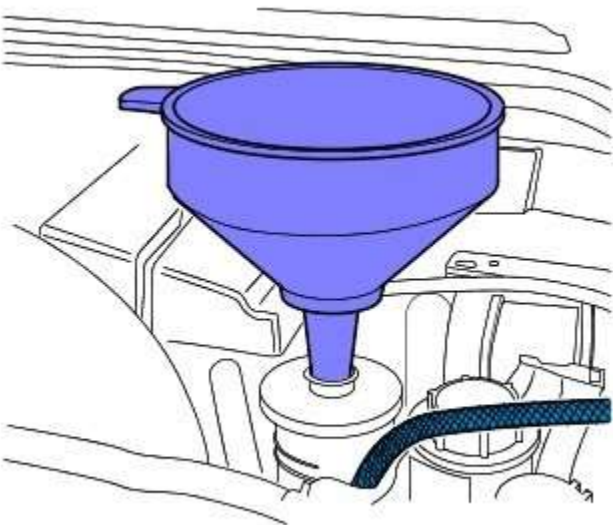
 Be prepared to collect escaping fluids.

 Do not allow the power steering fluid level in the power steering fluid reservoir to fall below the minimum power steering fluid level. Failure to follow this instruction may result in damage to the power steering system.

 Make sure the engine is switched off as soon as the full 4 litres of power steering fluid has entered the power steering fluid reservoir.

Flush the power steering system.

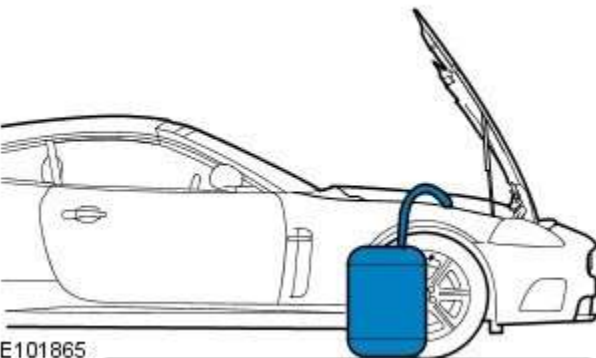
- Start the engine
- With assistance turn the steering slowly lock to lock 3 times at approximately 1 revolution every 5 seconds.
- Continue to flush the power steering system until 4 litres of power steering fluid has been added to the power steering reservoir. This should take approximately 30 seconds.



E94372

10.  CAUTION: Be prepared to collect escaping fluids.

Remove the suitable funnel.



E101865

11.  CAUTION: Be prepared to collect escaping fluids.

Remove the suitable pipe to the power steering return hose.

12.  CAUTION: Be prepared to collect escaping fluids.



NOTE: Note the orientation of the clip.

If a quick release coupling is fitted to the power steering return hose, connect the power steering fluid return hose to the coupling by installing the clip.

13. Install a new power steering fluid reservoir. For additional information, refer to: (211-02 Power Steering)
[Power Steering Fluid Reservoir - V6 3.0L Petrol](#) (Removal and Installation),
[Power Steering Fluid Reservoir - TDV6 3.0L Diesel](#) (Removal and Installation).

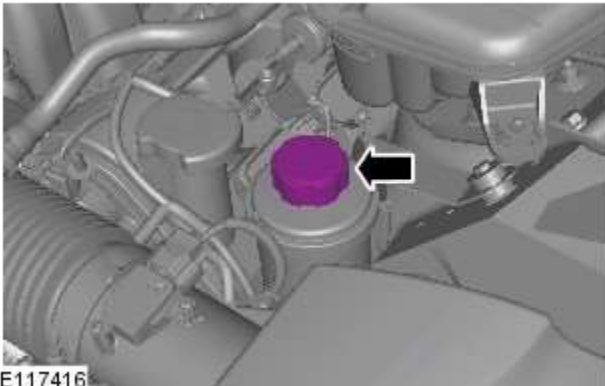
Steering System - General Information - Power Steering System Filling V8

5.0L Petrol/V8 S/C 5.0L Petrol

General Procedures

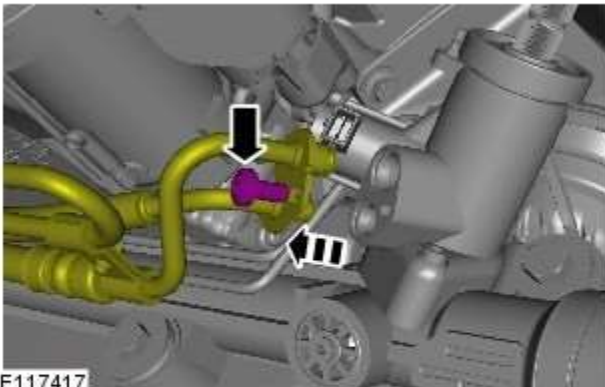
Draining

1.



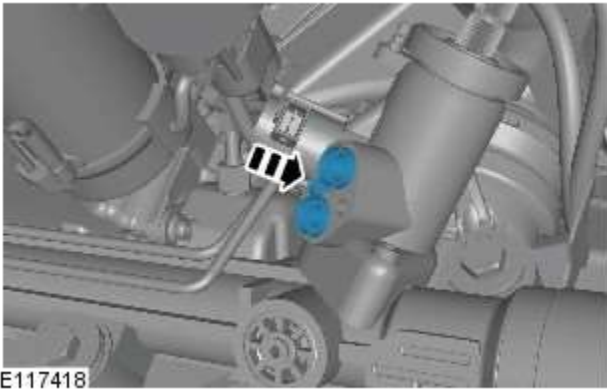
2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).




4.  **CAUTION:** Be prepared to collect escaping fluids.


 **NOTE:** Remove and discard the O-ring seals.



E117418

5. CAUTIONS:


 Make sure that the area around the component is clean and free of foreign material.

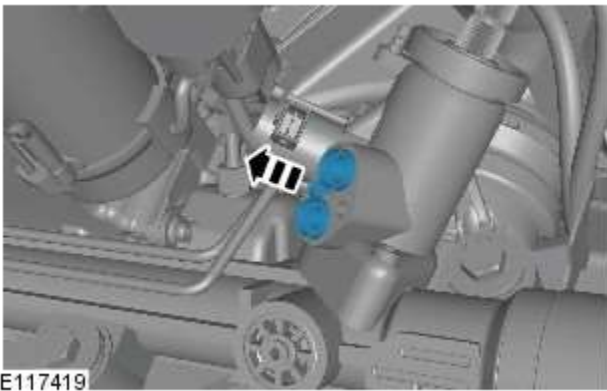
 The blanking plugs must not be removed until the power steering pipes are ready to be connected.

Filling

1. CAUTIONS:


 Make sure that the area around the component is clean and free of foreign material.

 The blanking plugs must not be removed until the power steering pipes are ready to be connected.



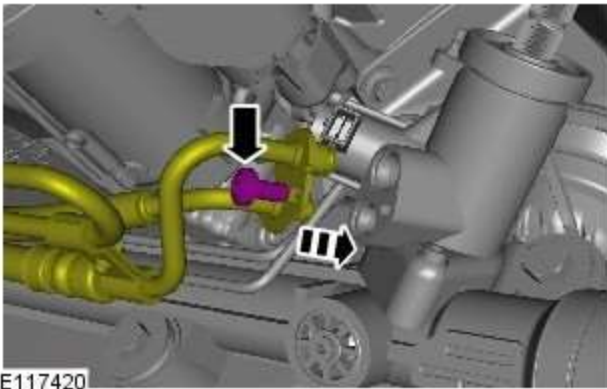
E117419

2. CAUTIONS:

 Make sure that the area around the component is clean and free of foreign material.

 Install new o-ring seals

Torque: 20 Nm

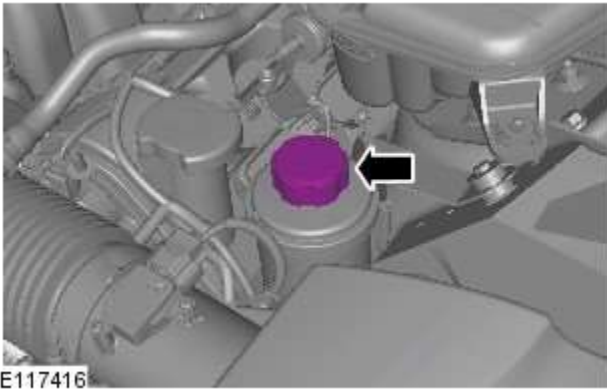


E117420

3. Lower the vehicle.



4. CAUTION: Fluid must always be present in the reservoir during bleeding.
 - Fill the power steering reservoir.



5. Install the vacuum hand pump to the power steering fluid reservoir.

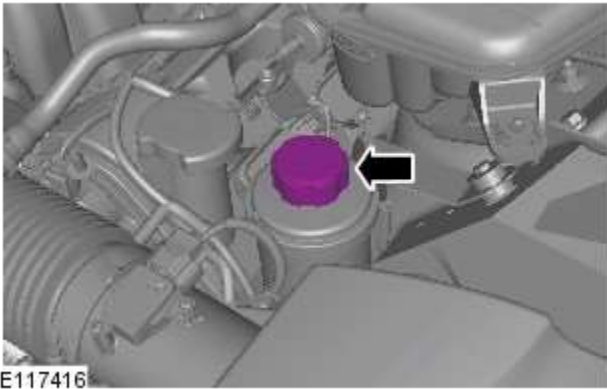


6. NOTE: Apply the maximum vacuum possible on the reservoir for 1 minute.
 - Apply a vacuum to the power steering fluid reservoir.

7. Remove the vacuum hand pump from the power steering fluid reservoir.



8. CAUTION: Fluid must always be present in the reservoir during bleeding.
 - Fill the power steering reservoir.



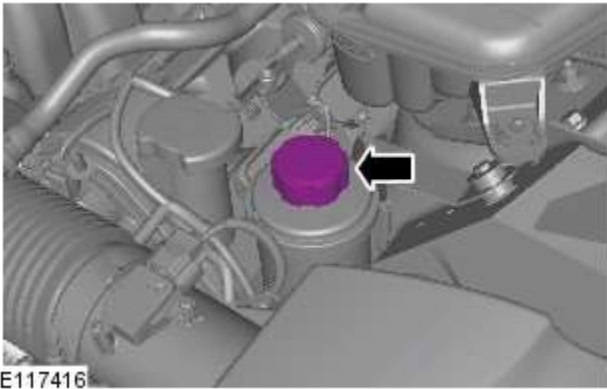
9.
 - Run the engine for 30 seconds.
 - Turn the steering fully lock-to-lock, stop the engine.


10. Install the vacuum hand pump to the power steering fluid reservoir.



11. NOTE: Apply the maximum vacuum possible on the reservoir for 1 minute.
 - Apply a vacuum to the power steering fluid reservoir.


12. Remove the vacuum hand pump from the power steering fluid reservoir.



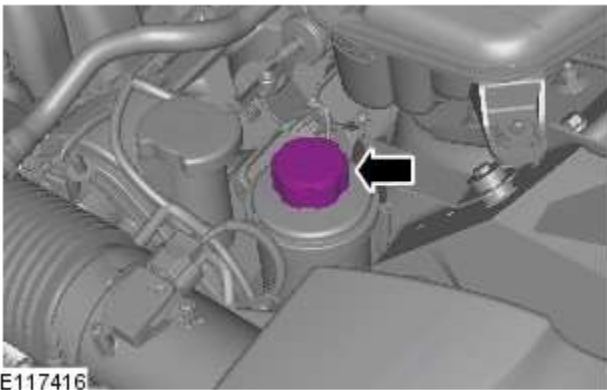
13.  **CAUTION:** Fluid must always be present in the reservoir during bleeding.
- Fill the power steering reservoir.


- 14.
- Run the engine for 30 seconds.
 - Turn the steering fully lock-to-lock, stop the engine.

15. Install the vacuum hand pump to the power steering fluid reservoir.

16.  **NOTE:** Apply the maximum vacuum possible on the reservoir for 1 minute.
- Apply a vacuum to the power steering fluid reservoir.

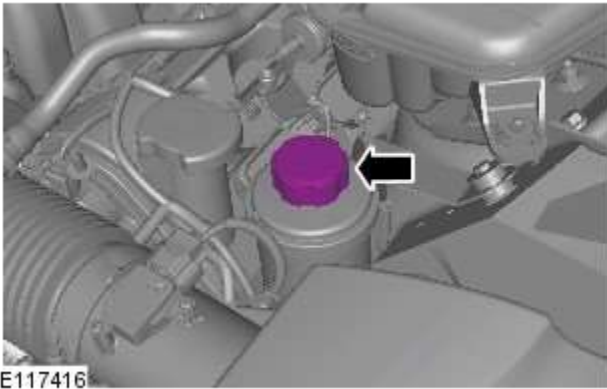
17. Remove the vacuum hand pump from the power steering fluid reservoir.



18.  **CAUTION:** Fluid must always be present in the reservoir during bleeding.
- Fill the power steering reservoir.

- 19.
- Run the engine for 30 seconds.
 - Turn the steering fully lock-to-lock, stop the engine.

20.



21. Check for fluid leaks.

22. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

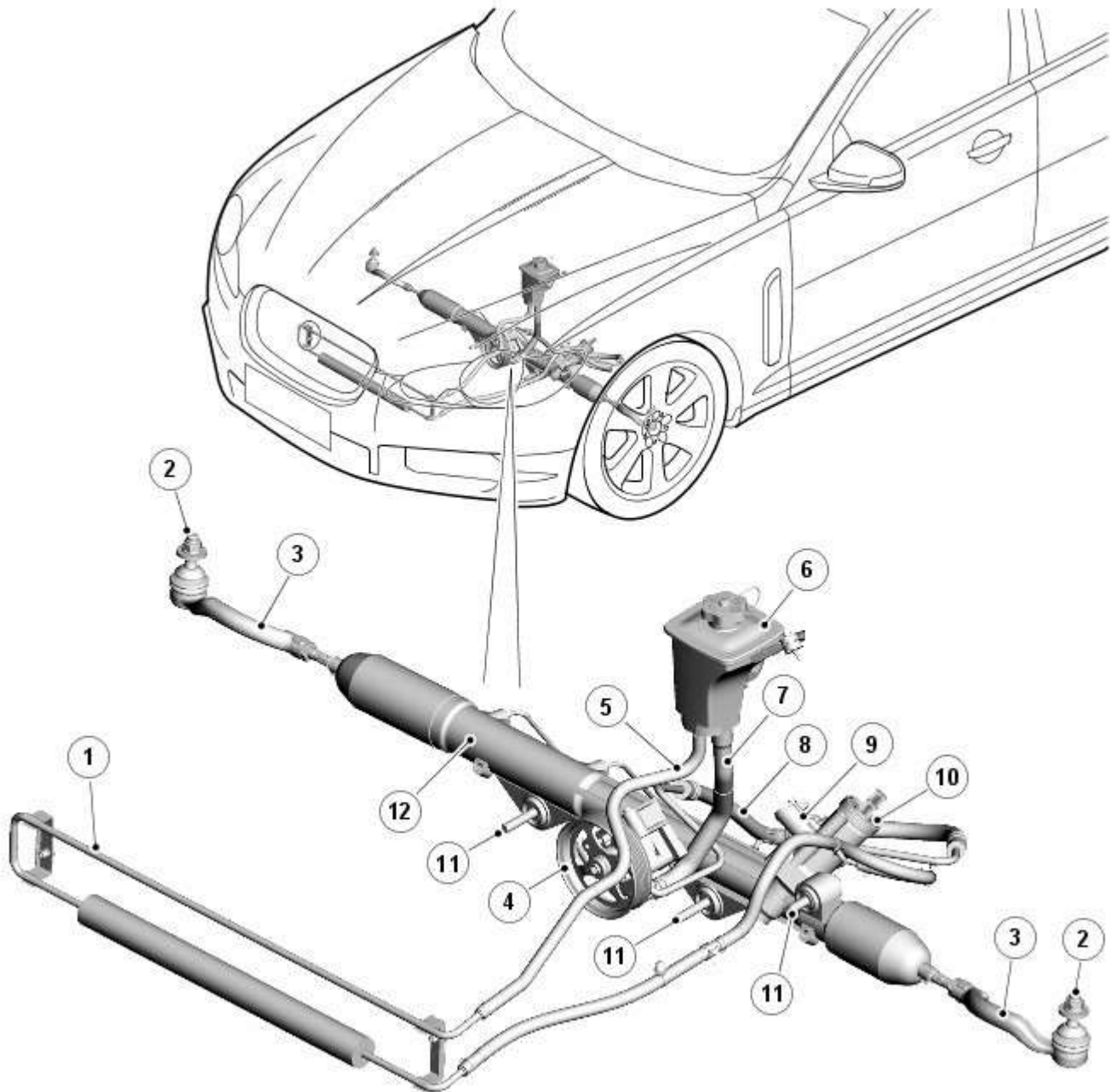
Power Steering -

Description	Nm	lb-ft	lb-in
Lower steering column slider pinch bolt	35	26	-
Lower steering column to steering gear pinch bolt	35	26	-
Power steering control valve actuator	2	-	18
Power steering fluid cooler retaining bolts	7	-	62
Power steering pump pulley retaining bolts	20	25	-
Power steering pump retaining bolts - All except vehicles with diesel engine	25	18	-
Power steering pump retaining bolts - Vehicles with diesel engine	22	16	-
Power steering pump to steering gear pressure line	25	18	-
Steering gear retaining bolts	100	74	-
Steering gear supply and return lines	10	-	89

Power Steering - Power Steering - Component Location

Description and Operation

POWER STEERING - COMPONENT LOCATION 5.0L V8



E93503

Item	Description
	NOTE: Naturally aspirated 5.0L V8 shown, Supercharged 5.0L V8 similar
1	Power steering fluid cooler
2	Tie-rod end (2 off)
3	Tie-rod (2 off)
4	Power steering pump
5	Low pressure fluid return hose
6	Power steering fluid reservoir
7	Feed pipe to pump
8	High pressure feed pipe to steering gear
9	Servotronic transducer valve
10	Valve unit
11	Mounting bolt (3 off)
12	Steering gear

Power Steering - Power Steering - Overview

Description and Operation

OVERVIEW

The steering system comprises a ZF manufactured rack and pinion Servotronic 2 steering gear, a power steering pump, a fluid reservoir, a fluid cooler (if fitted) and fluid hoses. The steering gear is an end take-off rack and pinion power assisted unit with the addition of road speed proportional ZF Servotronic 2 assistance.

The steering rack is connected to the front wheel knuckles by adjustable tie-rods. The tie-rods allow for adjustment to centralize the steering wheel and also adjust the toe setting of the front wheel geometry.

The steering gear has a variable ratio rack. This provides conventional response when the steering is in the centre, straight ahead position, but provides more direct and faster steering as the turning angle increases. The variable ratio provides precise and rapid steering response at high speeds and provides optimized steering of the vehicle when manoeuvring into parking spaces, turning in tight areas and when cornering in extreme conditions.

Fluid is supplied to the steering gear by a fixed displacement vane pump on petrol models and a variable displacement pump on diesel models. The pump is driven by a belt from the crankshaft pulley. The pump is mounted on the LH (left-hand) side of the engine, above the A/C (air conditioning) compressor. A fluid reservoir is positioned at the front LH side of the engine compartment, forward of the front suspension housing.

On petrol engine vehicles, a fluid cooler is located in front of the engine cooling radiator. Diesel models do not have a fluid cooler.

Servotronic 2 adds electronic control and speed sensitive steering to the steering gear. The Servotronic 2 feature provides easy and comfortable steering operation when parking, improved 'road feel' at increased road speeds and adds an integrated, positive center feel feature which optimises steering wheel torque during high speed driving. The Servotronic 2 system is controlled by software which is incorporated into the instrument cluster. The software responds to road speed signals and controls the power assistance via a transducer valve located on the steering gear valve housing.

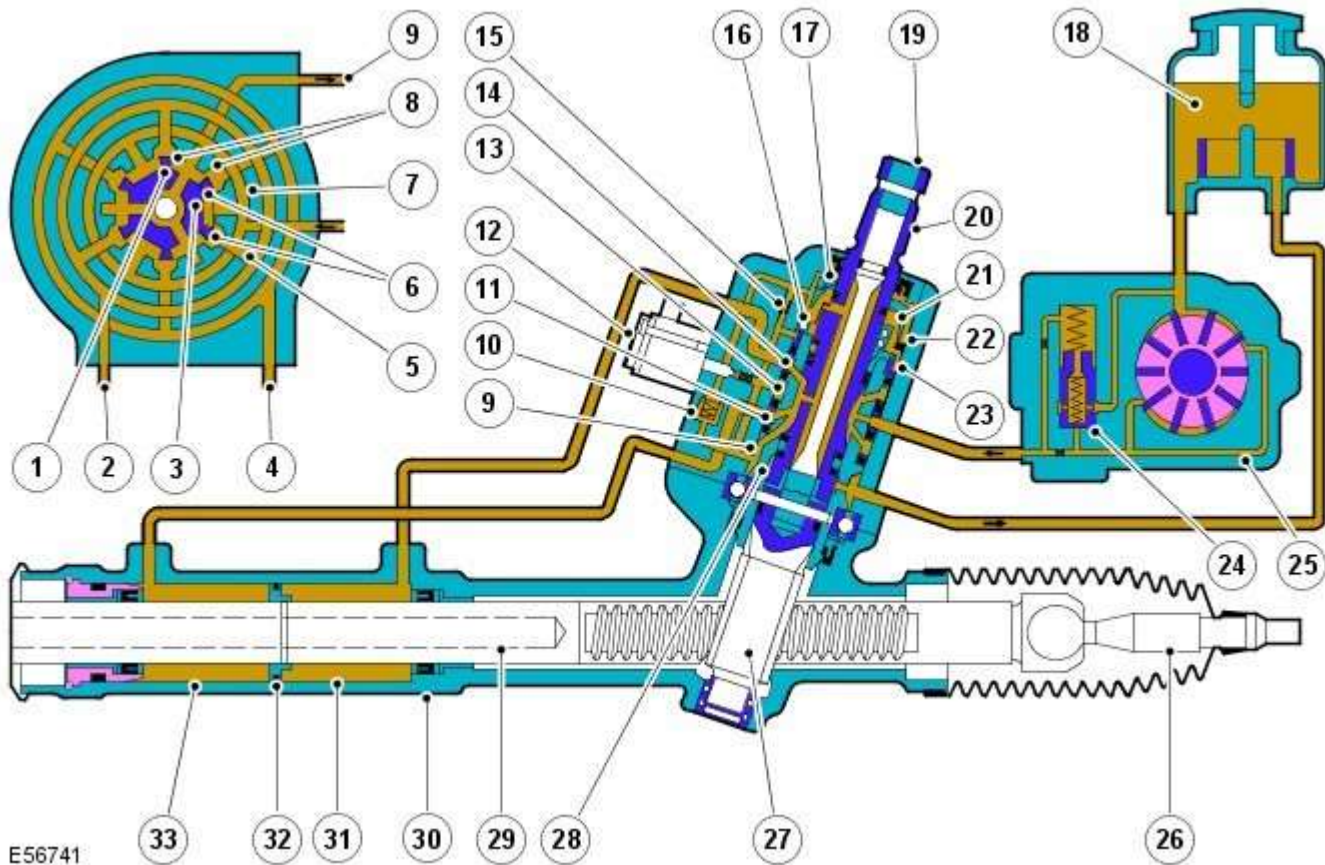
Power Steering - Power Steering - System Operation and Component Description

Description and Operation

System Operation

The following hydraulic circuits show power steering operation and fluid flow for the steering in a straight ahead, neutral position and when turning right. The circuit diagram for turning left is similar to that shown for turning right.

Power Steering in Neutral Position



Item	Description
1	Return fluid control groove
2	Radial groove
3	Feed fluid control groove
4	Radial groove
5	Axial groove
6	Feed fluid control edge
7	Feed fluid radial groove
8	Return fluid control edge
9	Return fluid chamber
10	Cut-off valve
11	Radial groove
12	Servotronic transducer valve
13	Feed fluid radial groove
14	Radial groove
15	Orifice
16	Balls
17	Compression spring

18	Torsion bar
19	Power steering fluid reservoir
20	Valve rotor
21	Reaction piston
22	Reaction chamber
23	Centering piece
24	Pressure relief/flow limiting valve
25	Power steering pump
26	Inner tie-rod
27	Pinion
28	Valve sleeve
29	Steering gear rack
30	Steering gear housing
31	Power assist cylinder - right
32	Piston
33	Power assist cylinder - left

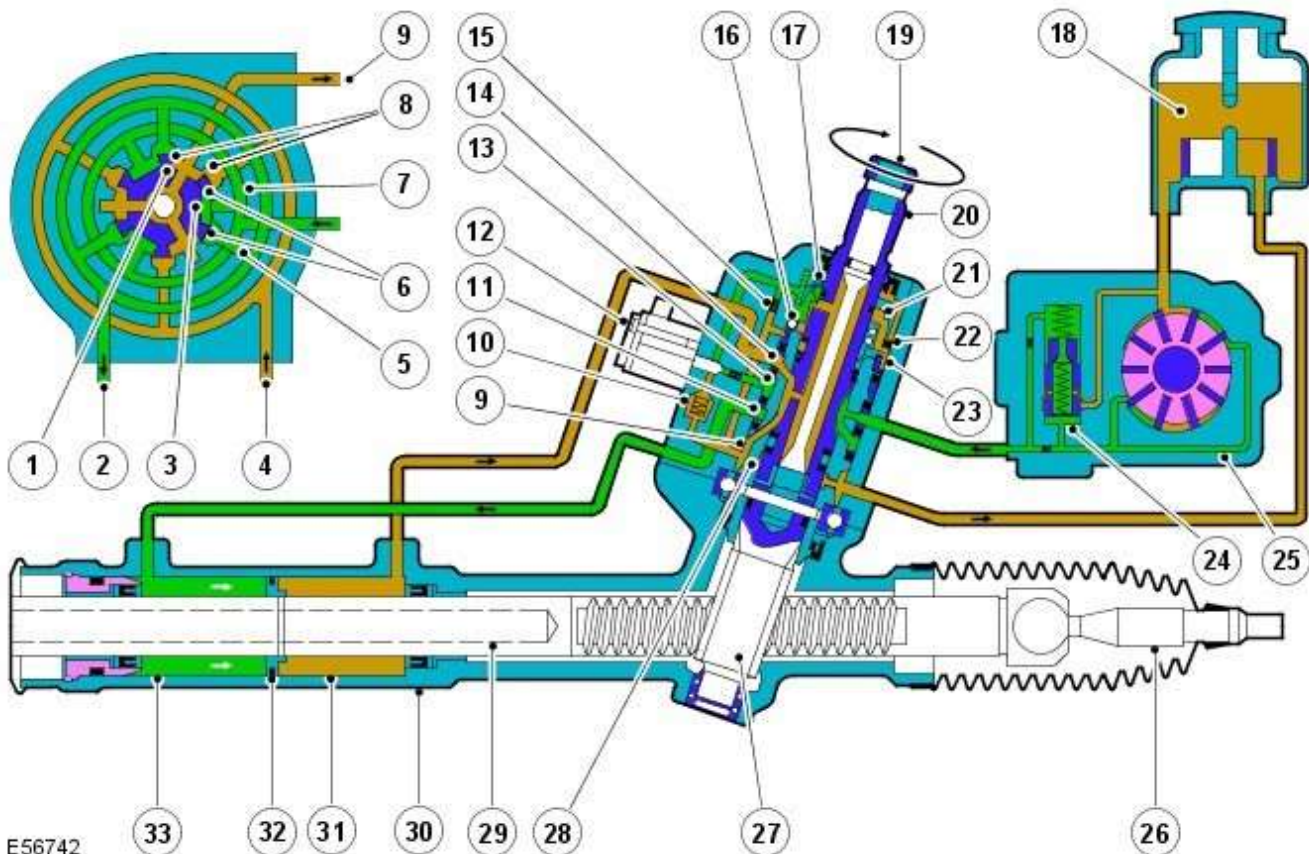
When the engine is started, the power steering pump draws fluid from the reservoir down the low pressure suction line. The fluid passes through the pump and is delivered at pressure, via a hose, to the steering rack valve unit.

The pressurized fluid flows through a connecting bore in the valve and, via the feed fluid radial groove and the transverse bores in the valve sleeve, passes to the feed fluid control groove of the valve rotor.

In the neutral (straight ahead) position, the fluid passes over the open feed fluid control edges to all valve sleeve axial grooves. The fluid then passes through return fluid control edges and the return fluid grooves of the valve rotor, back to the reservoir passes via the fluid cooler.

Simultaneously, the radial grooves of the valve and their associated pipes provide a connection the left and right power assist cylinders.

Power Steering in Right Turn Position



E56742

Item	Description
1	Return fluid control groove
2	Radial groove
3	Feed fluid control groove
4	Radial groove
5	Axial groove
6	Feed fluid control edge
7	Feed fluid radial groove
8	Return fluid control edge
9	Return fluid chamber
10	Cut-off valve
11	Radial groove
12	Servotronic transducer valve
13	Feed fluid radial groove
14	Radial groove
15	Orifice
16	Balls
17	Compression spring
18	Torsion bar
19	Power steering fluid reservoir
20	Valve rotor
21	Reaction piston
22	Reaction chamber
23	Centering piece
24	Pressure relief/flow limiting valve
25	Power steering pump
26	Inner tie-rod
27	Pinion
28	Valve sleeve
29	Steering gear rack
30	Steering gear housing
31	Power assist cylinder - right
32	Piston
33	Power assist cylinder - left

When the steering wheel is turned to the right, the steering rack and piston moves to the left in the piston bore. The valve rotor is rotated to the right (clockwise) and pressurized fluid is directed over the further opened feed fluid control edges and to the associated axial grooves, the radial groove and via an external pipe to the left power assist cylinder chamber. The pressure applied to the piston from the left power assist cylinder chamber provides the hydraulic assistance.

An adaptable pressure build-up is achieved by the partially or fully closed feed fluid control edges restricting or preventing a connection between the fluid pressure inlet and the other axial grooves connected to the radial groove.

Simultaneously, the fluid pressure outlet to the pressurized axial grooves are restricted or partially restricted by the closing return fluid control edges. The fluid displaced by the piston from the right power assist cylinder chamber, flows through an external pipe to the radial grooves. From there the fluid passes to the associated axial grooves and on to the return fluid control grooves, via the further opened return fluid control edges.

The return flow of fluid to the reservoir passes via interconnecting bores which lead to the return fluid chamber. When the steering wheel is turned to the left the operating sequence is as above but the pressure is applied to the opposite side of the piston.

Servotronic Operation

The Servotronic software contains a number of steering maps which are selected via the car configuration file depending on the vehicle mode and tire fitment.

If a failure of the Servotronic valve or software occurs, the system will suspend Servotronic assistance and only normal power steering wheel be available. Fault codes relating to the fault are stored, but no warning lamps are illuminated and the driver may be aware of the steering being 'heavier' than usual.

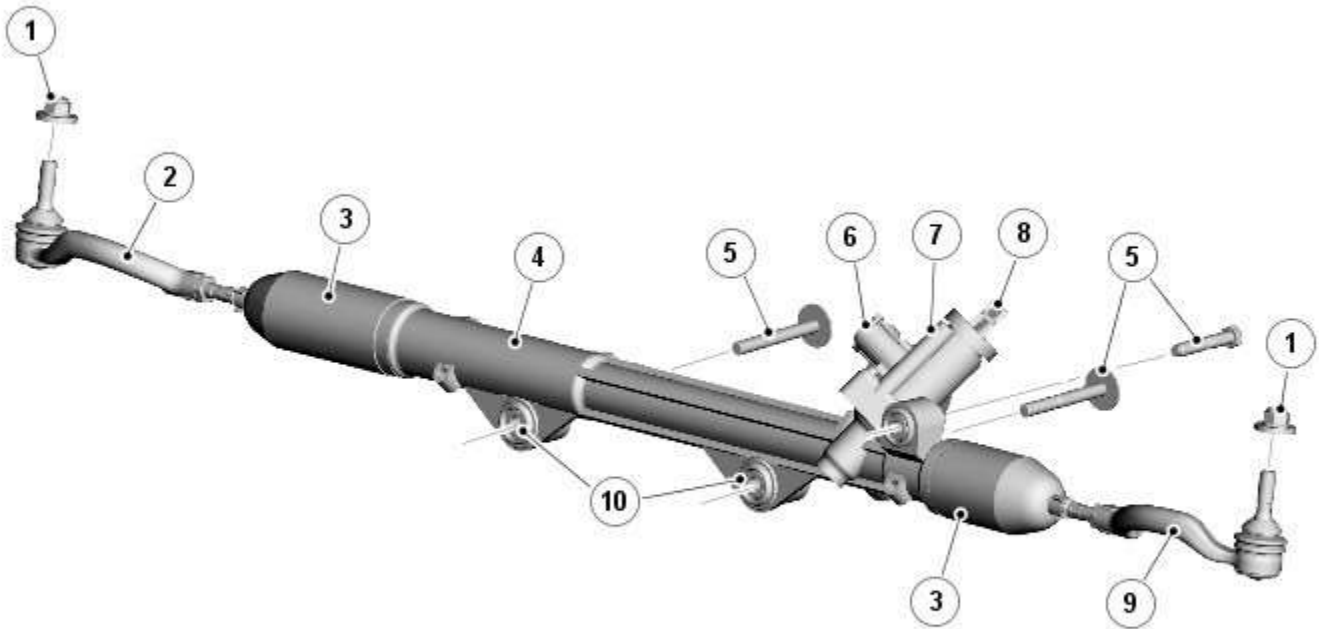
When the vehicle is manoeuvred into and out of a parking space (or other similar manoeuvre), the Servotronic software uses road speed data from the ABS module to determine the vehicle speed, which in this case will be slow or stationary. The Servotronic software analyses the signals and outputs an appropriate control current to the Servotronic transducer valve. The Servotronic valve closes and prevents fluid flowing from the feed fluid radial groove to the reaction chamber. An orifice also

ensures that there is return pressure in the reaction chamber. This condition eliminates any 'reaction' ensuring that the steering is very light to operate, reducing the effort required to turn the steering wheel.

As the vehicle is driven and the road speed increases, the Servotronic software analyses the road speed signals from the [ABS \(anti-lock brake system\)](#) module and reduces the amount of control current supplied to the Servotronic valve which increases the reaction pressure. This modifies the input torque applied through the steering wheel and provides the driver with an improved 'road feel' allowing precise steering and directional stability.

Component Description

Steering Gear



E97211

Item	Description
1	Locknut (2 off)
2	RH (right-hand) tie-rod
3	Steering gear boot (2 off)
4	Steering gear
5	Bolt and washer (3 off)
6	Servotronic valve
7	Valve unit
8	Input shaft
9	LH (left-hand) tie-rod
10	Steering gear mounting bushes

The steering gear is located at the rear of the engine and attached to the front sub-frame. The gear is secured to the sub-frame with 3 bolts and washers which screw into threaded tubes in bushes which are integral with the sub-frame.

The steering gear comprises an aluminum, cast, valve housing which contains the hydraulic valve unit and Servotronic valve. The mechanical steering rack and the hydraulic actuator are located in a steel cylinder which is attached to the cast valve housing.

The steering gear uses a rack with an integrated piston which is guided on plain bearings within the cylinder and the valve housing. The pinion, which is attached to the valve unit, runs in bearings and meshes with the rack teeth. The rack is pressed against the pinion by a spring loaded yoke which ensures that the teeth mesh with the minimum of play. The pinion is connected to the valve unit via a torsion bar. The rotary motion of the steering wheel is converted into linear movement of the rack by the rack and pinion mechanism and is initiated by the valve unit. This movement is transferred into movement of the road wheels by adjustable tie-rods.

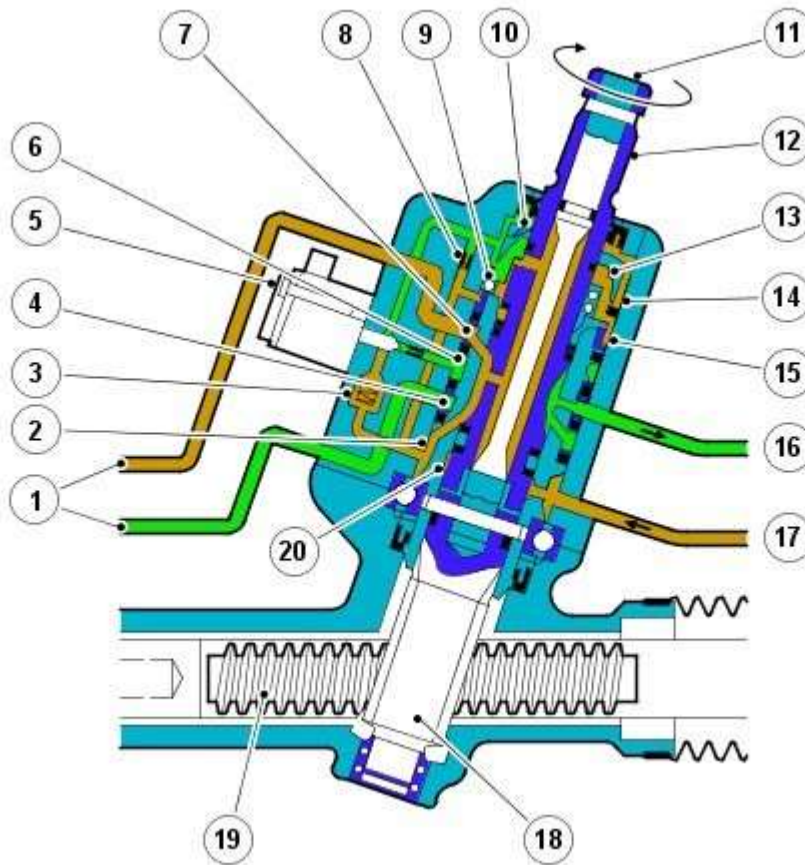
The rack teeth angles vary from 20 degrees in the centre position to 40 degrees at the end sections of the rack. It is this variation in teeth angles which provides the variable ratio.

The piston of the hydraulic actuator is located on the rack bar. Each side of the piston is connected to fluid pressure or fluid return via external metal pipes which are connected to the valve unit.

Each end of the rack bar has a threaded hole which provides for the fitment of the tie-rod. The external ends of the gear are sealed with boots which prevent the ingress of dirt and moisture. The tie-rod has a long threaded area which allows for the fitment of the tie-rod end. The thread allows for the adjustment of the steering toe. When the correct toe setting is achieved, a locknut is tightened against the tie-rod end preventing inadvertent movement.

The gear has a central hole machined along most of its length. The hole allows the air in the boots to be balanced when the steering is turned. The boots are serviceable items and are retained on the gear housing and the tie-rod with clips.

Valve Unit



E56740

Item	Description
1	Pressure/return to/from steering gear
2	Return fluid chamber
3	Cut-off valve
4	Radial groove
5	Servotronic transducer valve
6	Fluid feed radial groove
7	Radial groove
8	Orifice
9	Balls
10	Compression spring
11	Torsion bar
12	Valve rotor
13	Reaction piston
14	Reaction chamber
15	Centering piece
16	Return to reservoir

17	Pressure supply from pump
18	Pinion
19	Steering gear rack bar
20	Valve sleeve

The valve unit is an integral part of the steering gear. The principle function of the valve unit is to provide power assistance (i.e. when parking) to optimize the effort required to turn the steering wheel.

The pinion housing of the valve is an integral part of the main steering gear casting. The pinion housing has four machined ports which provide connections for pressure feed from the power steering pump, return fluid to the reservoir and pressure feeds to each side of the cylinder piston.

The valve unit comprises an outer sleeve, an input shaft, a torsion bar and a pinion shaft. The valve unit is co-axial with the pinion shaft which is connected to the steering column via the input shaft. The valve unit components are located in the steering gear pinion housing which is sealed with a cap.

The outer sleeve is located in the main bore of the pinion housing. Three annular grooves are machined on its outer diameter. [PTFE \(polytetrafluoroethylene\)](#) rings are located between the grooves and seal against the bore of the pinion housing. Holes are drilled radially in each annular groove through the wall of the sleeve. The bore of the outer sleeve is machined to accept the input shaft. Six equally spaced slots are machined in the bore of the sleeve. The ends of the slots are closed and do not continue to the end of the outer sleeve. The radial holes in the outer sleeve are drilled into each slot.

The input shaft has two machined flats at its outer end which allow for the attachment of the steering column intermediate shaft yoke. The flats ensure that the intermediate shaft is fitted in the correct position. The inner end of the input shaft forms a dog-tooth which mates with a slot in the pinion shaft. The fit of the dog-tooth in the slot allows a small amount of relative rotation between the input shaft and the pinion shaft before the dog-tooth contacts the wall of the slot. This ensures that, if the power assistance fails, the steering can be operated manually without over stressing the torsion bar. The central portion of the input shaft has equally spaced longitudinal slots machined in its circumference. The slots are arranged alternately around the input shaft.

The torsion bar is fitted inside the input shaft and is an interference fit in the pinion shaft. The torsion bar is connected to the input shaft by a drive pin. The torsion bar is machined to a smaller diameter in its central section. The smaller diameter allows the torsion bar to twist in response to torque applied from the steering wheel in relation to the grip of the tyres on the road surface.

The pinion shaft has machined teeth on its central diameter which mate with teeth on the steering gear rack. A slot, machined in the upper end of the pinion shaft mates with the dog-tooth on the input shaft. The pinion shaft locates in the pinion housing and rotates on ball and roller bearings.

Servotronic Valve

The Servotronic transducer valve is located in a port in the side of the steering gear valve housing. The valve is sealed in the housing with an O-ring seal and is secured with two long screws into threaded holes in the housing. The Servotronic valve is a transducer controlled valve which responds to control signals supplied from Servotronic software in the instrument cluster.

The Servotronic valve determines the hydraulic reaction at the steering gear rotary valve and controls the input torque required to turn the steering wheel. The Servotronic system allows the steering to be turned with the optimum effort when the vehicle is stationary or manoeuvred at slow speed. The hydraulic reaction changes proportional to the vehicle speed, with the required steering effort increasing as the vehicle moves faster. At high speeds, the Servotronic system provides the driver with a good feedback through the steering providing precise steering and improved stability.

The instrument cluster receives road speed signals from the [ABS](#) module and calculates the correct controlling signal for the Servotronic valve. The Servotronic software within the instrument cluster has a diagnostic capability which allows a Jaguar approved diagnostic system to check the tune of the steering and retrieve fault codes relating to the Servotronic valve. Two fault codes are stored relating to the valve for positive connection short to ground or battery and negative connection short to ground or battery.

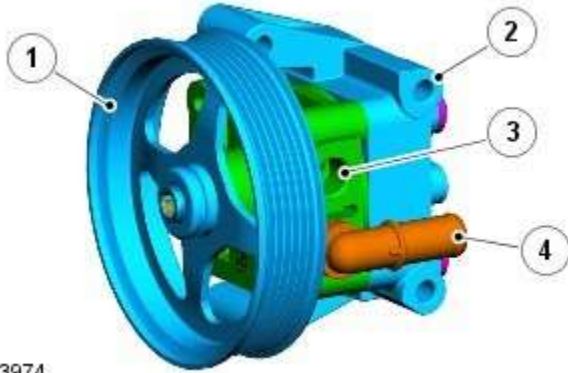
The Servotronic software within the instrument cluster also contains a number of steering maps which are selected via the car configuration file depending on the vehicle model and tire fitment.

If a failure of the Servotronic valve or software occurs, the system will suspend Servotronic assistance and only a default level of assistance will be available. Fault codes relating to the fault are stored in the instrument cluster. No warning lamps are illuminated and the driver may be aware of the steering being 'heavier' than usual.

Power Steering Pump - V6 and V8 Petrol Models



NOTE: V8 pump shown



E83974

The power steering pumps used on the different petrol engine variants are basically the same pump with different flow control valve mechanisms. The pump is a positive displacement, vane type pump which supplies a constant fluid flow to the steering gear valve unit. The pump is driven by a Poly Vee belt from the crankshaft pulley. A self-adjusting tensioner is fitted to maintain the correct tension on the belt.

The pump has an internal pressure relief valve and a flow control valve. The pressure relief valve limits the maximum pressure supplied to the steering gear to 110 bar (1595 lbf in²) \pm 4 bar (58 lbf in²). The flow control valve limits the maximum flow to 7.5 l/min (1.64 gal/min) \pm 0.75 l/min (0.16 gal/min) regardless of engine speed. The pump has a displacement of 10.5 cm³/rev (0.64 in³/rev).

A shaft runs longitudinally through the pump. One end of the shaft is fitted with a pressed-on drive pulley, the opposite end of the shaft is closed by a cover. The shaft runs in bearings located in the body and oil seals at each end of the shaft prevent leakage of hydraulic fluid. The pump contains ten vanes which rotate within a cam ring and are driven by the shaft. As the vanes rotate, the cam ring causes the space between the vanes to increase. This causes a depression between the vanes and fluid is drawn from the reservoir via the suction hose into the space between the vanes.

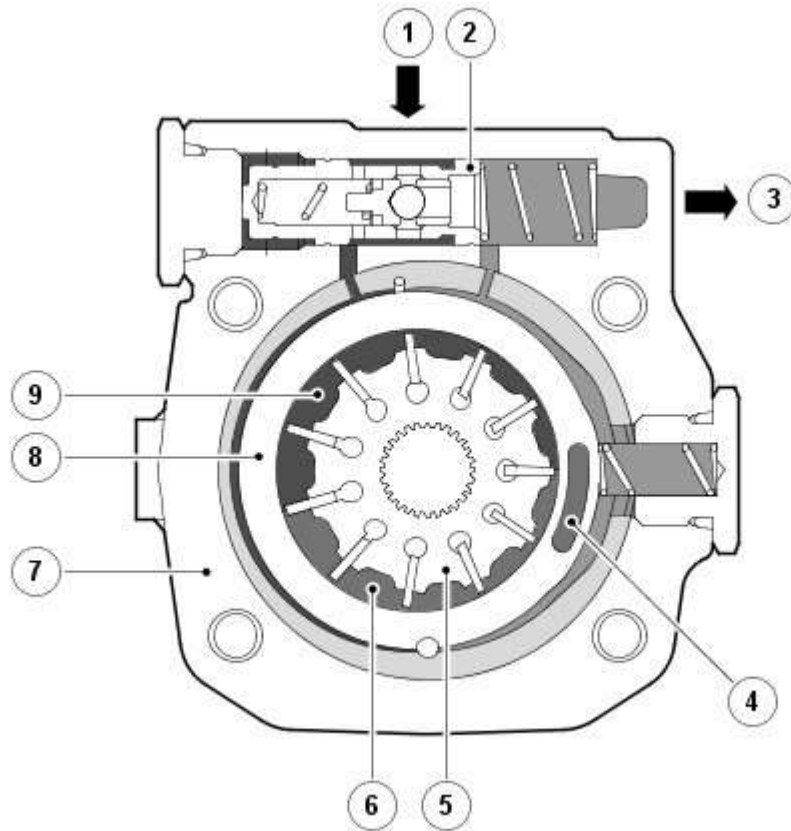
As the shaft rotates, the inlet port is closed to the vanes which have drawn in fluid, trapping the fluid between the vanes. The cam ring causes the space between the vanes to reduce and consequentially compresses and pressurises the hydraulic fluid trapped between them.

Further rotation of the shaft moves the vanes to the outlet port. As the vanes pass the port plate the pressurized fluid passes from the pump outlet port into the pressure hose to the steering gear.

The pressurized fluid is subject to control by the flow control and pressure relief valve. The flow control valve maintains a constant flow of fluid supplied to the steering gear irrespective of engine speed variations. The pressure relief valve limits the maximum pressure on the output side of the pump. A metering orifice is included in the discharge port of the pump. If the pressure in the orifice reaches a predetermined level, a spring loaded ball in the centre of the flow control valve is lifted from its seat and allows pressurized fluid to recirculate within the pump.

The pressure relief valve will operate if the discharge from the pump is restricted, i.e.; steering held on full lock. If the output from the pump is blocked, all output is recirculated through the pump. In this condition, as no fresh fluid is drawn into the pump from the reservoir, the fluid temperature inside the pump will increase rapidly. Consequentially, periods of operation of the steering gear on full lock should be kept to a minimum to prevent overheating of the pump and the fluid within it.

A variable displacement power steering pump is used on the diesel engine variants. The variable displacement, vane type pump supplies the required hydraulic pressure to the steering gear valve unit. The pump is located at the front of the engine and is driven by the FEAD (front end accessory drive) Poly Vee belt which is directly driven from the crankshaft. The output from the pump increases proportionally with the load applied to the steering valve unit.



E62615

Item	Description
1	Power steering fluid inlet port
2	Flow control valve
3	Power steering fluid outlet port
4	Variable Orifice
5	Pump rotor
6	High pressure
7	Adapter ring
8	Cam Ring
9	Low pressure

The pump consists of a shaft containing a number of slots into which vanes are inserted and these vanes run within a cam ring in the pump body. The centerline of the shaft is not concentric with that of the bore of the body and this creates the expanding and contracting cavities that form the pumping action.

The vanes rotate within the cam ring and are driven by the shaft. As the vanes rotate, the cam ring causes the space between the vanes to increase. This causes a depression between the vanes and fluid is drawn from the reservoir via the suction hose into the space between the vanes. As the shaft rotates, the inlet port is closed to the vanes which have drawn in fluid, trapping the fluid between the vanes. The cam ring causes the space between the vanes to reduce and consequentially compresses and pressurizes the hydraulic fluid trapped between them. Further rotation of the shaft moves the vanes to the outlet port. As the vanes pass the port plate the pressurized fluid passes from the pump outlet port into the pressure hose to the steering gear.

The cam ring in the pump body can move within the valve body. By moving the cam ring it is possible to vary the eccentricity of the shaft and the vanes in relation to the cam ring. As the eccentricity is decreased, the volume of hydraulic fluid trapped between the vanes decreases, maintaining the flow in response to pump speed. This reduces the load required to turn the pump and therefore improves engine output and economy. This allows the flow rate to be matched to the system demands and increased flow rate is only required when the steering wheel is turned.

The pump has an internal regulating valve which controls the eccentricity of the cam ring and therefore varies the flow rate according to demand. The regulating relief valve limits the maximum pressure supplied to the steering gear to 110 bar (1595 lbf in²) \pm 4 bar (58 lbf in²) and also limits the maximum flow to 8.5 l/min (1.86 gal/min) \pm 0.5 l/min (0.1 gal/min) regardless of engine speed.

Fluid Reservoir



E97212

Item	Description
1	Bolt and washer (2 off)
2	Rubber mounting (2 off)
3	Cap
4	Reservoir body
5	Return connection
6	Suction hose connection
7	Max/Min level
8	Lanyard

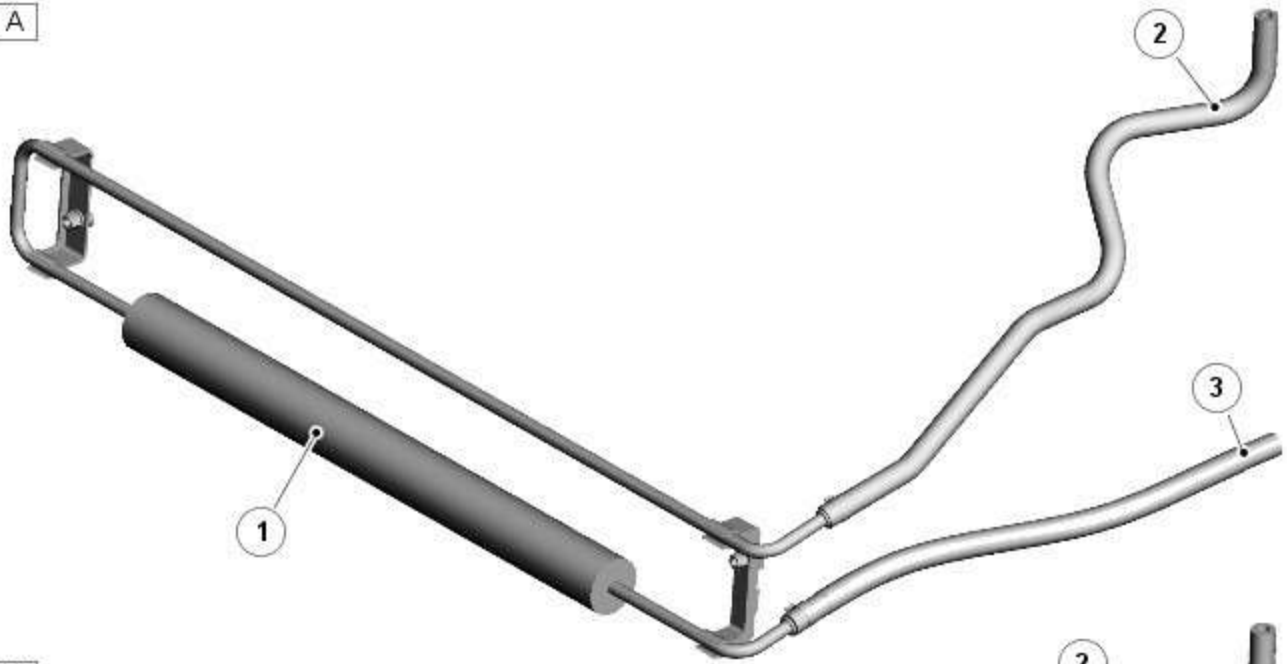
The reservoir is located in the engine compartment, on the [LH](#) suspension housing. The reservoir is attached to a bracket via 2 rubber mounts, and the bracket is attached to the suspension housing.

The reservoir is a plastic moulding with an integral 80 micron, non-serviceable filter. Two moulded ports at the base of the reservoir provide for attachment of the fluid supply hose to the power steering pump and fluid return hose from the fluid cooler. The reservoir is fitted with a removable cap which is screwed 1/4 turn to lock into the reservoir body.

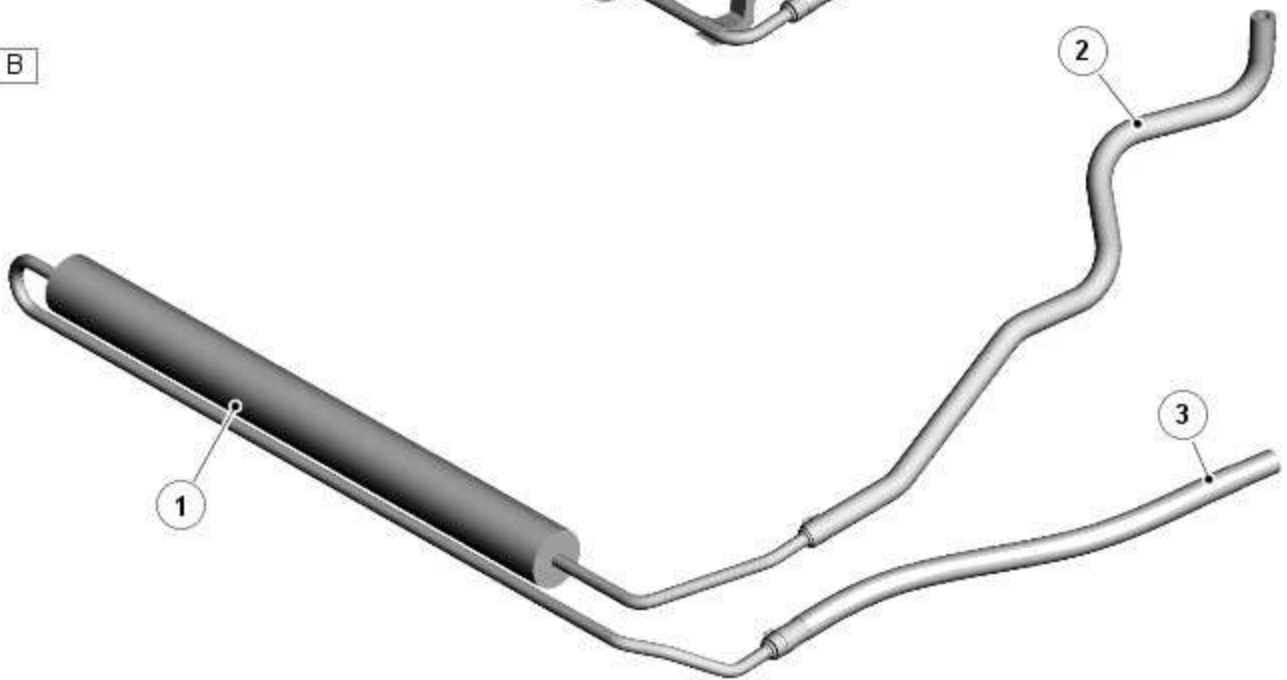
The reservoir has upper and minimum marks moulded on its outside of the body.

Fluid Cooler

A



B



E97213

Item	Description
A	V8 naturally aspirated and 3.0 V6
B	V8 supercharged
1	Fluid cooler
2	Hose - return to fluid reservoir
3	Hose - Return from steering gear valve unit

The fluid cooler is located in the return circuit from the steering gear to the reservoir. The cooler is an aluminum fin and tube design. Cool air entering the front of the vehicle passes over the cooler and flows through the fins. The fins act as heat exchangers, conducting heat from the fluid as it passes through the tube.

Power Steering - Power Steering

Diagnosis and Testing

For additional information.

REFER to: [Specifications](#) (211-00 Steering System - General Information, Specifications).

Power Steering - Steering Gear

Removal and Installation

Removal

CAUTIONS:



Make sure that only the manufacturers' recommended four wheel alignment equipment is used.



Do not turn the steering wheel with the steering column lower shaft disconnected as damage to the clockspring and steering wheel switches may occur.

NOTES:



Make sure the steering is in the straight ahead position.



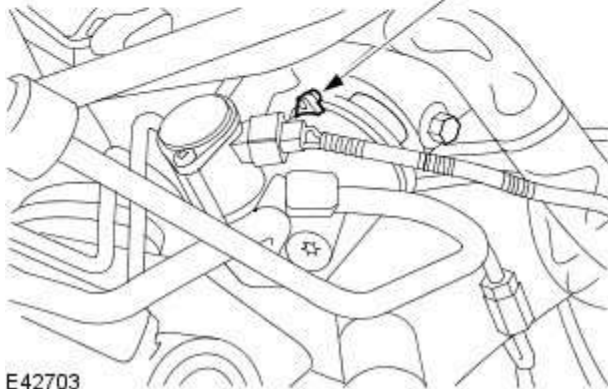
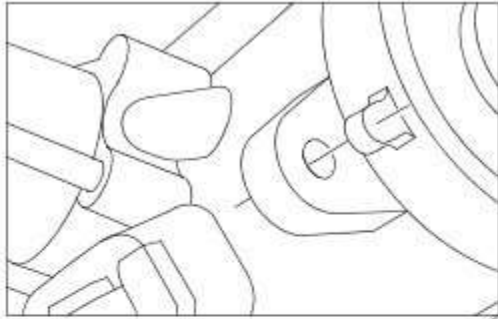
RHD illustration shown, LHD is similar.



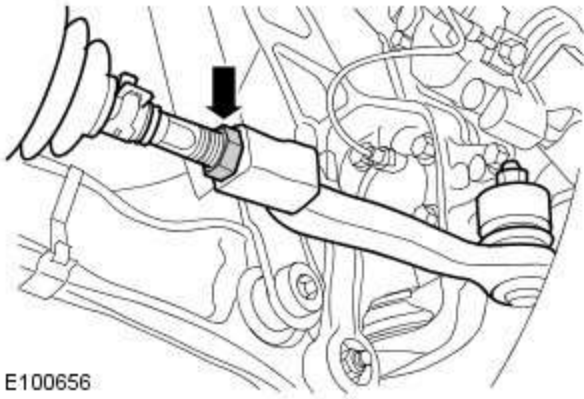
Some variation in the illustrations may occur, but the essential information is always correct.

1. Raise and support the vehicle.
2. Center the steering wheel.
 - Lock in position and remove the ignition key.
3. Remove the front wheels and tires.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
4. Remove the air deflector.
For additional information, refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).


5. Make sure the alignment mark, on the steering gear pinion seal protection cover, is central to the steering gear pinion casting.



E42703



E100656

6.  **CAUTION:** Do not allow the gaiter to twist.

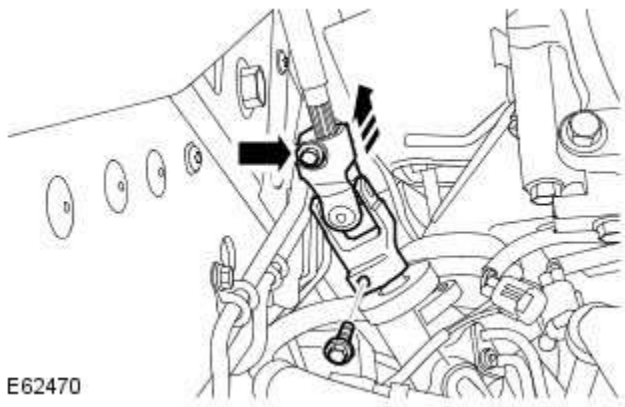
Release both track rods from tie rod ends, note the number of turns for installation.

- Loosen the tie-rod ends lock nuts.



E62469

7. Disconnect the power steering control valve actuator electrical connector.



E62470

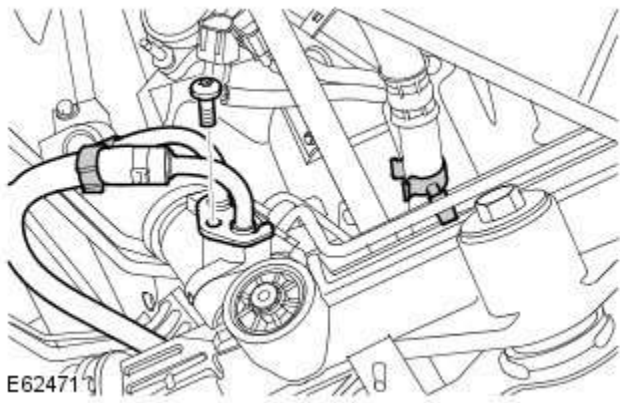


8. **CAUTION:** Air tools **MUST NOT** be used on steering column bolts.

Disconnect the lower steering column from the steering gear.

- Remove and discard the bolt.

9. Release the power steering line support bracket.



E62471

10. **CAUTIONS:**



Before disconnecting or removing the components, make sure the area around the joint faces and connections are clean and dry. Plug open connections to prevent contamination.



Cap the power steering line to prevent loses of fluid and dirt ingress.



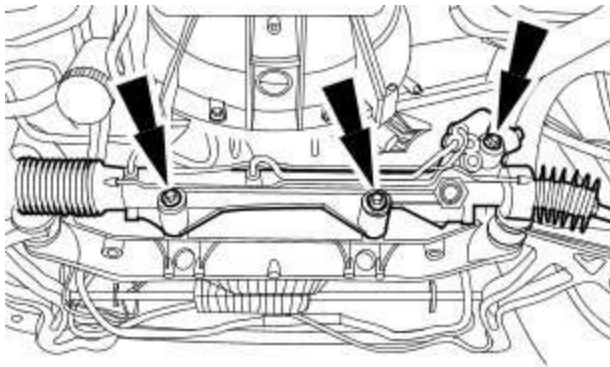
If power steering fluid is spilt on the paintwork, the effected area must be immediately washed down with cold water. Failure to follow this instruction may result in damage to the vehicle.



NOTE: Some fluid spillage is inevitable during this operation.

Disconnect the power steering feed and return fluid lines from the steering gear.

- Remove the bolt.
- Position a container to collect spillage.
- Remove and discard both O-ring seals.

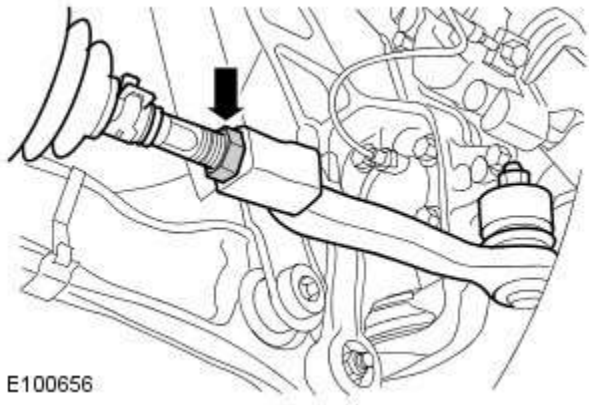


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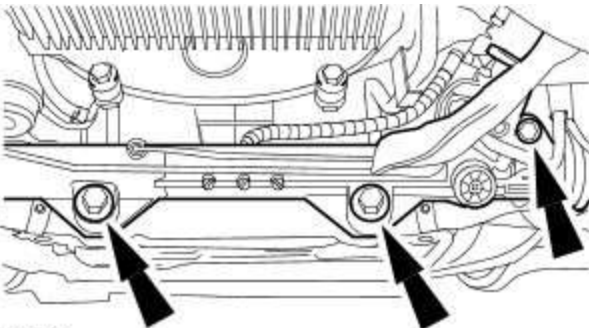
11. Remove the steering gear.
- Remove the 3 bolts.

Installation

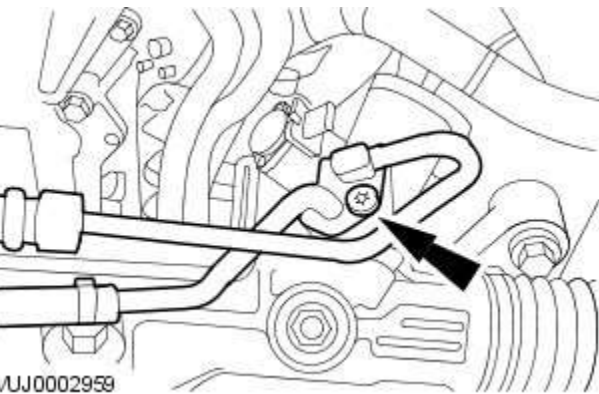
1. To install, reverse the removal procedure.




2. Install the tie rod end, note the number of turns until adjacent to the locknut.
 - Repeat the above procedure for the other side.



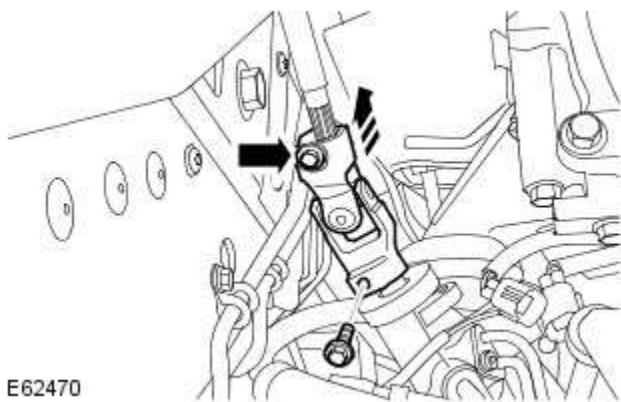
3. Tighten the bolts to 117 Nm.



4.  **NOTE:** Make sure that all the component mating faces are clean.

Tighten to 20 Nm.

- Install the new O-ring seals.



5. Tighten to 35 Nm.
 - Install a new retaining bolt.

6. Fill and bleed the power steering system.
For additional information, refer to: [Power Steering System Bleeding](#)

(211-00 Steering System - General Information, General Procedures).

7. Using only four-wheel alignment equipment approved by Jaguar, check and adjust the wheel alignment.
For additional information, refer to: [Front Toe Adjustment](#) (204-00 Suspension System - General Information, General Procedures).

Power Steering - Power Steering Fluid Reservoir V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.



1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Power Steering System Filling - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (211-00 Steering System - General Information, General Procedures).

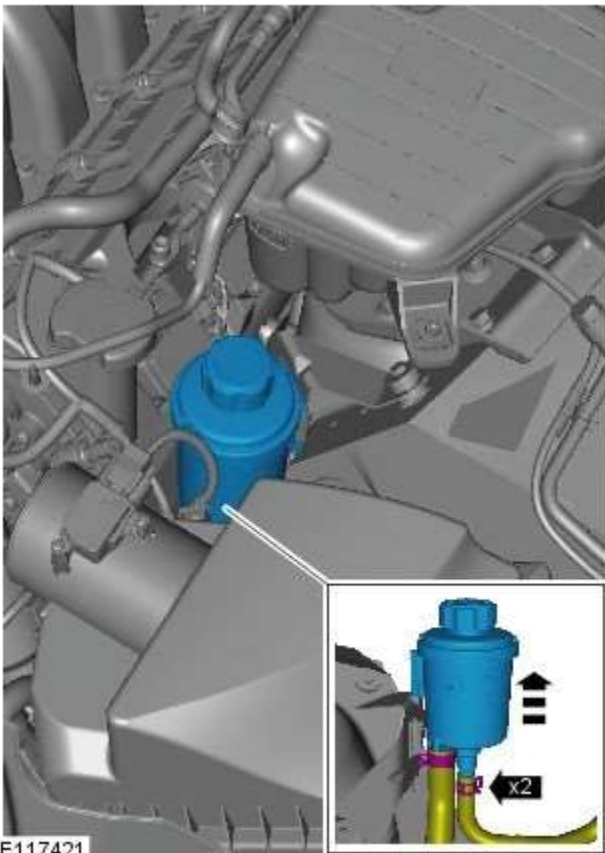
3. CAUTIONS:



Be prepared to collect escaping fluids.



Make sure that all openings are sealed. Use new blanking caps.



Installation

1. To install, reverse the removal procedure.

Power Steering - Power Steering Pump V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

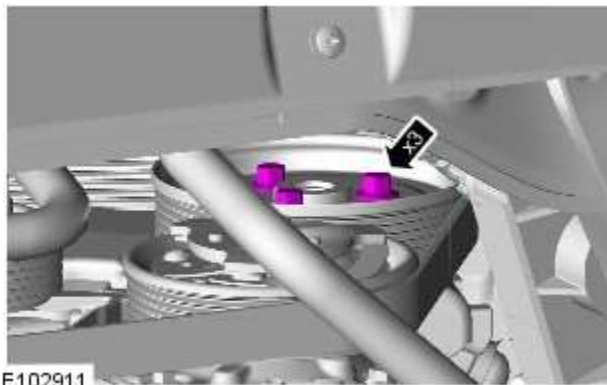
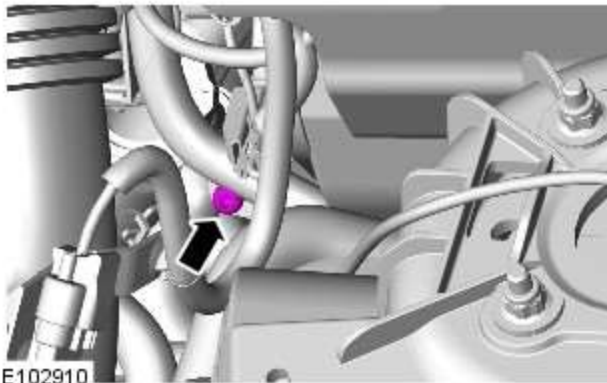


2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

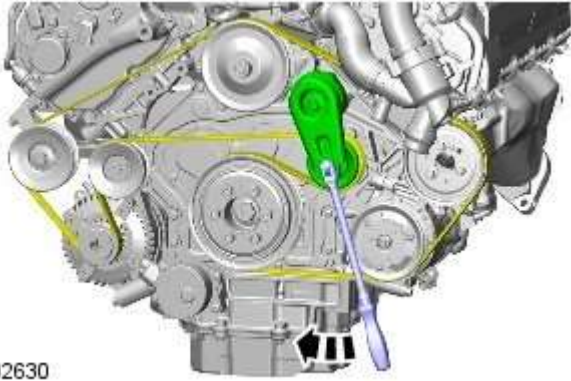
3. Refer to: [Power Steering System Bleeding](#) (211-00 Steering System - General Information, General Procedures).
4. Refer to: [Air Cleaner Outlet Pipe LH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
5. Refer to: [Air Cleaner LH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

6. Torque: 25 Nm



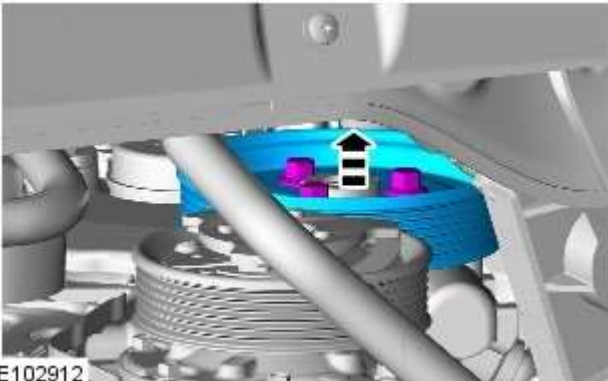
7.  **NOTE:** Do not loosen the bolts more than 2 turns.

Torque: 25 Nm



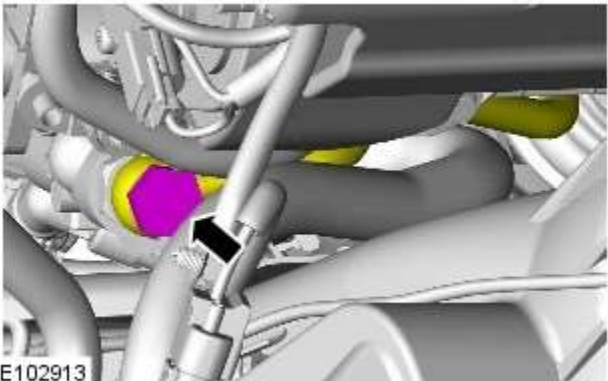
E102630

8.



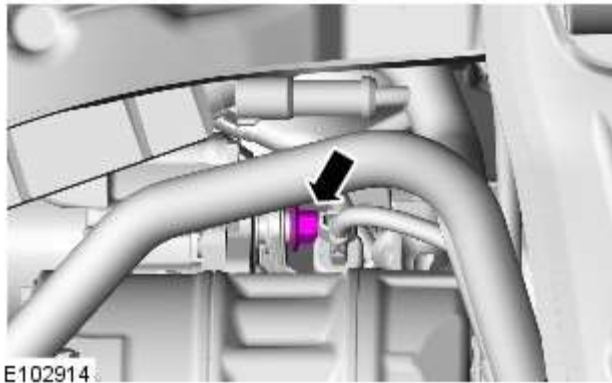
E102912

9.



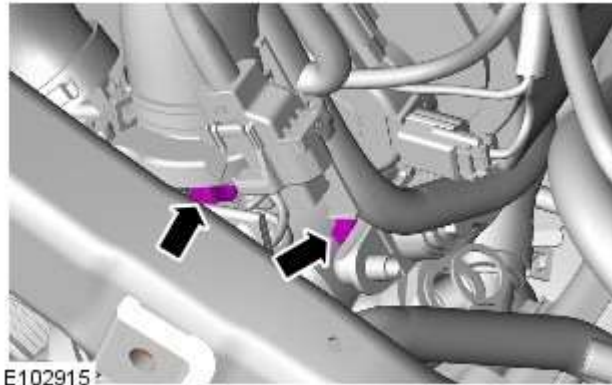
E102913

10. *Torque: 25 Nm*



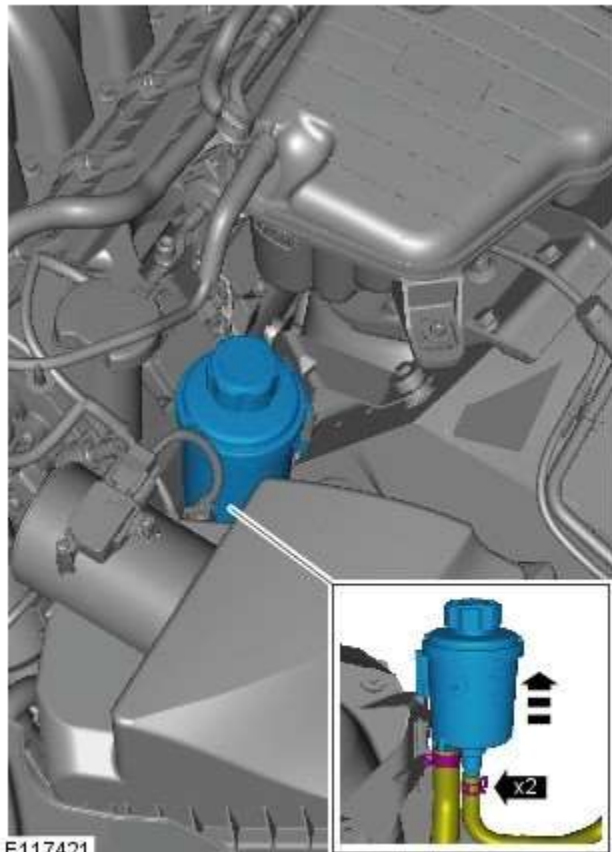
E102914

11. Torque: 25 Nm



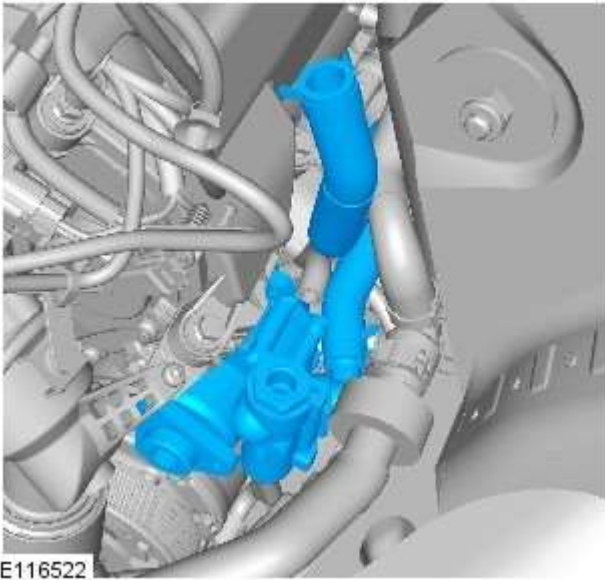
E102915

12. Torque: 25 Nm



E117421

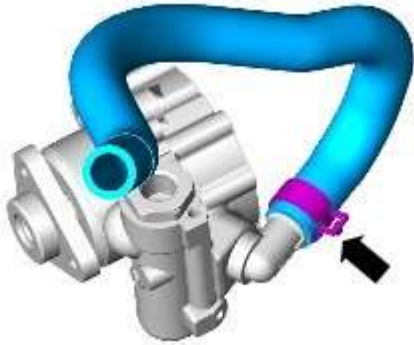
13.



E116522

14.  CAUTION: Note the fitted position of the component prior to removal.

15.



E102918

Installation

1. To install, reverse the removal procedure.

Power Steering - Power Steering Pump to Steering Gear Pressure Line V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal

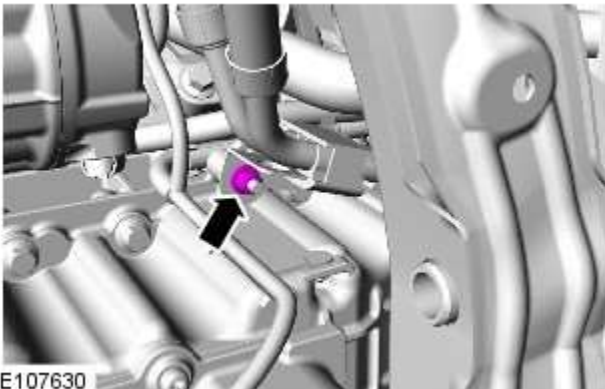


NOTE: Removal steps in this procedure may contain installation details.

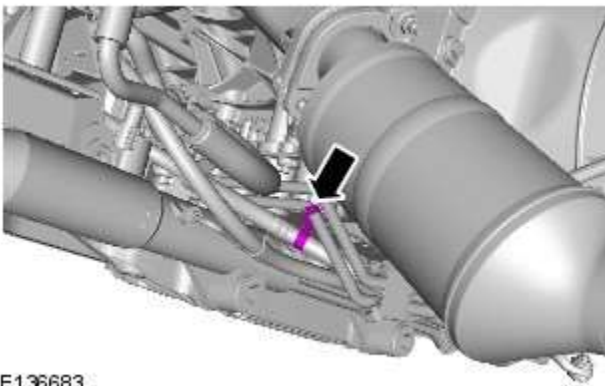


1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Power Steering System Filling - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (211-00 Steering System - General Information, General Procedures).

3. Torque: 11 Nm



E107630



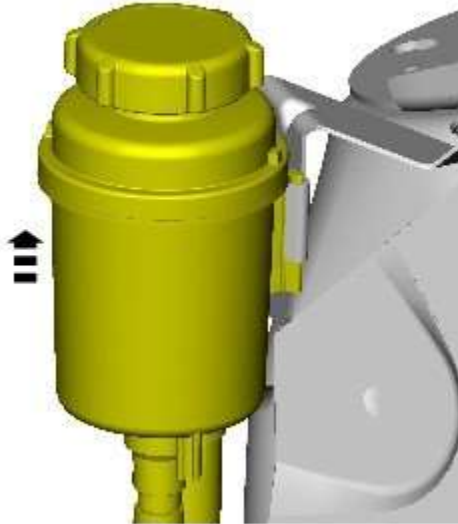
E136683

4.  NOTE: RHD shown, LHD is similar.

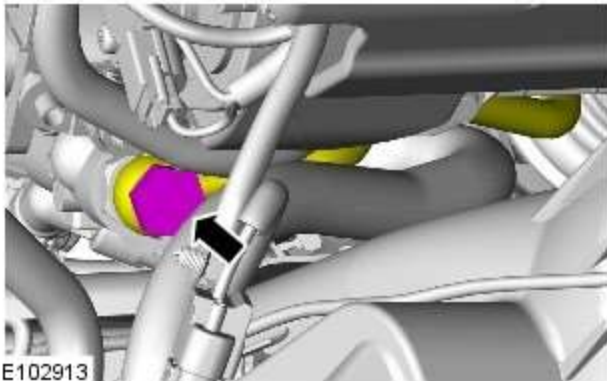
5. Lower the vehicle.




6. CAUTION: Make sure on installation the component is correctly located.



E163646



E102913

7.  WARNING: Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.



- CAUTION: Always plug any open connections to prevent contamination.

NOTES:



Note the fitted position.



Discard the sealing washers.

Torque: 28 Nm

8. Raise the vehicle.



9. WARNING: Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.



- CAUTION: Always plug any open connections to prevent contamination.

NOTES:



RHD shown, LHD is similar.

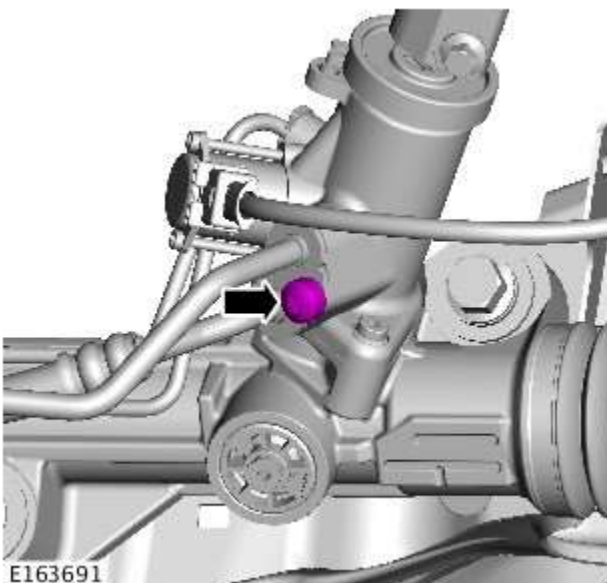


Discard the retaining bolt.

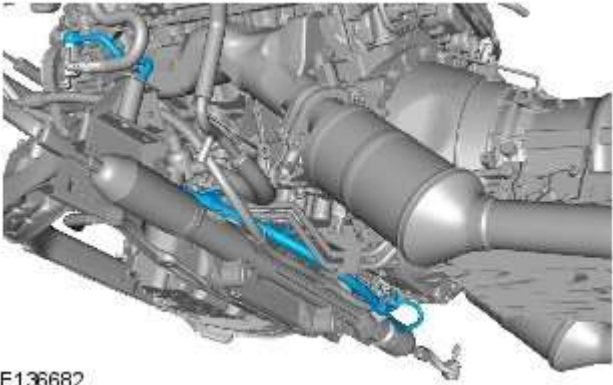


Discard the o-ring seals.

Torque: 20 Nm



E163691



E136682

10.  NOTE: RHD shown, LHD is similar.

Installation

1. To install, reverse the removal procedure.

Power Steering - Steering Gear to Fluid Cooler Return Hose V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal

NOTES:




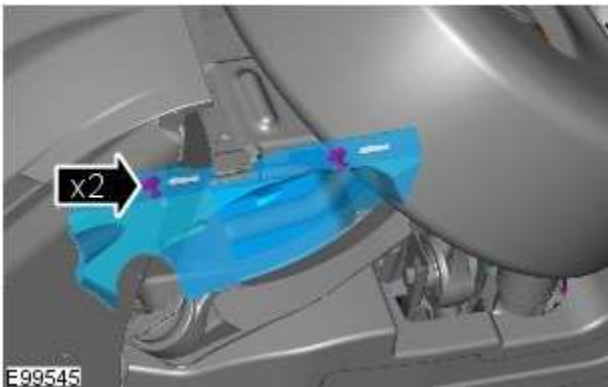
Some variation in the illustrations may occur, but the essential information is always correct.



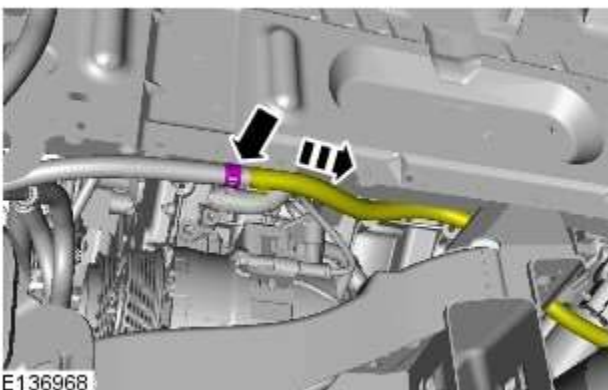
Removal steps in this procedure may contain installation details.

All vehicles

-  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
- Refer to: [Power Steering System Filling - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (211-00 Steering System - General Information, General Procedures).

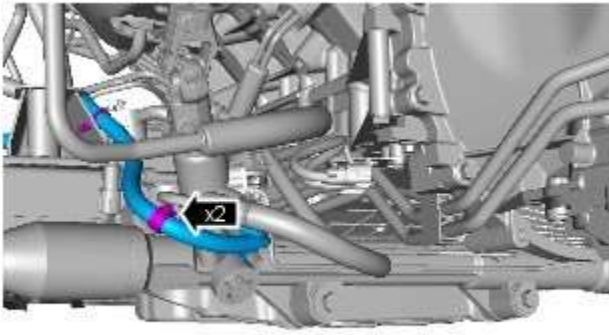


-  **NOTE:** If equipped.



-

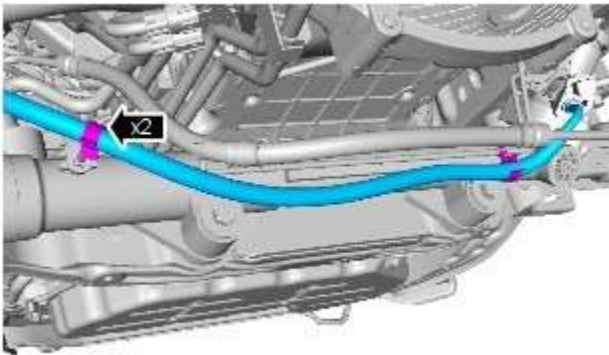
Left-hand drive vehicles



E136965

5.

Right-hand drive vehicles



E136967

6.

Installation

1. To install, reverse the removal procedure.
2. Refer to: [Power Steering System Filling - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (211-00 Steering System - General Information, General Procedures).

Steering Linkage -

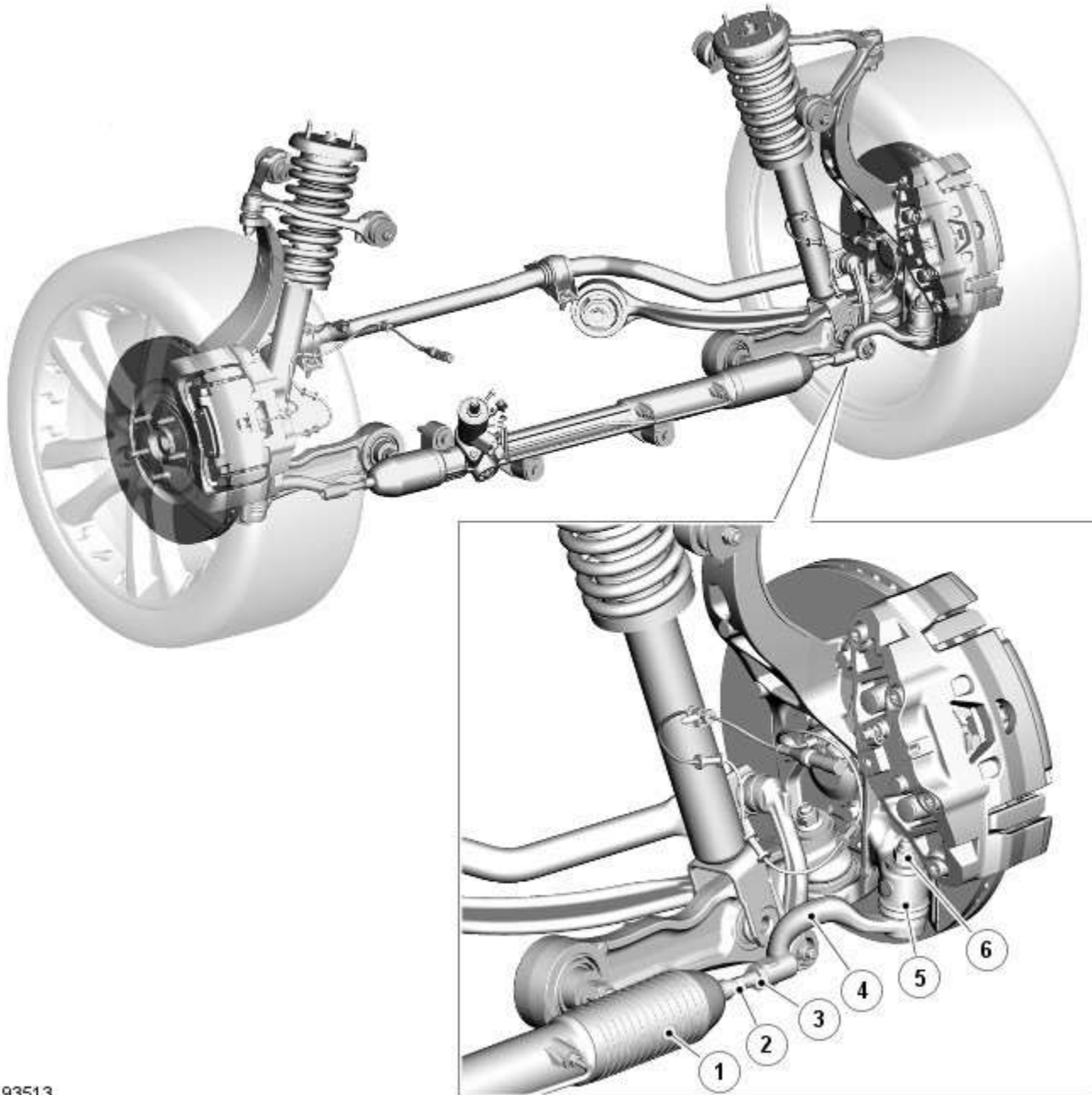
Torque Specifications

Description	Nm	lb-ft	lb-in
Tie-rod end retaining nut	133	98	-
Tie-rod end lock nut	55	41	-

Steering Linkage - Steering Linkage - Component Location

Description and Operation

STEERING LINKAGE COMPONENT LOCATION



E93513

Item	Description
1	Steering gear boot
2	Inner tie-rod arm
3	Locknut
4	Outer tie-rod arm
5	Taper ball joint
6	Locknut

Steering Linkage - Steering Linkage - Overview

Description and Operation

OVERVIEW

The steering linkage comprises the tie rod which provides the connection between the steering gear and the front wheel knuckle. Each end of the steering gear has a threaded hole which provides for the fitment of the inner tie rods. The external ends of the inner tie rods are sealed with boots to prevent the ingress of dirt and moisture into the steering gear.

Steering Linkage - Steering Linkage - System Operation and Component Description

Description and Operation

System Operation

TIE-ROD

The threads on the tie rods allow the position of the outer tie rod to be adjusted in order to set the correct toe angle for each front wheel.

Component Description

TIE-ROD

Each tie rod comprises two parts; an inner and outer tie rod. The inner and outer tie rods are screwed into each other and locked with a locknut to prevent inadvertent movement.

The outer tie rod incorporates a non-serviceable tapered ball joint which locates in a tapered hole in the front wheel knuckle and is secured with a self-locking nut. The ball joint has an internal hexagonal drive which enables the joint to be held stationary when the self-locking nut is tightened.

Steering Linkage - Steering Linkage

Diagnosis and Testing


For additional information.

REFER to: [Steering System](#) (211-00 Steering System - General Information, Diagnosis and Testing).

Steering Linkage - Tie Rod End

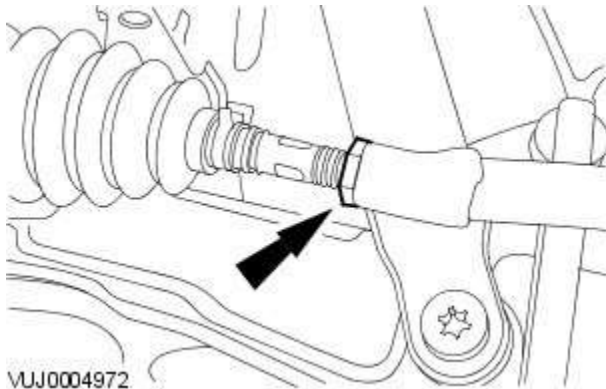
Removal and Installation

Removal

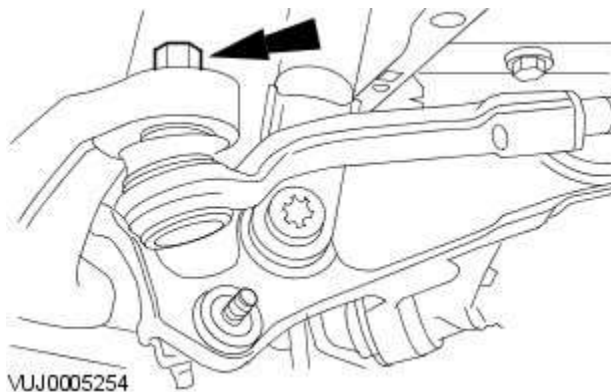
1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.


Raise and support the vehicle.

2. Remove the front wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

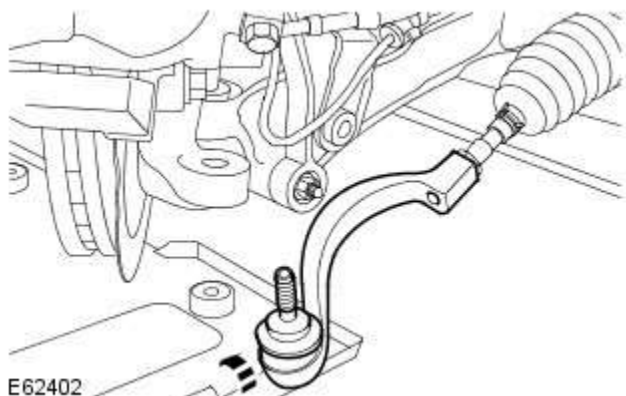


3. Loosen the tie-rod end lock nut.



4.  **CAUTION:** Make sure that the ball joint ball does not rotate.

Remove and discard the tie rod end retaining nut.



5. Remove the tie-rod end, note the number of turns for installation.

Installation

1. Install the tie rod end, note the number of turns until adjacent to the locknut.



2. **CAUTION:** Make sure that the ball joint ball does not rotate.

Connect the tie-rod end ball joint.

- Clean the component mating faces.
 - Install a new nut and tighten to 133 Nm.
3. Tighten the tie-rod locking nut.
 - Clean the component mating faces.
 - Tighten the nut to 55 Nm.
 4. Install the front wheel.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
 5. Using only four-wheel alignment equipment approved by Jaguar, check and adjust the wheel alignment.
For additional information, refer to: [Four-Wheel Alignment](#) (204-00 Suspension System - General Information, General Procedures).

Steering Column -

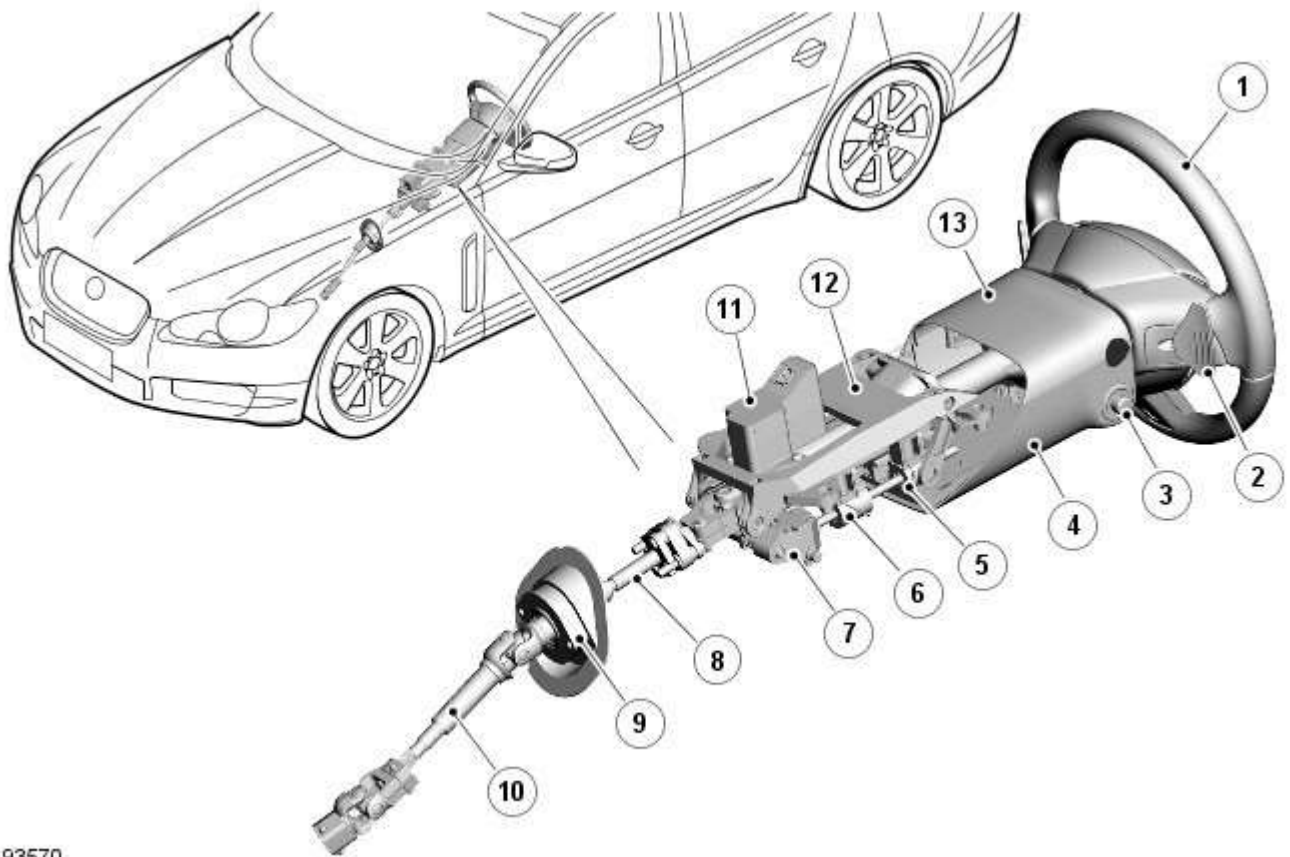
Torque Specifications

Description	Nm	lb-ft	lb-in
Steering wheel retaining bolt	60	44	-
Steering column pinch bolt	35	26	-
Steering column retaining nuts	30*	22	-
Tilt solenoid retaining bolts	1	-	9
Telescopic solenoid retaining bolts	1	-	9
Telescopic housing retaining bolts	8	-	71

If you are re-using this fixing on a vehicle built prior to VIN N83337, then tighten to 25 Nm. If you are replacing a fixing, then you must tighten to 30 Nm.

Steering Column - Steering Column - Component Location

Description and Operation



E93570

Item	Description
1	Steering wheel
2	Gear change paddle switch
3	Column adjust switch
4	Lower shroud
5	Rake adjustment housing
6	Reach adjustment housing
7	Column adjustment motor
8	Lower column - Upper collapse shaft
9	Bulkhead bearing and seal assembly
10	Lower column - Lower collapse shaft
11	Electric steering lock mechanism
12	Column mounting plate
13	Upper shroud

Steering Column - Steering Column - Overview

Description and Operation

OVERVIEW

The steering column comprises the upper column assembly, the lower column assembly and the steering wheel. The 3 components are positively connected together to pass driver rotary input from the steering wheel to a linear output of the steering rack.

The upper column assembly contains electrical adjustment for steering wheel reach and rake, the electric steering lock mechanism and the steering angle sensor. Steering adjustment memory positions are stored in the driver's seat module.

The electric steering column is a standard fitment on all models. The upper column assembly contains electrical adjustment for steering wheel reach and rake, the electric column lock mechanism and the steering angle sensor. Steering adjustment memory positions are stored in the driver's seat module. The column also features a 'tilt away' function which moves the steering column away from the driver allowing easier exit and entry to the vehicle.

Column adjustment is provided by a single motor for both reach and rake adjustment. Operation of the column adjustment is controlled by a four way joystick type switch located in the column lower shroud. Column adjustment is an integral part of the driver position memory system.

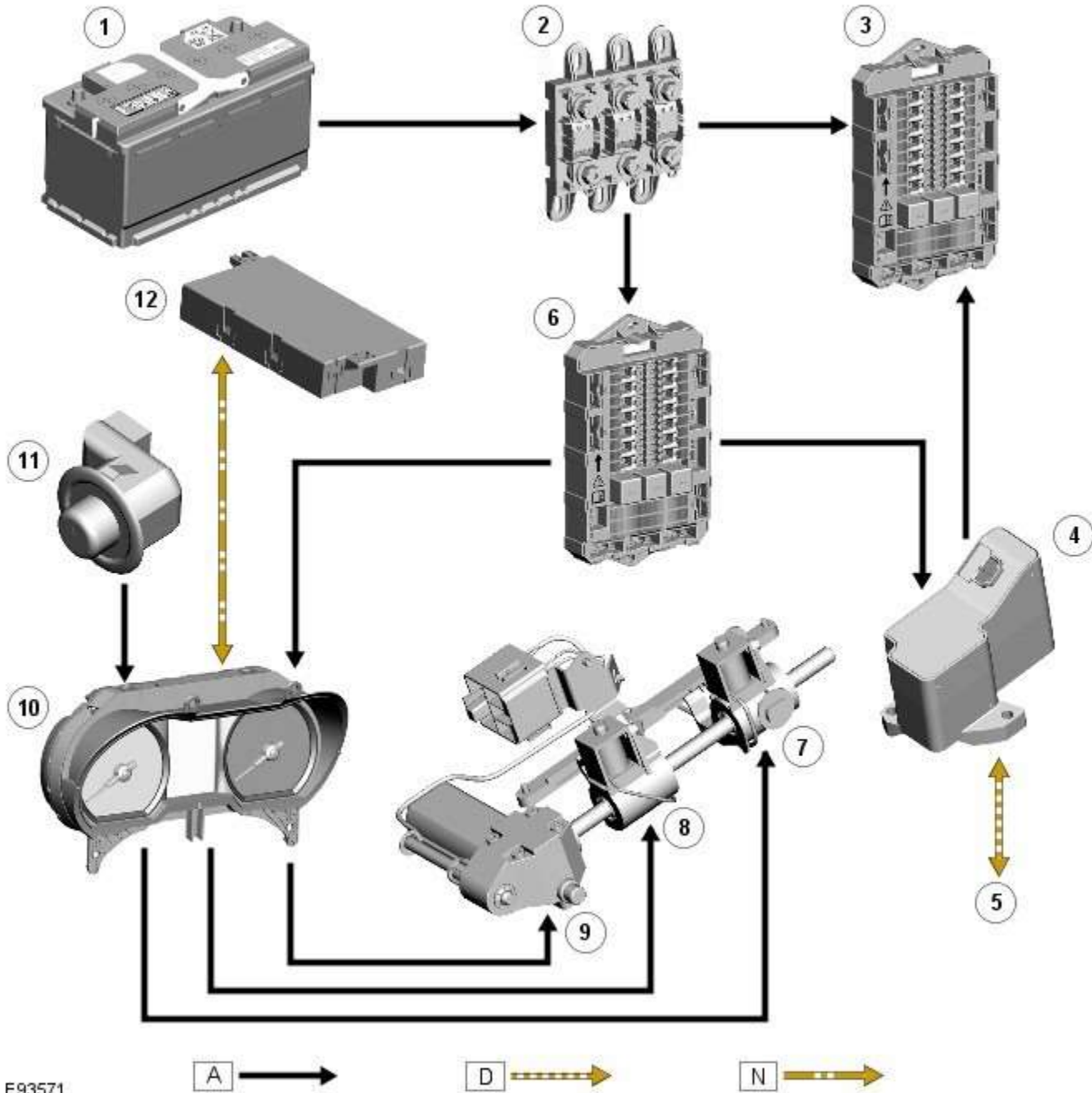
Steering Column - Steering Column - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN bus; **N** = Medium speed CAN bus



E93571

Item	Description
1	Battery
2	BJB (battery junction box) - Megafuse (175A)
3	RJB (rear junction box)
4	Electric steering column lock
5	High Speed CAN (controller area network) bus to other vehicle systems
6	CJB (central junction box)

7	Rake adjustment solenoid and potentiometer
8	Reach adjustment solenoid and potentiometer
9	Column adjustment motor
10	Instrument cluster
11	Steering column adjust switch
12	Driver's seat module (position memory)

System Operation

STEERING COLUMN ADJUSTMENT

Power for the column adjustment motor is supplied via a megafuse in the [BJB](#) to the [CJB](#). A fused supply from the [CJB](#) is passed to the instrument cluster which controls the power application to the motor.

The column adjust switch is hardwired to the instrument cluster. Up/down and in/out selections on the switch are each passed through a resistor of differing values to the instrument cluster. The cluster monitors the output value from the switch and operates the motor in the required direction and simultaneously energizes the required solenoid for rake or reach adjustment. When the applicable solenoid is energized, a clutch is engaged and locates on a lead screw. The motor rotates the lead screw and the rotational drive of the screw is transferred into linear movement of the applicable clutch to move either the rake or reach adjustment. For reach adjustment, the lead screw drives the outer housing in or out as required. For rake adjustment the lead screw drives a rake lever which moves the column up or down as required.

The position of the column is monitored by potentiometers which are connected to the instrument cluster. The cluster monitors the output signal from the potentiometers to precisely control the positioning of the column in each plane.

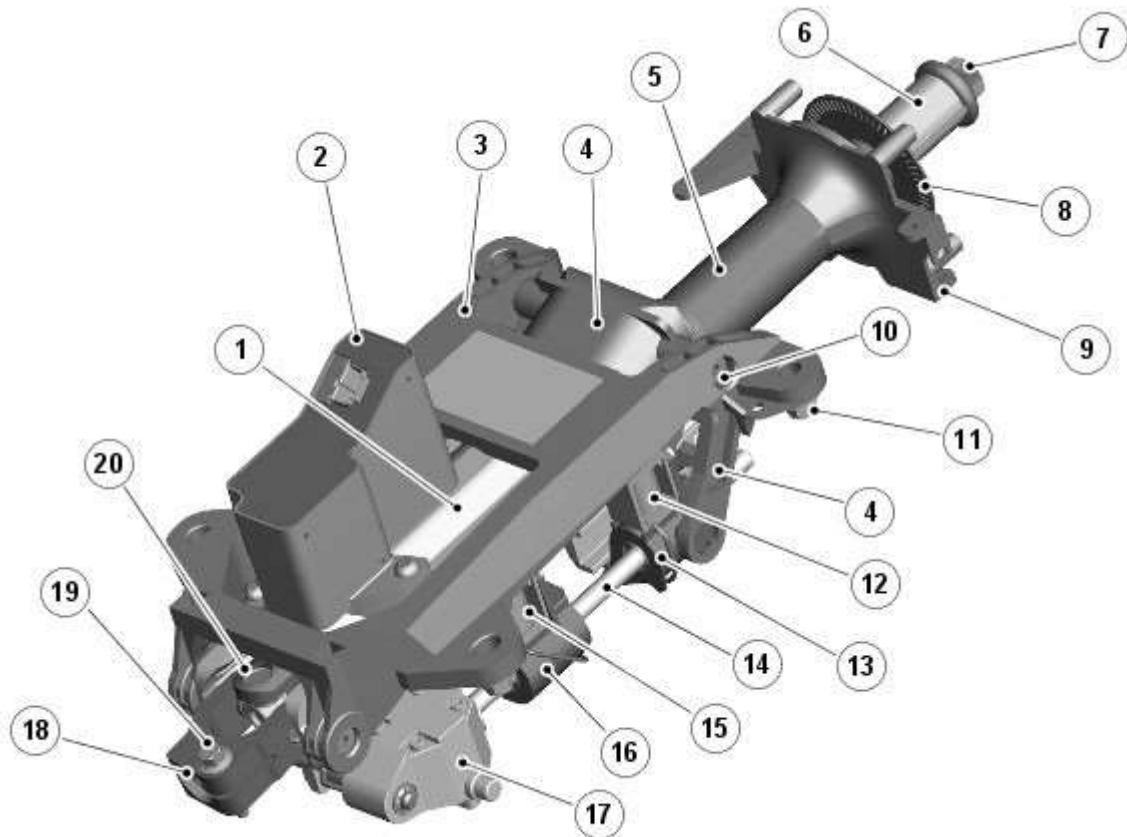
The instrument cluster controls the memory positioning of the column via a medium speed [CAN](#) bus connection to the driver's seat module. The driver's seat module receives information regarding the particular remote handset used to enter the vehicle and outputs positional information relative to that stored for the handset. This information is passed to the instrument cluster via the medium speed [CAN](#) bus which moves the column to the memorized positions.

The column logic in the instrument cluster also incorporates an entry/exit mode. When the vehicle is unlocked or the ignition is switched off, the instrument cluster lifts the column upwards to its maximum rake position to allow the driver more room below the steering wheel and improve access/egress of the vehicle. When the ignition is next switched on the column will adjust to its previous position.

The electric steering column lock is controlled by the [CJB](#).

Component Description

STEERING COLUMN



E97704

Item	Description
1	Rake housing
2	Electric steering column lock
3	Mounting plate
4	Rake lever
5	Crash tube
6	Distance keeper
7	Steering wheel mounting splines
8	Steering angle sensor ring
9	Crash adaptor
10	Rake lever pivot bearing (2 off)
11	Flanged locknut (4 off) - mounting to cross-beam
12	Rake solenoid
13	Rake clutch
14	Spindle
15	Reach solenoid
16	Reach clutch
17	Column adjustment motor
18	Outer clamping yoke
19	Clamp bolt
20	Inner tube yoke



WARNING: Do not attempt to dismantle the steering column. The crash safety of the unit will be compromised.

The steering column is attached to the in-vehicle cross-beam and secured with 4 flanged lock nuts onto 4 studs integral with the cross-beam.

Steering Column - Sectional View



E97705

Item	Description
1	Tube and clamping yoke pivot bearing
2	Tube yoke
3	Tolerance ring
4	Locking ring
5	Axial housing
6	Rake housing
7	Tube
8	Splined shaft
9	Crash adaptor
10	Steering angle sensor ring
11	Steering wheel mounting splines
12	Upper bearing
13	Column adjustment motor
14	Lower bearing

15	Outer clamping yoke
16	Ball (12 off)
17	Distance keeper
18	Crash tube

The column comprises a cast magnesium mounting bracket which provides the attachment to the cross-beam. Attached to the mounting bracket is a rake lever which is attached to the mounting bracket at the lower end with two pivot bearings. The bearings allow the rake lever to rotate upwards or downward to adjust the column rake.

The rake lever also provides for the attachment of the rake housing which can slide within the lever to provide the reach adjustment. Within the rake housing is the axial housing which is supported on each side with 6 ball bearings which allow the rake housing to move forward or backwards. The bearings on each side are arranged in groups of 3 bearings and are separated by a distance keeper which allows the housing to be supported on bearings along its length. Within the axial housing is a tube which is supported at the upper end of the column on the upper bearing. The tube has a central splined hole which provides for the fitment of the splined shaft. The splined shaft can slide within the tube on the splines when the column reach is adjusted or the column collapses in a crash condition. The splined shaft also passes rotary motion from the steering wheel through the length of the column to the outer clamping yoke which is supported on the lower bearing.

The electric steering column lock is attached to the top of the rake lever. A lock bolt within the steering column lock engages in one of 8 slots in the locking sleeve located at the lower end of the column preventing rotation of the steering wheel. The locking sleeve is retained by a tolerance ring which in turn is located on the outer diameter of the tube yoke. The tolerance ring allows a specified amount of torque to be applied to the splined shaft before it slips, preventing damage to the column lock due to excessive force being applied to the steering wheel when the lock is engaged. The tolerance ring is designed to slip on the splined shaft when the applied torque exceeds the fitted slip load of 200 Nm minimum. Repeated rotation of the lock collar will reduce its slipping torque to 100 Nm minimum. The lock is controlled by the [CJB](#).

A steering angle sensor is located at the upper end of the steering column and is attached to the crash adaptor. The sensor measures steering rotation via a toothed wheel located on the splined tube at the upper end of the column. The sensor receives a power supply from the [CJB](#) and supplies 2 signals (A and B) relating to the steering rotation to the [ABS \(anti-lock brake system\)](#) module. The module transmits this data on the high speed [CAN](#) bus for use by other vehicle systems. Refer to: [Anti-Lock Control - Stability Assist](#) (206-09 Anti-Lock Control - Stability Assist, Description and Operation).

The steering column is adjustable electrically, for reach and rake. The adjustment mechanism comprises an electric adjustment motor, a lead screw, a rake solenoid, a reach solenoid, a reach clutch and a rake clutch. The column adjustment is controlled manually using a joystick switch located on the [LH \(left-hand\)](#) side of the column lower cowl. The joystick can be moved forward and backward to adjust the column reach in and out and moved up and down to adjust the rake. The switch selection energizes the adjustment motor in the applicable direction and also engages the applicable solenoid and clutch.

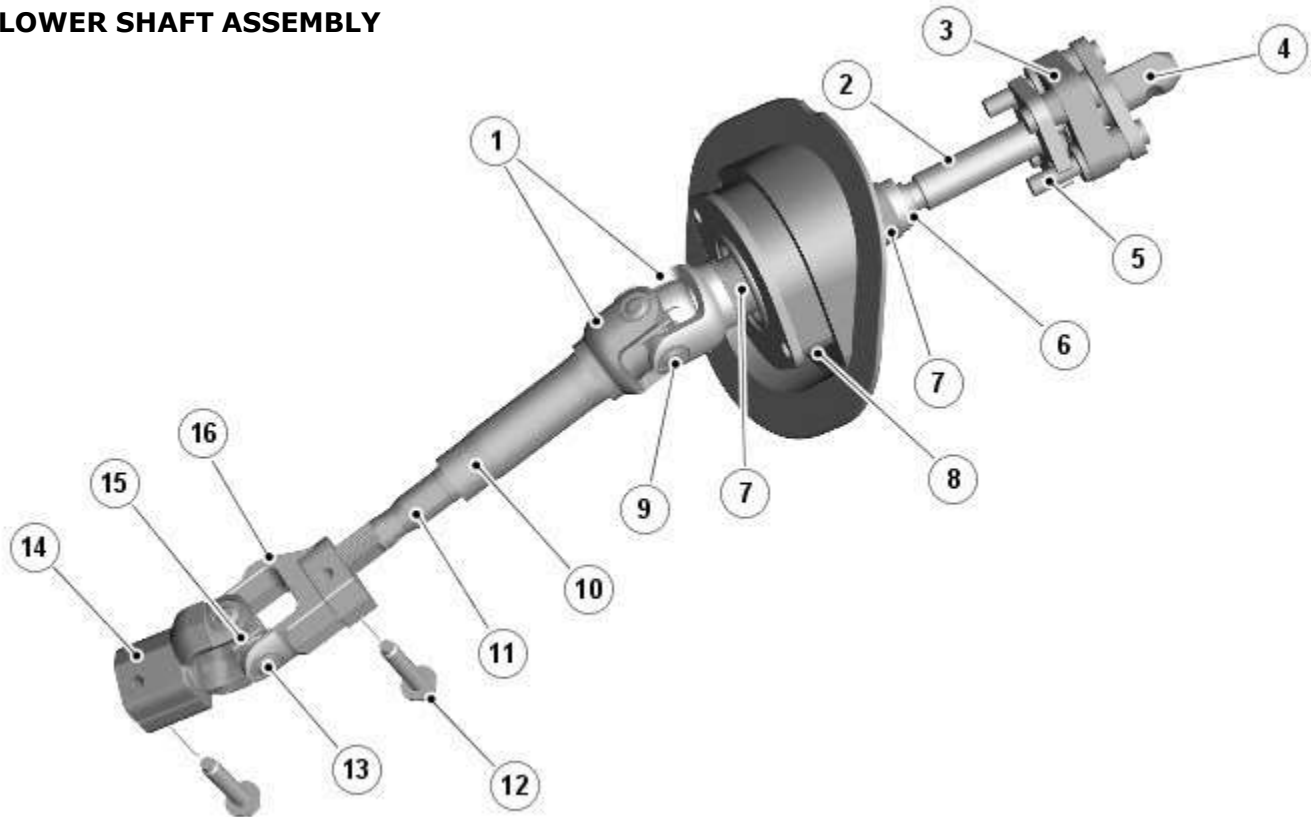
When the joystick switch is rotated to the 'auto' position, the steering column will adjust to the uppermost rake position when the ignition is switched off. It will re-adjust to the position corresponding to the memory position for the remote handset when the ignition is switched on.

The memory function of the electric column is linked to and controlled by the driver's seat module. The module provides for the storage of three separate memory positions which are stored against 3 individual remote handsets. Refer to: [Seats](#) (501-10 Seating, Description and Operation).

The steering wheel locates on a splined shaft in the upper column assembly and is secured with a bolt. The steering wheel houses the driver's airbag and switches for the audio system, gear change and speed control. A clockspring is used to connect the steering wheel electrical components to the vehicle harness.

Two plastic shrouds are fitted to the upper column assembly. The lower shroud is fitted with an energy absorbing foam pad to minimize leg injury in the event of an accident.

LOWER SHAFT ASSEMBLY



E97706

Item	Description
1	Yoke
2	Upper collapse shaft
3	Flexible coupling
4	Shaft plate
5	Rivet (4 off)
6	Upper tube
7	Plastic sleeve
8	Boot
9	Bearing (4 off)
10	Teeth tube
11	Lower shaft
12	Yoke clamp bolt (2 off)
13	Bearing (4 off)
14	Lower yoke
15	Spider
16	Upper yoke

The lower shaft assembly comprises 2 splined shafts connected by a universal joint in the center.

The upper collapse shaft has a flexible couple at its upper end. The flexible coupling controls axial and torsional movements and also assists with noise and vibration damping. The flexible coupling is fitted with a shaft plate which has a boss with machined flats on it. The flats provide positive location on the upper column outer clamping yoke. A cut-out in the boss allows for the fitment of a clamping bolt to secure the upper column outer clamping yoke. The cut-out ensures that the lower shaft assembly can only be fitted in one orientation.

The upper collapse shaft is connected to the stopper plate of the flexible coupling with splines. The stopper plate is connected to the shaft plate via the flexible coupling and is secured with rivets. The upper collapse shaft has a series of splines which engage with the upper tube. The splines allow the upper collapse shaft to slide into the upper tube in the event of an accident.

The upper tube is positively connected to the upper half of the yoke of the universal joint. A plastic tube is located around the upper tube and provides for the attachment of a boot which seals the lower shaft assembly where it passes through the vehicle bulkhead.

The yoke is attached to the teeth tube which in turn is located over the lower shaft on splines. The teeth tube is fitted with a tolerance ring which provides resistance to movement of the splines on the lower shaft. The splines of the lower shaft allow it to slide into the teeth tube with the tolerance ring controlling the collapse.

The lower shaft is fitted with a yoke which provides the attachment to the torsion bar of the steering valve unit.

Steering Column - Steering Column

Diagnosis and Testing

For additional information.

REFER to: [Steering System](#) (211-00 Steering System - General Information, Diagnosis and Testing).

Steering Column - Steering Column

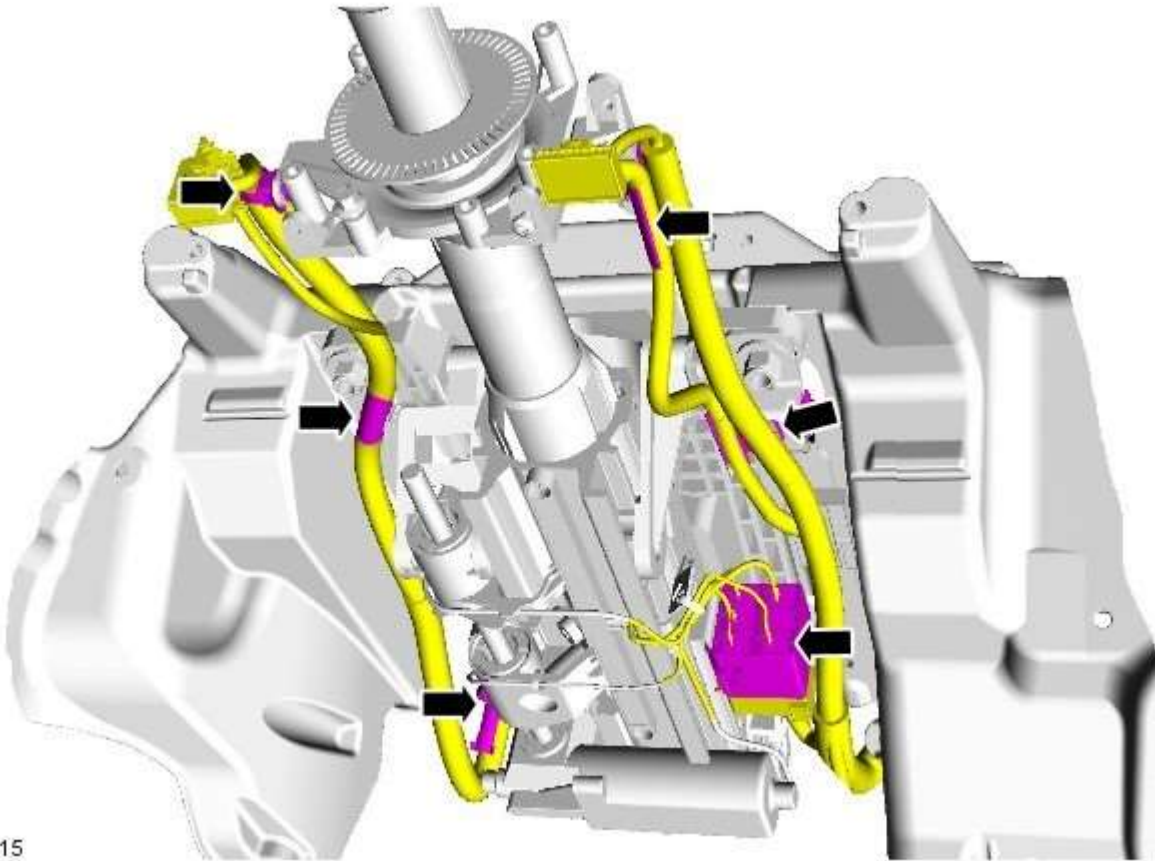
Removal and Installation

Removal



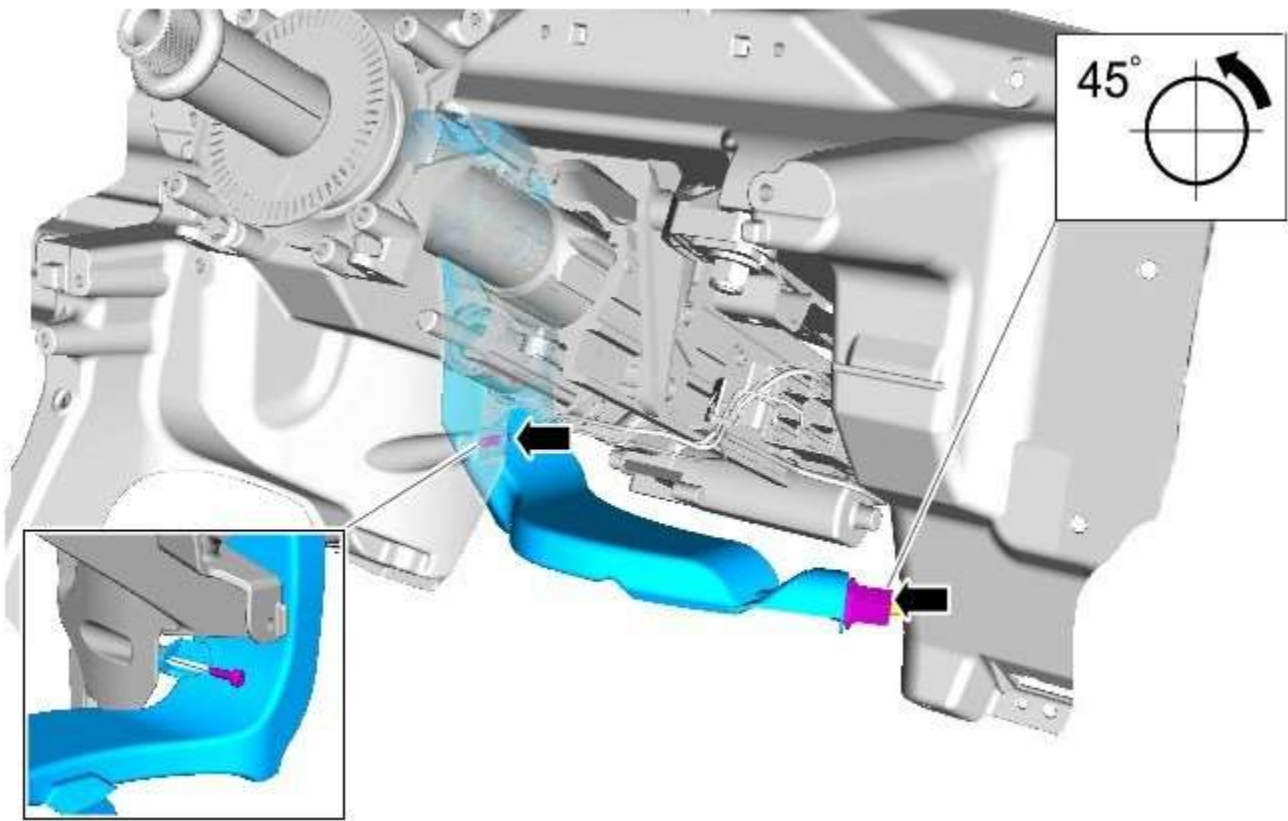
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Instrument Panel Lower Trim Panel](#) (501-12 Instrument Panel and Console, Removal and Installation).
3. Refer to: [Steering Wheel Rotation Sensor](#) (206-09 Anti-Lock Control - Stability Assist, Removal and Installation).
- 4.



E133415

- 5.

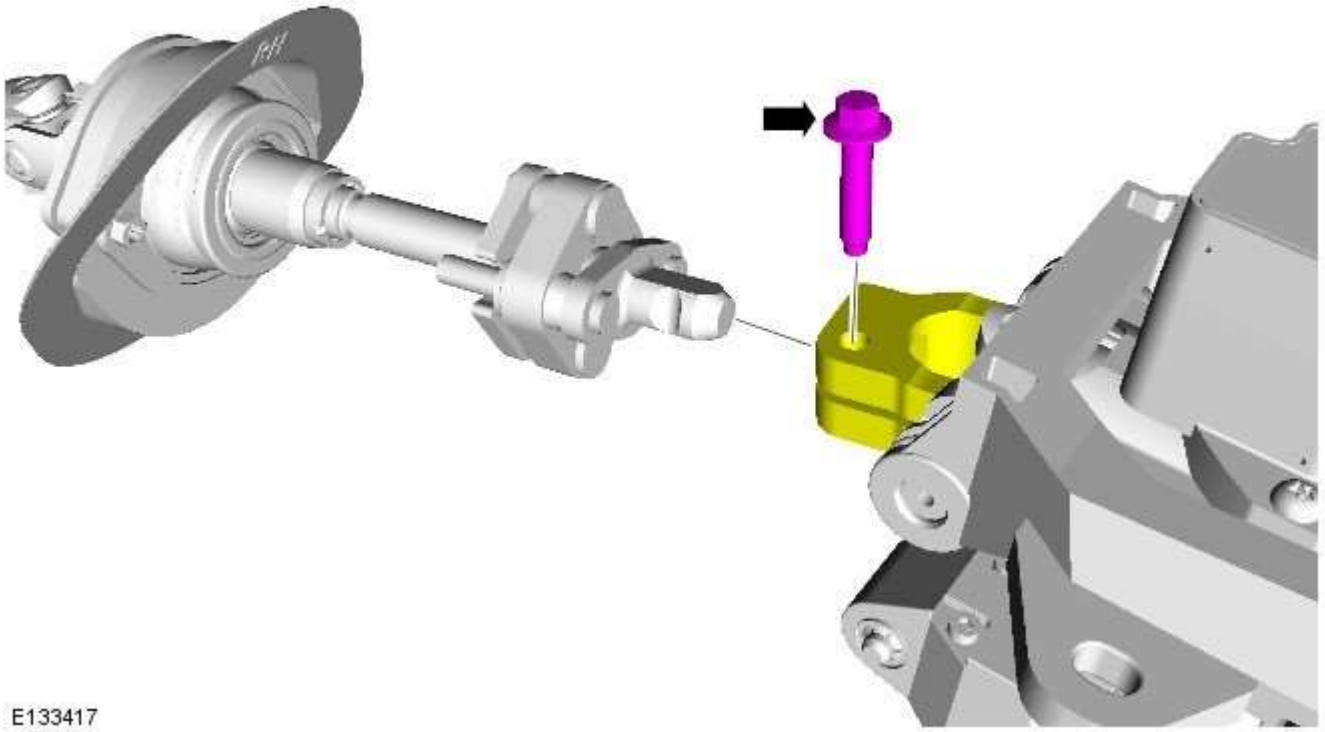


E133416



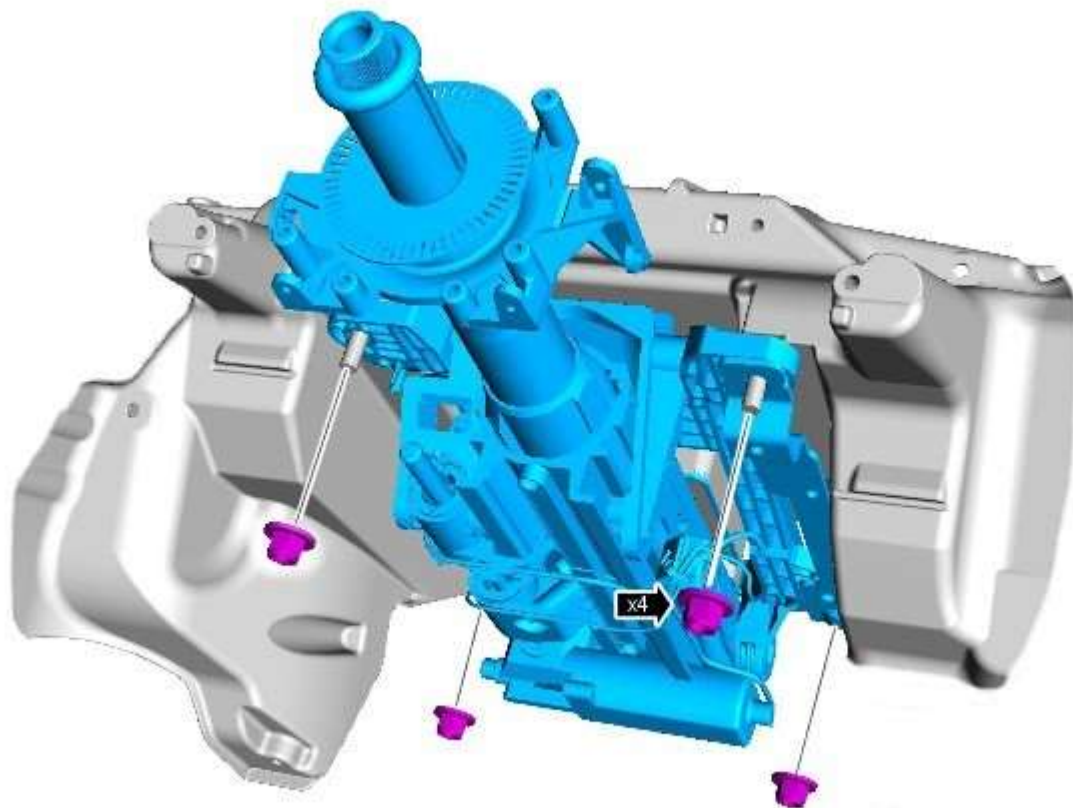
6. **WARNING:** Make sure that a new steering column flexible coupling bolt is installed.

Torque: 30 Nm



E133417

7. Torque: 25 Nm



E133418

Installation

1. To install, reverse the removal procedure.

Steering Column - Steering Column Flexible Coupling

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

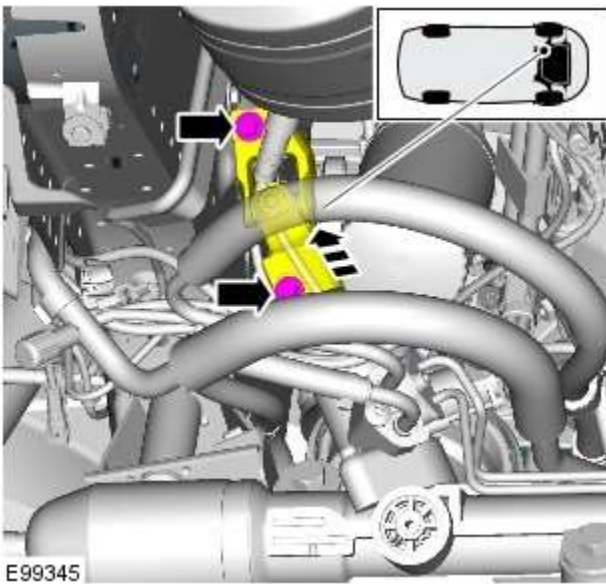
3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

4. Refer to: [Instrument Panel Lower Trim Panel](#) (501-12 Instrument Panel and Console, Removal and Installation).



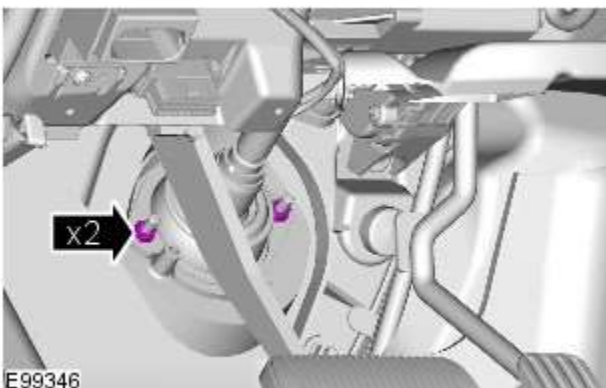
5. **WARNING:** Make sure that a new steering column flexible coupling bolt is installed.

Torque: 30 Nm

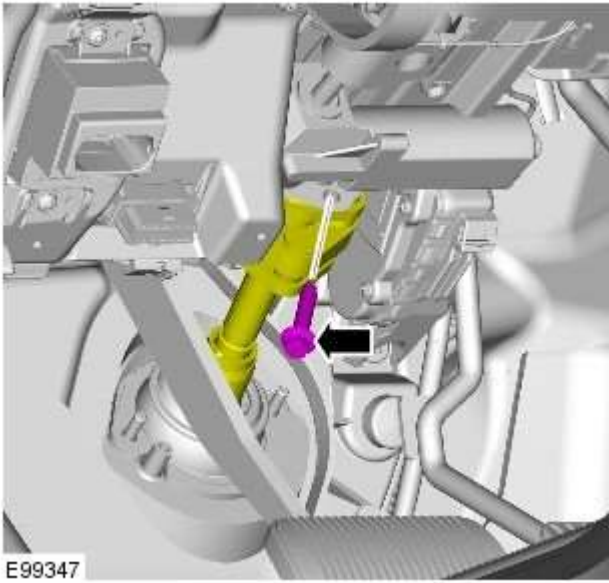



E99345

6. *Torque:* 10 Nm

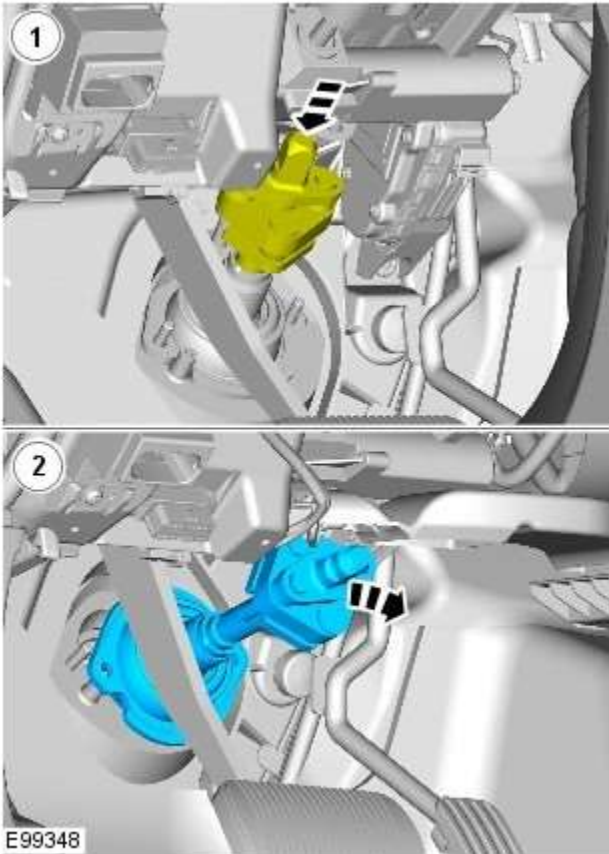


E99346



7.  **WARNING:** Make sure that a new steering column flexible coupling bolt is installed.

Torque: 30 Nm



- 8.


Installation

1. To install, reverse the removal procedure.

Steering Column - Steering Wheel

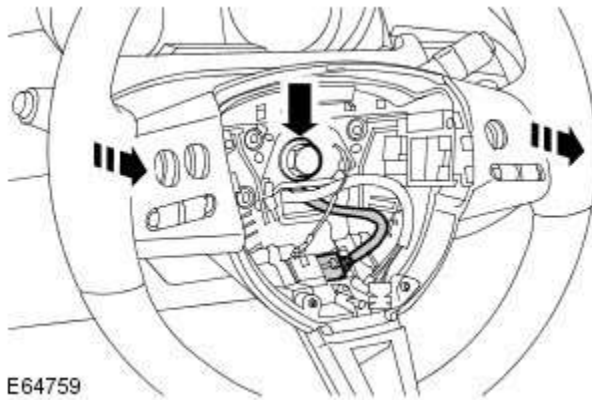
Removal and Installation

Special Tool(s)

 <p>E43628</p>	<p>Clockspring locking tool 211-326</p>
---	---

Removal

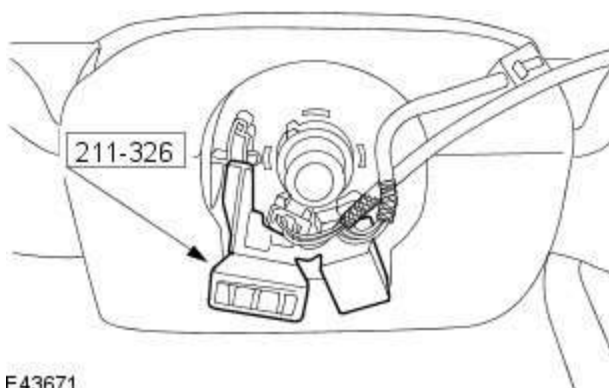
1. Make the SRS system safe.
For additional information, refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).
2. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Remove the driver air bag module.
For additional information, refer to: [Driver Air Bag Module](#) (501-20B Supplemental Restraint System, Removal and Installation).



4.  **NOTE:** Note the fitted position.


Remove the steering wheel.

- Disconnect the electrical connector.
- Loosen, but do not fully remove the bolt.
- Release the steering wheel from the spline.
- Remove the bolt.
- Release the electrical harness.



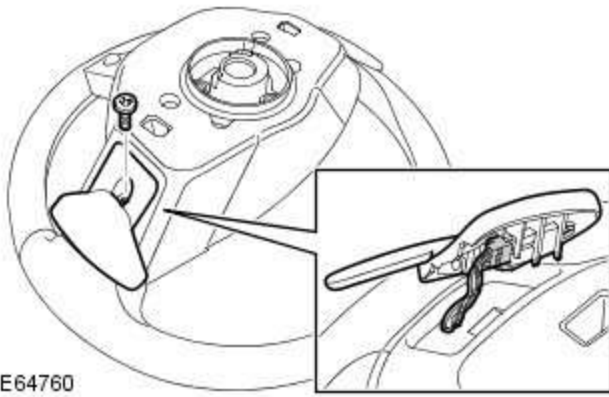
5. **CAUTIONS:**

 Failing to install the clockspring special tool, may result in damage to vehicle.

 Do not dismantle the clockspring, it has no serviceable parts and must be replaced as a complete assembly.

 Do not allow the clockspring to unwind.

Install the special tool to the clockspring.



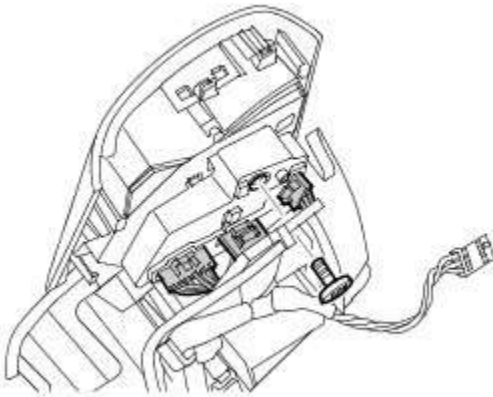
E64760



6. **NOTE:** Do not disassemble further if the component is removed for access only.

Remove the upshift and downshift paddle switches.

- Remove the Torx bolt.
- Release the assembly.
- Disconnect the electrical connector.
- Repeat the procedure and remove the opposite hand.



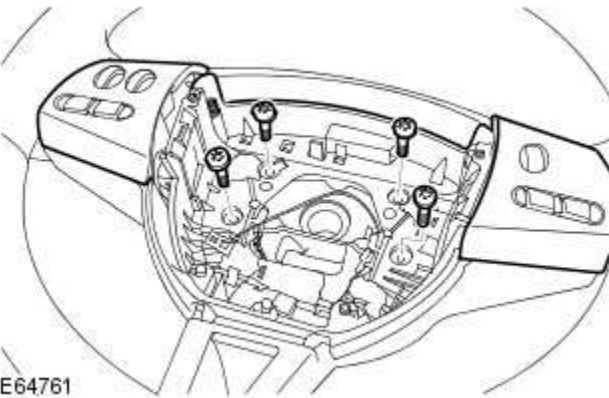
E64762



7. **NOTE:** The steering wheel is shown removed for clarity.

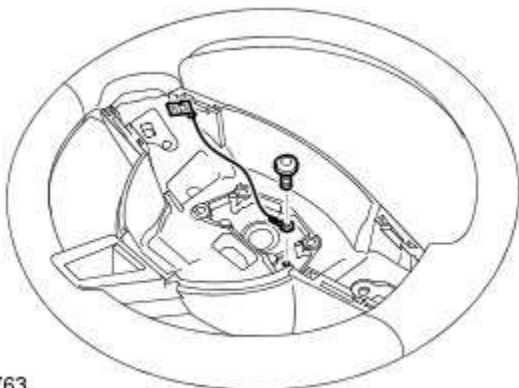
Release the steering wheel switch assembly.

- Remove the Torx bolt.
- Repeat the procedure and remove the opposite hand.



E64761

8. Remove the air bag housing.
- Remove the 4 Torx bolts.
 - Release the electrical harness.

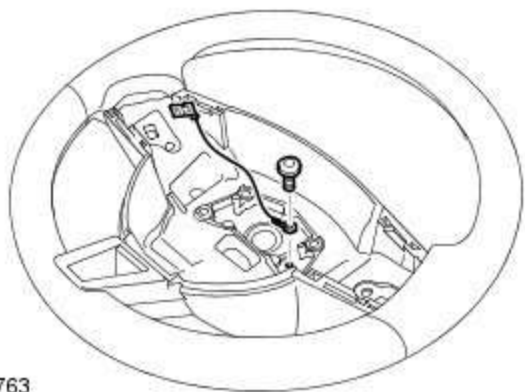


E64763

9. Remove the air bag ground cable.
- Remove the Torx screw.

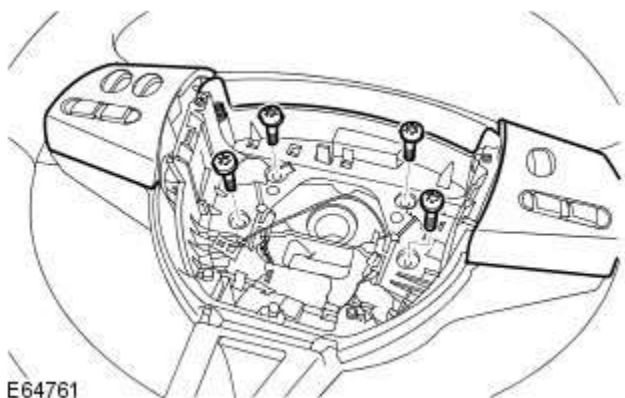
Installation

1. Install the air bag ground cable.
 - Install the Torx screw.



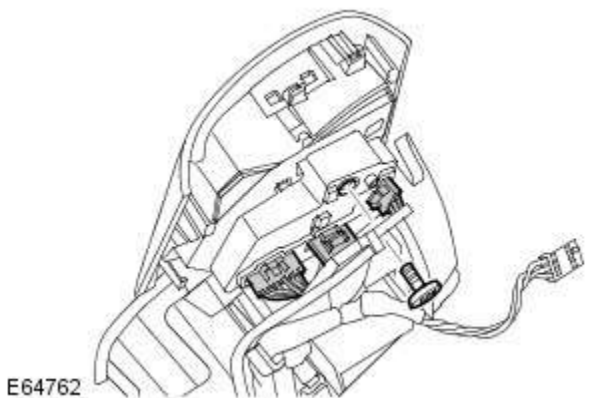
E64763

2. Install the air bag housing.
 - Secure the electrical harness.
 - Tighten to 6 Nm.

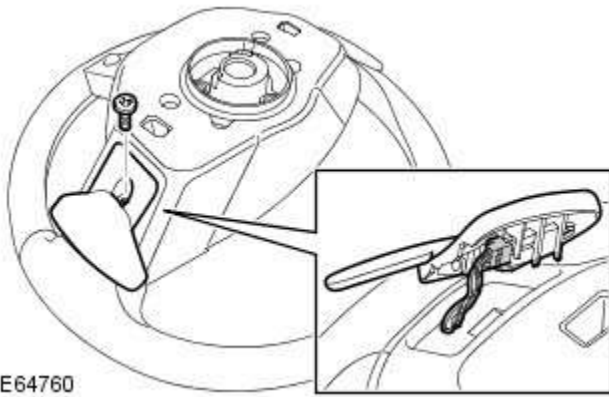


E64761

3. Secure the steering wheel switch assembly.
 - Connect and secure the electrical connectors.
 - Tighten to 3 Nm.
 - Repeat the above procedure on the opposite hand.

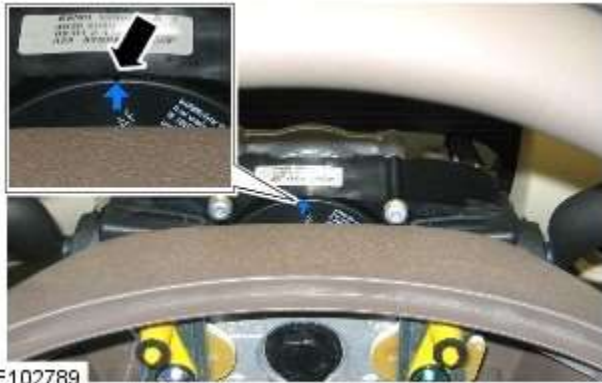


E64762




E64760

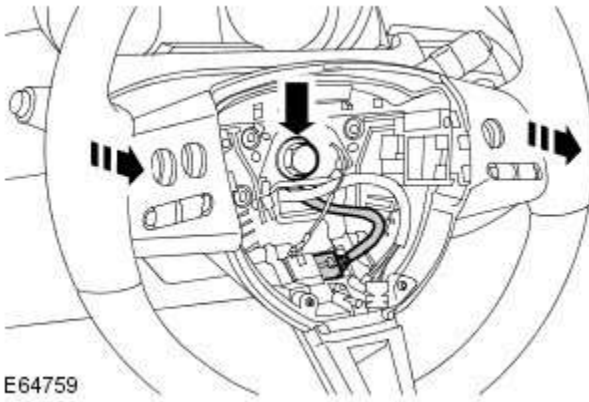
4. Install the upshift and downshift paddle switches.
 - Connect and secure the electrical connector.
 - Tighten to 3 Nm.
 - Repeat the above procedure on the opposite hand.




E102789

5.  **CAUTION:** Make sure that the arrow on the cassette is centered and pointing vertically prior to the steering wheel installation. On removal of the special tool keep the clockspring cables taught to prevent the cassette moving from the set position. Do not allow the clockspring to unwind. Failure to follow this instruction may result in damage to the component.

Remove the special tool.



E64759

6.  **CAUTION:** Check the alignment arrow is still in the vertical position with the wheels straight ahead to make sure that the directional indicator cancellation is central.

Install the steering wheel.

- Check the clockspring is aligned.
- Position the electrical harness.
- Connect the electrical connector.
- Tighten to 60 Nm.

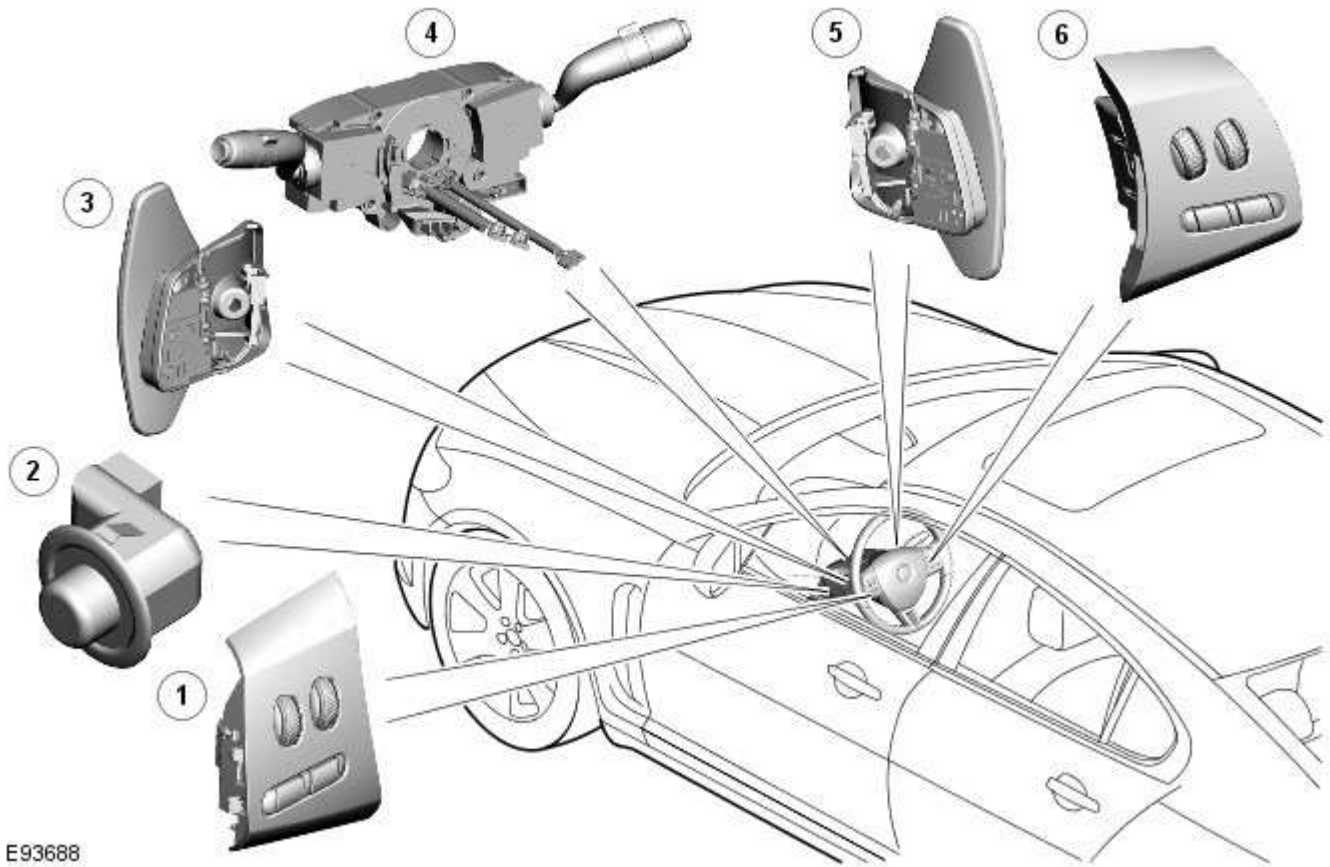
7. Install the driver air bag module.
For additional information, refer to: [Driver Air Bag Module](#) (501-20B Supplemental Restraint System, Removal and Installation).

8. Connect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Steering Column Switches - Steering Column Switches - Component Location

Description and Operation

STEERING COLUMN SWITCHES COMPONENT LOCATION



E93688

Item	Description
1	Audio and telephone switches
2	Steering column adjustment switch
3	LH (left-hand) (-) gear change paddle switch
4	Steering column multifunction switches and clockspring
5	RH (right-hand) (+) gear change paddle switch
6	Speed control switches (Adaptive Speed Control switch pack shown, non adaptive speed control switch pack similar)

Steering Column Switches - Steering Column Switches - Overview

Description and Operation

OVERVIEW

The steering column multifunction switch is situated on the steering column and consists of the wiper switch, the turn signal indicator/lighting switch and the trip computer switch.

The **RH (right-hand)** multifunction switch controls the following windshield wiper functions:

- Flick wipe
- Intermittent wipe
- Slow speed wipe
- High speed wipe
- Wash/Wipe
- Headlamp powerwash
- Rain sensing / variable wipe selection.

The **LH (left-hand)** multifunction switch controls the following functions:

- Turn signal indicators
- Side lamps
- Headlamps
- Auto lamps
- High/low beam
- Headlamp flash
- Headlamp timer
- Trip computer.

The steering column adjustment switch is located in the steering column lower shroud on the **LH** side. The switch is a 4 position 'joystick' which controls reach and rake adjustment.

The trip button allows the driver to cycle through an option menu and also reset trip cycle mileage calculations. The trip computer information is displayed in the instrument cluster message centre.

Steering wheel mounted switches on the **LH** side of the driver's airbag, control the audio and telephone functions. Switches on the **RH** side of the driver's airbag, control the speed control functions.

The steering wheel has an internal heating element. This is controlled by the driver via the Touch Screen Display (TSD).

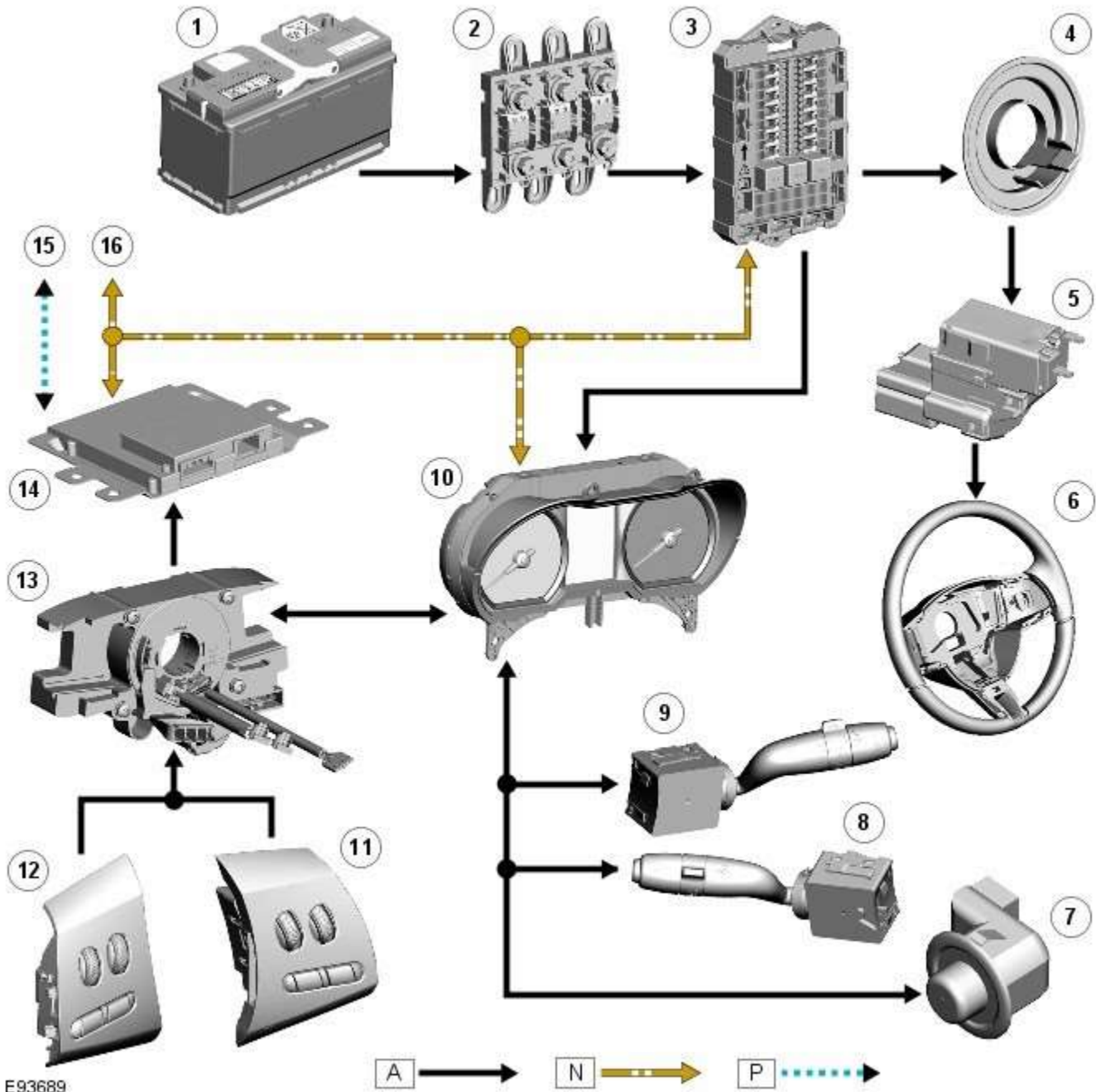
Steering Column Switches - Steering Column Switches - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **N** = Medium speed CAN bus; **P** = Fibre Optic MOST ring



E93689

Item	Description
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	Heated steering wheel slip rings
5	Heated steering wheel control module
6	Steering wheel heater element

7	Steering column adjustment switch
8	Steering column LH (left-hand) multifunction switch
9	Steering column RH (right-hand) multifunction switch
10	Instrument cluster
11	Speed control switches
12	Audio/telephone switches
13	Clockspring
14	Information and entertainment module
15	Media Oriented System Transport (MOST) ring connection to other vehicle systems
16	Medium speed CAN (controller area network) bus to other vehicle systems

System Operation

LEFT HAND MULTIFUNCTION SWITCH

Turn Signal Indicators

The instrument cluster outputs a reference voltage to the turn signal indicator switch. When the switch is in the central off position, the voltage flows through 3 resistors which are connected in series and back to the instrument cluster which monitors the signal and determines the turn signal indicators are off. This information is broadcast on the medium speed CAN bus to the CJB.

When the switch is operated in the LH turn signal indicator position, the reference voltage from the instrument cluster is routed via 1 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB. The CJB activates the applicable turn signal indicators until it receives an off message from the instrument cluster.

When the switch is operated in the RH turn signal indicator position, the reference voltage from the instrument cluster is routed via 2 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB. The CJB activates the applicable turn signal indicators until it receives an off message from the instrument cluster.

Lighting Control Switch

The instrument cluster outputs 2 reference voltages to the rotary lighting control switch; one feed being supplied to the light selection function of the switch and the second feed being supplied to the autolamp exit delay function. The switch position is determined by instrument cluster by the change in returned signal voltage which is routed through up to 4 resistors in series depending on the selection made.

When the lighting control switch is in the off position, the reference voltage flows through 1 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB that no lighting selection is made. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB that autolamp or exit delay has not been selected.

When the lighting control switch is in the sidelamp position, the reference voltage flows through 2 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB to activate the sidelamps. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB that autolamp or exit delay has not been selected.

When the lighting control switch is in the headlamp position, the reference voltage flows through 3 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB to activate the headlamps. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB that autolamp or exit delay has not been selected.

When the lighting control switch is in the autolamp position, the reference voltage flows through 4 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB to activate the autolamp function. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB that autolamp has been selected.

Autolamp Exit Delay

When the lighting control switch is in any of the autolamp exit delay position, the lighting control switch reference voltage flows through 4 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed CAN bus to the CJB that autolamps has been selected.

Depending on the selected position, the reference voltage to the autolamp exit delay switch is routed through 3, 2 or 1 resistors which is detected by the instrument cluster. The cluster outputs a message on the medium speed CAN bus to the CJB that autolamp exit delay period has been selected at 30, 60 or 120 seconds respectively.

Trip Function Button

The instrument cluster outputs a reference voltage to the trip function button. When the function button is pressed a ground

path is completed and a signal voltage is returned to the instrument cluster via a resistor. The returned reference voltage is detected by the instrument cluster and performs the requested trip function.

RIGHT HAND MULTIFUNCTION SWITCH

The instrument cluster outputs 4 separate reference voltages to the following switch functions:

- Wash/wipe switch
- Intermittent wipe switch
- Master wiper switch
- Flick wipe switch.

Wash/Wipe Switch

The reference voltage is supplied to one of two resistors connected in parallel. When the switch is not being operated the current flows through one resistor and the returned signal voltage is monitored by the instrument cluster. When the wash/wipe switch is operated, a connection is made and the current flows through the second resistor. The change in signal voltage is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [CJB](#) to activate the wash/wipe function.

Intermittent Delay/Auto Wipe Switch

The reference voltage is supplied to the switch and can pass through up to 7 resistors, connected in series, for intermittent delay selections and the auto wipe function.

When the rotary switch is in the auto position the reference voltage flows through 1 resistor. The returned signal voltage is detected by the instrument cluster which determines auto wipe is selected. The instrument cluster outputs a message on the medium speed [CAN](#) bus to the [CJB](#) to activate the auto wipe function.

With the rotary switch in one of the intermittent positions, the reference voltage is routed through up to 7 of the resistors depending on the delay period selected. The returned signal voltage is detected by the instrument cluster which determines selected delay period. The instrument cluster outputs a message on the medium speed [CAN](#) bus to the [CJB](#) to activate the selected intermittent wipe function.



NOTE: The delay period for the intermittent selections can vary according to vehicle speed.

Master Wiper Switch

The reference voltage supplied from the instrument cluster to the master wiper switch. The voltage can pass through up to 4 resistors connected in series.

When the switch is in the off position, the reference voltage passes through 4 resistors and the returned voltage is monitored by the instrument cluster. The instrument cluster outputs a message on the medium speed [CAN](#) bus to the [CJB](#) that no wiper selections have been requested.

With the switch in the intermittent, slow wipe or fast wipe position, the reference voltage passes through 3, 2 or 1 resistors respectively. The returned signal voltage is detected by the instrument cluster which determines selected delay period. The instrument cluster outputs a message on the medium speed [CAN](#) bus to the [CJB](#) to activate the selected wipe function.

Flick Wipe Switch

The reference voltage is supplied to one of two resistors connected in parallel. When the switch is not being operated the current flows through one resistor and the returned signal voltage is monitored by the instrument cluster. When the flick wipe switch is operated, a connection is made and the current flows through the second resistor. The change in signal voltage is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [CJB](#) to activate the flick wipe function.

STEERING COLUMN ADJUSTMENT SWITCH

The instrument cluster supplies 2 reference voltages to the column adjustment switch.

The first reference voltage is supplied to the joystick switch. When the switch is moved to one of its 4 positions, the switch contact is completed and the reference voltage is passed through one of 4 different resistors with different values. The returned signal voltage is measured by the instrument cluster which determines the selected column adjust request. The instrument cluster outputs a supply to the steering column adjustment motor and energizes the applicable clutch solenoid to move the column to the desired position.

The second reference voltage is supplied to the auto/manual selection of the switch. When the switch is in the auto position, the reference voltage passes directly through the switch contacts and is measured by the instrument cluster. The instrument cluster outputs a message on the medium speed [CAN](#) bus to the driver seat module which responds with the recorded memory position setting. The instrument cluster then activates the column adjustment motor and clutch solenoids to move the column to the memorized position. When the switch is in the manual position the reference circuit is broken. The instrument cluster detects the broken circuit and allows manual operation of the column adjustment switch to move the column.

HEATED STEERING WHEEL

The heated steering wheel receives a battery power supply via the [CJB](#). The heated steering wheel is controlled by the driver using a selection on the TSD. When the driver selects the heated steering wheel to be active, the request is passed from the TSD on the MOST ring to the information and entertainment module. The information and entertainment module converts the

message into a medium speed [CAN](#) bus message which is passed to the [CJB](#). The [CJB](#) processes the request and allows the battery power supply to be passed via the slip ring assembly in the steering wheel to the heated steering wheel control module. The steering wheel module supplies power to the steering wheel heater element and also monitors the temperature via a [NTC \(negative temperature coefficient\)](#) temperature sensor incorporated into the heater element. The control module varies the power supply to the element to maintain the steering wheel rim at the optimum temperature.

Component Description

STEERING COLUMN MULTIFUNCTION SWITCHES

The steering column multifunction switches are situated on the steering column and consists of the wiper switch, the turn signal indicator/lighting switch and the trip computer switch.

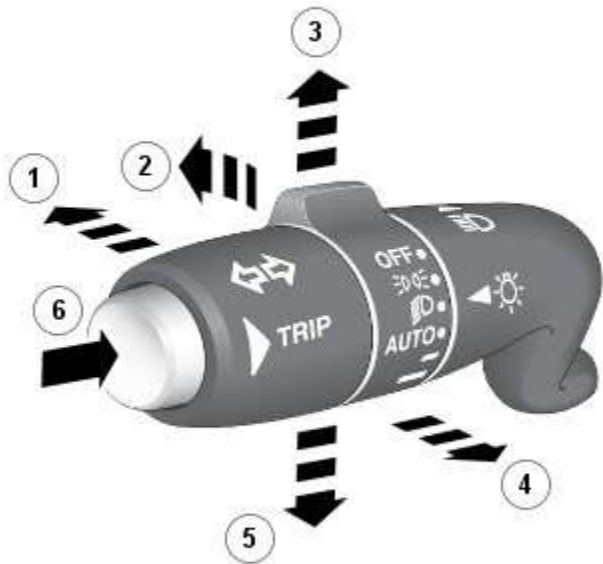
The steering column adjustment switch is located in the steering column lower shroud on the [LH](#) side. The switch is a 4 position 'joystick' which controls reach and rake adjustment.

Steering wheel mounted switches on the [LH](#) side of the driver's airbag, control the audio and telephone functions. Switches on the [RH](#) side of the driver's airbag, control the speed control functions. For additional information, refer to:

[Audio System](#) (415-01A Information and Entertainment System, Description and Operation),
[Speed Control](#) (310-03A, Description and Operation),
[Speed Control](#) (310-03B, Description and Operation),
[Speed Control](#) (310-03C, Description and Operation).

Two transmission paddle switches are located at the rear of the steering wheel.
Refer to: [External Controls](#) (307-05, Description and Operation).

LH Multifunction Switch



E97751

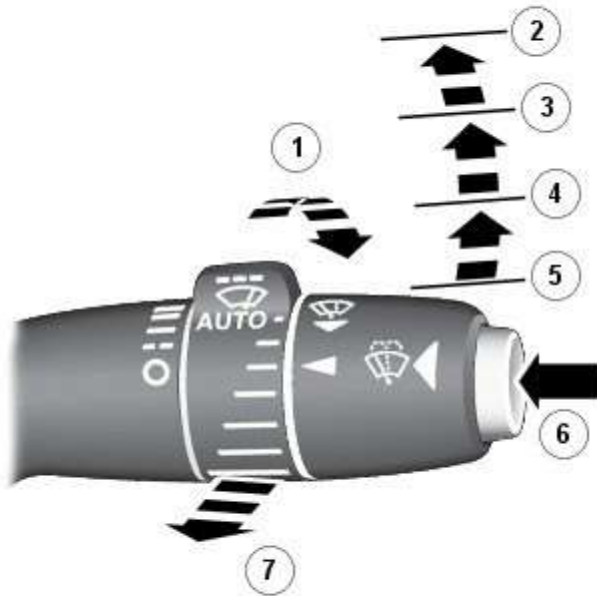
Item	Description
1	High beam
2	Lighting control rotary switch
3	RH turn signal indicator
4	Headlamp flash
5	LH turn signal indicator
6	Trip computer function button

The [LH](#) multifunction switch controls the following windshield wiper functions:

- Turn signal indicators
- Side lamps
- Headlamps
- Auto lamps
- High/low beam
- Headlamp flash
- Headlamp timer
- Trip computer.

The switch is located in a slot in the clockspring and secured with 2 plastic clips.

RH Multifunction Switch



E97752

Item	Description
1	Auto/intermittent rotary switch
2	Fast wiper
3	Slow wiper
4	Intermittent wiper
5	Off position
6	Wash/wipe
7	Flick wiper

The RH multifunction switch controls the following windshield wiper functions:

- Flick wiper
- Intermittent wiper
- Slow speed wiper
- High speed wiper
- Wash/Wipe
- Headlamp powerwash
- Rain sensing / variable wiper selection.

The switch is located in a slot in the clockspring and secured with 2 plastic clips.

STEERING COLUMN ADJUSTMENT SWITCH

The column adjustment switch is located in the steering column lower shroud and held in place with a spring clip. The switch allows the adjustment of the steering column for both reach and rake angle. The switch has an auto position which allows the desired position of the column to be set by the driver using the driver's seat memory buttons. The column position is

automatically reset once the applicable remote handset has been detected by the vehicle security systems.

STEERING WHEEL HEATER

On certain models the rim of the steering wheel contains a heater element. Operation of the heater is selected using the Touch Screen Display (TSD).

The heater temperature is controlled by a heated steering wheel control module located within the steering wheel. Power for the heater element is supplied to the steering wheel via 2 contacts on the clockspring and a slip ring mounted on the steering wheel.

Steering Column Switches - Steering Column Switches

Diagnosis and Testing

Principle of Operation

For a detailed description of the steering column lock and switches, refer to the relevant Description and Operation section in the workshop manual. REFER to: (211-05 Steering Column Switches)

[Steering Column Switches](#) (Description and Operation),
[Steering Column Switches](#) (Description and Operation),
[Steering Column Switches](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Switches • Steering column lock 	<ul style="list-style-type: none"> • Fuse(s) • Electrical connector(s) • Wiring Harness

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for DTCs and refer to the DTC Index.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Central Junction Box \(CJB\)](#) (100-00 General Information, Description and Operation).

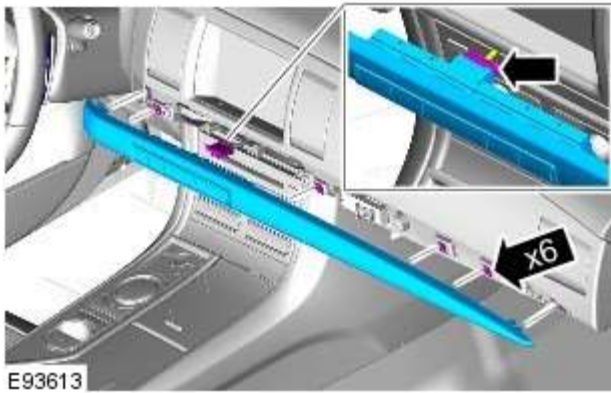
Steering Column Switches - Hazard Flasher Switch

Removal and Installation


Removal



NOTE: Removal steps in this procedure may contain installation details.



E93613

1.  NOTE: When removing the component, some of the clips may remain attached. These clips should be removed and returned to their original positions in the instrument panel.



E93614

- 2.

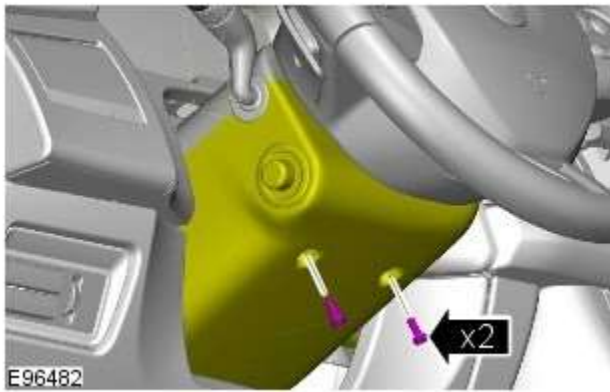
Installation

1. To install, reverse the removal procedure.

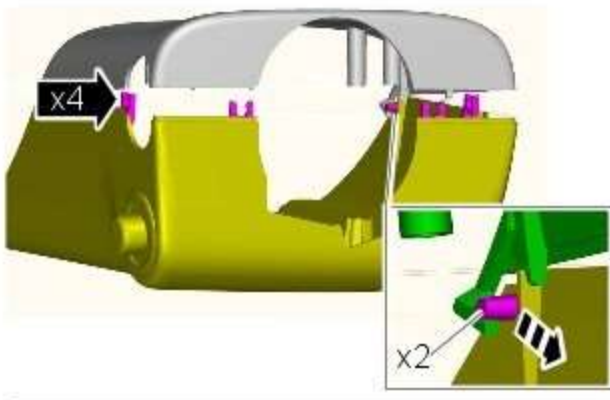
Steering Column Switches - Steering Column Multifunction Switch LH

Removal and Installation

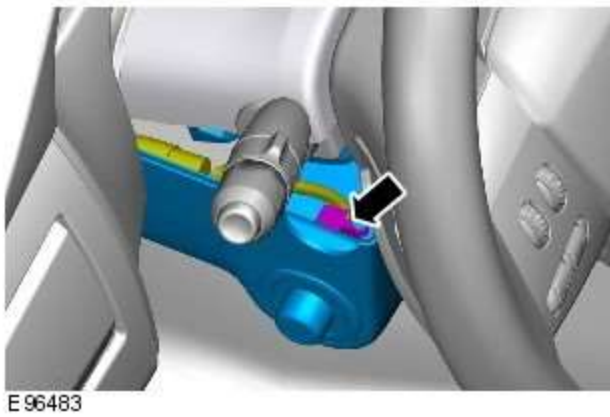
Removal



1.

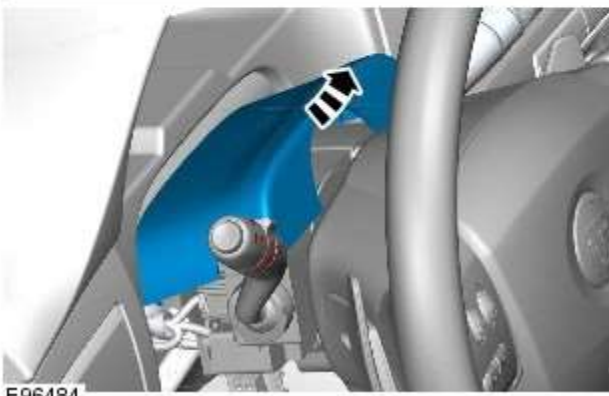
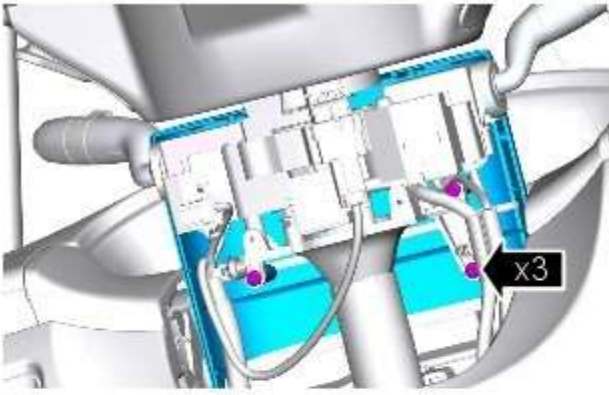


2.

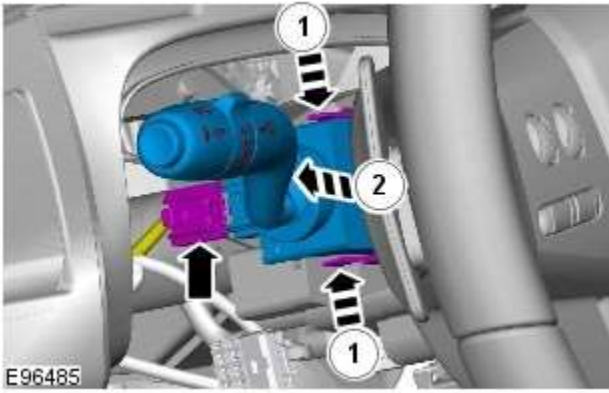


E 96483

3.



4.



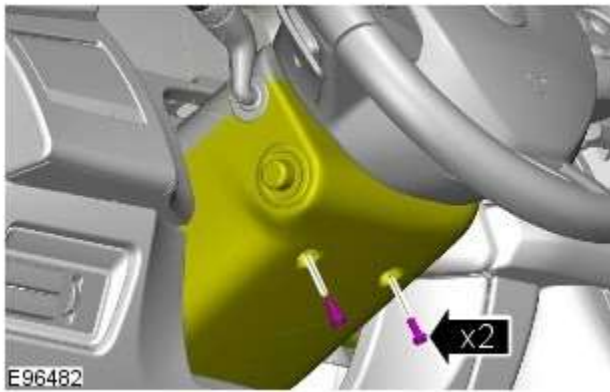
Installation

1. To install, reverse the removal procedure.

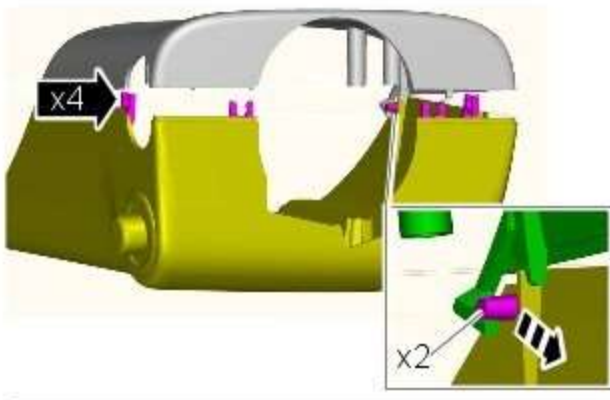
Steering Column Switches - Steering Column Multifunction Switch RH

Removal and Installation

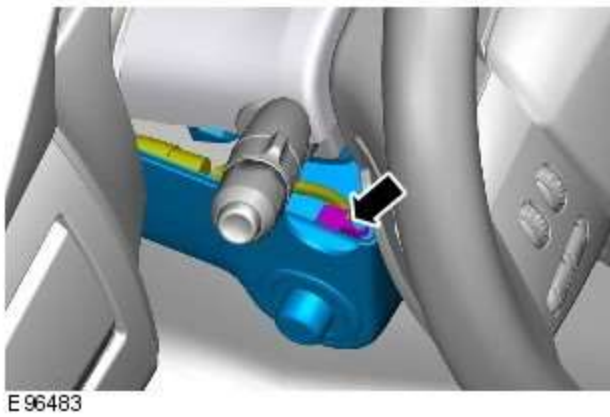
Removal



1.

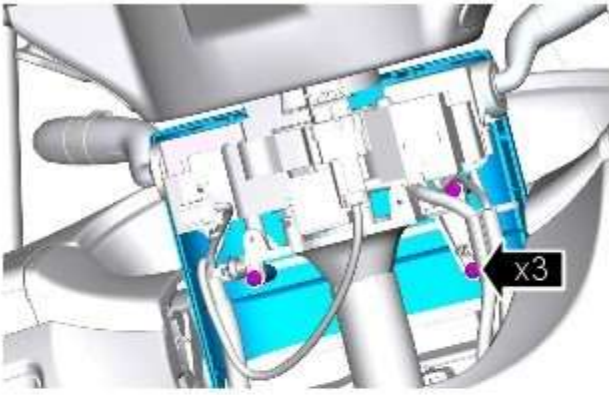


2.



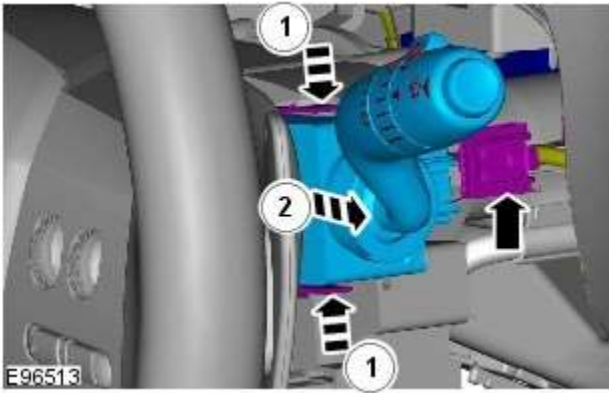
E 96483

3.



E96484

4.



E96513

Installation

1. To install, reverse the removal procedure.

Steering Column Switches - Steering Column Lock Actuator

Removal and Installation

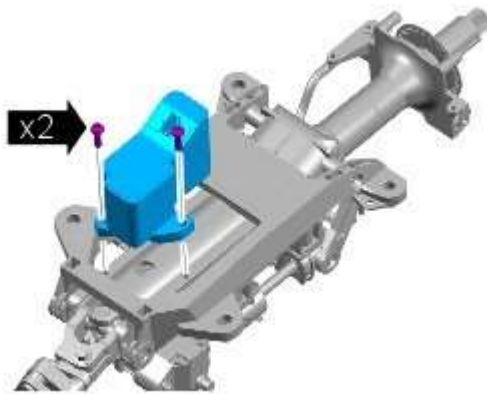
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Steering Column](#) (211-04 Steering Column, Removal and Installation).

3. Torque: 12 Nm




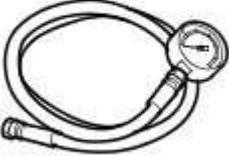
Installation

1. To install, reverse the removal procedure.

Engine System - General Information - Engine 5.0L

Diagnosis and Testing

Special Tool(s)

 <p>303-1451</p> <p>E136285</p>	Oil pressure testing adaptor, 303-1451
 <p>303-871</p> <p>E57919</p>	Oil pressure testing gauge, 303-871

Principle of Operation

For a detailed description of the 5.0L engine, refer to the relevant Description and Operation sections in the workshop manual. REFER to:

[Engine](#) (303-01C Engine - V8 5.0L Petrol, Description and Operation),
[Engine](#) (303-01C Engine - V8 5.0L Petrol, Description and Operation),
[Engine](#) (303-01C Engine - V8 5.0L Petrol, Description and Operation),
[Engine](#) (303-01D Engine - V8 S/C 5.0L Petrol, Description and Operation),
[Engine](#) (303-01D Engine - V8 S/C 5.0L Petrol, Description and Operation),
[Engine](#) (303-01D Engine - V8 S/C 5.0L Petrol, Description and Operation).

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Coolant leaks • Oil leaks • Leaks in the fuel system • Visibly damaged or worn parts • Loose or missing fixings 	<ul style="list-style-type: none"> • Fuses • Loose or corroded electrical connectors • Harnesses • Sensors

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the concern is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the relevant DTC Index.

Symptom Chart

NOTES:



If an engine is suspect, and the vehicle remains under the Manufacturers warranty refer to the Warranty Policy and Procedure manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new engine.



Due to the possibility of loose carbon, that has become trapped between the valve face and seat, effecting the pressure readings, when carrying out a compression test and some cylinders are found to have low pressures, install the spark plugs, road test the vehicle and re-test the suspect cylinders. If the correct pressures are restored, no further action is required.

Symptom	Action
All engine related issues	<ul style="list-style-type: none"> • Check ECM for Diagnostic Trouble Codes (DTCs) and refer to DTC Index. REFER to: Electronic Engine Controls (303-14C Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing), Electronic Engine Controls (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).
Difficult to start hot and cold	<ul style="list-style-type: none"> • Carry out general engine checks: <ul style="list-style-type: none"> - Compression test. Refer to component tests in this section. - Valve clearances - Spark plug condition and color
Poor idle	<ul style="list-style-type: none"> • Ensure the air intake system is free from leaks • Carry out general engine checks: <ul style="list-style-type: none"> - Compression test. Refer to component tests in this section. - Valve clearances - Spark plug condition and color • Check for collapsed catalytic converter/blocked exhaust system • Check long and short term fuel trim datalogger signals <ul style="list-style-type: none"> - Readings up to 10%: may be considered as acceptable if the readings are equal bank to bank - Positive readings of between 10-20%: check for air leaks in air intake system - Negative readings of between 10-20%: check for over fuelling e.g. leaking injectors, high fuel pressure - Readings above 20%: check for DTCs and refer to DTC Index. REFER to: Electronic Engine Controls (303-14C Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing), Electronic Engine Controls (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing). • Carry out a vacuum gauge check. Refer to component tests in this section
Insufficient power/Insufficient compression	<ul style="list-style-type: none"> • Ensure the air intake system is free from leaks • Carry out general engine checks: <ul style="list-style-type: none"> - Compression test. Refer to component tests in this section. - Valve clearances - Spark plug condition and color • Check for collapsed catalytic converter/blocked exhaust system • Check long and short term fuel trim datalogger signals <ul style="list-style-type: none"> - Readings up to 10%: may be considered as acceptable if the readings are equal bank to bank - Positive readings of between 10-20%: check for air leaks in air intake system - Negative readings of between 10-20%: check for over fuelling e.g. leaking injectors, high fuel pressure - Readings above 20%: check for DTCs and refer to DTC Index. REFER to: Electronic Engine Controls (303-14C Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing), Electronic Engine Controls (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing). • Carry out a vacuum gauge check. Refer to component tests in this section
Oil consumption	<ul style="list-style-type: none"> • Carry out oil leak check followed by an oil consumption test. Refer to the component tests in this section • If oil consumption is excessive: • Check the integrity of the engine breather system • Carry out general engine checks: <ul style="list-style-type: none"> - Compression test. Refer to component tests in this section. - Valve clearances - Spark plug condition and color
Noise	<ul style="list-style-type: none"> • Refer to the Special Service Messages on the Electronic Product Quality Report (EPQR) system for sound files. If the symptom does NOT compare to any of the sound files, contact Dealer Technical Support (DTS)

DTC Index

For a list of DTCs that could log in the Engine Control Module (ECM) refer to section 303-14. REFER to:

[Electronic Engine Controls](#) (303-14C Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing), [Electronic Engine Controls](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).

Component Tests

Engine Oil Leaks



NOTE: Before installing new gaskets or oil seals, make sure that the fault is clearly established.

If the oil leak cannot be identified clearly by a visual inspection, carry out an Ultraviolet test:

Fluorescent Oil Additive Method

1. Clean the engine with a suitable cleaning fluid (brake cleaner).
2. Drain the engine oil and refill with recommended oil, premixed with Diesel Engine Oil Dye or equivalent. Use a minimum 14.8 ml (0.5 ounce) to a maximum 29.6 ml (1 ounce) of fluorescent additive to all engines. If oil is not premixed, fluorescent additive must first be added to the crankcase.
3. Run engine for 15 minutes. Stop the engine and inspect all seal and gasket areas for leaks using a 12 Volt Master UV Diagnostic Inspection Kit or equivalent. A clear bright yellow or orange area will identify leak. For extremely small leaks, several hours may be required for the leak to appear.
4. As necessary, pressurize the main oil gallery system to locate leaks due to incorrectly sealed, loose or cocked plugs. If the flywheel bolts leak oil, look for sealer on the threads.
5. Repair all leaks as necessary.

Compression Test

General Remarks

NOTES:



Removing fuses and disconnecting electrical components may cause the Engine Control Module (ECM) to log Diagnostic Trouble Codes (DTCs). After the measurements have been carried out, DTCs should be cleared from memory by connecting to the Manufacturer Approved Diagnostic System.



Only check the compression pressure with the valves set to the prescribed clearance (if this can be adjusted).

The compression pressure should be checked with the engine at normal operating temperature.

Check the Compression Pressure



WARNING: Move gear selector lever to 'P' position. Failure to follow this instruction may result in personal injury.

1. Remove the fuel pump relay.
2. Start the engine - the engine will start, run for a few seconds then stall.
3. Remove the spark plugs.
4. Install the compression tester.
5. Install an auxiliary starter switch in the starting circuit. With the ignition switch OFF, using the auxiliary starter switch, crank the engine a minimum of five compression strokes and record the highest reading. Note the approximate number of compression strokes required to obtain the highest reading.
6. Repeat the test on each cylinder, cranking the engine approximately the same number of compression strokes.
7. Install the removed components in reverse order, observing the specified tightening torques.
8. Clear all DTCs from the ECM.

Interpretation of the Results



NOTE: Due to the possibility of loose carbon that has become trapped between the valve face and seat effecting the pressure readings, when carrying out a compression test and cylinders are found to have low pressures, install the spark plugs, road test the vehicle and re-test the suspect cylinders. If the correct pressures are restored, no further action is required.

The indicated compression pressures are considered within specification if the lowest reading cylinder is within 75% of the highest reading.

If the cylinder pressures are found to be low, carry out a leakdown test to determine the location of the fault (if any leakback can be heard through the engine breather system suspect the piston rings, if any leakback can be heard through the inlet system suspect the inlet valve or seat, if any leakback can be heard through the exhaust manifold suspect the exhaust valve or seat. If the measurements for two cylinders next to each other are both too low then it is very likely that the cylinder head gasket between them is burnt through. This can also be recognized by traces of engine oil in the coolant and/or coolant in the

engine oil).

Oil Consumption Test

The amount of oil an engine uses will vary with the way the vehicle is driven in addition to normal engine-to-engine variation. This is especially true during the first 16,100 km (10,000 miles) when a new engine is being broken in or until certain internal components become conditioned. Vehicles used in heavy-duty operation may use more oil. The following are examples of heavy-duty operation:

- Trailer towing applications
- Severe loading applications
- Sustained high speed operation

Engines need oil to lubricate the following internal components:

- Cylinder block cylinder walls
- Pistons and piston rings
- Intake and exhaust valve stems
- Intake and exhaust valve guides
- All internal engine components

When the pistons move downward, a thin film of oil is left on the cylinder walls. As the vehicle is operated, some oil is also drawn into the combustion chambers past the intake and exhaust valve stem seals and burned.

The following are examples of conditions that can affect oil consumption rates:

- Engine size
- Operator driving habits
- Ambient temperatures
- Quality and viscosity of oil
- Engine is being run in an overfilled condition (check the oil level at least five minutes after a hot shutdown with the vehicle parked on a level surface. The oil level should not be above the top of the cross-hatched area and the letter "F" in FULL).

Operation under varying conditions can frequently be misleading. A vehicle that has been run for several thousand miles on short trips or in below-freezing ambient temperatures may have consumed a "normal" amount of oil. However, when checking the engine oil level, it may measure up to the full mark on the oil level indicator due to dilution (condensation and fuel) in the engine crankcase. The vehicle then might be driven at high speeds on the highway where the condensation and fuel boil off. The next time the engine oil is checked it may appear that a liter of oil was used in about 160 km (100 miles). Oil consumption rate is about one liter per 2,400 km (1,500 miles).

Make sure the selected engine oil meets Jaguar specification and the recommended API performance category "SG" and SAE viscosity grade as shown in the vehicle Owner's Guide. It is also important that the engine oil is changed at the intervals specified for the typical operating conditions.

The following diagnostic procedure is used to determine the source of excessive oil consumption.



NOTE: Oil use is normally greater during the first 16,100 km (10,000 miles) of service. As mileage increases, oil use decreases. High speed driving, towing, high ambient temperature and other factors may result in greater oil use.

1. Define excessive consumption, such as the number of miles driven per liter of oil used. Also determine customer's driving habits, such as sustained high speed operation, towing, extended idle and other considerations.
2. Verify that the engine has no external oil leaks as described under Engine Oil Leaks in this section.
3. Carry out an oil consumption test:
 - Run the engine to normal operating temperature. Switch engine OFF and allow oil to drain back for at least five minutes.
 - With vehicle parked on level surface, check the engine oil level.
 - If required, add engine oil to set level exactly to the FULL mark.
 - Record the vehicle mileage.
 - Instruct the customer to return for a level check after driving the vehicle as usual for 1,610 km (1000 miles).
 - Check the oil level under the same conditions and at the same location as the initial check.



NOTE: If the oil consumption rate is unacceptable go to Step 4.

4. Check the Positive Crankcase Ventilation (PCV) system. Make sure the system is not plugged.
5. Check for plugged oil drain-back holes in the cylinder head and cylinder block.
6. If the condition still exists after carrying out the above tests go to step 9.
7. Carry out a cylinder compression test. Refer to the Compression Test procedure in this section. This can help determine the source of oil consumption such as valves, piston rings or other areas.
8. Check valve guides for excessive guide clearance. Install new valve stem seals after verifying valve guide clearance.
9. Worn or damaged internal engine components can cause excessive oil consumption. Small deposits of oil on the tips of the spark plugs can be a clue to internal oil consumption.

Intake Manifold Vacuum Test

Bring the engine to normal operating temperature. Connect a vacuum gauge or equivalent to the intake manifold. Run the engine at the specified idle speed.

The vacuum gauge should read between 51-74 kPa (15-22 in-Hg) depending upon the engine condition and the altitude at which the test is performed. Subtract 4.0193 kPa (1 in-Hg) from the specified reading for every 304.8 m (1,000 feet) of elevation above sea level.

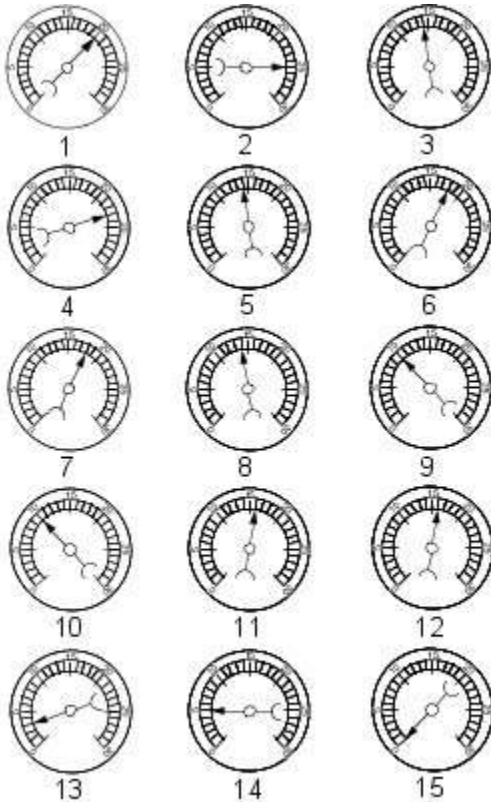
The reading should be steady. As necessary, adjust the gauge damper control (where used) if the needle is fluttering rapidly. Adjust damper until needle moves easily without excessive flutter.

Interpreting Vacuum Gauge Readings

A careful study of the vacuum gauge reading while the engine is idling will help pinpoint trouble areas. Always conduct other appropriate tests before arriving at a final diagnostic decision. Vacuum gauge readings, although helpful, must be interpreted carefully.

Most vacuum gauges have a normal band indicated on the gauge face.

The following are potential gauge readings. Some are normal; others should be investigated further.



VUJ0001694

1. **NORMAL READING:** Needle between 51-74 kPa (15-22 in-Hg) and holding steady.
2. **NORMAL READING DURING RAPID ACCELERATION:** When the engine is rapidly accelerated, the needle will drop to a low (not to zero) reading. When the throttle is suddenly released, the needle will snap back up to a higher than normal figure.
3. **NORMAL FOR HIGH-LIFT CAMSHAFT WITH LARGE OVERLAP:** The needle will register as low as 51 kPa (15 in-Hg) but will be relatively steady. Some oscillation is normal.
4. **WORN RINGS OR DILUTED OIL:** When the engine is accelerated, the needle drops to 0 kPa (0 in-Hg). Upon deceleration, the needle runs slightly above 74 kPa (22 in-Hg).
5. **STICKING VALVES:** When the needle remains steady at a normal vacuum but occasionally flicks (sharp, fast movement) down and back about 13 kPa (4 in-Hg), one or more valves may be sticking.
6. **BURNED OR BENT VALVES:** A regular, evenly-spaced, downscale flicking of the needle indicates one or more burned or damaged valves. Insufficient hydraulic valve tappet or hydraulic lash adjuster clearance will also cause this reaction.
7. **POOR VALVE SEATING:** A small but regular downscale flicking can mean one or more valves are not seating correctly.
8. **WORN VALVE GUIDES:** When the needle oscillates over about a 13 kPa (4 in-Hg) range at idle speed, the valve guides could be worn. As engine speed increases, the needle will become steady if guides are responsible.

9. WEAK VALVE SPRINGS: When the needle oscillation becomes more violent as engine RPM is increased, weak valve springs are indicated. The reading at idle could be relatively steady.
10. LATE VALVE TIMING: A steady but low reading could be caused by late valve timing.
11. IGNITION TIMING RETARDED: Retarded ignition timing will produce a steady but somewhat low reading.
12. INSUFFICIENT SPARK PLUG GAP: When spark plugs are gapped too close, a regular, small pulsation of the needle can occur.
13. INTAKE LEAK: A low, steady reading can be caused by an intake manifold or throttle body gasket leak.
14. BLOWN HEAD GASKET: A regular drop of fair magnitude can be caused by a blown head gasket or warped cylinder head to cylinder block surface.
15. RESTRICTED EXHAUST SYSTEM: When the engine is first started and is idled, the reading may be normal, but as the engine RPM is increased, the back pressure caused by a clogged muffler, kinked tail pipe or other concerns will cause the needle to slowly drop to 0 kPa (0 in-Hg). The needle then may slowly rise. Excessive exhaust clogging will cause the needle to drop to a low point even if the engine is only idling.

When vacuum leaks are indicated, search out and correct the cause. Excess air leaking into the system will upset the fuel mixture and cause concerns such as rough idle, missing on acceleration or burned valves. If the leak exists in an accessory such as the power brake booster, the unit will not function correctly. Always repair vacuum leaks.

Engine Oil Pressure Check



NOTE: Prior to checking the engine oil pressure, a road test of 6 miles (10 kilometres), must be carried out. Do not attempt to attain engine normal operating temperature by allowing the engine to idle.

1. Disconnect the battery ground cable. Refer to section 414-00 - Charging System - General Information of the workshop manual
2. **WARNINGS:**



The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.



Wear protective gloves.

Remove the engine oil filter element

REFER to: [Oil Filter Element](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).



NOTE: Ensure the oil filter element is not contaminated during this procedure

3. Install the oil filter element into special tool (Oil filter adapter number 303-1451)
4. Install the special tool (Oil filter adapter number 303-1451) to the engine. Torque: 25 Nm
5. Install the special tool (Oil pressure testing gauge, 303-871) and tighten the union
6. Connect the battery ground cable
7. Refer to owner hand book, check and top-up the engine oil if required
8. Start and run the engine
9. Note the oil pressure readings with the engine running at idle and 3500 RPM
10. Turn off the engine
11. Disconnect the battery ground cable
12. Remove the special tools
 1. Clean the components
13. Install the engine oil filter element
REFER to: [Oil Filter Element](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).

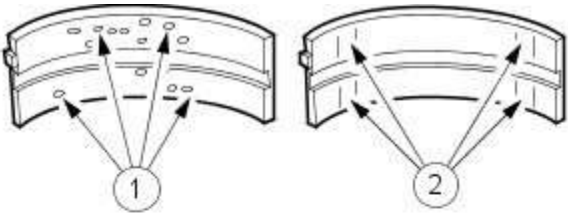


NOTE: Ensure the oil filter element is not contaminated during this procedure

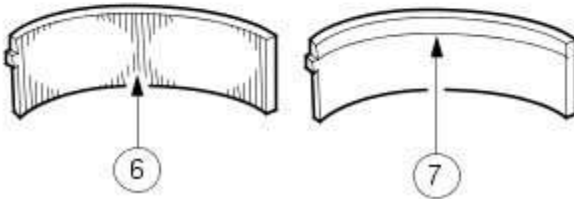
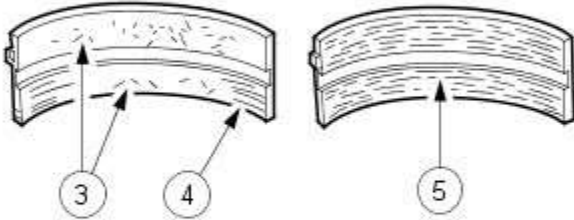
14. Connect the battery ground cable
15. Refer to owner hand book, check and top-up the engine oil if required

Engine System - General Information - Bearing Inspection

General Procedures



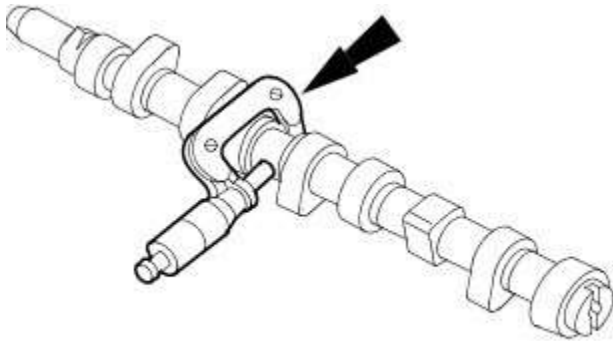
1. Inspect bearings for the following defects.
 1. Cratering - fatigue failure
 2. Spot polishing - incorrect seating.
 3. Imbedded dirt engine oil.
 4. Scratching - dirty engine oil.
 5. Base exposed - poor lubrication.
 6. Both edges worn - journal damaged.
 7. One edge worn - journal tapered or bearing not seated.



VUJ0002219

Engine System - General Information - Camshaft Bearing Journal Diameter

General Procedures

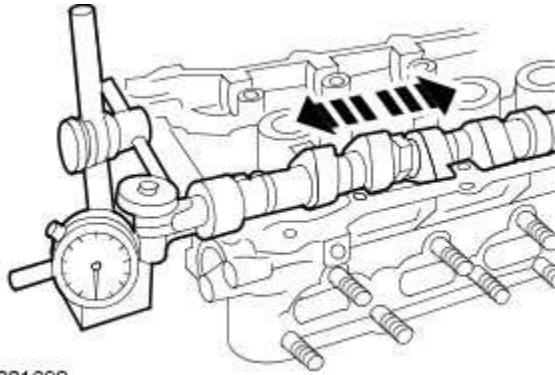


1. Determine the diameter of the camshaft journals.
 - Using a micrometer measure the diameter at 90 degrees intervals to determine if the journals are out-of-round.
 - Measure at two different points on the journal to determine if there is any tapering.
 - If the measurements are out of the specified range, install a new camshaft.


VUJ0001695

Engine System - General Information - Camshaft End Play

General Procedures



VUJ0001698

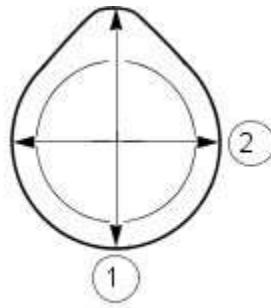
1.  NOTE: Make sure that the camshaft is to specification.

Using the special tool, measure the end play.

- Slide the camshaft in both directions. Read and note the maximum and minimum values on the dial indicator gauge.
 1. End play = maximum value minus minimum value.
- If the measurement is out of specification, install new components.

Engine System - General Information - Camshaft Lobe Lift

General Procedures

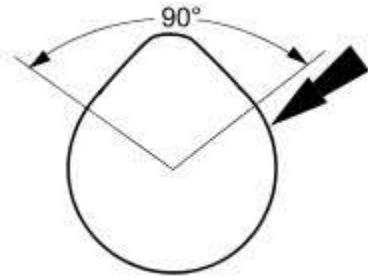


1. Measure the diameter (1) and diameter (2) with a vernier caliper. The difference in measurements is the lobe lift.

VUJ0001699

Engine System - General Information - Camshaft Surface Inspection

General Procedures

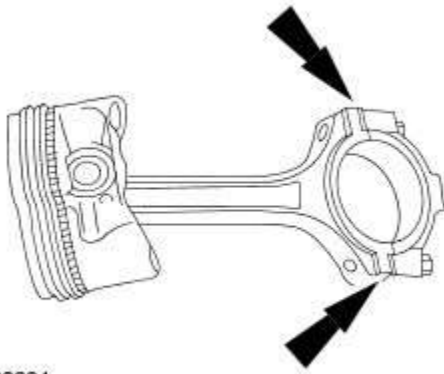


1. Inspect camshaft lobes for pitting or damage in the active area. Minor pitting is acceptable outside the active area.


VUJ0001700

Engine System - General Information - Connecting Rod Cleaning

General Procedures



VUJ0002224

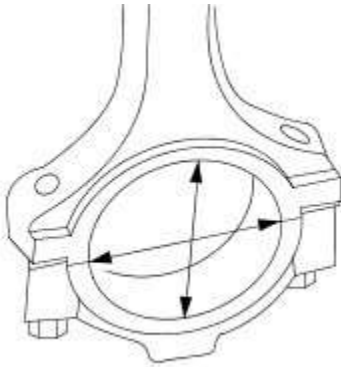
1.  **CAUTION:** Do not use a caustic cleaning solution or damage to connecting rods may occur.

Mark and separate the parts and clean with solvent. Clean the oil passages.

Engine System - General Information - Connecting Rod Large End Bore

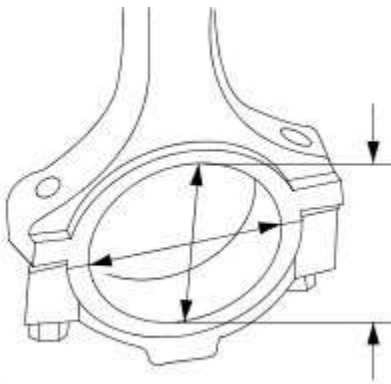
General Procedures

1. Measure the bearing bore in two directions. The difference is the connecting rod bore out-of-round. Verify the out-of-round is within specification.



VUJ0002223

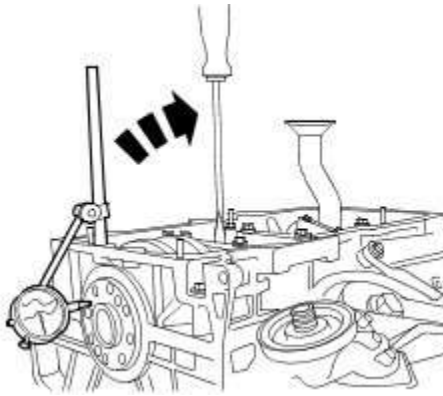
2. Measure the bearing bore diameter in two directions. Verify the bearing bore is within specification.



VUJ0002222

Engine System - General Information - Crankshaft End Play

General Procedures

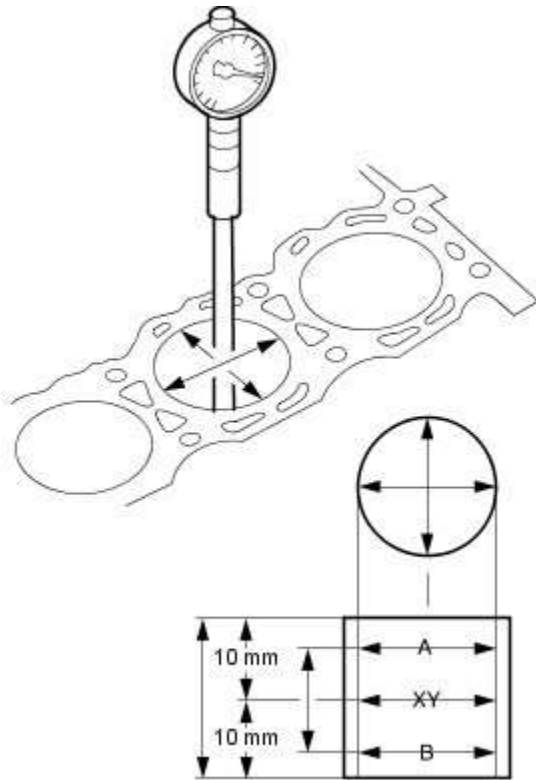


VUJ0002235

1. Using the Dial Indicator Gauge with Brackets, measure the end play.
 - Measure the end play by lifting the crankshaft using a lever.
 - If the value is out of the specification, install new thrust half rings to take up the end float and repeat the measurement.

Engine System - General Information - Cylinder Bore Out-of-Round

General Procedures



VUJ0002234



- NOTE: The main bearing caps or lower crankcase must be in place and tightened to the specified torque; however, the bearing shells should not be installed.

Measure the cylinder bore with an internal micrometer.

- Carry out the measurements in different directions and at different heights to determine if there is any out-of-roundness or tapering.
- If the measurement is out of the specified range, hone out the cylinder block or install a new block.

Engine System - General Information - Exhaust Manifold Cleaning and Inspection

General Procedures

1. Inspect the cylinder head joining flanges of the exhaust manifold for evidence of exhaust gas leaks.
2. Inspect the exhaust manifold for cracks, damaged gasket surfaces, or other damage that would make it unfit for further use.

Engine System - General Information - Leakage Test Using Smoke Test

Equipment

General Procedures



CAUTION: The compressed air line supply pressure must be between 3.5 and 12 bar (50 and 175 psi) for the smoke test equipment to function correctly. Do not exceed this pressure. Failure to follow this instruction may result in damage to the smoke test equipment.

NOTES:



The vehicle battery must be in good condition and fully charged before carrying out this procedure.



On vehicles with 3.0L TDV6, it will be necessary to insert smoke at both air cleaner outlet pipes independently if the right hand turbocharger and associated hoses are to be tested.



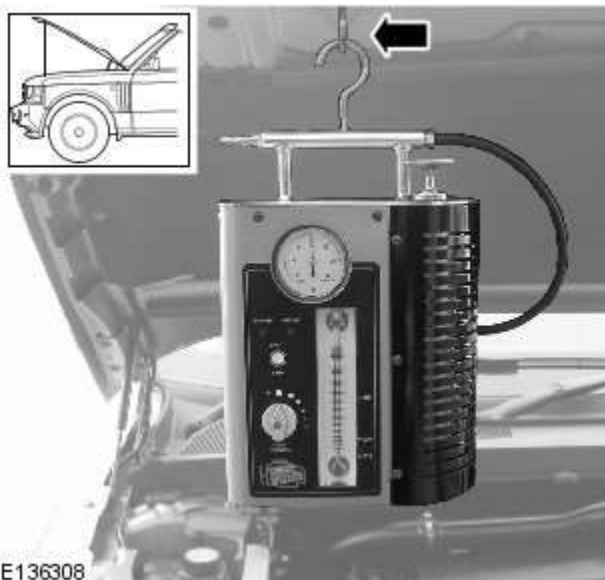
In some cases it may be necessary to remove undertrays, trim or engine covers to obtain access to all potential leak locations.



Some variation in the illustrations may occur, but the essential information is always correct.



For further information regarding operation of the test equipment refer to the manufacturers operators manual supplied with the kit.



- WARNING:** Use an additional support to prevent the hood from falling if the smoke test equipment is secured to the hood. Failure to follow this instruction may result in personal injury.

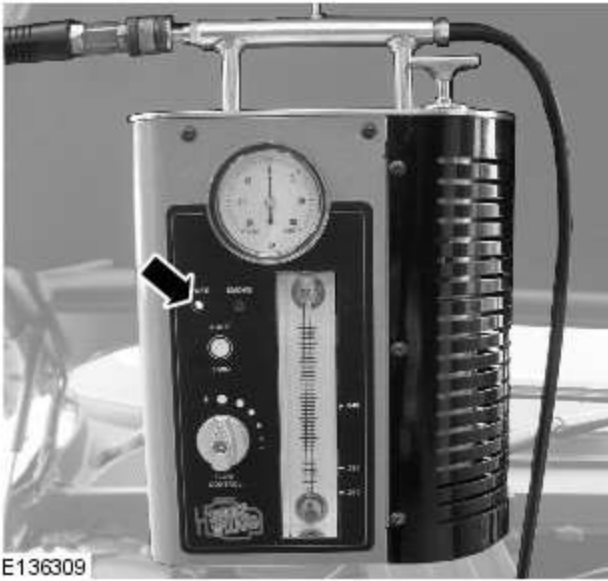
Install the smoke test equipment to a suitable location under the hood.

- Connect a suitable compressed air line to the smoke test equipment.
- Connect the smoke test equipment positive power cable to the battery positive terminal.



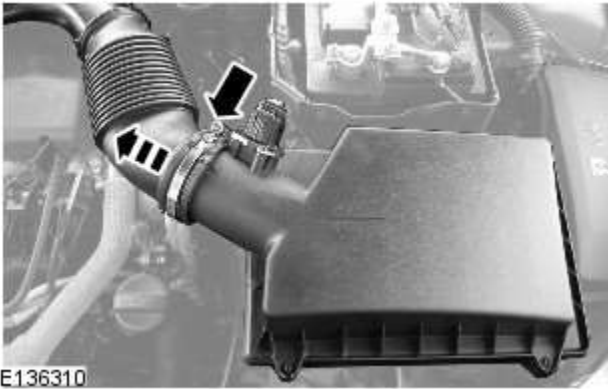
- WARNING:** Do not connect the smoke test equipment negative cable to the battery negative terminal.

Connect the smoke test equipment negative cable to a suitable body ground point.





5. NOTE: A flashing green light indicates low battery voltage. In this case, place the battery on charge and make sure that the battery is fully charged before using the smoke test equipment.

Observe the power indicator lamp on the smoke test equipment. Make sure that a continuous green light is displayed.



6. NOTES:

 In some cases it may be necessary to remove the air cleaner(s) to allow access to the air cleaner outlet pipes.

 In some cases it will be necessary to cap one of the air cleaner outlet pipes. Use the blanking caps supplied in the kit to cap the open orifice.

Disconnect the air cleaner outlet pipe(s).



E136311



7. **NOTE:** Make sure the smoke test equipment adapter is a good fit to the air cleaner outlet pipe. This must be an air tight seal.

Connect the smoke test equipment supply hose to the air cleaner outlet pipe.

1. Install the appropriate adapter to the air cleaner outlet pipe.
2. Connect the smoke test equipment supply hose to the adapter link hose.



E136312

8. **NOTES:**



The flow control valve must be in the fully open position.



Smoke is produced for 5 minutes. The smoke test equipment will automatically switch off after this period of time.

Switch the smoke test equipment on.

9. Remove the oil filler cap, and observe until a constant flow of smoke is visible leaving the oil filler orifice. Install the oil filler cap.

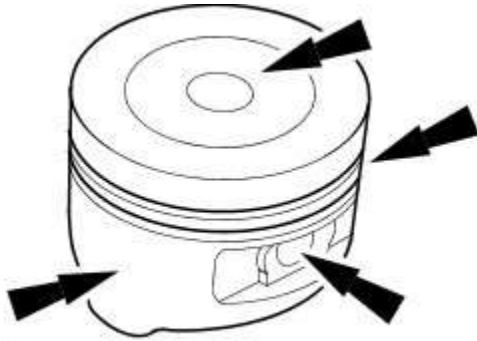


10. **NOTE:** The longer smoke is allowed to exit from a leak, the more fluorescent dye will be deposited at a leak location.

Using the torch supplied in the kit set to white light, look for escaping smoke. Alternatively, use the ultraviolet light to look for fluorescent dye deposits at the source of a leak.

Engine System - General Information - Piston Inspection

General Procedures



VUJ0002233



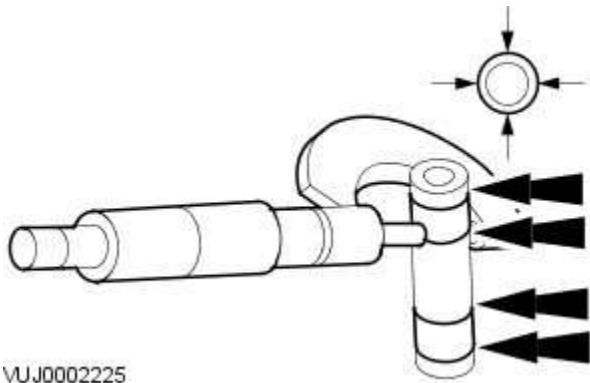
1. **CAUTION:** Do not use any aggressive cleaning fluid or a wire brush to clean the piston.

Carry out a visual inspection.

- Clean the piston skirt, pin bush, ring grooves and crown and check for wear or cracks.
- If there are signs of wear on the piston skirt, check whether the connecting rod is twisted or bent.

Engine System - General Information - Piston Pin Diameter

General Procedures



VUJ0002225



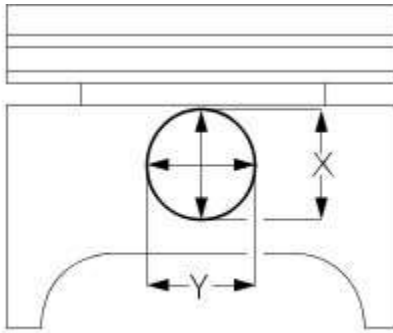
1. **NOTE:** The piston and piston pin are a matched pair. Do not mix up the components.

Measure the piston pin diameter.

- Measure the diameter in two directions.
- If the values are not to specification, install a new piston and a new piston pin.

Engine System - General Information - Piston Pin to Bore Diameter

General Procedures



VUJ0002232



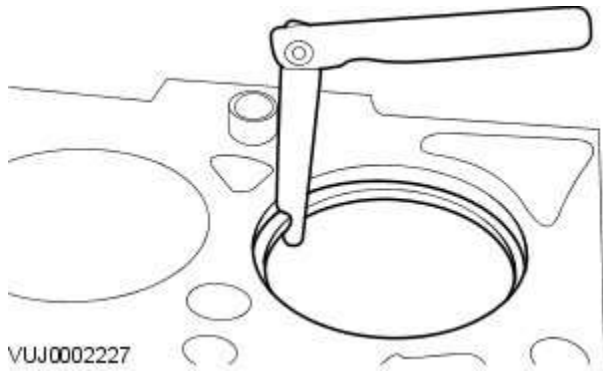
1. **NOTE:** The piston and piston pin form a matched pair. Do not mix up the components.

Measure the diameter of the piston pin bore.

- Measure the diameter in two directions.
- If the values are not to specification, install both a new piston and a new piston pin.

Engine System - General Information - Piston Ring End Gap

General Procedures



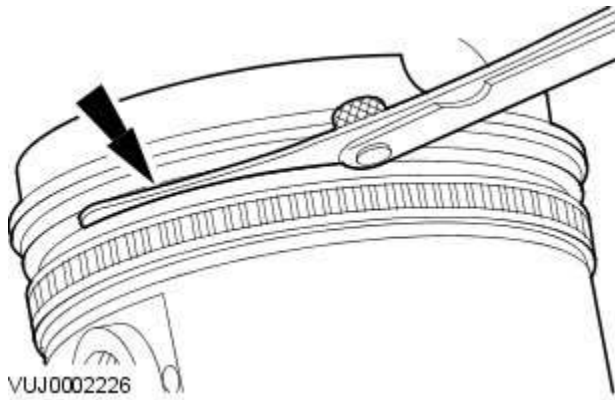
1. **CAUTION:** Do not mix up the piston rings. Install the piston rings in the same position and location.

Using the Feeler Gauge, measure the piston ring gap.

- The values given in the specification refer to a gauge ring used during production.

Engine System - General Information - Piston Ring-to-Groove Clearance

General Procedures



VUJ0002226

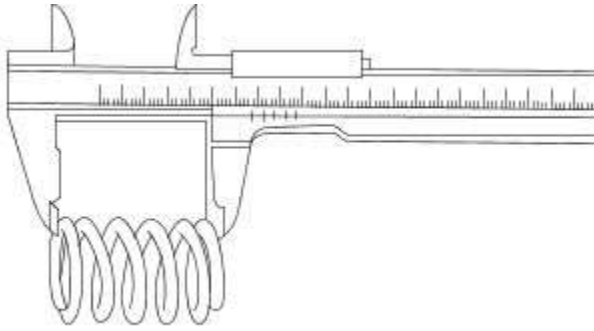


1. **NOTE:** The piston ring must protrude from the piston groove. To determine the piston ring clearance, insert the Feeler Gauge right to the back of the groove, behind the wear ridge.

Using the Feeler Gauge, measure the piston ring clearance.

Engine System - General Information - Valve Spring Free Length

General Procedures

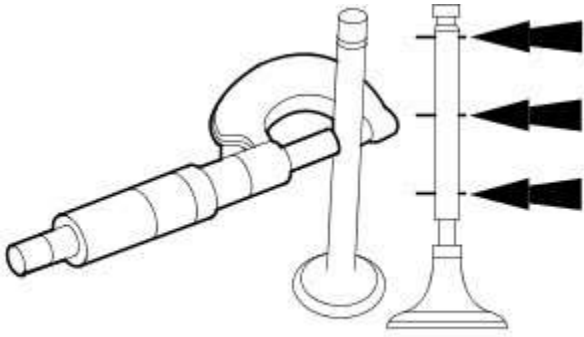


VUJ0002221

1. Using a vernier gauge, measure the free length of each valve spring. Verify the length is within specification.

Engine System - General Information - Valve Stem Diameter

General Procedures



1. Using a micrometer measure the diameter of the valve stems.
 - If the measurements are not to specification, install a new valve.

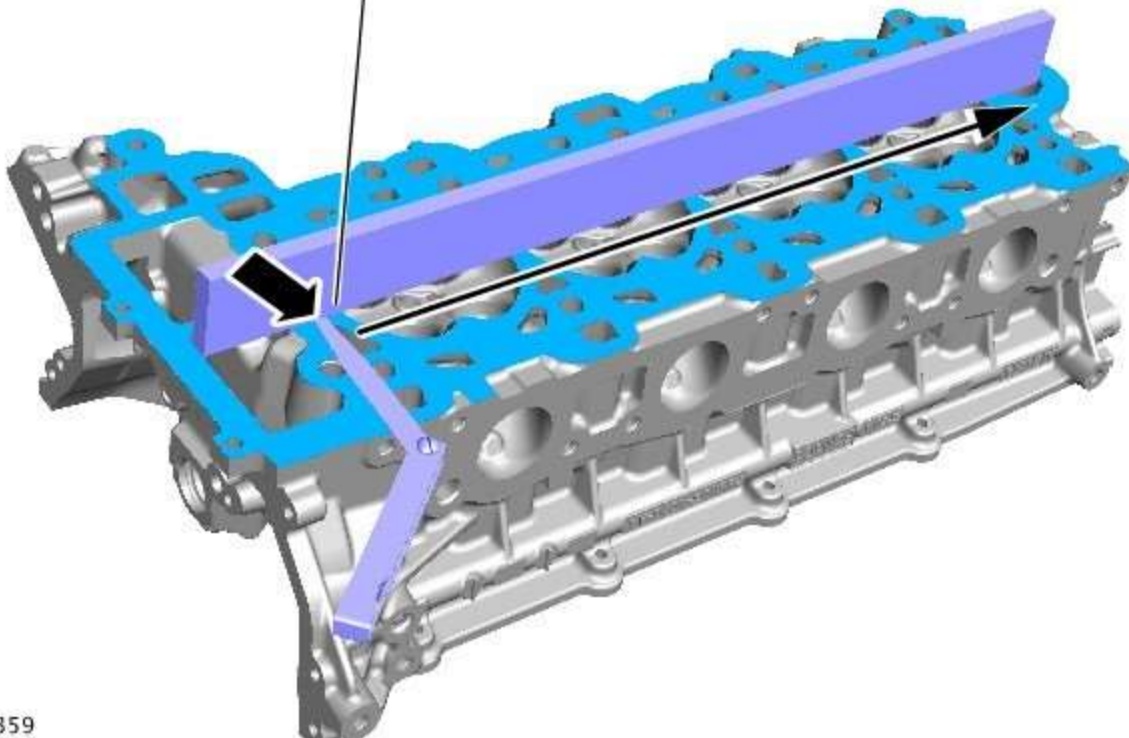
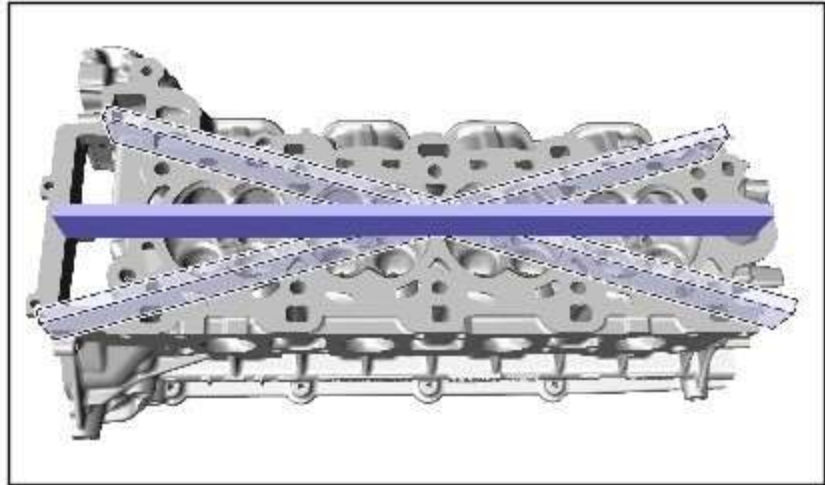
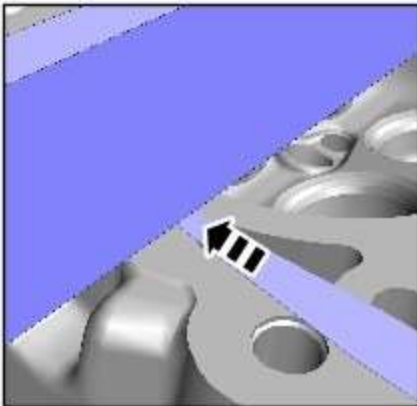
VUJ0002220

Engine System - General Information - Cylinder Head Distortion

General Procedures

Check

1. Using a suitable metallic straight edge and feeler gauge, measure the cylinder head face in the areas illustrated. **Note the maximum value.**



E160359



2. CAUTION: Machine the **minimum** thickness of material from the cylinder head to meet specification. If a selection of cylinder head gaskets are available, increase the thickness of the cylinder head gasket by one size.

NOTES:



Prior to having the cylinder head machined, prior approval is required by Jaguar or Land Rover engineering.



If the cylinder head requires machining, this must be carried out by a local engineering company.

If the cylinder head exceeds the maximum value (0.2mm), the cylinder head must be machined.

Engine System - General Information - Cylinder Compression Test V8 S/C 5.0L Petrol

General Procedures

Check



CAUTION: Before disconnecting or removing components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.

NOTES:



Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.



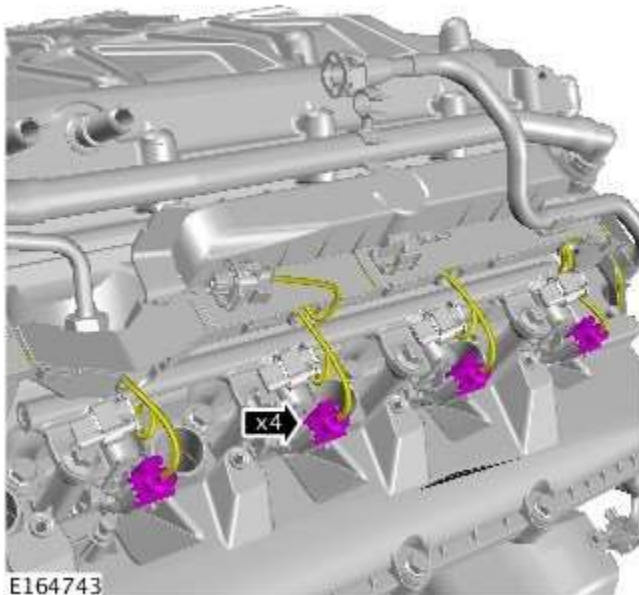
The vehicle battery must be in good condition and fully charged before carrying out this procedure.

1. Refer to: [Ignition Coil-On-Plug - V8 S/C 5.0L Petrol](#) (303-07B Engine Ignition - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

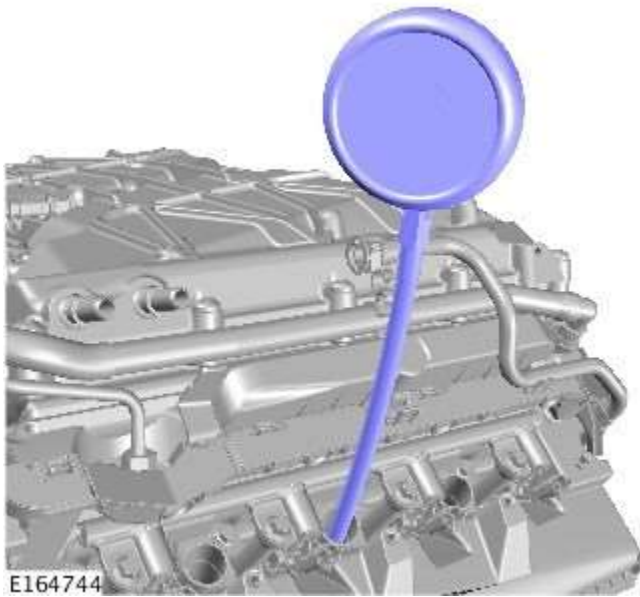


2. **CAUTION:** Make sure the fuel injection system is disabled before carrying out a cylinder compression test. Failure to follow this step may result in damage to the vehicle.

Repeat procedure for the other side.



3. Crank engine for approximately five seconds to remove any remaining fuel in the cylinders.



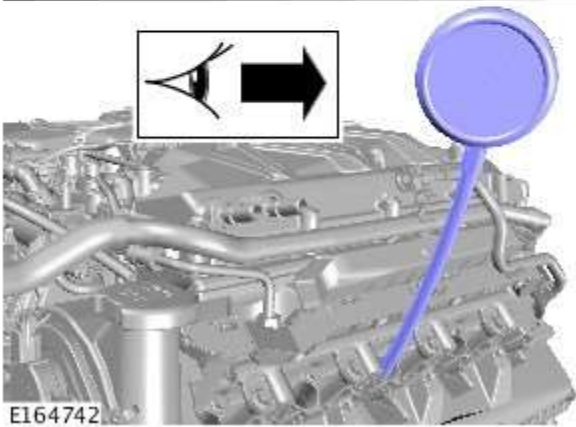
4. NOTE: Dry cylinder compression test.
Install the compression test gauge.



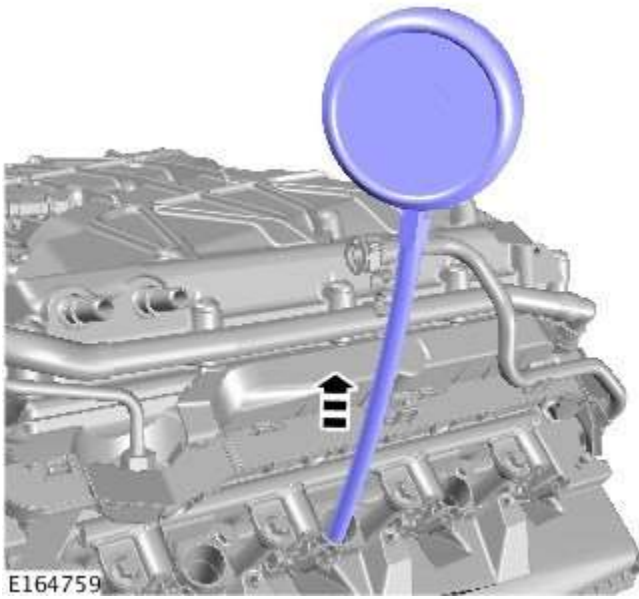
5. NOTES:

- △ This step requires the aid of another technician.
- △ Print graphic number E164747 in step 11. Use this graphic to record each cylinder compression figure.
- △ The vehicle battery must be in good condition and fully charged before carrying out this procedure.

Crank the engine for 10 seconds and record the figure displayed on the compression test gauge. Make sure the pressure is released from the compression test gauge after each cylinder recording. Repeat the process for all cylinders.

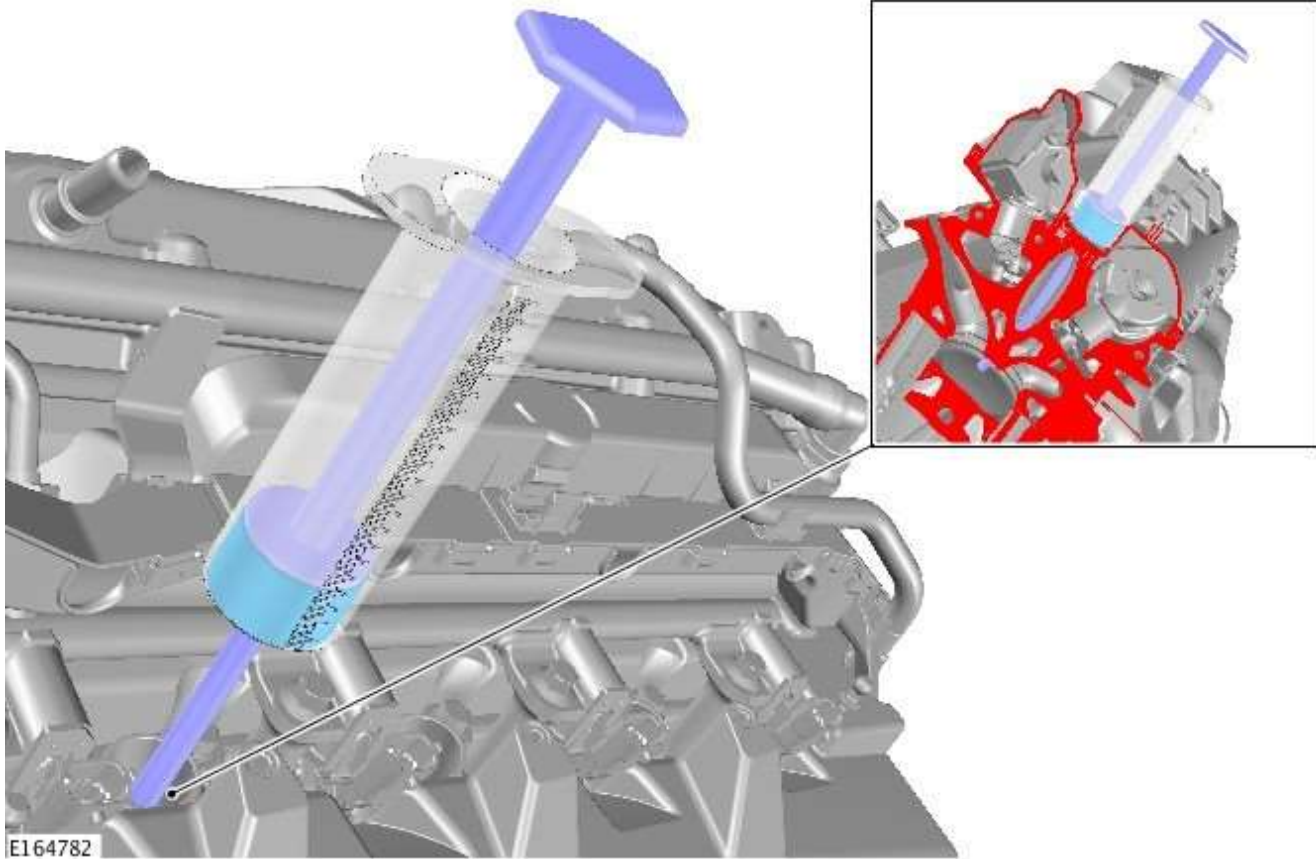


6. Remove the compression test gauge.

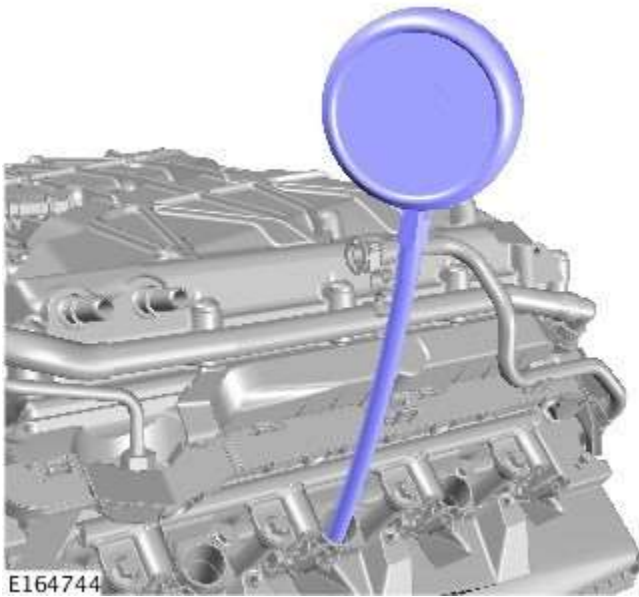


7.  NOTE: Wet cylinder compression test.


Using a suitable syringe add 10 ml of clean engine oil into the cylinder.




8. Install the compression test gauge.



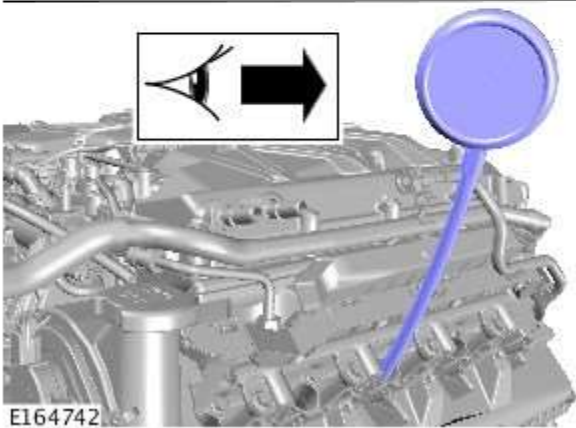
9. NOTES:

 This step requires the aid of another technician.

 Print graphic number E164747 in Step 11. Use this graphic to record each cylinder compression figure.

 The vehicle battery must be in good condition and fully charged before carrying out this procedure.

Crank the engine for 10 seconds and record the figure displayed on the compression test gauge. Make sure the pressure is released from the compression test gauge after each cylinder recording. Repeat the process for all cylinders.

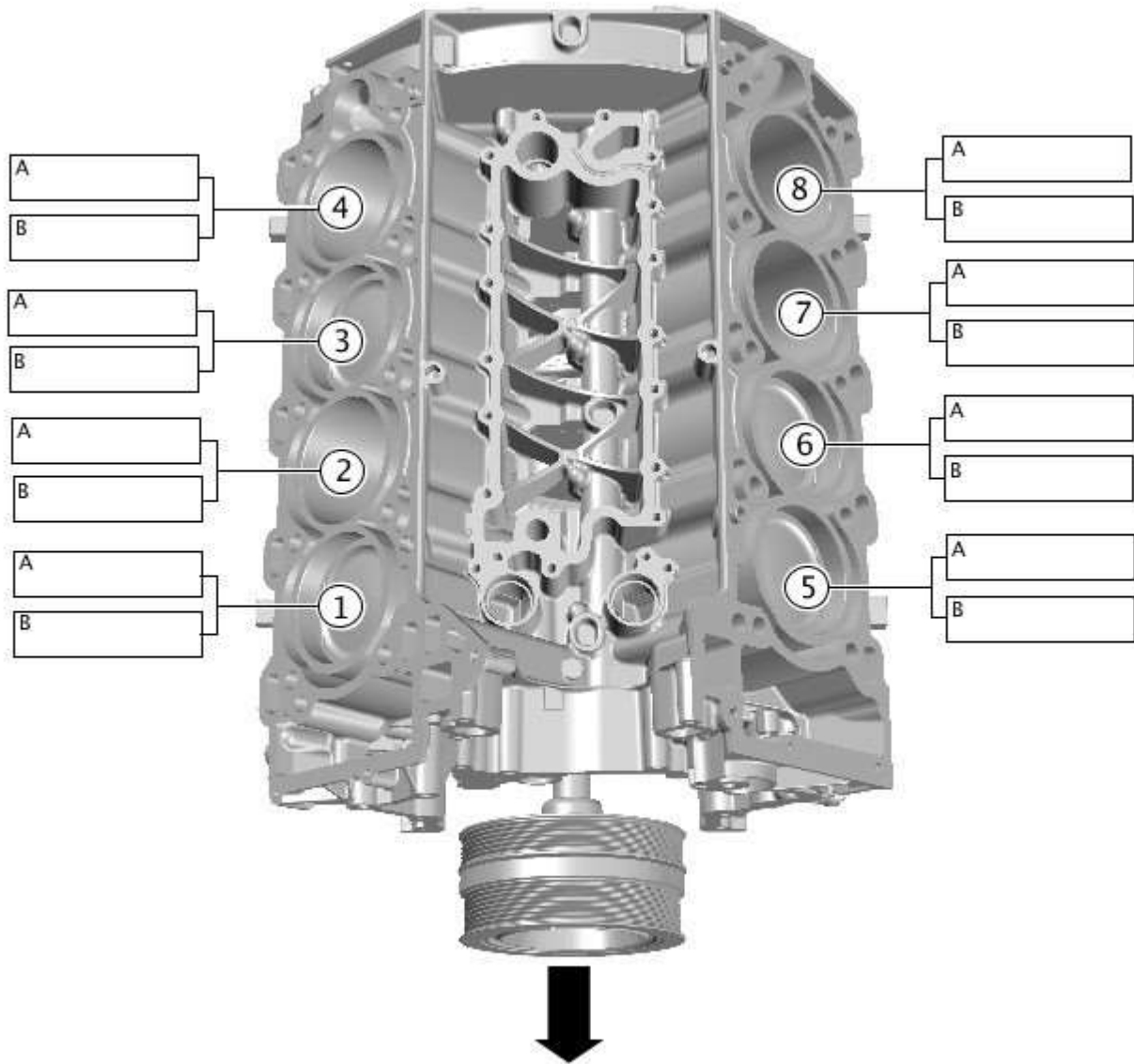


10. After each wet cylinder compression test remove the compression test gauge and crank engine for approximately 10 seconds to remove engine oil from the cylinder


11. NOTES:

 A= dry cylinder compression test.

 B= wet cylinder compression test.



E164747

12.  NOTE: Remove and discard all blanking caps.
To install, reverse the removal procedure.
13. The minimum cylinder compression reading recorded must be within 10% of the maximum cylinder compression reading recorded. If the difference across the cylinders is higher than 10% please contact dealer technical support (DTS) for further assistance.
14. Using Land Rover approved diagnostic equipment, read and clear any diagnostic trouble codes (DTCs).

Engine - V8 S/C 5.0L Petrol -**Engine Data**

Engine Description	Engine Capacity	Maximum Engine Torque (EEC) (SAE)	Maximum Engine Power (EEC) (SAE)	Compression Ratio	Bore	Stroke
• 90° "Vee" • 8 Cylinder • 32 Valves	4.999 ccm	625 Nm at 2.500 - 5.500 RPM	375 kW at 6.000 - 6.500 RPM	9.5 ± 0.50	92.509 ± 0.009 mm	93 ± 0.1 mm

Engine Firing Order

Standard	Firing order
ISO	1:2:7:3:4:5:6:8
DIN	1:5:4:2:6:3:7:8

Engine Valve Clearance (cold)

Intake Valve	Exhaust Valve
0.20 ±0.02	0.25 ±0.02

Spark Plugs

Specification	Spark Plug Gap
ILKR6C-10	1 mm

Lubricants, Fluids, Sealers and Adhesives

NOTE: When servicing or draining the engine oil, the 0w20 oil is compatible with 5w20. Any residue mix is acceptable.

Description	Specification
Engine Oil - Vehicles built up to March 2014	SAE 5W20 WSS-M2C925-A
Engine Oil - Vehicles built from March 2014	SAE 0W20 STJLR.51.5122
Sealant	WSE-M4G323-A6
Core plug and stub pipe retainer	WSK-M2G349-A7
Jaguar Premium Cooling System Fluid	WSS-M97B44-D

Capacities

NOTE: For supercharged 5.0L engines.

Description	Litres
Engine oil, initial fill	8.9
Engine oil, service fill with oil filter change	7.25
Engine oil, service fill without oil filter change	6.75

Capacities

NOTE: For naturally aspirated 5.0L engines.

Description	Litres
Engine oil, initial fill	8.75
Engine oil, service fill with oil filter change	7.25
Engine oil, service fill without oil filter change	6.75

Cylinder Head and Valve Train

Item	Specification
Cylinder head maximum permitted warp (flatness specification)	0.2 mm (0.008 in)
Valve guide inner diameter (mm)	5.51 ± 0.01
Intake valve effective length (mm) (tip to gauge line)	117.21 ± 0.1
Exhaust valve effective length (mm) (tip to gauge line)	94.39 ± 0.1
Valve stem to guide clearance intake diametrical (mm)	0.022 - 0.057
Valve stem to guide clearance exhaust diametrical (mm)	0.03 - 0.065
Valve head diameter intake (mm)	36 ± 0.1
Valve head diameter exhaust (mm)	30 ± 0.1
Intake valve face angle (degrees)	44.875 ± 0.125
Exhaust valve face angle (degrees)	44.875 ± 0.125
Valve stem diameter intake (mm)	5.4705 ± 0.0075
Valve stem diameter exhaust (mm)	5.4625 ± 0.0075
Valve spring free length (mm) - inlet	46.1
Valve spring free length (mm) - exhaust	46.1
Valve spring installed height (mm) - inlet	35.74
Valve spring installed height (mm) - exhaust	35.1
Camshaft lobe lift intake (mm)	10
Camshaft lobe lift exhaust (mm)	9.36
Camshaft journal to cylinder head bearing surface clearance diametrical (mm)	0.025 - 0.065
Camshaft journal diameter - all positions	26.965 ± 0.01
Bearing diameter - all positions	27.01 ± 0.01

Item	Specification
Camshaft journal maximum run out limit (mm)	
Camshaft journals to end journals	0.03
Camshaft journals to adjacent journals	0.015
Camshaft journal maximum out of round (mm) - all journals	0.005

Torque Specification



NOTE: **A** = Refer to procedure for correct torque sequence.

Description	Nm	lb-ft	lb-in
Engine cover mounting bolts	10	7	-
Accessory drive belt tensioner retaining bolt	40	30	-
Supercharger belt idler/tensioner bracket retaining bolts	25	18	-
Secondary drive belt idler retaining bolts	40	30	-
Power steering pump pulley retaining bolts	25	18	-
Power steering pump retaining bolts	25	18	-
Power steering pump bracket to engine retaining bolts	25	18	-
Generator retaining bolts	48	35	-
Starter motor retaining bolts	48	35	-
Air conditioning compressor retaining bolts	25	18	-
Engine mounting to engine mounting bracket retaining nuts	48	35	-
Engine mounting to subframe retaining nuts	63	46	-
Engine mounting bracket to engine retaining bolts	48	35	-
Crankshaft damper pulley retaining LH threaded bolt	200 + 270°	148 + 180°	-
Flexplate retaining bolts	45 + 90°	33 + 90°	-
Exhaust manifold heat shield retaining bolts	A	-	-
Exhaust manifold retaining bolts	A	-	-
Engine wiring harness bracket retaining bolts	10	7	-
Coolant outlet pipe	10	7	-
Intercooler retaining bolts	25	18	-
Intake manifold retaining bolts	25	18	-
Oil Cooler retaining bolts	13	10	-
Knock sensor (KS) retaining bolt	20	14	-
Ignition coil retaining bolts	8	-	71
Spark plugs	20	15	-
Fuel rail retaining bolts	A	-	-
High pressure fuel pipe retaining bolts	A	-	-
High pressure fuel pump retaining bolts	12	9	-
Oil filter housing assembly retaining bolts	12	9	-
Oil filter cap	28	21	-
Lifting eye bolts	25 + 90°	18 + 90°	-
Manifold absolute pressure and temperature (MAPT) sensor sensor retaining bolts	5	-	44
Coolant pump retaining bolts	12	9	-
Variable valve timing (VVT) oil control solenoid retaining bolts	10	7	-
Camshaft position (CMP) sensor retaining bolts	10	7	-
Camshaft cover retaining bolts	13	10	-
Front upper timing cover retaining bolts	12	9	-
Front lower timing cover retaining bolts	A	-	-
Engine rear cover retaining bolts	A	-	-
VVT to camshaft retaining bolts	32	24	-
Camshaft bearing caps retaining bolts	11	8	-
Primary timing chain fixed guide retaining bolts	12	9	-
Primary timing chain tensioner retaining bolts	12	9	-
Primary timing chain tensioner guide blade retaining bolts	25	18	-
Auxiliary chain tensioner guide retaining bolts	21	15	-
Auxiliary chain fixed guide retaining bolt	12	9	-
Oil pump sprocket retaining bolt	21	15	-
Cylinder head retaining bolts	A	-	-
Engine oil level (EOL) sensor retaining bolt	12	9	-
Oil pan to oil sump body retaining bolts	12	9	-
Oil sump body to engine retaining bolts	25	18	-
Oil pan drain plug	23	17	-
Oil transfer tube to Oil pan body retaining bolts	11	8	-
Oil pump to engine block retaining bolts	25	18	-
Pick-up pipe to oil pump retaining bolts	12	9	-
Windage tray retaining bolts	25	18	-
Piston cooling jet retaining bolts	12	9	-
Engine block coolant draining plug	50	37	-
Connecting Rod bolts			
Stage 1	10	7	-
Stage 2	50	37	-

Description	Nm	lb-ft	lb-in
Main bearing cap			
M10 bolt Stage 1	25	18	-
M10 bolt Stage 2	57 + 70°	42 + 70°	-
M8 bolt Stage 1	15	11	-
M8 bolt Stage 2	33 + 75°	24 + 75°	-

Engine - V8 S/C 5.0L Petrol - Engine - Component Location

Description and Operation

EXTERNAL VIEW



E106721

Engine - V8 S/C 5.0L Petrol - Engine - Overview

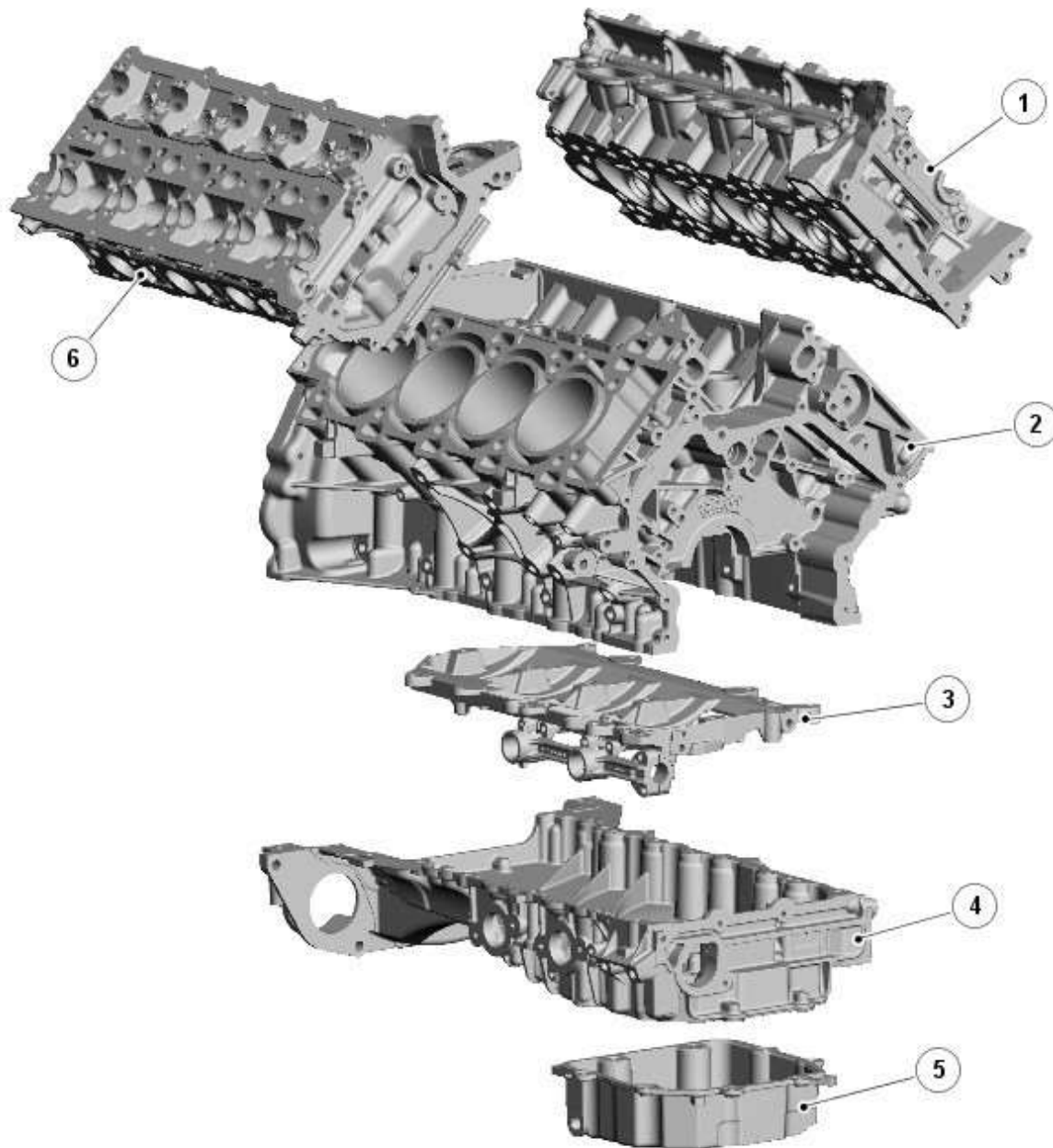
Description and Operation

INTRODUCTION

The 5.0L **SC (supercharger)** gasoline engine is a liquid cooled V8 unit featuring direct fuel injection, four overhead camshafts and four valves per cylinder. All four camshafts incorporate **VCT (variable camshaft timing)**.

The main structural components of the engine are all manufactured from aluminum alloy. The engine is built around a very stiff, lightweight, enclosed V, deep skirt cylinder block. A structural windage tray is bolted to the bottom of the cylinder block to further improve the block stiffness, minimize **NVH (noise, vibration and harshness)** and help reduce oil foaming. To further enhance the stiffness of the lower engine structure, a heavily ribbed sump body is installed. The sump body also helps to reduce engine noise.

Engine Structure



Item	Description
1	LH (left hand) cylinder head (bank B)
2	Cylinder block
3	Windage tray
4	Sump body
5	Sump pan
6	RH (right hand) cylinder head (bank A)

Engine - V8 S/C 5.0L Petrol - Engine - System Operation and Component Description

Description and Operation

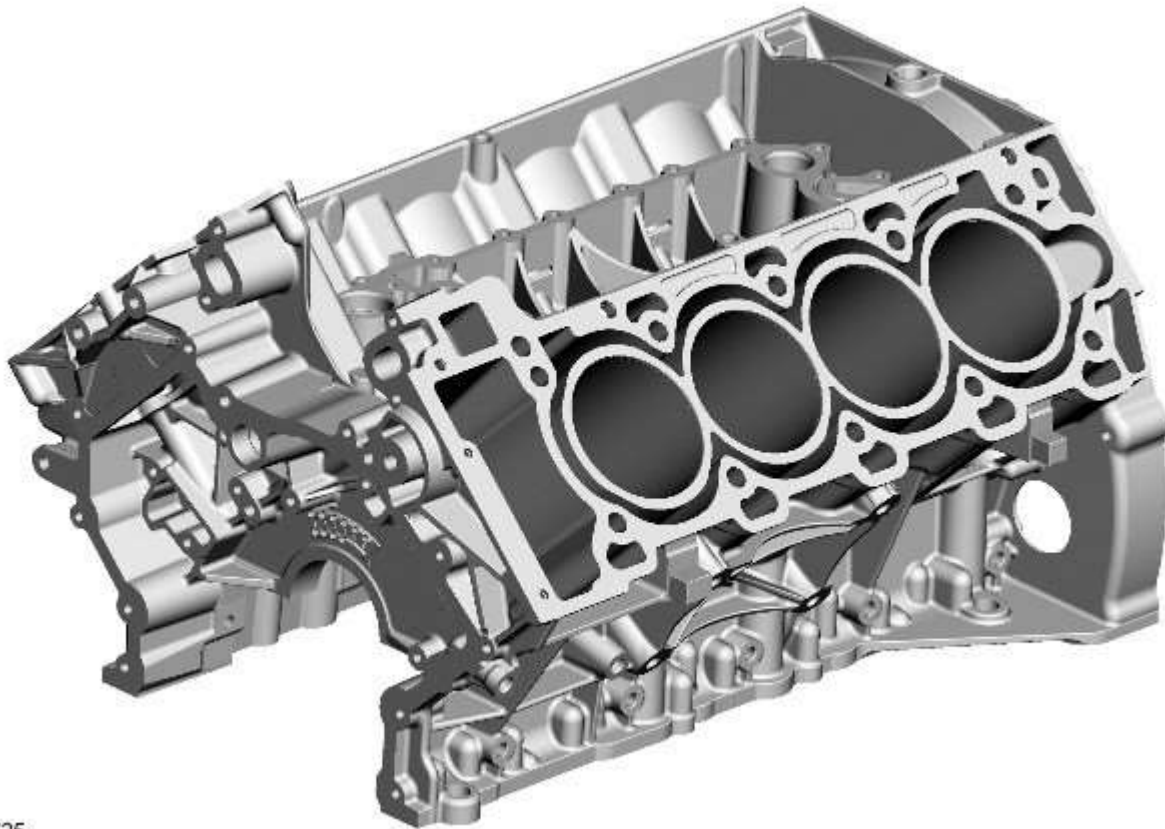
System Operation

Operation of the engine is controlled by the [ECM \(engine control module\)](#).

Refer to: [Electronic Engine Controls](#) (303-14C Electronic Engine Controls - V8 5.0L Petrol, Description and Operation).

Component Description

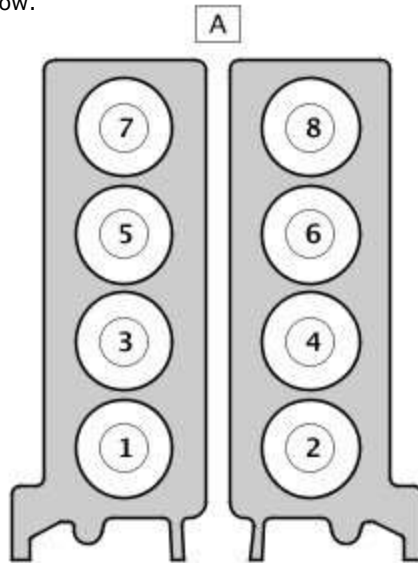
CYLINDER BLOCK



E106725

The cylinder block is a 90 degree configuration with cast-in iron cylinder liners and an open deck die-cast coolant jacket. The low volume coolant jacket gives good warm-up times and low piston noise levels. The longitudinal flow design of the coolant jacket, with a single cylinder head coolant transfer port in each bank, provides good rigidity and head gasket sealing.

The cylinders are numbered as shown below.



E163887

Item	Description
A	ISO standard cylinder numbering

ISO cylinder firing order 1,2,7,3,4,5,6,8

Engine Data Location

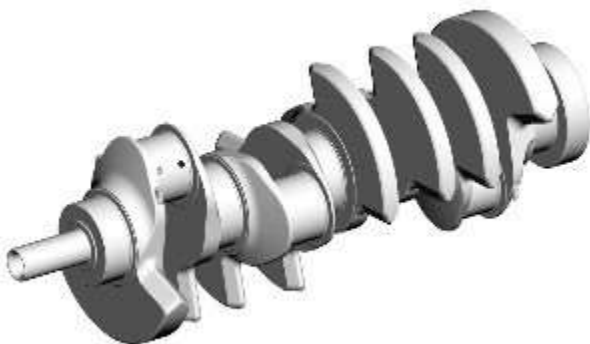


E108429

Item	Description
1	Engine data location

Engine data is marked on the cylinder block at the rear of the RH cylinder bank.

CRANKSHAFT



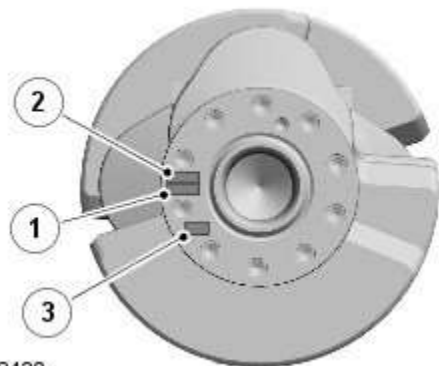
E106729

The crankshaft is made from spheroidal graphite cast iron, which, compared with grey cast iron, has higher mechanical strength, ductility and increased shock resistance. The undercut and rolled fillets also improve strength. Eight counter-balance

weights ensure low vibration levels and the large, cross-drilled main bearing journals are designed to contribute to stiffness.

An oil groove in the upper half of each main bearing transfers the oil into the crankshaft for lubrication of the connecting rod bearings. A thrust washer is installed each side of the top half of the center main bearing.

Crankshaft Data Location

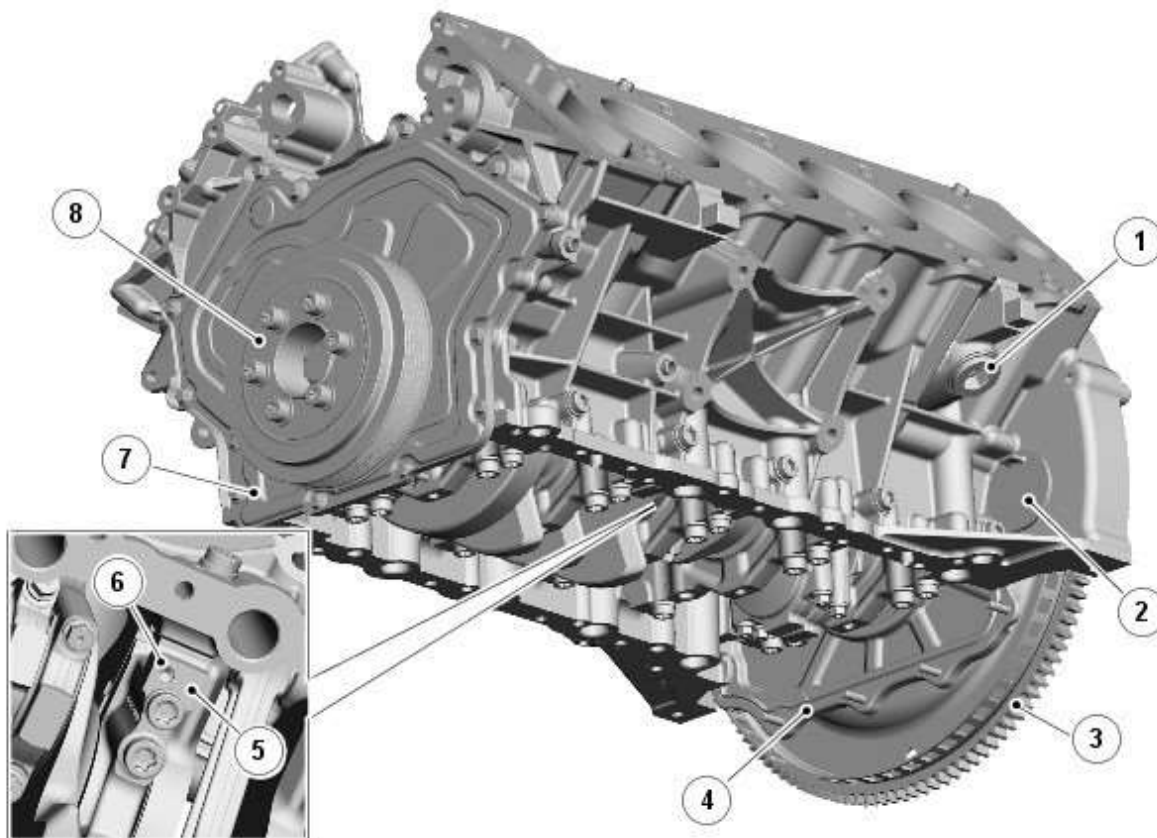


E108430

Item	Description
1	Pin journal classification and plant identification
2	Main journal classification
3	Date and time codes

The main bearings are numbered 1 to 5 starting from the front of the engine. There are five grades of main bearing available, each being color coded. Journal sizes are marked on the rear of the crankshaft. For further information refer to Engine - 5.0L, Vehicles With: Supercharger - General Procedures.

Crankshaft Installation



E115927

Item	Description
1	Coolant drain plug
2	Torque converter access plug
3	Drive plate
4	Rear cover
5	Main bearing cap
6	Identification mark
7	Front cover
8	Front pulley

The main bearing caps are made from cast iron and are cross bolted to increase rigidity. An identification mark on the bearing cap faces the front of the engine.

At the front of the crankshaft, a tuned torsional vibration damper is incorporated into the crankshaft front pulley. At the rear of the crankshaft a pressed steel drive plate, with a steel starter ring gear, is installed to transfer drive from the engine to the transmission. The reluctor ring for the [CKP \(crankshaft position\)](#) sensor is integrated into the perimeter of the drive plate.

The crankshaft seals are located in the front and rear covers.

PISTONS AND CONNECTING RODS



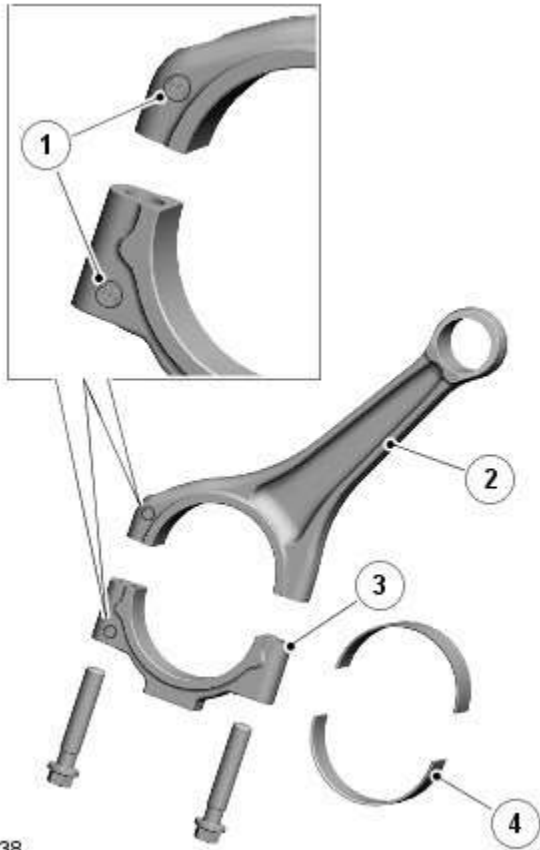
E116028

The diameter of each piston is graded and precisely matched to each cylinder bore to help reduce noise. In the vertical plane, the pistons have a slight barrel form, which helps to ensure a reliable oil film is maintained between the piston and the cylinder bore. A solid film lubricant coating is applied to both reaction faces of the piston to reduce wear and improve fuel economy.

A three-ring piston-sealing system is used. The steel top ring is treated with a PVD (physical vapor deposition) peripheral coating. PVD is a coating technique where material can be deposited with improved properties to ensure good cylinder bore compatibility and wear resistance. A Napier center ring helps cylinder pressure and oil management, while the three-piece oil control lower ring is produced from nitrided steel.

The pistons are cooled with engine oil from four piston cooling jets installed under the valley of the cylinder block. Each piston cooling jet sprays oil onto the underside of the two adjacent pistons, one from each cylinder bank.

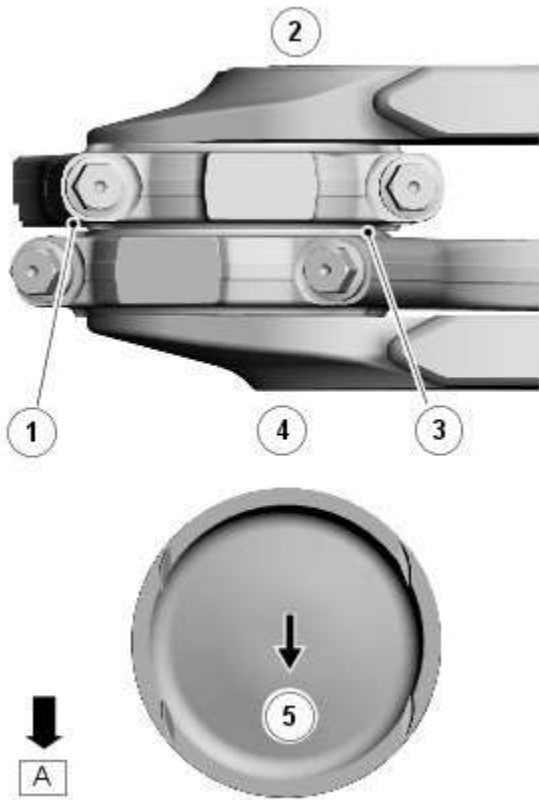
The connecting rods are forged from high strength steel. The cap is fracture-split from the rod to ensure precision re-assembly for bearing shell alignment. There are three grades of large end bearing available, each being color coded. For further information refer to Engine - 5.0L, Vehicles Without: Supercharger - General Procedures.



E108438

Item	Description
1	Alignment marks
2	Connecting rod
3	Cap
4	Bearings

The correct alignment of the cap with the connecting rod is indicated by marks on adjacent faces of the two components.



E116029

Item	Description
A	Front of engine
1	Alignment mark
2	LH side (bank B)
3	Alignment mark
4	RH side (bank A)
5	Piston orientation arrow

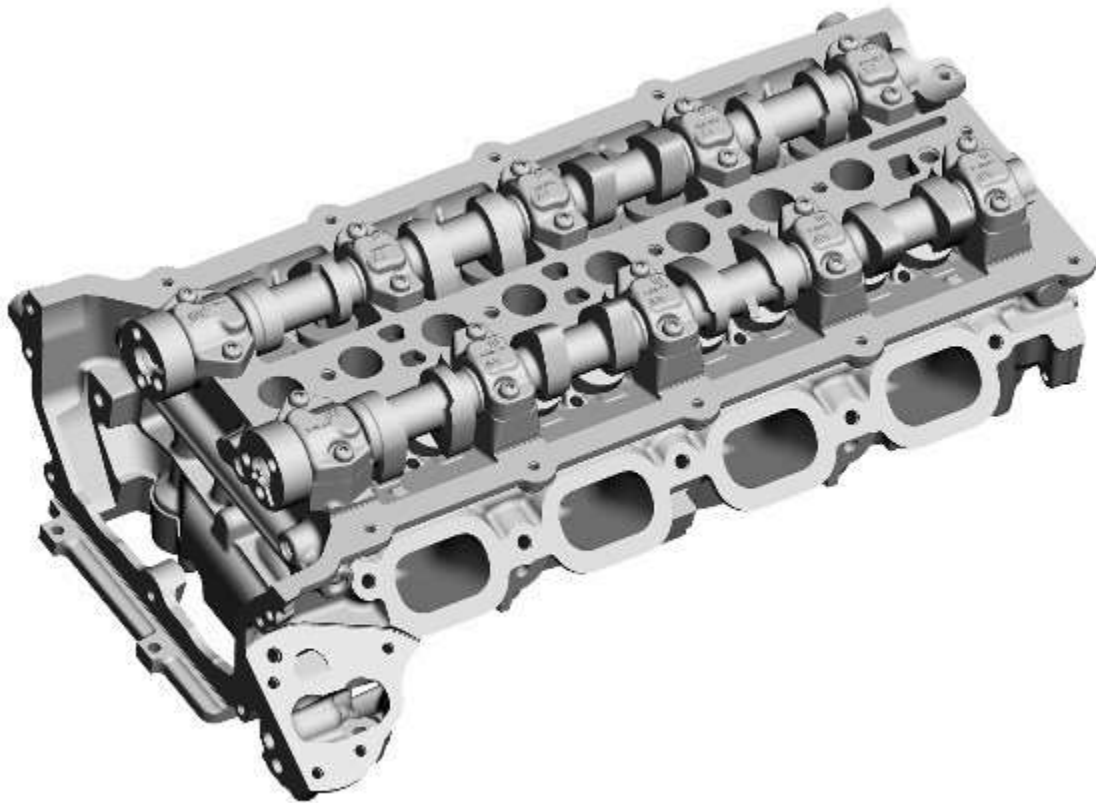
The orientation of the connecting rods and pistons on the crankshaft are given below:

- Bank A - The arrow on the piston crown must face the front of the engine and the cap and connecting rod alignment marks must face the rear of the engine.
- Bank B - The arrow on the piston crown must face the front of the engine and the cap and connecting rod alignment marks must face the front of the engine.

CYLINDER HEADS



NOTE: RH (right-hand) (A bank) cylinder head shown, LH (left-hand) (B bank) cylinder head similar.



E116030

The cylinder heads are manufactured in gravity die cast aluminum alloy and are unique for each cylinder bank. Deep-seated bolts reduce distortion and secure the cylinder heads to the cylinder block.

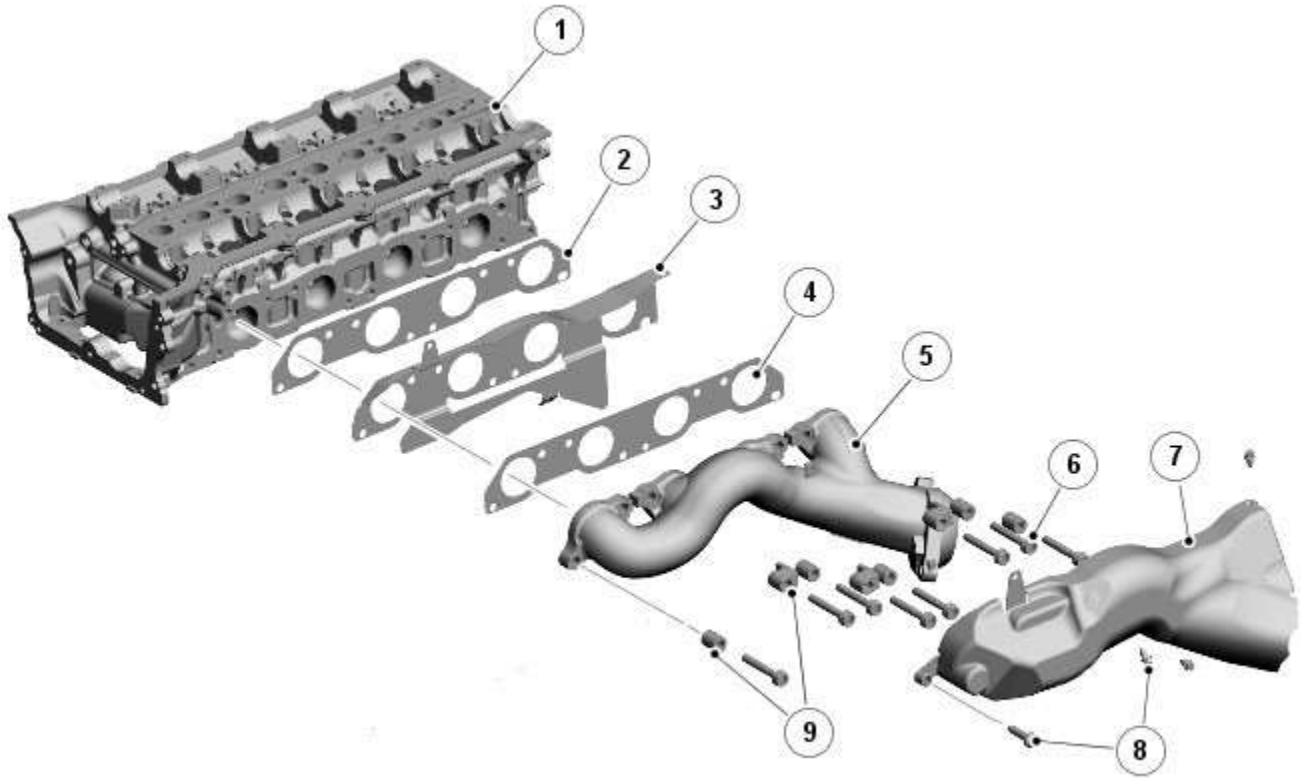
Each cylinder is served by four valves. To help achieve the required gas-flow characteristics, these are arranged asymmetrically around the cylinder bore. Each cylinder has a centrally mounted fuel injector and spark plug.

The cylinder head gasket is of a multi-layer steel construction.

EXHAUST MANIFOLD



NOTE: LH (B bank) installation shown, RH (A bank) installation similar.

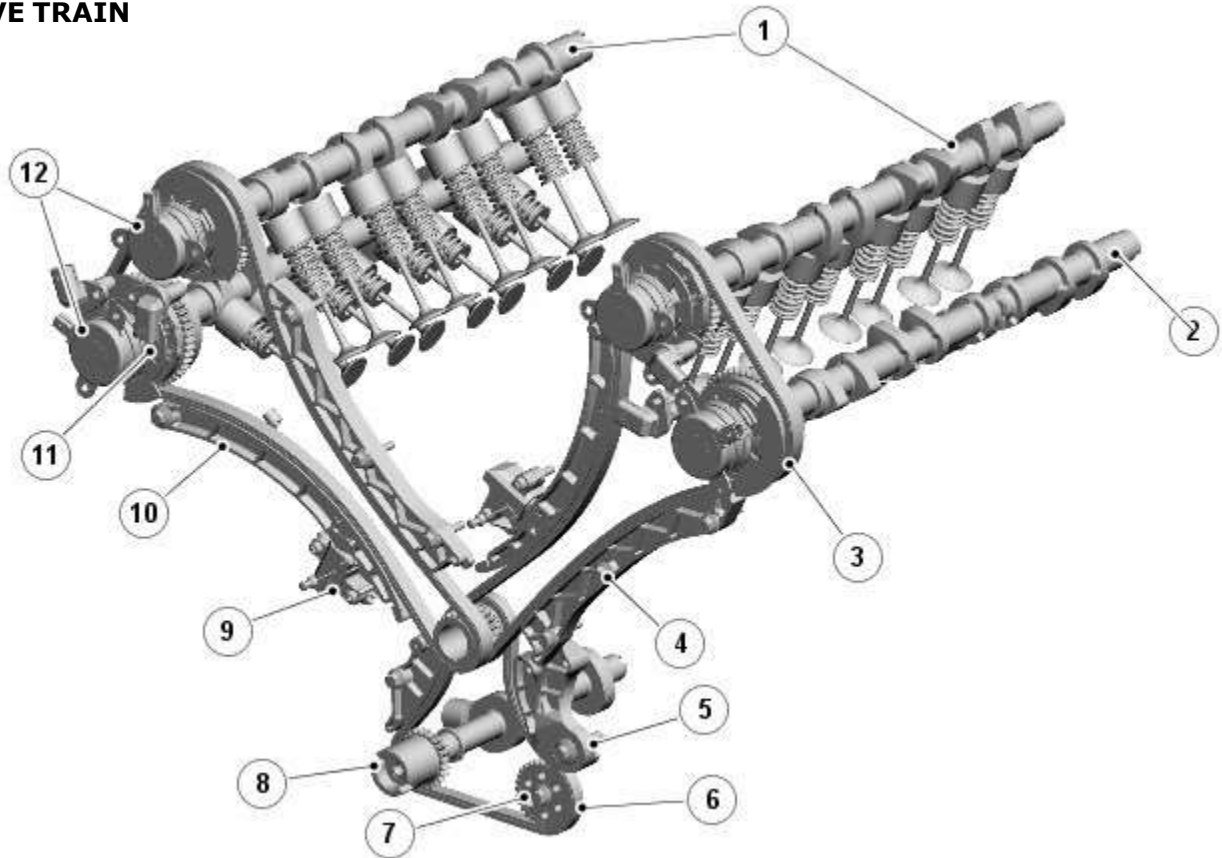


E115622

Item	Description
1	Cylinder head
2	Gasket
3	Heat shield
4	Gasket
5	Exhaust manifold
6	Bolt (8 off)
7	Heat shield
8	Bolt (4 off)
9	Spacer (8 off)

The high SiMo (silicon molybdenum) cast iron exhaust manifolds are unique for each cylinder bank. Each exhaust manifold installation includes two metal gaskets and two heat shields. Spacers on the securing bolts allow the manifolds to expand and contract with changes of temperature while maintaining the clamping loads.

VALVE TRAIN



E116031

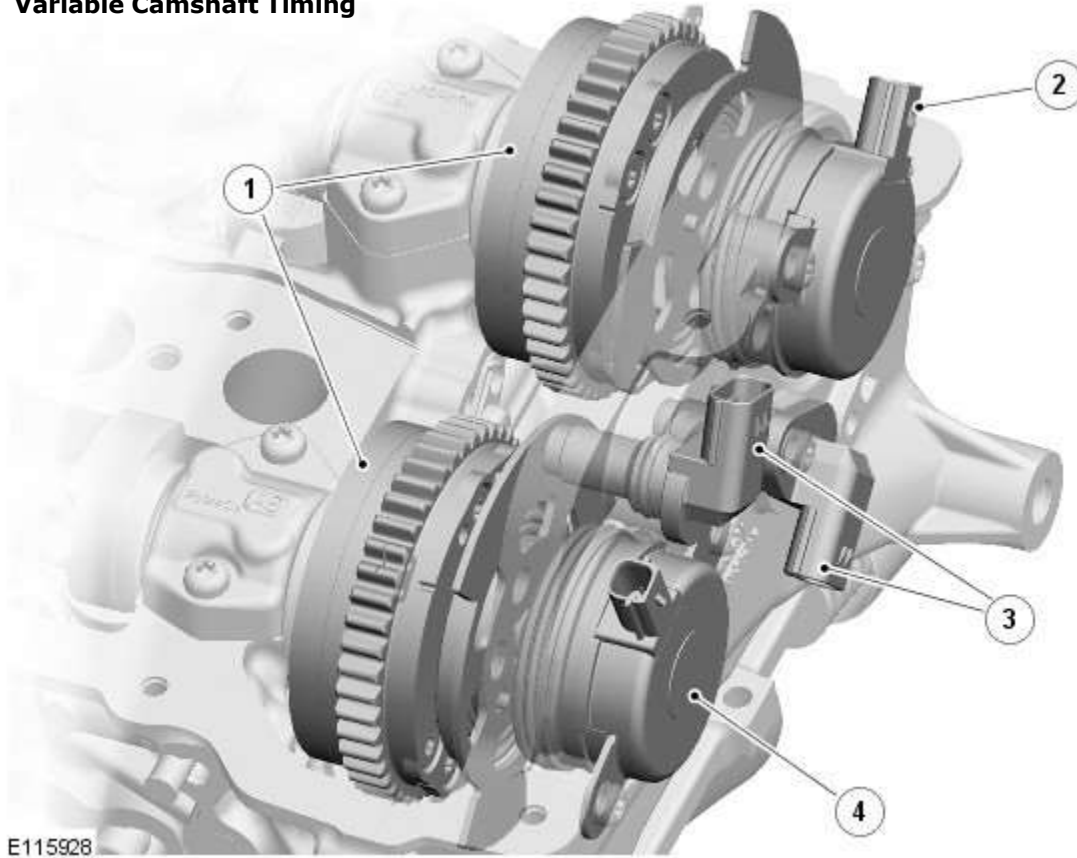
Item	Description
1	Inlet camshafts
2	Exhaust camshaft
3	Inverted tooth timing chain
4	Nylon chain guide
5	Auxiliary chain tensioner
6	Auxiliary drive chain
7	Oil pump drive
8	Auxiliary drive camshaft
9	Timing chain tensioner
10	Tensioner lever
11	VCT unit
12	VCT solenoids

The lightweight valve train provides good economy and noise levels and is chain driven from the crankshaft.

Double overhead camshafts on each cylinder head operate the valves. For each cylinder head, an inverted tooth timing chain transfers drive from the crankshaft to the **VCT (variable camshaft timing)** unit on the front of each camshaft. Graded tappets enable setting of inlet and exhaust valve clearances.

Each timing chain has a hydraulic tensioner operated by engine oil pressure. The chain tensioners incorporate a ratchet mechanism, which maintains tension while the engine is stopped to eliminate start-up noise. The chains are lubricated with engine oil from jets located at the front of the engine block. Nylon chain guides control chain motion on the drive side.

Variable Camshaft Timing



Item	Description
1	VCT units
2	Intake camshaft VCT solenoid
3	Camshaft position sensors
4	Exhaust camshaft VCT solenoid

The [VCT](#) system varies the timing of the intake and exhaust camshafts to deliver optimum engine power, efficiency and emissions. The timing of the intake camshafts has a range of 62 degrees of crankshaft angle. The timing of the exhaust camshafts has a range of 50 degrees of crankshaft angle.

In the base timing position:

- The intake camshafts are fully retarded.
- The exhaust camshafts are fully advanced.

VCT Operating Ranges

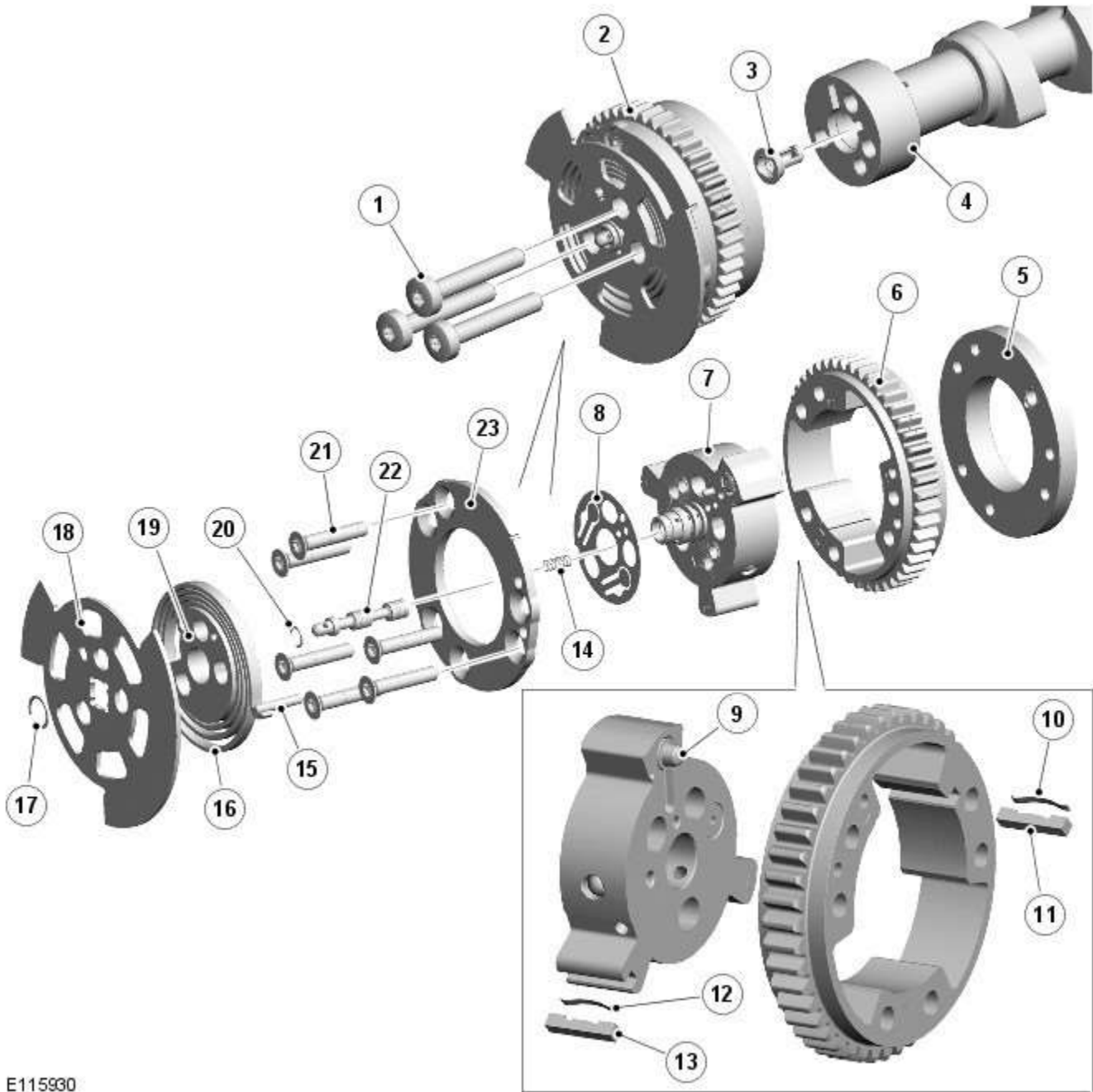
Camshaft	Valve Opens	Valve Closes
Intake	29 degrees BTDC (before top dead center) to 33 degrees ATDC (after top dead center)	207 to 269 degrees ATDC
Exhaust	244 to 194 degrees BTDC	6 to 56 degrees ATDC

The system consists of a [VCT](#) unit and a [VCT](#) solenoid for each camshaft. The [ECM](#) controls the system using [PWM](#) (pulse width modulation) signals to the [VCT](#) solenoids.

The torsional energy generated by the valve springs and the inertia of the valve train components are used to operate the system.

Variable Camshaft Timing Units

The [VCT](#) units change the position of the camshafts in relation to the timing chains.



E115930

Item	Description
1	Bolt (3 off)
2	VCT unit
3	Filter
4	Camshaft
5	Inner plate
6	Housing and sprocket
7	Rotor assembly
8	Reed plate
9	Spring and lock pin
10	Spring (3 off)
11	Tip seal (3 off)
12	Spring (2 off)
13	Tip seal (2 off)
14	Spring

15	Dowel pin
16	Bias spring
17	Snap ring
18	Reluctor ring
19	Center plate
20	Snap ring
21	Screw (6 off)
22	Spool valve
23	Outer plate

Each [VCT](#) unit is attached to the camshaft by three bolts. A rotor assembly and a reed plate are installed inside a sprocket housing, which consists of a sprocket, an outer plate and an inner plate held together by six screws.

A reluctor ring, for the [CMP \(camshaft position\)](#) sensor, a center plate and a bias spring are installed at the front of the [VCT](#) unit. The ends of the bias spring locate on the center plate assembly and the sprocket housing, to give a turning moment to the camshaft in the advance direction. A snap ring locates the reluctor ring on to a sleeve installed in the center of the rotor assembly. The opposite end of the sleeve locates in a bore in the front face of the camshaft, which contains a filter.

A spring and spool valve are installed in the rotor assembly sleeve and retained by a snap ring. The spring keeps the spool valve in contact with the armature of the related [VCT](#) solenoid.

Each [VCT](#) unit is supplied with engine oil from an oil gallery in the cylinder head, through the camshaft front bearing cap and a bore in the center of the camshaft.

Variable Camshaft Timing Solenoids

The [VCT](#) solenoids control the position of the spool valves in the [VCT](#) units.



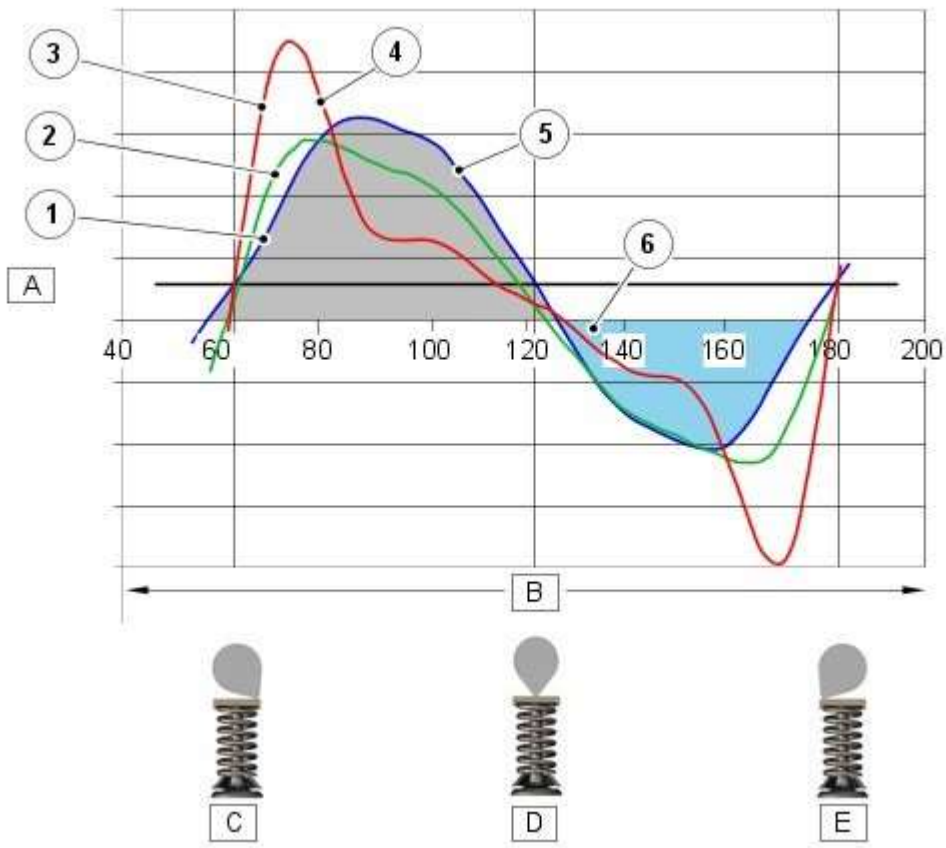
E 115929

The [VCT](#) solenoids are installed in the front upper timing covers, immediately in front of their related [VCT](#) units. Each [VCT](#) solenoid is secured with two screws and sealed with an O-ring. A two pin electrical connector provides the interface with the engine harness.

Each [VCT](#) solenoid incorporates a spindle that acts on the spool valve in the related [VCT](#) unit to advance and retard the camshaft timing. The [VCT](#) solenoids operate independently and are controlled by a [PWM](#) signal from the [ECM](#).

Variable Camshaft Timing Operation

When the engine is running, the compression and expansion of the valve springs causes momentary increases and decreases in the torque acting on the camshafts. These momentary changes of torque are sensed in the [VCT](#) units and used to change the camshaft timing.



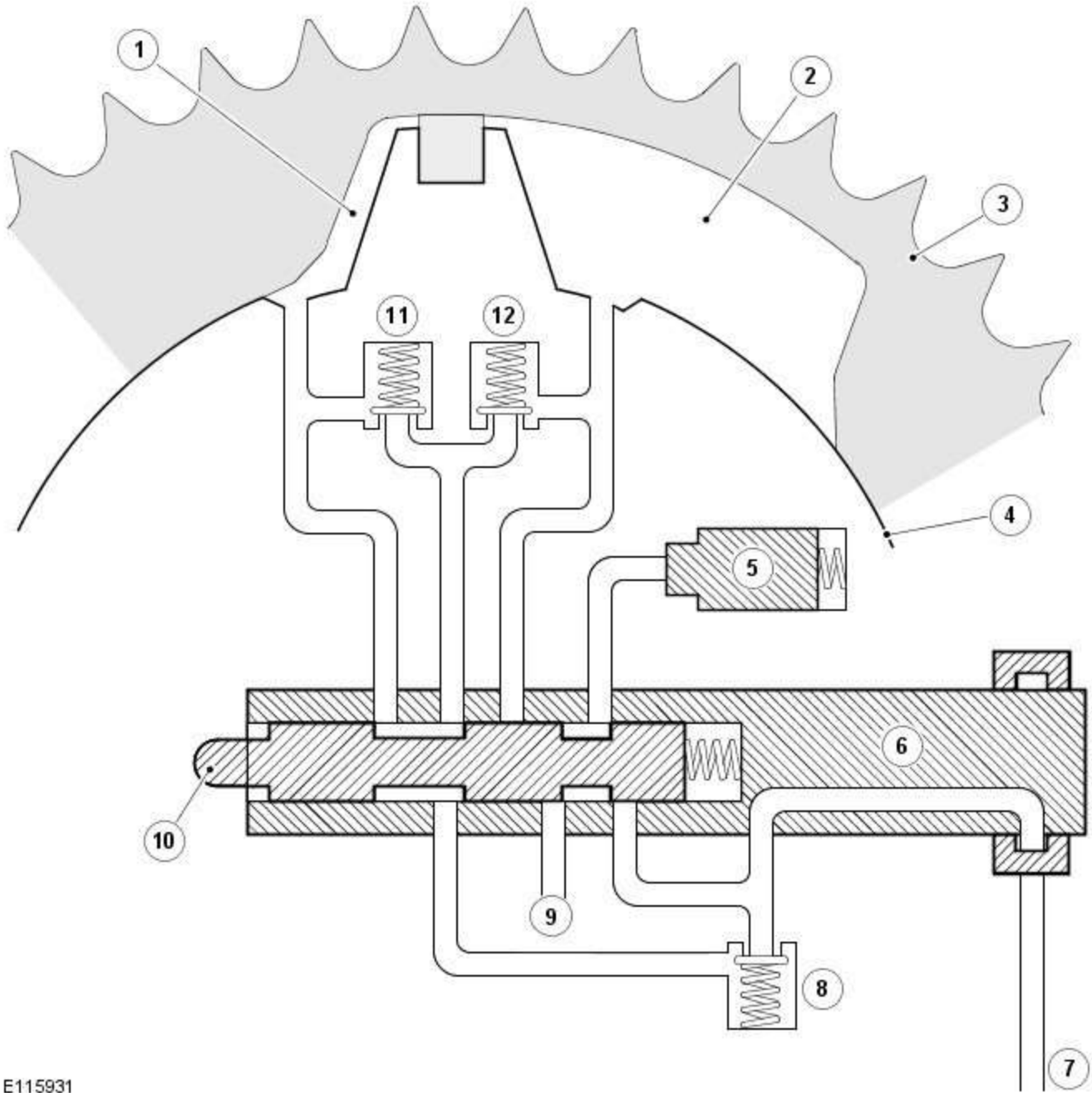
E112406

Item	Description
A	Camshaft torque
B	Camshaft rotation (degrees)
	Valve opening
D	Peak lift
E	Valve closing
1	1000 rev/min
2	4000 rev/min
3	7000 rev/min
4	Inertia effects from valve train rotating components
5	Force caused by valve spring
6	Bias torque from friction



NOTE: Intake camshaft [VCT](#) unit shown. For exhaust camshaft [VCT](#) unit, read advance for retard and retard for advance.

Variable Camshaft Timing Unit Schematic - Base Timing



E115931

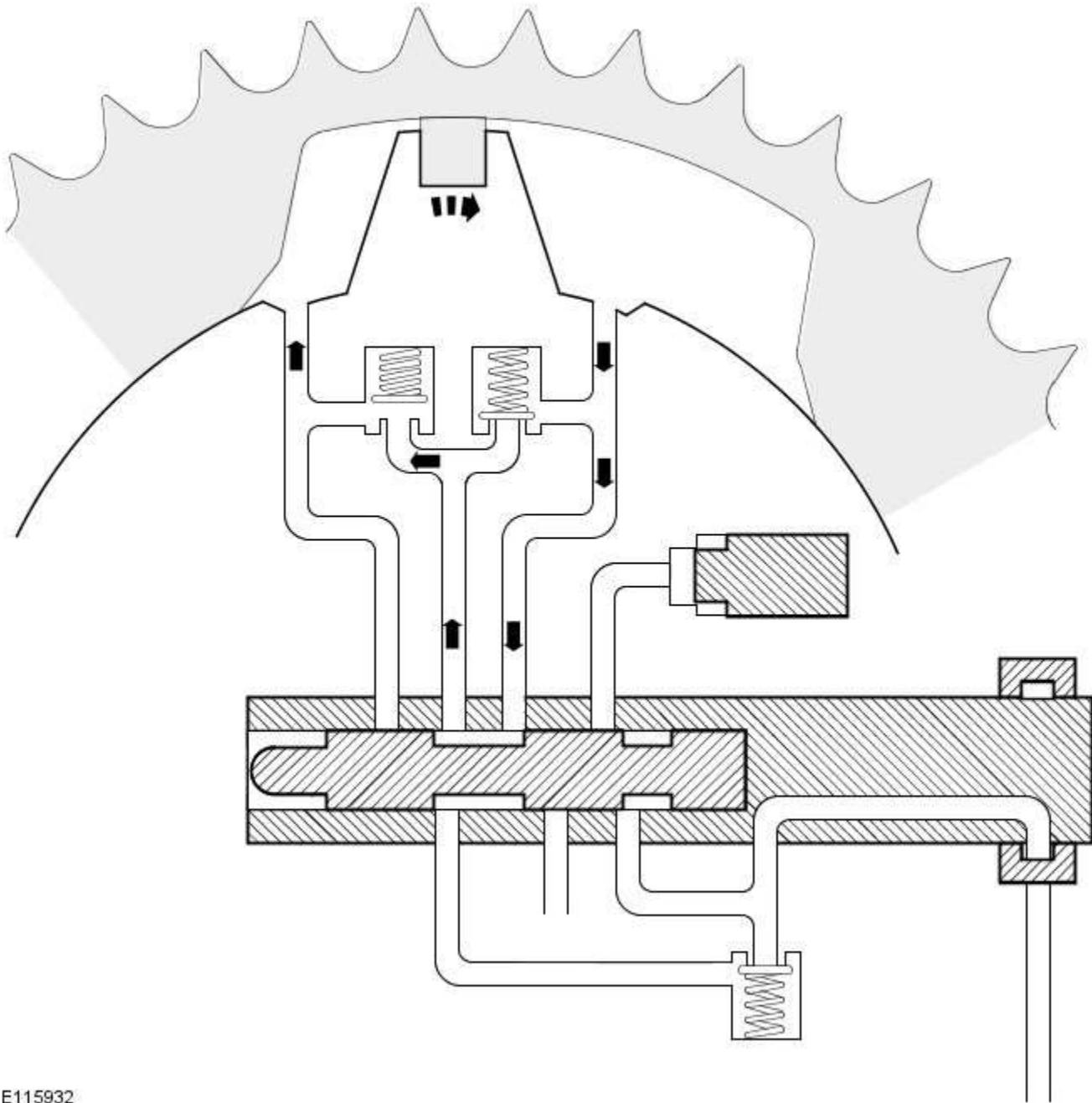
Item	Description
1	Advance chamber
2	Retard chamber
3	Sprocket housing
4	Rotor assembly
5	Lock pin
6	Sleeve
7	Engine oil supply from camshaft
8	Inlet check valve
9	Lock pin drain
10	Spool valve
11	Advance check valve
12	Retard check valve

At engine start-up, once the engine oil pressure in the camshaft is sufficient to open the inlet check valve, engine oil flows across the spool valve, through the advance and retard check valves and into the advance and retard chambers. During the start cycle, the [ECM](#) signals the [VCT](#) solenoid to move the spool valve into the sleeve and connect the lock pin to inlet oil

pressure. The inlet oil pressure causes the lock pin to retract from the inner plate and unlock the rotor assembly and camshaft from the sprocket housing.

There is a constant supply of oil to the [VCT](#) to ensure the unit remains filled during operation.

Variable Camshaft Timing Unit Schematic - Advance

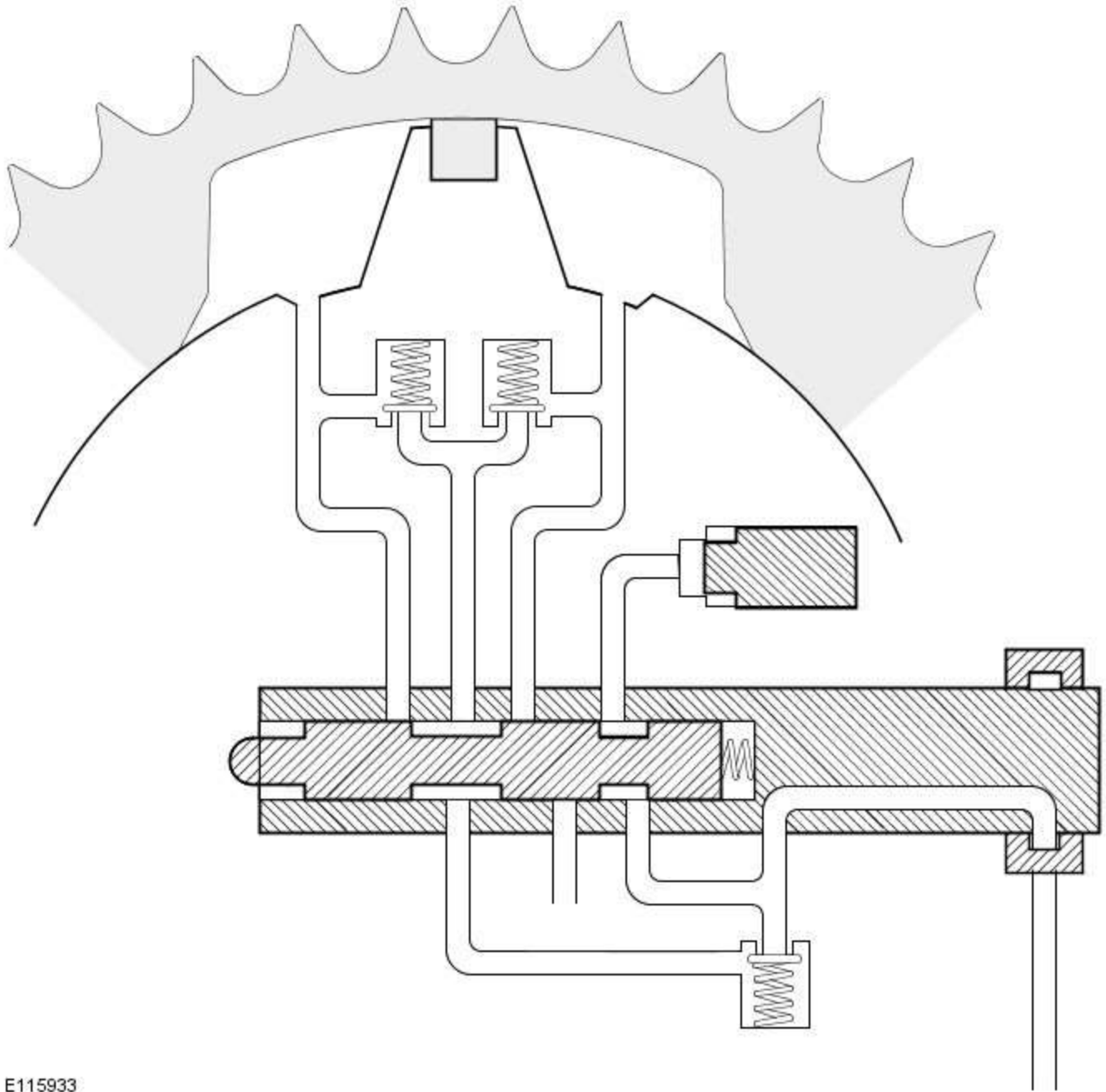


E115932

To advance the camshaft timing, the [ECM](#) adjusts the signal to the [VCT](#) solenoid to move the spool valve so that the advance chamber oil passage is closed and the retard chamber oil passage is connected to inlet oil.

Each momentary increase of the torque acting on the camshaft generates a pressure pulse in the retard chamber. Oil moves from the retard chamber, through the spool valve and the advance check valve to the advance chamber, to equalize the pressures in the two chambers. The displacement of oil from the retard chamber causes the rotor assembly to advance in relation to the sprocket housing. Each momentary decrease of torque acting on the camshaft also generates a pressure pulse in the advance chamber, but, with the advance chamber oil passage closed, no movement of oil between the advance and retard chambers occurs and the rotor assembly cannot move in the retard direction.

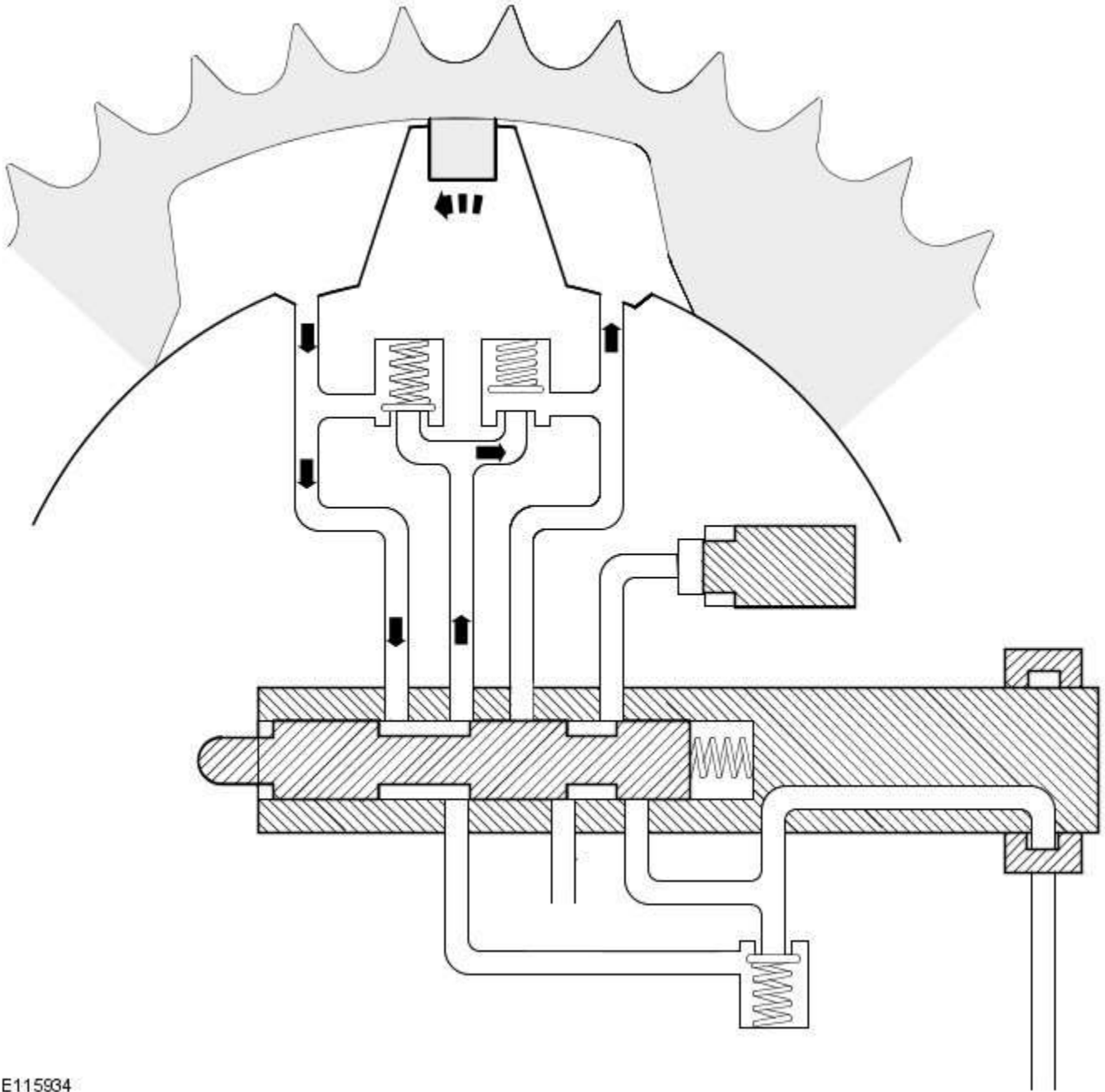
Variable Camshaft Timing Unit Schematic - Null



E115933

Once the camshaft has reached the required timing position the [ECM](#) adjusts the signal to the [VCT](#) solenoid to set the spool valve in the null position. In the null position, the advance and retard chamber oil passages are both closed by the spool valve and the rotor assembly is hydraulically locked to the sprocket housing.

Variable Camshaft Timing Unit Schematic - Retard

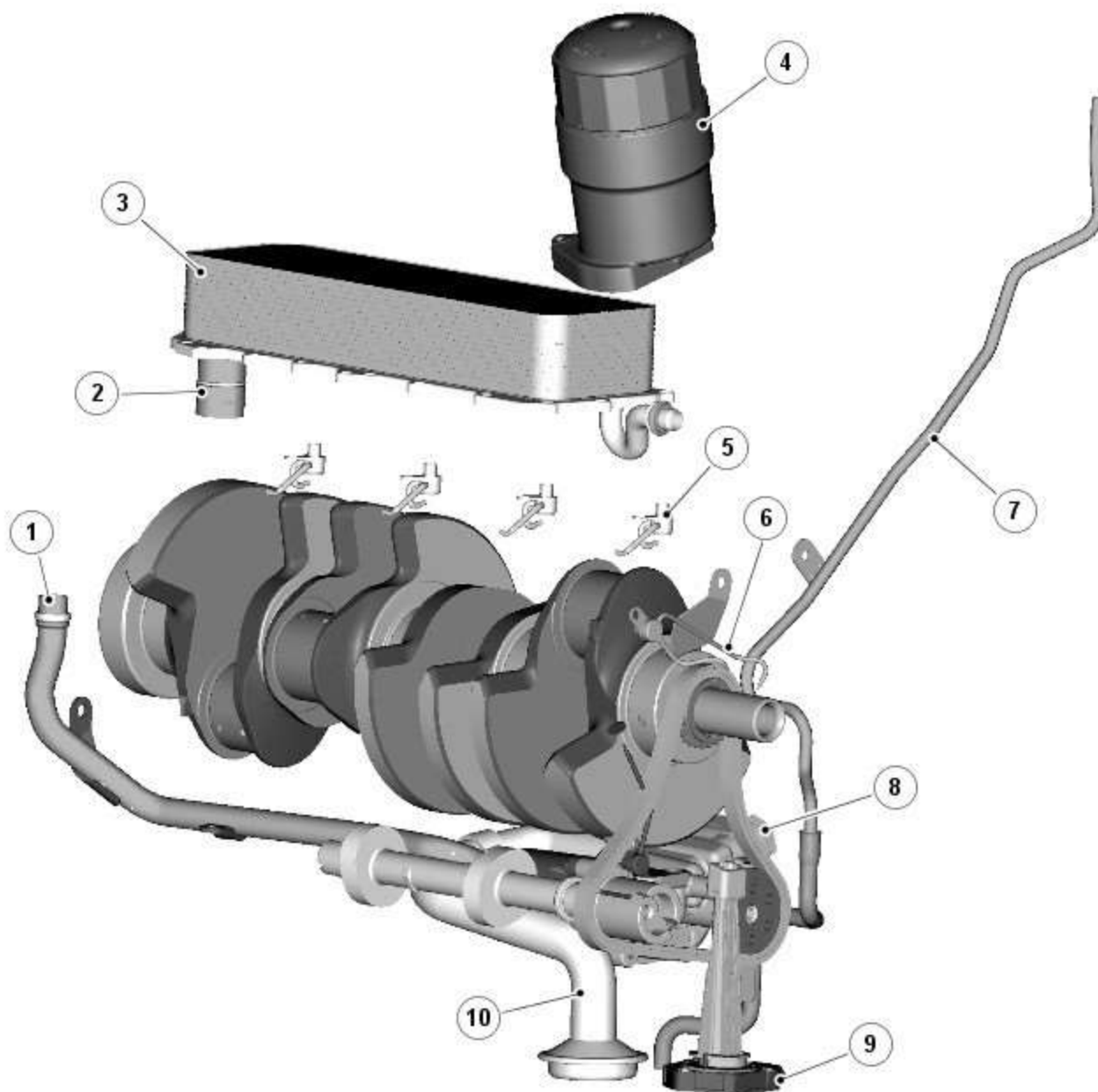


E115934

To retard the camshaft timing, the [ECM](#) adjusts the signal to the [VCT](#) solenoid to move the spool valve to close the retard chamber oil passage and connect the advance chamber oil passage to the inlet oil.

Each momentary decrease of the torque acting on the camshaft causes oil to transfer from the advance chamber, through the spool valve and the retard check valve to the retard chamber, and so retard the camshaft timing.

LUBRICATION SYSTEM



E106742

Item	Description
1	Oil pump outlet tube
2	Anti-drain valve
3	Oil cooler
4	Oil filter
5	Piston cooling jets
6	Timing chain lubrication jets
7	Oil evacuation tube
8	Oil pump
9	Oil temperature and level sensor
10	Oil pick-up

The oil pump is attached to the underside of the windage tray. The input shaft of the oil pump is driven from the front of the crankshaft, by the auxiliary chain, at 0.87 engine speed.

The oil pump draws oil from the sump pan through a centrally mounted pick-up pipe. The oil is pressurized and pumped through an output tube to the cylinder block. After passing through an anti-drain valve and a plate type oil cooler, the oil is filtered by a replaceable cartridge installed on the front of the [RH](#) cylinder head.

The output from the oil filter is distributed through oil galleries in the cylinder heads and cylinder block. All moving parts are lubricated by pressure or splash oil. Pressurized oil is also provided for the [VCT](#) system, the timing chain tensioners, the piston cooling jets and the timing chain lubrication jets.

The oil returns to the oil pan under gravity. Large drain holes through the cylinder heads and cylinder block ensure the rapid return of the oil to the sump pan. System replenishment is through the oil filler cap on the [LH](#) cylinder head cover.

An oil evacuation tube is installed to allow oil to be drawn from the sump pan. The upper end of the oil evacuation tube is located under the oil filler cap.

An oil drain plug is installed in the [RH](#) side of the sump pan.

Oil Pump Nominal Operating Pressures

Engine Speed, rev/min	Temperature, °C (°F)	Pressure, bar (lbf/in ²)
Idle	20 (68)	2.0 (29.0)
1500	20 (68)	6.0 (87.0)
3000	40 (104)	6.2 (90.0)
3000	110 (230)	5.0 (72.5)
3000	130 (266)	4.0 (58.0)

Oil Level Monitoring

Oil level monitoring is provided by an oil level and temperature sensor that measures the oil level in the sump pan. The oil level can be displayed in the message center of the instrument cluster.



E115936

The oil level and temperature sensor supplies the [ECM](#) with a signal containing the level and temperature of the oil in the sump pan. The oil level and temperature sensor is secured to the bottom of the sump pan with three screws and sealed with a gasket.

The oil level and temperature sensor sends an ultrasonic pulse vertically upward and measures the time taken for the pulse to be reflected back from the top surface of the oil. This time is compared with the time taken for an ultrasonic pulse to travel a reference distance within the oil level and temperature sensor to determine the oil level. The oil level reading is combined with the oil temperature reading and transmitted in a [PWM](#) signal to the [ECM](#).

Oil Level and Temperature Sensor Specifications

Feature	Details
Power source	Battery Voltage
Level Accuracy	±2 mm (±0.08 in.) at temperatures of -30 °C (-22 °F) and above; (±4 mm (±0.16 in.) at temperatures below -30 °C (-22 °F))
Temperature Accuracy	±2 °C (±3.6 °F)
Operating Level Range	116 to 147 mm (4.57 to 5.79 in.)

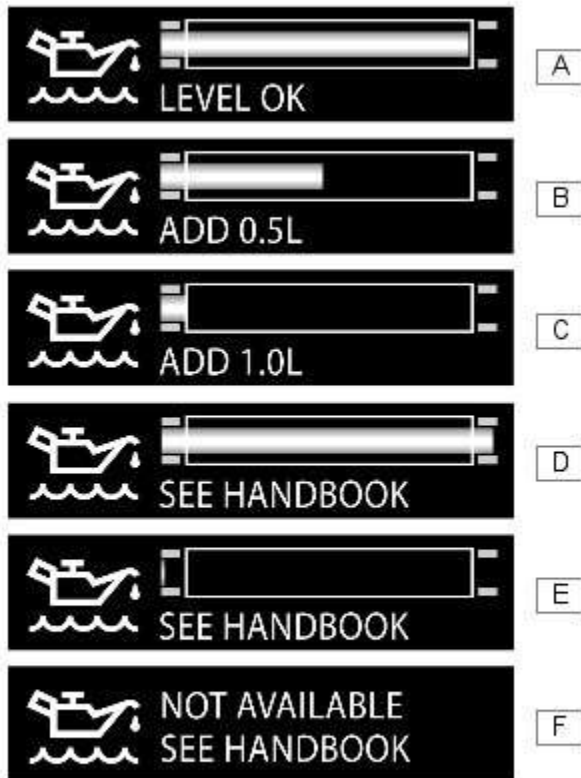
Feature	Details
Operating Temperature Range	-40 to 160 °C (-40 to 320 °F)

Oil Level Check

For additional information, refer to Engine Oil Draining and Filling (303-01A, General Procedures).

For accuracy, oil level checks should be performed with the vehicle on level ground when the oil is hot. The vehicle needs to stand for approximately 10 minutes, after the engine is switched off, to allow the oil to drain back into the sump pan and the oil level to stabilize. The oil level system will not give a reading until the oil level has stabilized.

With the ignition on, the engine stopped and the transmission in P (park), repeatedly press the trip button on the end of the [LH](#) multifunction switch until the oil level icon and applicable message are displayed in the fuel gage/trip computer area of the message center, as shown below:



E107571

Item	Description
A	Oil level is between 50% and 100% of recommended level. No top-up required.
B	Oil level is between 12.5% and 50% percent of recommended level. Add 0.5 liter (0.53 US quart) of oil.
C	Oil level is between 0% and 12.5% of recommended level. Add 1 liter (1.06 US quarts) of oil.
D	Oil level is above maximum for safe operation. Reduce oil level to recommended level.
E	Oil level is below minimum for safe operation. Add 1.5 liters (1.59 US quarts) of oil, then recheck level.
F	Oil level is stabilizing. Wait 10 minutes and then recheck level. If this display is accompanied by the message ENGINE OIL LEVEL MONITOR SYSTEM FAULT, a fault with the oil level monitoring system is indicated.

System Fault Warning

If there is a fault with the system, in addition to being displayed during an oil level check, the message ENGINE OIL LEVEL MONITOR SYSTEM FAULT will be temporarily displayed when the ignition is first switched on.

Engine - V8 S/C 5.0L Petrol - Engine

Diagnosis and Testing

For additional information.

REFER to: [Engine - 5.0L](#) (303-00 Engine System - General Information, Diagnosis and Testing).

Engine - V8 S/C 5.0L Petrol - Engine Oil Draining and Filling

General Procedures

Draining



WARNING: The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.



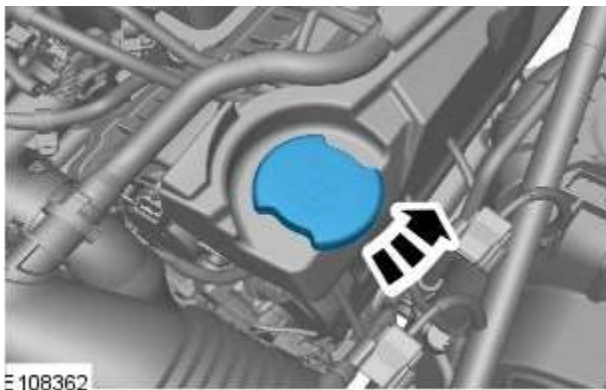
CAUTION: Correct installation of the oil filler cap can be obtained by tightening the cap until hard stop.



NOTE: Clean the components general area prior to dismantling.

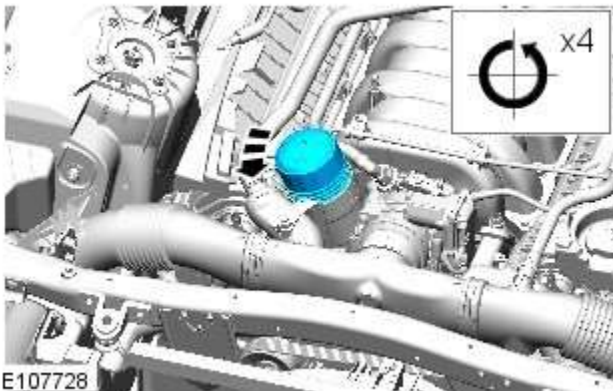
1.  **CAUTION:** Make sure the engine is warm.

Start the engine and allow to run for 10 minutes, stop the engine.



- 2.

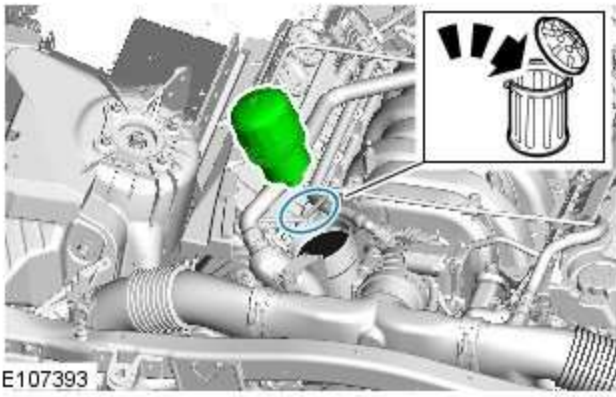
3. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



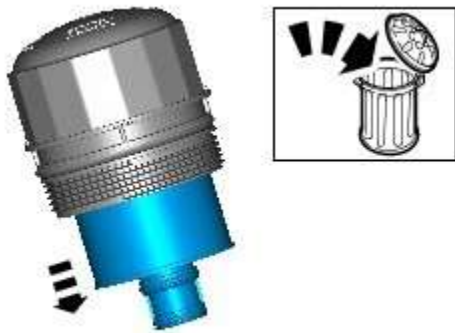
- 4.

- Loosen the element cover 4 complete turns to allow engine oil to drain from the filter cover.
- Make sure that the O-ring seal is exposed.


5. **NOTE:** Allow 10 minutes for the engine oil to drain from the oil filter housing.



6.  NOTE: Remove and discard the O-ring seal.

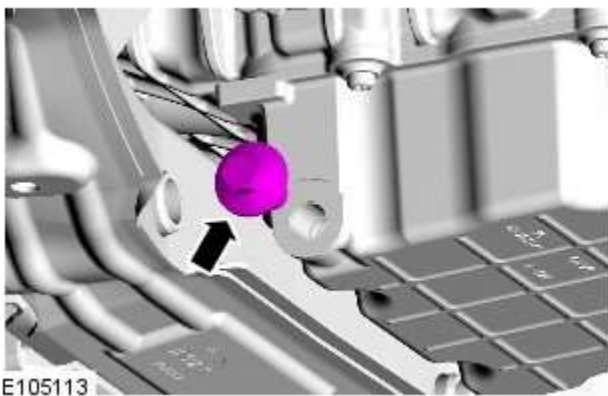


7. Remove and discard the oil filter element.

8.  WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

9. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).



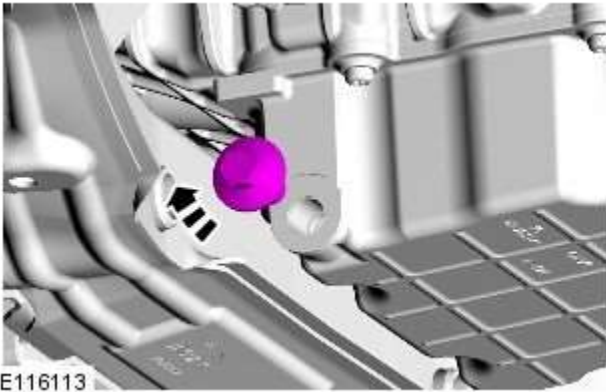
10. CAUTIONS:

 Be prepared to collect escaping oil.

 Allow at least 10 minutes for the engine oil to drain.

 NOTE: Discard the sealing washer.

Filling



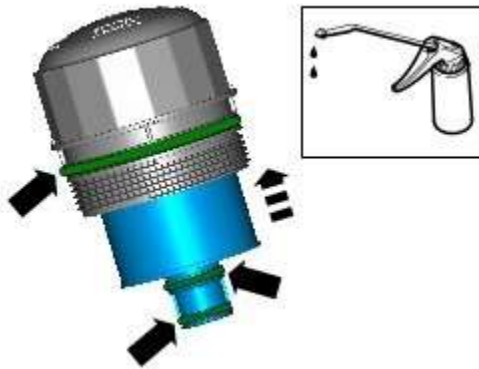
1. CAUTION: Make sure that the area around the component is clean and free of foreign material.



NOTE: Install a new sealing washer.

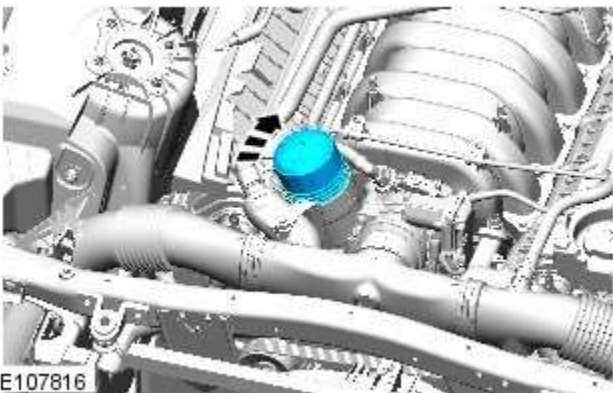
Torque: 24 Nm

2. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).




3. NOTE: Install new O-ring seals.

Lubricate the oil filter element O-ring seal with clean engine oil.



4. CAUTION: Tighten the component finger tight first.

- Torque: 25 Nm

5.  CAUTION: Make sure that the vehicle is left for 5 minutes from filling with oil and that the engine oil level is reading at least minimum (by following Steps 9-13), before starting the engine.

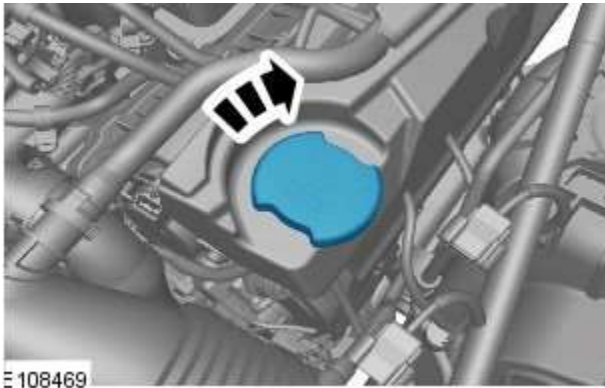
- Fill the engine with oil - for filling values on vehicles without supercharger:

Refer to: [Specifications](#) (303-01C Engine - V8 5.0L Petrol, Specifications).


- Fill the engine with oil - for filling values on vehicles with supercharger:

Refer to: [Specifications](#) (303-01D Engine - V8 S/C 5.0L Petrol, Specifications).

- Clean any residual engine oil from the oil filler cap area.



6.

7.  CAUTION: Make sure that the vehicle has been left for 5 minutes from filling with oil.

Follow the Steps 9-13 before starting the engine.

8.

- Start the engine and allow to run for 10 minutes, stop the engine.
- Check for leaks.

9. CAUTIONS:



Make sure that the selector lever and the gearshift mechanism are in the park (P) position.



Make sure that the hood is open.

- Turn the ignition on.



E115112

10.

- Scroll through the trip menu to access the engine oil level display.



E111933

11.

- Press the cruise control cancel button twice within 2 seconds.



E111932

12.

- The message center display will revert to the normal display in the trip computer.
- Scroll through the trip menu to access the engine oil level display.
- Check that the oil level display shows an oil level reading.
- Only after having started and run the engine for 10 minutes (as indicated in Step 8), switch off the engine, then stabilizing for 10 minutes, take a reading from the oil level display and, if necessary top up with engine oil.

13.  **NOTE:** If instructed to follow Steps 9-13 in a previous step, return to Step 8 and continue the procedure.

Turn the ignition off.

14. Allow 10 minutes for the engine oil level to stabilize if there has been additional oil top up.

15.  **NOTE:** The following steps are to update the average oil level value.

- Turn the ignition on.
- Press and hold the cruise control cancel button for more than 2 seconds.



E111933

16.
 - The message center display will revert to the normal display in the trip computer.
17. Turn the ignition off.
18. Turn the ignition on.

19.

- Scroll through the trip menu to access the engine oil level display.
- Make sure that the average oil level value has now been updated.





E111932

20. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

Engine - V8 S/C 5.0L Petrol - Engine Oil Vacuum Draining and Filling

General Procedures

Special Tool(s)

 <p>E129630</p>	<p>303-1484 Vacuum Pump, Oil Drain</p>
 <p>E129631</p>	<p>303-1484-01 Adapter for 303-1484</p>

Draining



WARNING: The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.



CAUTION: Correct installation of the oil filler cap can be obtained by tightening the cap until hard stop.

NOTES:



Make sure that the vehicle is parked on level ground.



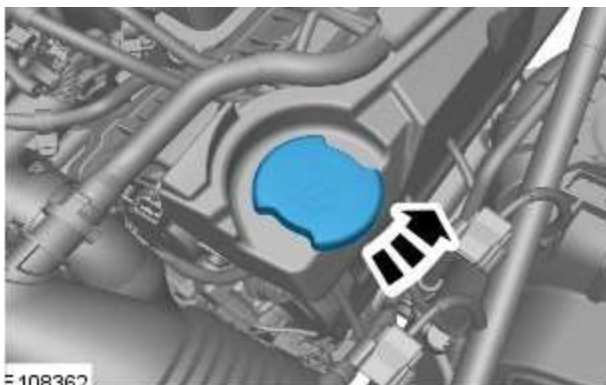
Clean the components general area prior to dismantling.

1.

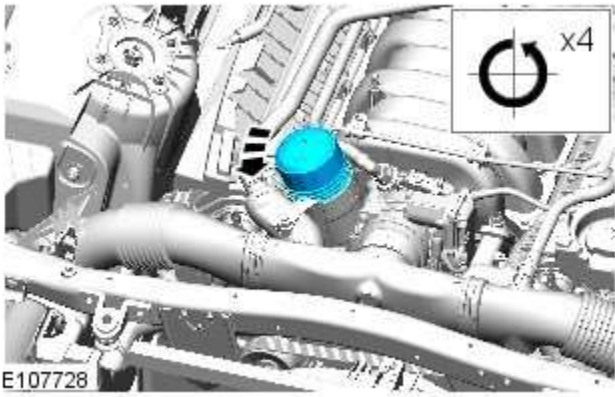
- Start the engine and allow to run for 10 minutes, stop the engine.



2. **CAUTION:** Allow 10 minutes from turning the engine off before starting oil extraction.

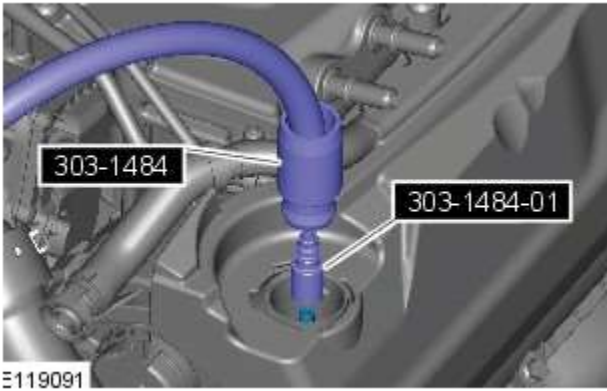


3. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



4.

- Loosen the element cover 4 complete turns to allow engine oil to drain from the filter cover.



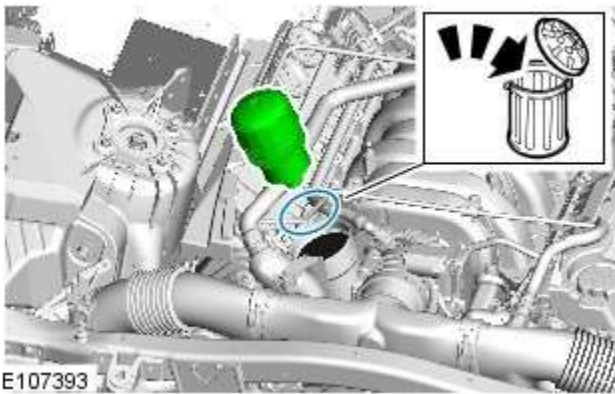
5.

- Using the oil vacuum pump drain the oil out through the oil extraction tube.

Special Tool(s): [303-1484](#), [303-1484-01](#)

6.

- Remove the oil vacuum pump.



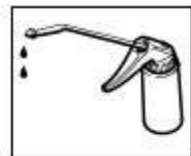
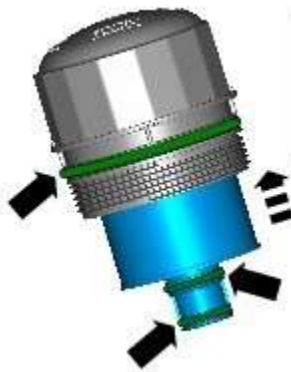
7.



8. NOTE: Discard the O-ring seals.

E107394

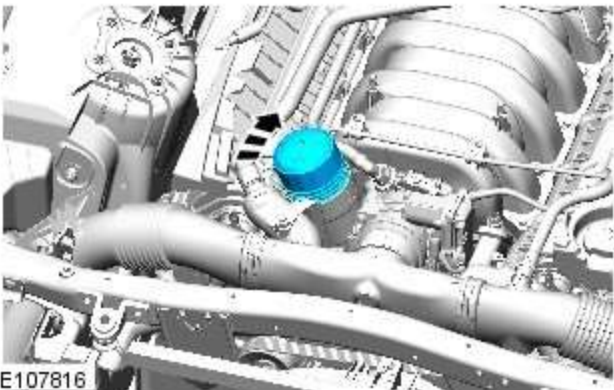
Filling




1.  NOTE: Install new O-ring seals.

Lubricate the oil filter element O-ring seal with clean engine oil.


E107727



E107816

2.  CAUTION: Tighten the component finger tight first.

- Torque: 25 Nm

3.  CAUTION: Make sure that the vehicle is left for 5 minutes from filling with oil and that the engine oil level is reading at least minimum (by following Steps 7-11), before starting the engine.

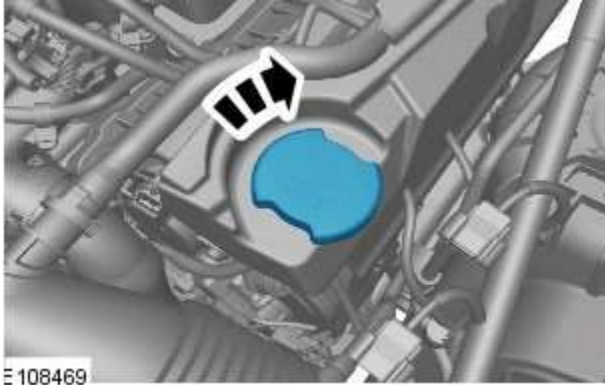
- Fill the engine with oil - for filling values on vehicles without supercharger:

Refer to: [Specifications](#) (303-01C Engine - V8 5.0L Petrol, Specifications).


- Fill the engine with oil - for filling values on vehicles with supercharger:

Refer to: [Specifications](#) (303-01D Engine - V8 S/C 5.0L Petrol,

- Specifications).
- Clean any residual engine oil from the oil filler cap area.



4.


5.  CAUTION: Make sure that the vehicle has been left for 5 minutes from filling with oil.

Follow the Steps 7-11 before starting the engine.

- 6.
- Start the engine and allow to run for 10 minutes, stop the engine.
 - Check for leaks.

7. CAUTIONS:

 Make sure that the selector lever and the gearshift mechanism are in the park (P) position.

 Make sure that the hood is open.

- Turn the ignition on.



E115112

- 8.
- Scroll through the trip menu to access the engine oil level display.



E111933

- 9.
- Press the cruise control cancel button twice within 2 seconds.



E111932

10.

- The message center display will revert to the normal display in the trip computer.
- Scroll through the trip menu to access the engine oil level display.
- Check that the oil level display shows an oil level reading.
- Only after having started and run the engine for 10 minutes (as indicated in Step 6), switch off the engine, then stabilizing for 10 minutes, take a reading from the oil level display and, if necessary top up with engine oil.

11.  **NOTE:** If instructed to follow Steps 7-11 in a previous step, return to Step 6 and continue the procedure.

Turn the ignition off.

12. Allow 10 minutes for the engine oil level to stabilize if there has been additional oil top up.

13.  **NOTE:** The following steps are to update the average oil level value.

- Turn the ignition on.
- Press and hold the cruise control cancel button for more than 2 seconds.



E111933

14.
 - The message center display will revert to the normal display in the trip computer.
15. Turn the ignition off.
16. Turn the ignition on.

17.

- Scroll through the trip menu to access the engine oil level display.
- Make sure that the average oil level value has now been updated.





E111932

18. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

Engine - V8 S/C 5.0L Petrol - Fuel Pump Camshaft Timing Check

General Procedures

Special Tool(s)

 <p>E115265</p>	<p>303-1447 Timing Tool</p>
 <p>E140377</p>	<p>JLR-303-1621 Alignment Tool, Fuel Pump Camshaft Timing</p>

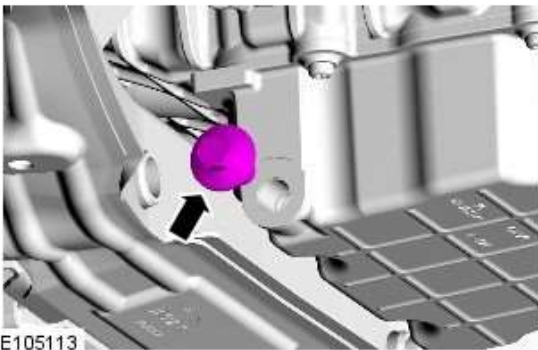
Check

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).



4.  **CAUTION:** Be prepared to collect escaping oil.

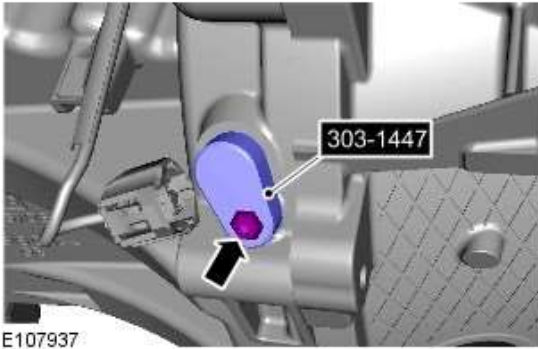
NOTES:

 Discard the sealing washer.


 Collect the engine oil in a clean container.



- 5.

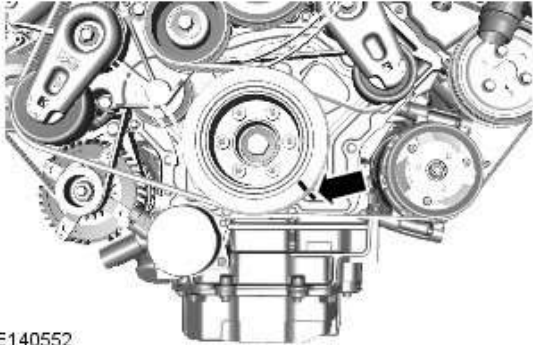


6. CAUTIONS:

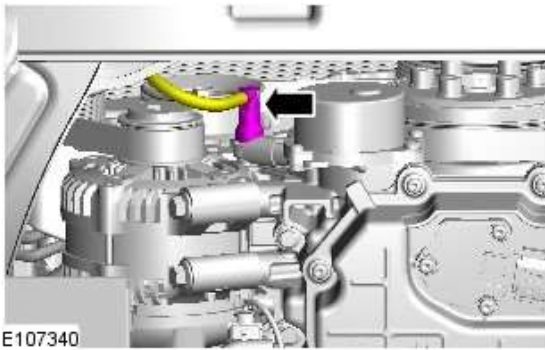
 Only rotate the crankshaft clockwise.

 Make sure that the crankshaft is fully locked.

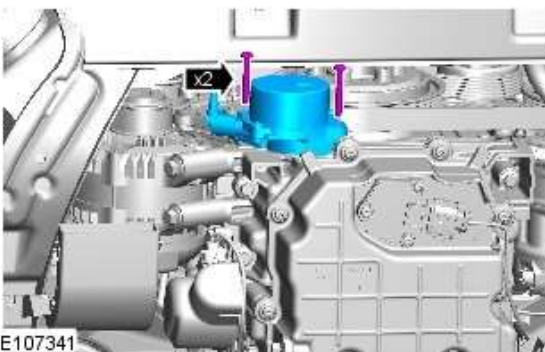
Install the Special Tool(s): [303-1447](#)



7. Using a suitable marker, mark the position of the crankshaft pulley as illustrated.

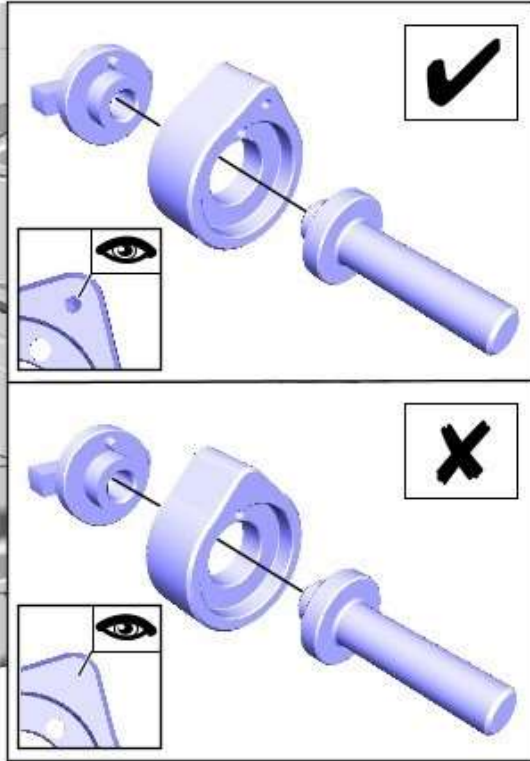
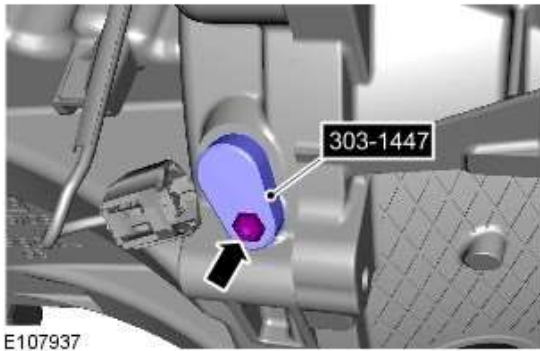


8.



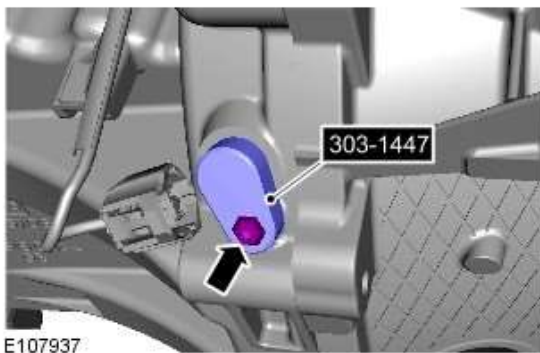
9.  NOTE: Discard the seal.

10. Remove the Special Tool(s): [303-1447](#)




11. If required, carefully adjust the crankshaft position to allow correct installation of the special tool.

Install the Special Tool(s): [JLR-303-1621](#)



12.  CAUTION: Do not use excessive force when adjusting the crankshaft position.

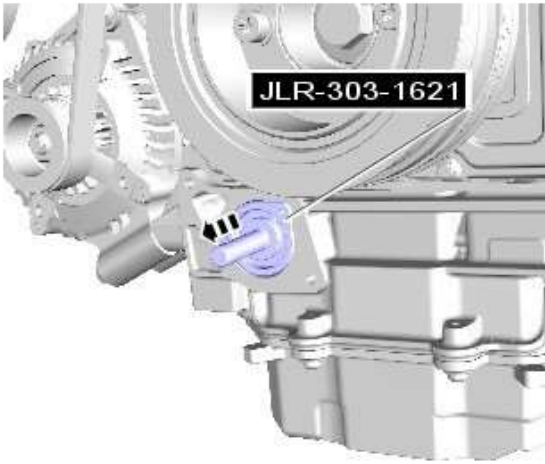
 NOTE: If the crankshaft timing tool cannot be installed, adjustment of the fuel pump camshaft timing will be required.

- If required, carefully adjust the crankshaft position to allow correct installation of the special tool.

Install the Special Tool(s): [303-1447](#)

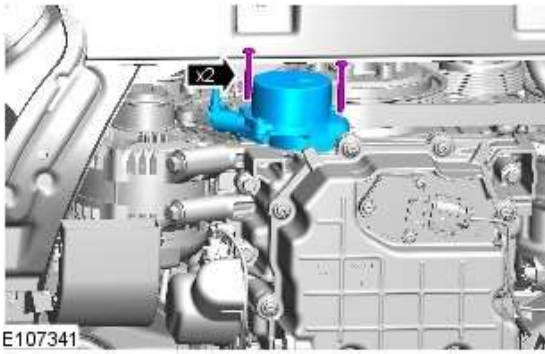
- If the crankshaft timing tool cannot be installed, adjustment of the fuel pump camshaft timing will be required.


Refer to: [Fuel Pump Camshaft Timing Adjustment](#) (303-01C Engine - V8 5.0L Petrol, General Procedures).

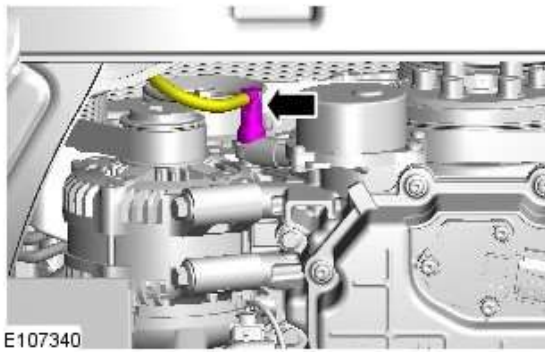


13. Remove the Special Tool(s): [JLR-303-1621](#)

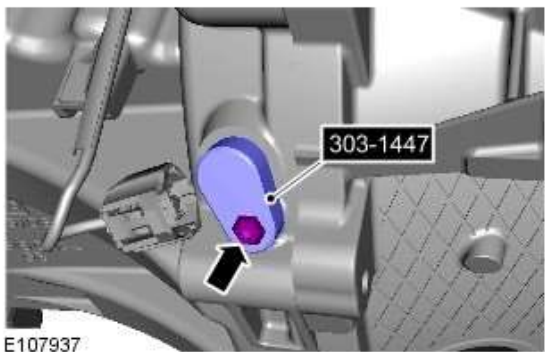
E154428



14.  NOTE: Install a new seal.
Torque: 12 Nm

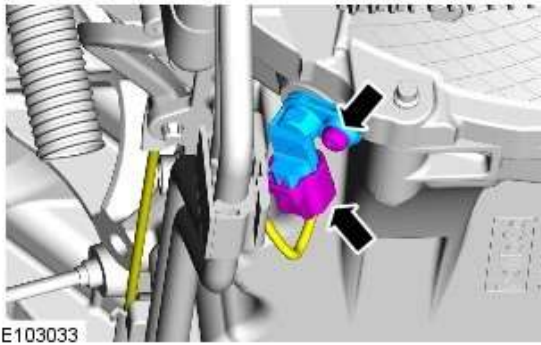


15.

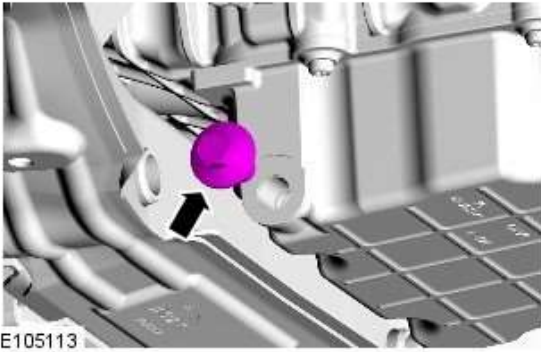


16. Remove the Special Tool(s): [303-1447](#)

E107937




17. Torque: 10 Nm



18.  NOTE: Install a new sealing washer.

Torque: 24 Nm

19. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

20.  CAUTION: Make sure that the vehicle is left for 5 minutes from filling with oil and that the engine oil level is reading at least minimum (by following Steps 23-27), before starting the engine.

- Fill the engine with oil - for filling values on vehicles without supercharger:

Refer to: [Specifications](#) (303-01C Engine - V8 5.0L Petrol, Specifications).

- Fill the engine with oil - for filling values on vehicles with supercharger:

Refer to: [Specifications](#) (303-01D Engine - V8 S/C 5.0L Petrol, Specifications).

- Clean any residual engine oil from the oil filler cap area.

21.  CAUTION: Make sure that the vehicle has been left for 5 minutes from filling with oil.

Follow the Steps 23-27 before starting the engine.

22.

- Start the engine and allow to run for 10 minutes, stop the engine.
- Check for leaks.

23. CAUTIONS:



Make sure that the selector lever and the gearshift mechanism are in the park (P) position.



Make sure that the hood is open.

- Turn the ignition on.



E115112

24.

- Scroll through the trip menu to access the engine oil level display.



E111933

25.

- Press the cruise control cancel button twice within 2 seconds.



E111932


26.

- The message center display will revert to the normal display in the trip computer.
- Scroll through the trip menu to access the engine oil level display.
- Check that the oil level display shows an oil level reading.
- Only after having started and run the engine for 10 minutes (as indicated in Step 22), switch off the engine, then stabilizing for 10 minutes, take a reading from the oil level display and, if necessary top up with engine oil.

27.  **NOTE:** If instructed to follow Steps 23-27 in a previous step, return to Step 22 and continue the procedure.

Turn the ignition off.

28. Allow 10 minutes for the engine oil level to stabilize if there has been additional oil top up.

29.  **NOTE:** The following steps are to update the average oil level value.

- Turn the ignition on.
- Press and hold the cruise control cancel button for more than 2 seconds.



E111933

30.

- The message center display will revert to the normal display in the trip computer.

31. Turn the ignition off.

32. Turn the ignition on.

33.

- Scroll through the trip menu to access the engine oil level display.
- Make sure that the average oil level value has now been updated.





E111932

34. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

Engine - V8 S/C 5.0L Petrol - Fuel Pump Camshaft Timing Adjustment

General Procedures

Special Tool(s)

 <p>E115265</p>	<p>303-1447 Timing Tool</p>
 <p>E140377</p>	<p>JLR-303-1613 Alignment Tool, Fuel Pump Camshaft Timing</p>

Adjustment

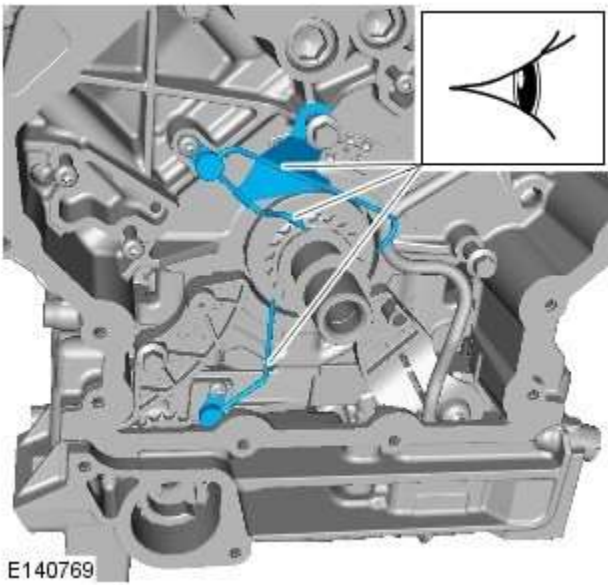
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).





2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

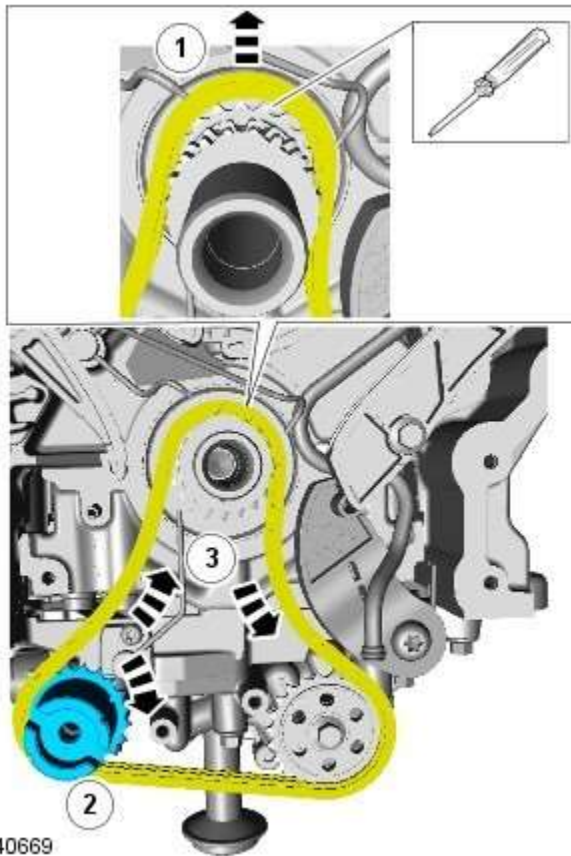
Raise and support the vehicle.


3. Refer to: [Fuel Pump Camshaft Timing Check](#) (303-01D Engine - V8 S/C 5.0L Petrol, General Procedures).
4. Refer to: [Lower Timing Cover](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).
Refer to: [Lower Timing Cover](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).



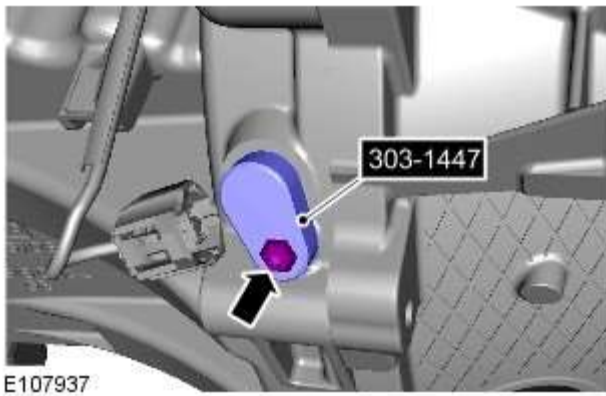
5. CAUTIONS:

-  Make sure that the area around the component is clean and free of foreign material.
-  Inspect the 3 timing chain oil nozzles for signs of damage, install as necessary.

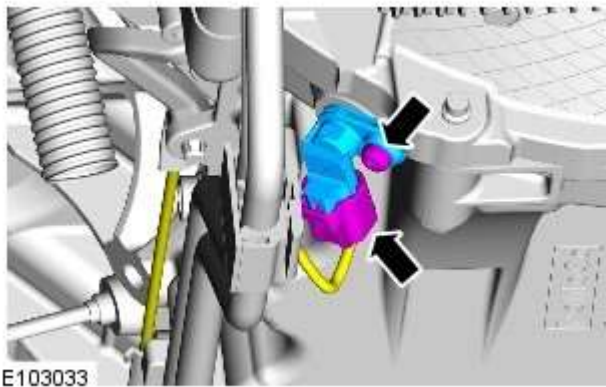


6.  **NOTE: Using a suitable tie strap, position the tensioner to one side.**
- Special Tool(s):* [JLR-303-1613](#)
Torque: 12 Nm

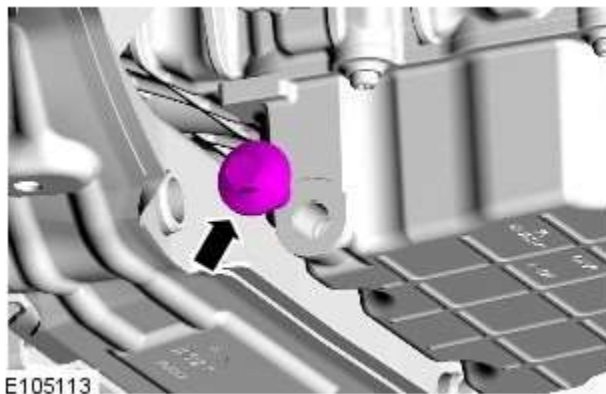
7. Refer to: [Lower Timing Cover](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).
 Refer to: [Lower Timing Cover](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).




8. Remove the Special Tool(s): [303-1447](#)




9. Torque: 10 Nm



10.  NOTE: Install a new sealing washer.
Torque: 24 Nm

11. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

12.  CAUTION: Make sure that the vehicle is left for 5 minutes from filling with oil and that the engine oil level is reading at least minimum (by following Steps 15-19), before starting the engine.


- Fill the engine with oil - for filling values on vehicles without supercharger:

Refer to: [Specifications](#) (303-01C Engine - V8 5.0L Petrol, Specifications).

- Fill the engine with oil - for filling values on vehicles with supercharger:

Refer to: [Specifications](#) (303-01D Engine - V8 S/C 5.0L Petrol, Specifications).

- Clean any residual engine oil from the oil filler cap area.


13.  **CAUTION:** Make sure that the vehicle has been left for 5 minutes from filling with oil.

Follow the Steps 15-19 before starting the engine.

- 14.
- Start the engine and allow to run for 10 minutes, stop the engine.
 - Check for leaks.

15. **CAUTIONS:**

 Make sure that the selector lever and the gearshift mechanism are in the park (P) position.

 Make sure that the hood is open.

- Turn the ignition on.

- 16.

- Scroll through the trip menu to access the engine oil level display.



E115112



17.

- Press the cruise control cancel button twice within 2 seconds.



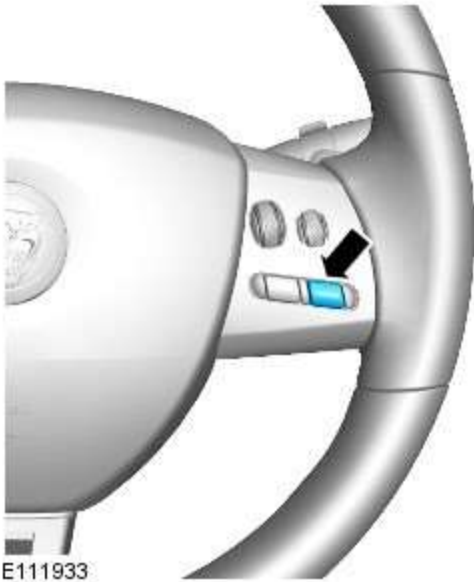
18.


- The message center display will revert to the normal display in the trip computer.
- Scroll through the trip menu to access the engine oil level display.
- Check that the oil level display shows an oil level reading.
- Only after having started and run the engine for 10 minutes (as indicated in Step 14), switch off the engine, then stabilizing for 10 minutes, take a reading from the oil level display and, if necessary top up with engine oil.

19.  **NOTE:** If instructed to follow Steps 15-19 in a previous step, return to Step 14 and continue the procedure.

Turn the ignition off.

20. Allow 10 minutes for the engine oil level to stabilize if there has been additional oil top up.



21.  **NOTE:** The following steps are to update the average oil level value.
- Turn the ignition on.
 - Press and hold the cruise control cancel button for more than 2 seconds.

- 22.
- The message center display will revert to the normal display in the trip computer.

23. Turn the ignition off.

24. Turn the ignition on.

- 25.
- Scroll through the trip menu to access the engine oil level display.
 - Make sure that the average oil level value has now been updated.



26. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

Engine - V8 S/C 5.0L Petrol - Valve Clearance Check

General Procedures

Check

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Valve Cover LH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

4. Refer to: [Valve Cover RH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

5. **CAUTIONS:**



Rotate the engine clockwise until the camshafts are positioned as shown.



Do not rotate the crankshaft counterclockwise. The timing chains may bind causing engine damage.

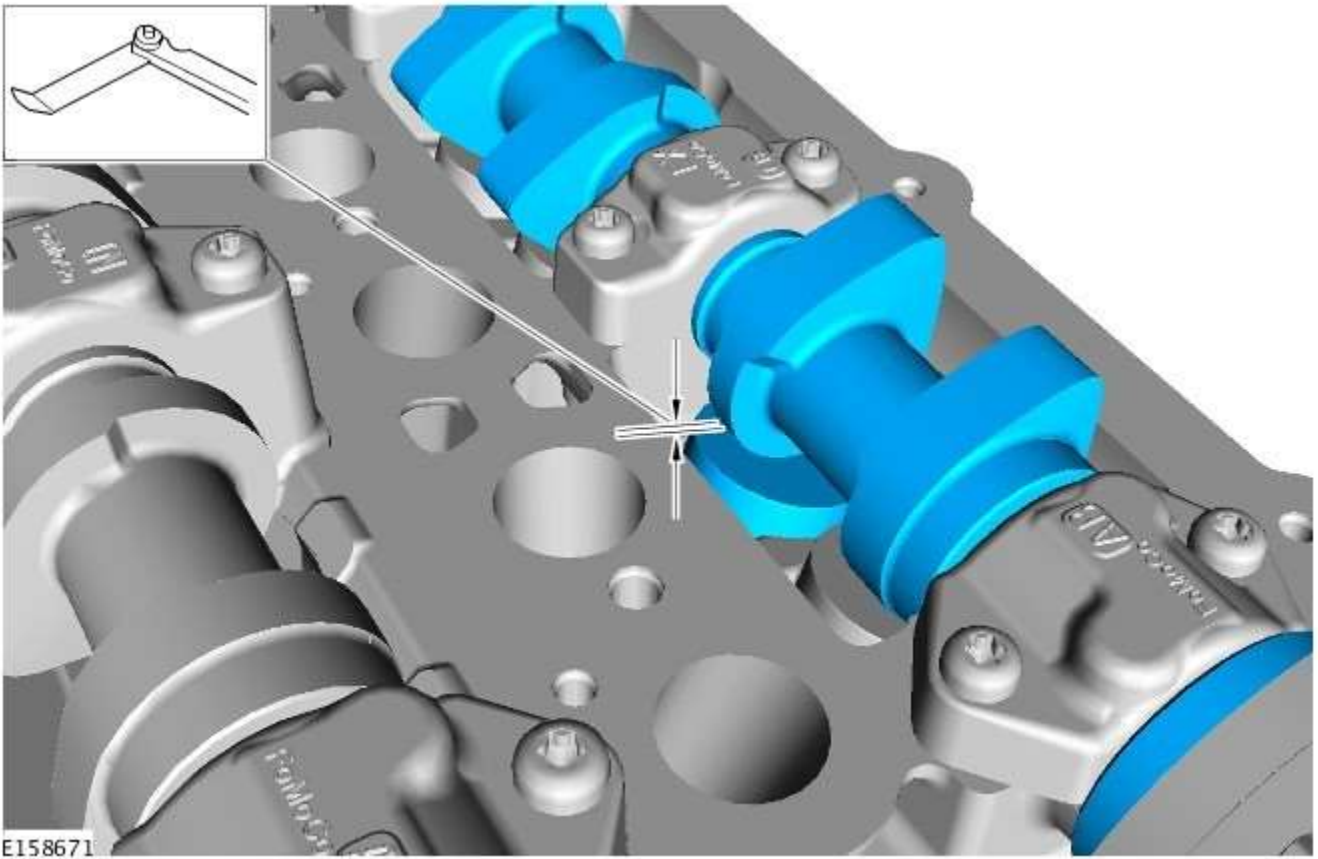


Camshaft lobes must be 180 degrees away from each valve tappet or valve clearance will be incorrect.



NOTE: Using feeler gauge check the gap between the tappet and the camshaft lobe and check against specifications table.

- Using feeler gauge check the gap between the tappet and the camshaft lobe and check against specifications table.
- Repeat for the remaining valve tappets.



Engine - V8 S/C 5.0L Petrol - Valve Clearance Adjustment

General Procedures

Check

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

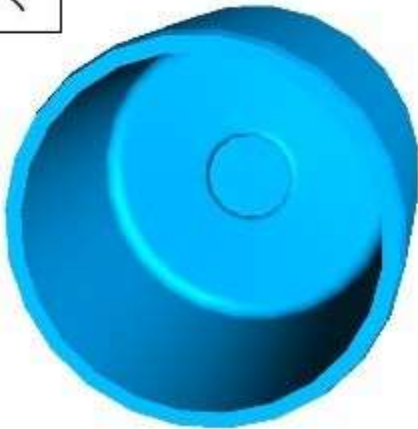
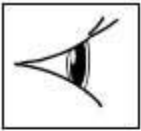
Raise and support the vehicle.

3. Refer to: [Valve Clearance Check](#) (303-01D Engine - V8 S/C 5.0L Petrol, General Procedures).

Adjustment

1. Refer to: [Camshaft LH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
2. Refer to: [Camshaft RH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

3.



E158863

Engine - V8 S/C 5.0L Petrol - Camshaft LH

Removal and Installation

Removal



CAUTION: Make sure that the orientation and code on the top of the camshaft bearing caps is noted (along with the bank - A or B), so that on installation the components are installed to their original position. Failure to follow this instruction may cause damage to the vehicle.



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

3.

4. **CAUTIONS:**



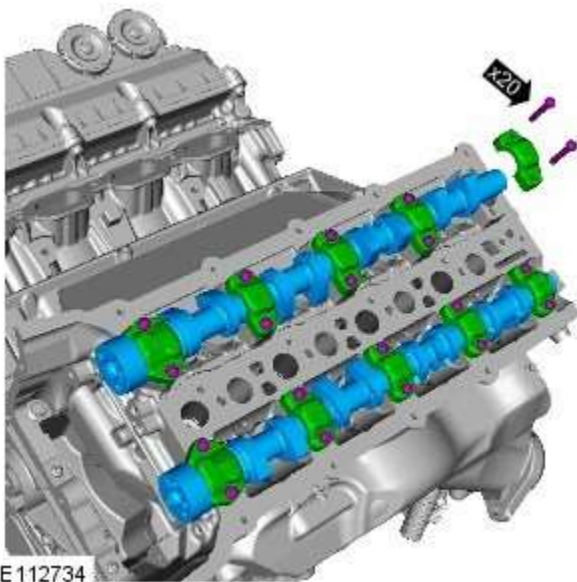
Rotate the camshafts until all the valves are at their minimum open point.



Evenly and progressively, release the camshaft bearing caps.

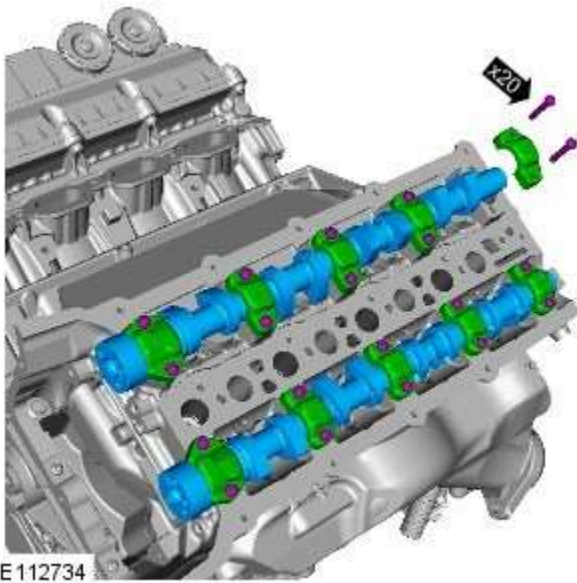


NOTE: Remove the camshaft bearing caps. Note: their position, orientation and markings. Each is marked with its position (number) and an orientation (arrow).



E112734

Installation



1. CAUTIONS:



Prior to installing the camshafts, position the crankshaft 45 degrees ATDC cylinder 1A to prevent valve/piston collision.



Make sure that the camshafts and camshaft bearing caps are installed in their original locations.

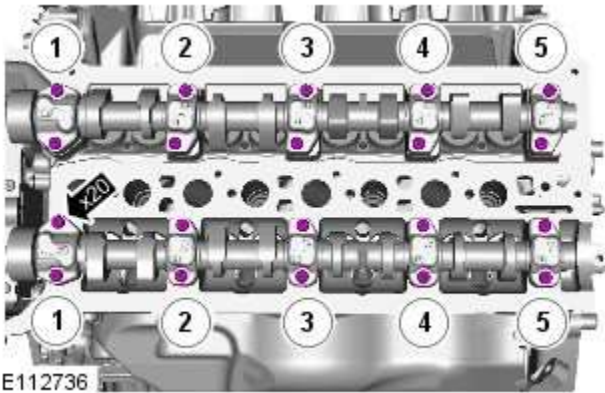


Evenly and progressively install and tighten the camshaft bearing caps.



NOTE: Lubricate the camshafts and the camshaft bearing caps with EP90 oil (or 75/90 viscosity oil will suffice) prior to installation.

Torque: 3 Nm



2. NOTE: Tighten the bolts in the indicated sequence.

Torque: 12 Nm



3. CAUTION: Only rotate the crankshaft clockwise.

Rotate the crankshaft until the camshaft lobe on the valve being checked is 180 degrees from the maximum opening position.

4. NOTE: If the valve clearance is incorrect, continue to the next step. If the valve clearance is correct, continue to step 8.

Using feeler gauge check the gap between the tappet and the camshaft lobe and check against specifications table.

5. CAUTIONS:



Do not use a magnet to remove the tappet.



Use the following formula to calculate the required bucket thickness. Original thickness + measured clearance - desired clearance = required bucket thickness.

Remove the tappet and measure the thickness.

6. NOTE: If a new tappet is installed then go back to step 1 of the install procedure.

Install a new tappet if required.

7. Using feeler gauge check the gap between the tappet and the camshaft lobe and check against specifications table.

8.

9. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Camshaft RH

Removal and Installation

Removal



CAUTION: Make sure that the orientation and code on the top of the camshaft bearing caps is noted (along with the bank - A or B), so that on installation the components are installed to their original position. Failure to follow this instruction may cause damage to the vehicle.



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

3.

4. **CAUTIONS:**



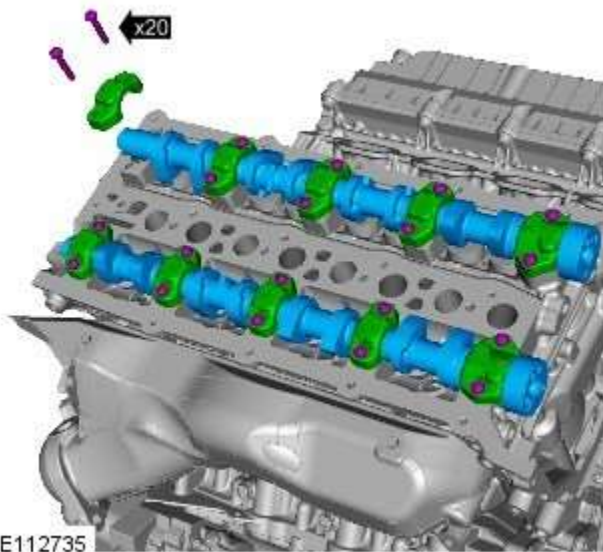
Rotate the camshafts until all the valves are at their minimum open point.



Evenly and progressively, release the camshaft bearing caps.

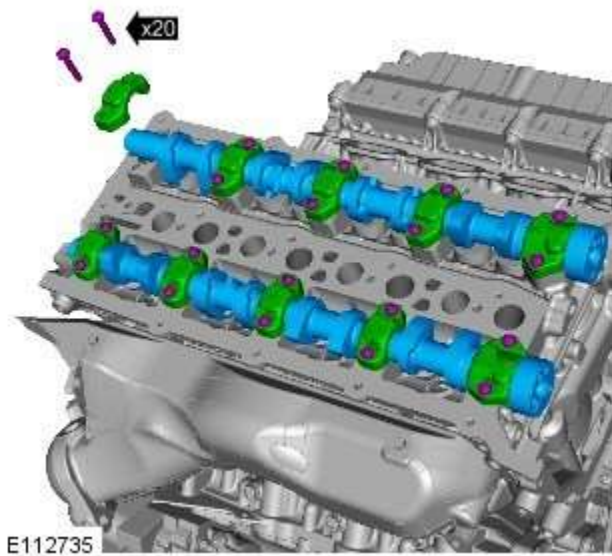


NOTE: Remove the camshaft bearing caps. Note: their position, orientation and markings. Each is marked with its position (number) and an orientation (arrow).

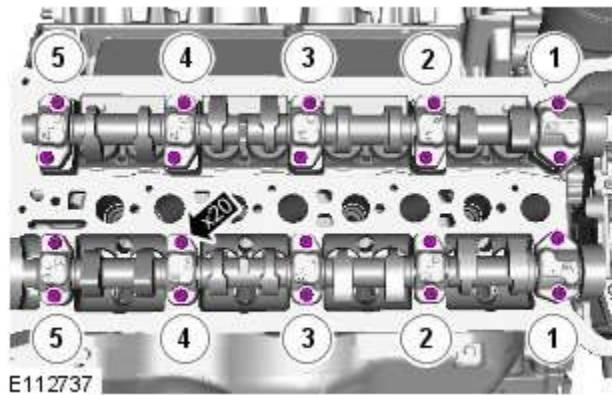


E112735

Installation



E112735



E112737

1. CAUTIONS:



Prior to installing the camshafts, position the crankshaft 45 degrees ATDC cylinder 1A to prevent valve/piston collision.



Evenly and progressively install and tighten the camshaft bearing caps.



Make sure that the camshafts and camshaft bearing caps are installed in their original locations.



NOTE: Lubricate the camshafts and the camshaft bearing caps with EP90 oil (or 75/90 viscosity oil will suffice) prior to installation.

Torque: 3 Nm

2. NOTE: Tighten the bolts in the indicated sequence.

Torque: 12 Nm



3. CAUTION: Only rotate the crankshaft clockwise.

Rotate the crankshaft until the camshaft lobe on the valve being checked is 180 degrees from the maximum opening position.

4. NOTE: If the valve clearance is incorrect, continue to the next step. If the valve clearance is correct, continue to step 8.

Using feeler gauge check the gap between the tappet and the camshaft lobe and check against specifications table.

5. CAUTIONS:



Use the following formula to calculate the required bucket thickness. Original thickness + measured clearance - desired clearance = required bucket thickness.



Do not use a magnet to remove the tappet.

Remove the tappet and measure the thickness.

6. NOTE: If a new tappet is installed then go back to step 1 of the install procedure.

Install a new tappet if required.

7. Using feeler gauge check the gap between the tappet and the camshaft lobe and check against specifications table.

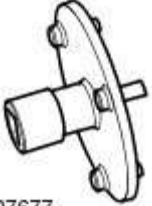
8.

9. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Crankshaft Front Seal

Removal and Installation

Special Tool(s)

 E107677	303-1434 Remover/Installer, Front Crankshaft Seal
--	--

Removal



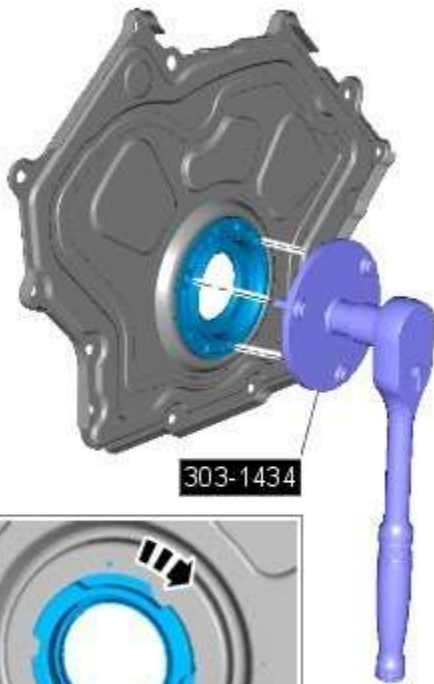
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Crankshaft Pulley](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).



3. CAUTION: Do not over tighten the crankshaft front seal. Failure to follow this instruction may result in damage to the vehicle.

Special Tool(s): [303-1434](#)



E112056

Installation

1. CAUTIONS:



Do not over tighten the crankshaft front seal. Failure to follow this instruction may result in damage to the vehicle.



Take extra care not to damage the seal.

To install, reverse the removal procedure.

Engine - V8 S/C 5.0L Petrol - Crankshaft Pulley

Removal and Installation

Special Tool(s)

 <p>E115256</p>	<p>303-1437 Crankshaft Damper Remover/Installer</p>
 <p>E115257</p>	<p>303-1438 Crankshaft Damper Bolt Remover/Installer</p>
 <p>E115258</p>	<p>303-1439 Crankshaft Damper Removal Plate</p>
 <p>E115259</p>	<p>303-1440 Crankshaft Damper Removal/Installation Stud</p>
 <p>E115260</p>	<p>303-1441 Crankshaft Damper Remover/Installer Body</p>
 <p>E115266</p>	<p>303-1448 Locking Tool</p>

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



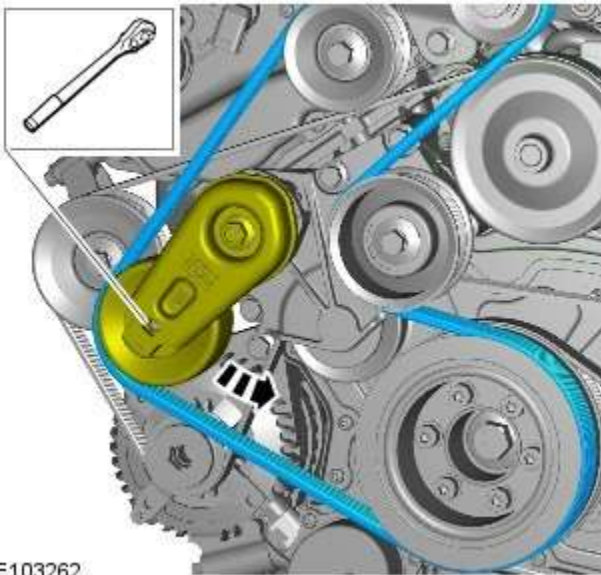
2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

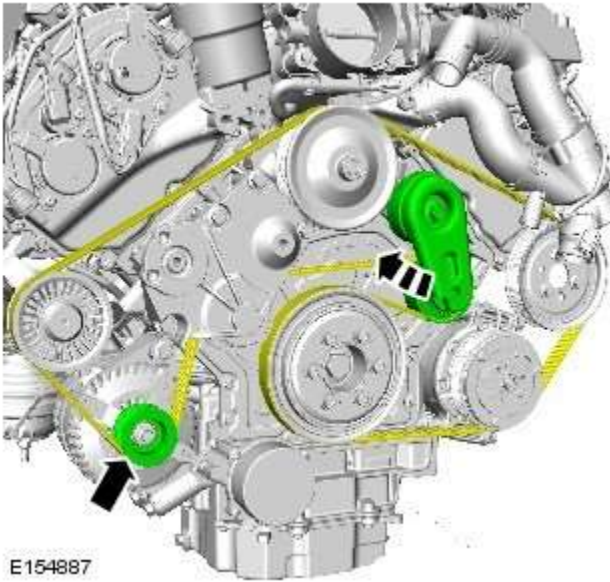
3. Refer to: [Cooling Fan Motor and Shroud - Vehicles With: Supercharger](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

4. Refer to: [Starter Motor](#) (303-06C Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

5.




E103262

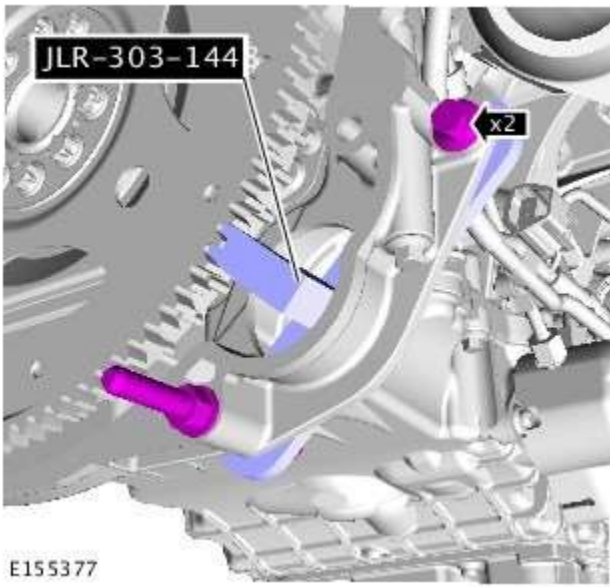


6.



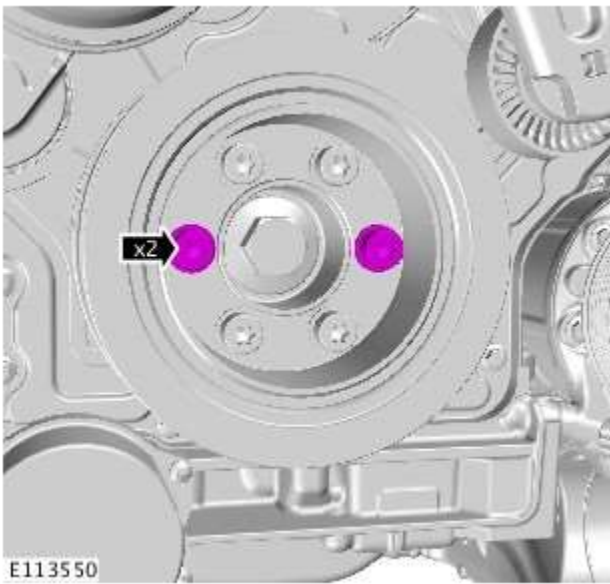
7.  CAUTION: Before removing the crankshaft pulley bolt, note the numbers on the bolt head. If the bolt head shows 10.9, the bolt must be removed counter clockwise. If the bolt head shows 12.9, the bolt must be removed clockwise. Failure to follow this instruction may result in damage to the crankshaft.

Note the markings on the crankshaft pulley bolt.

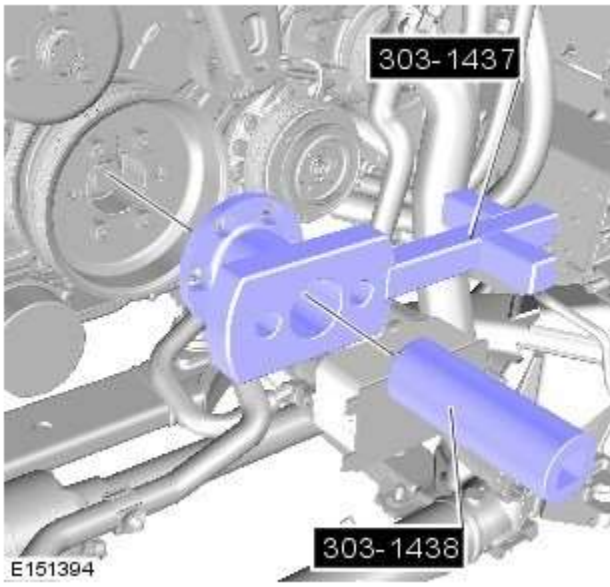


8. Install the special tool.

Special Tool(s): [303-1448](#)

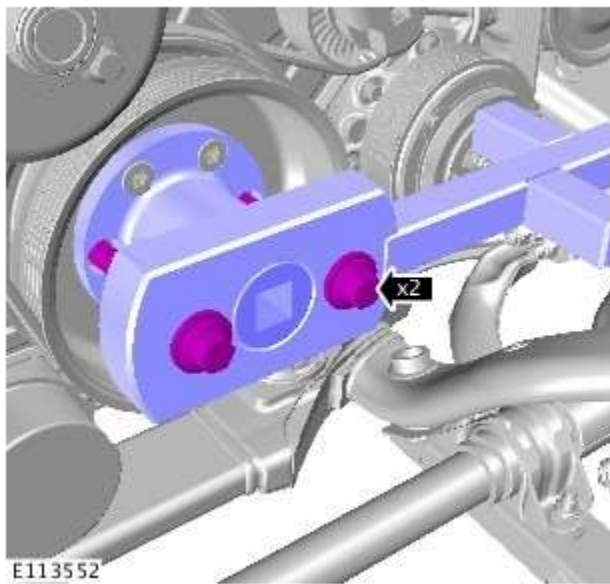


9.

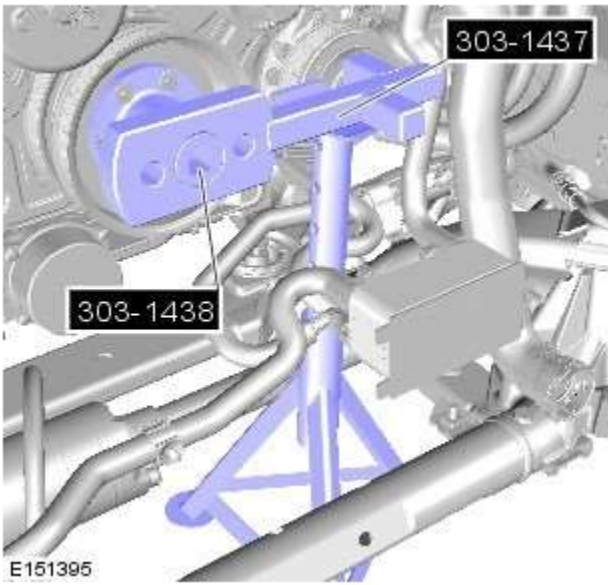



10. Install the special tool.

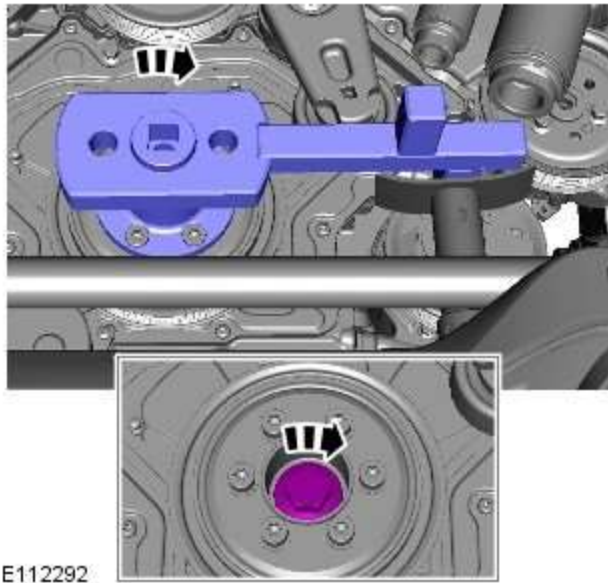
Special Tool(s): [303-1438](#), [303-1437](#)



11. Torque: 25 Nm




12.  NOTE: The graphic shows the tool position for LH thread only, RH thread will be the opposite.
Support the special tool using a suitable vehicle stand.



13.  CAUTION: Discard the bolt.

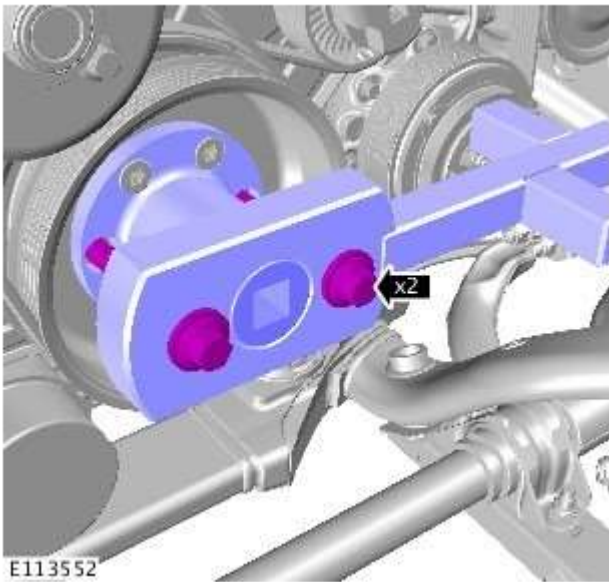
NOTES:

 The graphic shows the step for LH thread only, RH thread will be the opposite.

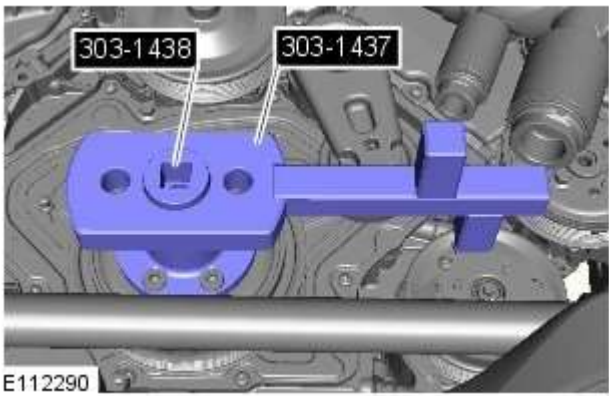
 The crankshaft pulley bolt will be very tight.

 The thread is left handed.

14.



15. Remove the special tool.



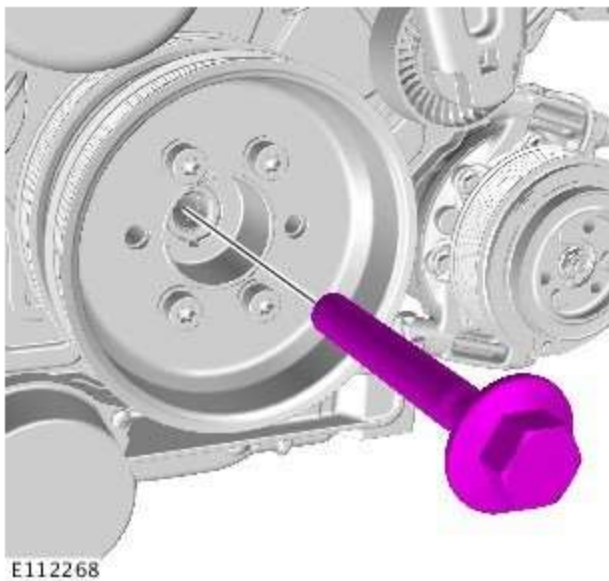
16. NOTES:



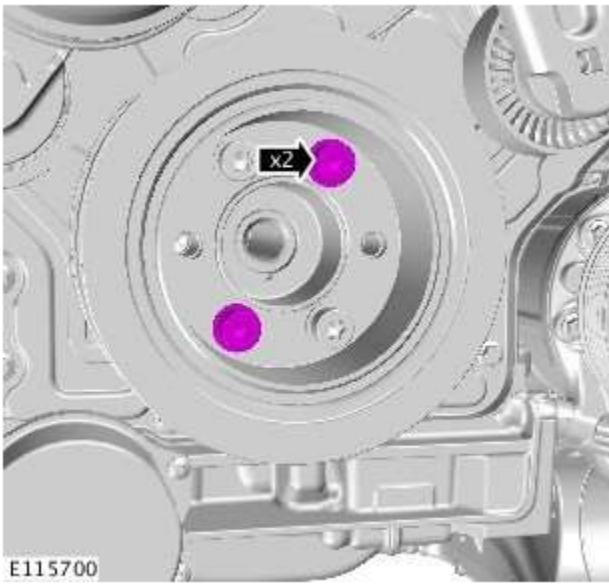
If the crankshaft damper is fitted with an early RH thread crankshaft bolt then the pulley can be removed with a standard puller.



Discard the bolt after removal.

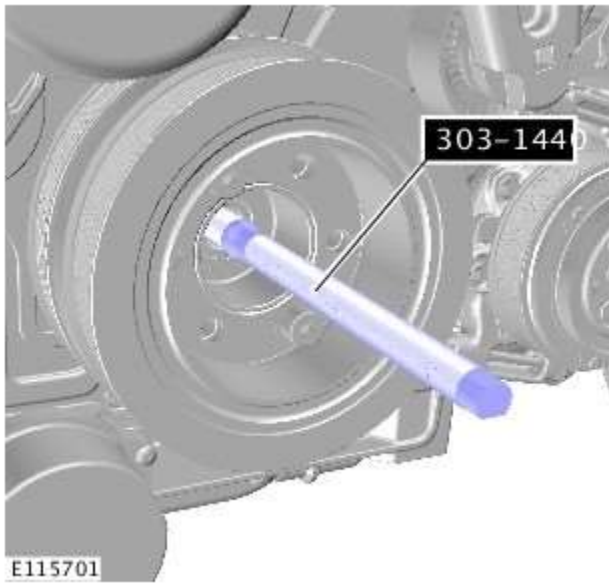


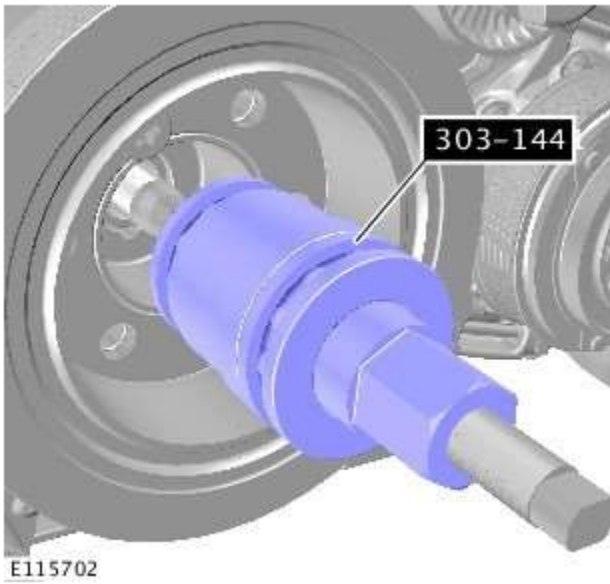
17.



18. Install the special tool.

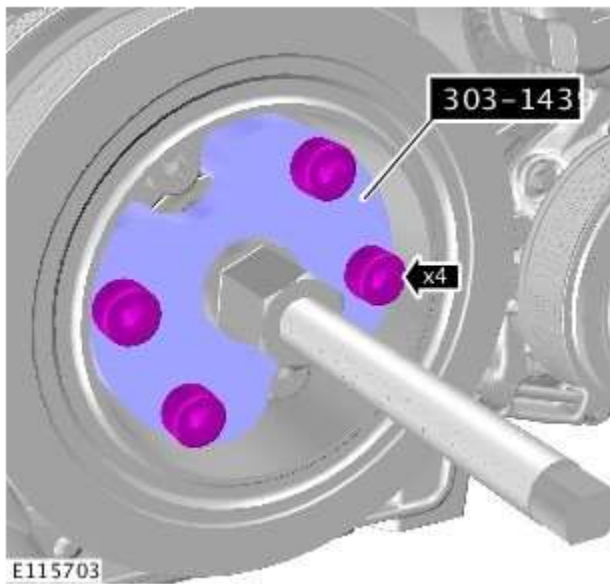
Special Tool(s): [303-1440](#)





19. Install the special tool.

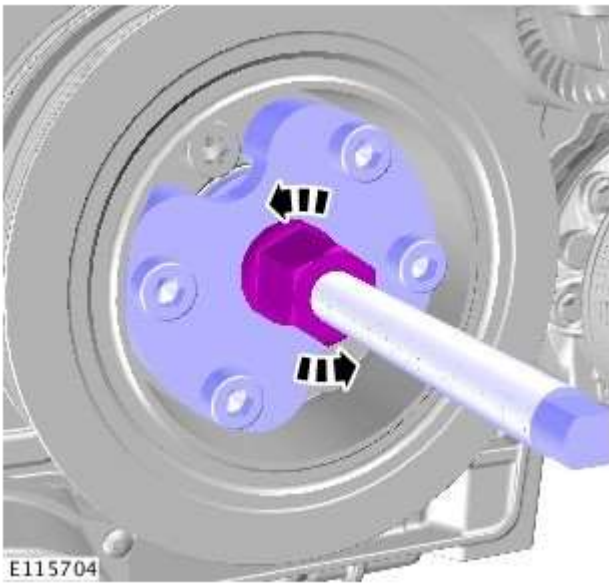
Special Tool(s): [303-1441](#)




20. Install the special tool.

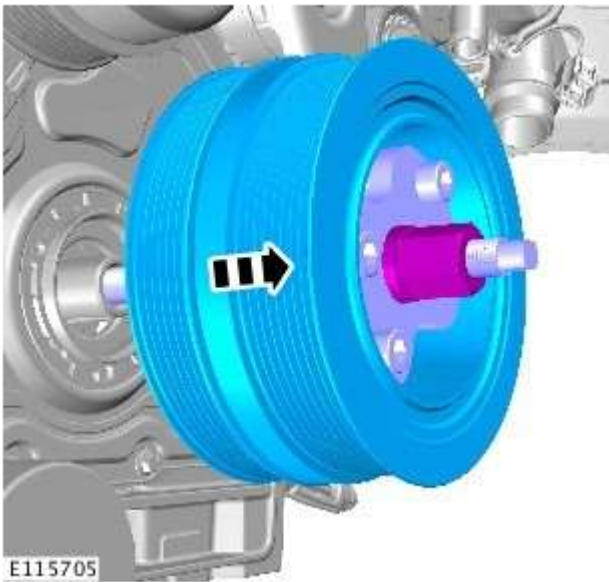
Special Tool(s): [303-1439](#)

21.

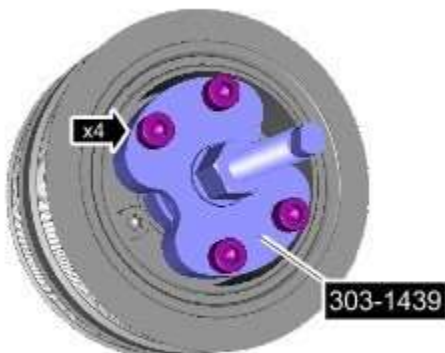


22.  CAUTION: Discard the friction washer after removing the crankshaft pulley.

 NOTE: Make sure to clean the threads in the end of the crankshaft and that the crank nose is free of any foreign materials.

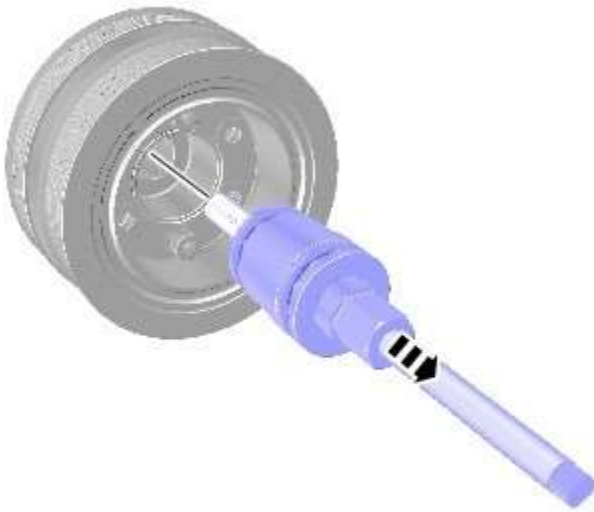


23.



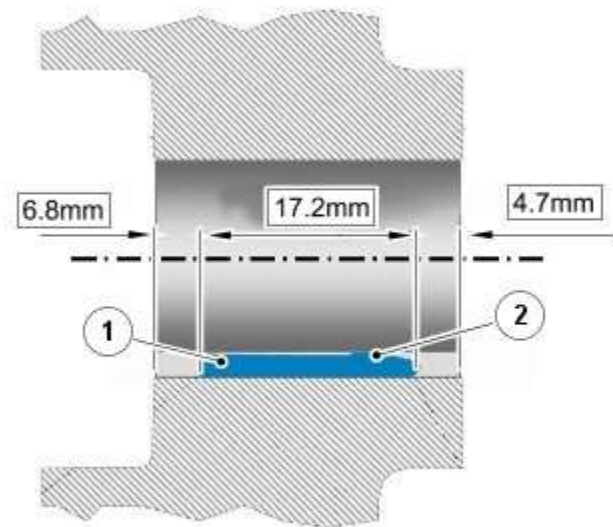
E115655

24.



E115707

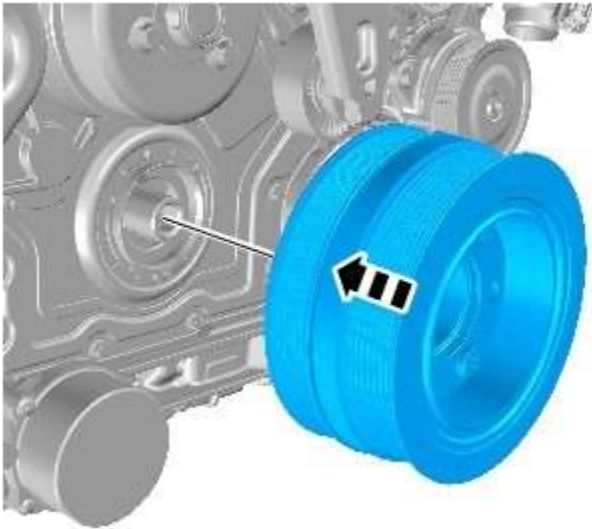
Installation



E115889

1.

- Apply RTV sealant to the crankshaft pulley keyway.
- Make sure that the RTV sealant is applied in a 2mm diameter bead.
- Make sure that when the RTV sealant is applied that the RTV sealant is level with the top of the keyway.



E112288



2. **CAUTION:** Install a new friction washer before installing the crankshaft pulley.

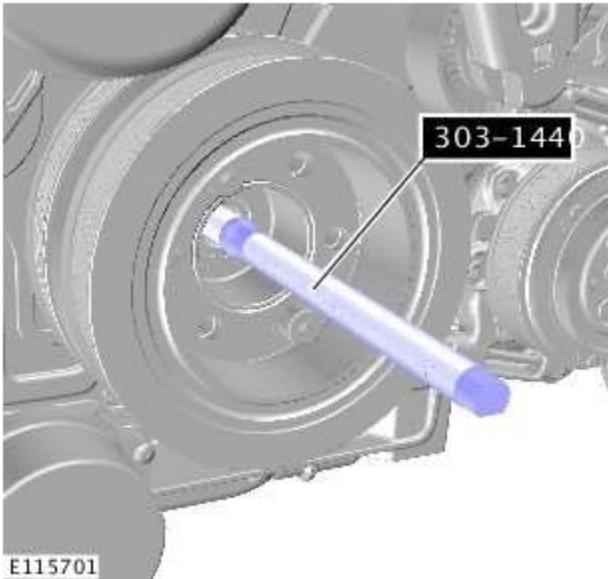
NOTES:



Make sure to clean the threads in the end of the crankshaft and that the crank nose is free of any foreign materials.

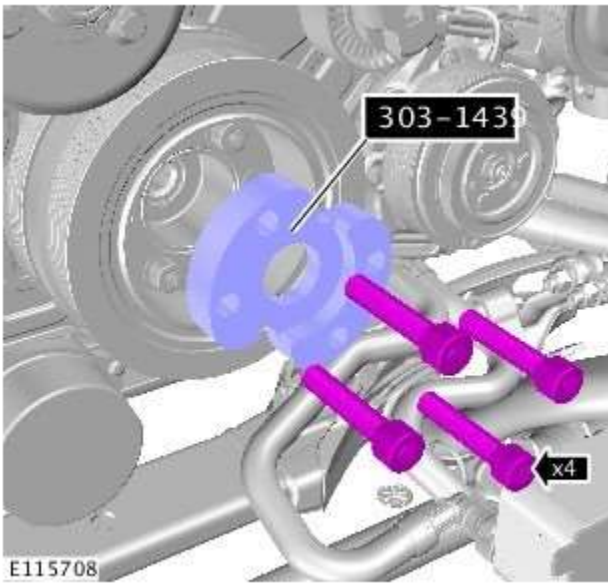


Skip to step 11 for engines fitted with early RH thread crankshaft bolt.

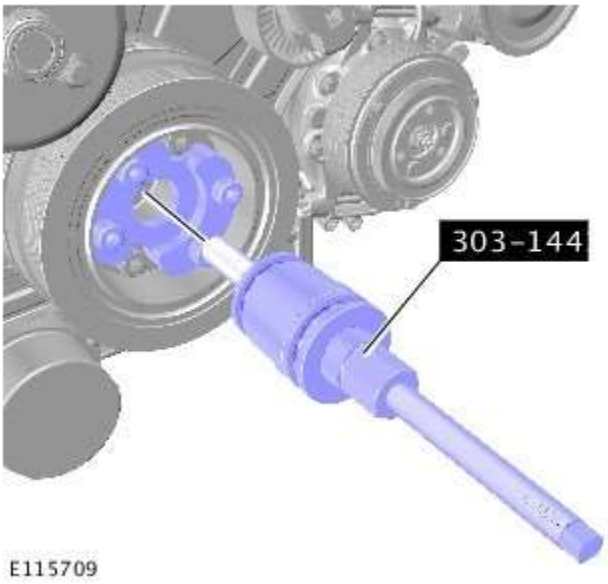


E115701

3. Install the special tool.



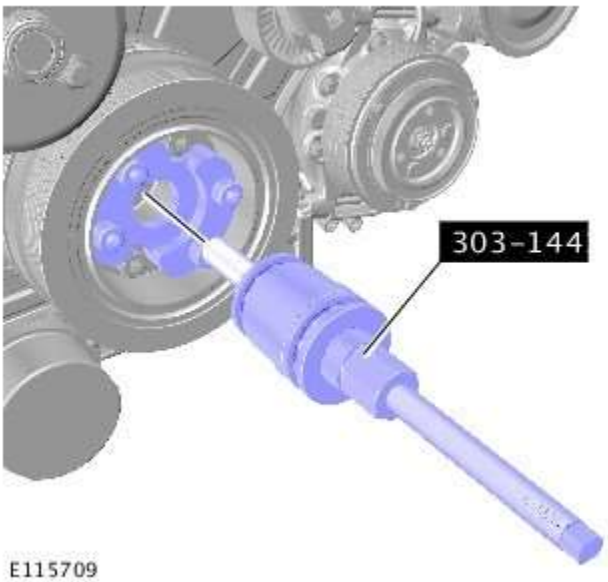
4. Install the special tool.



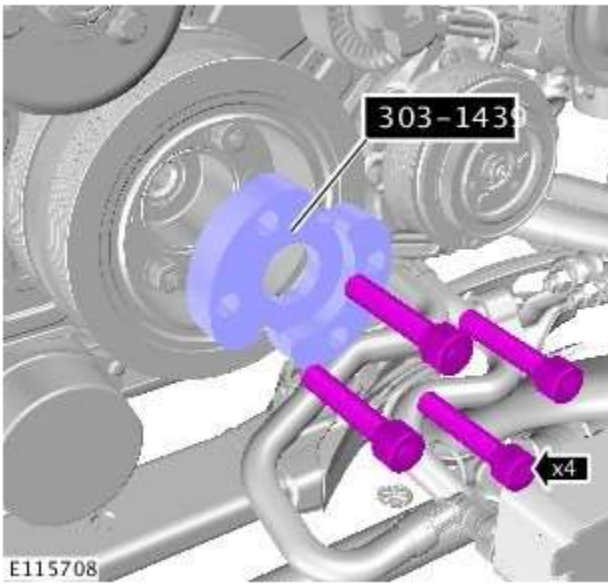
5. Install the special tool.



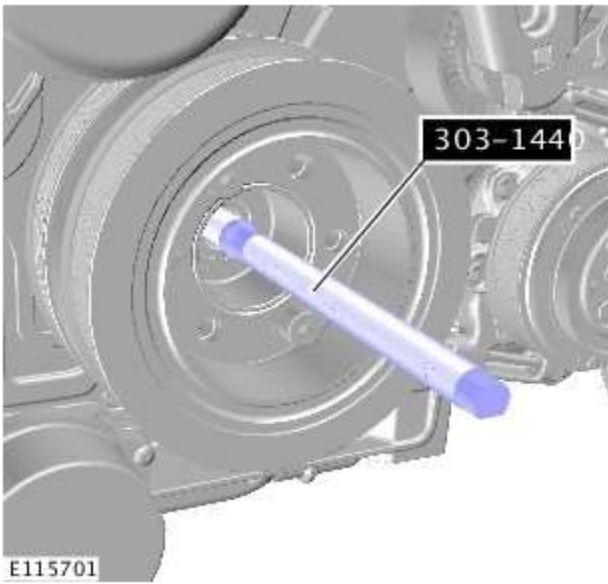
6. CAUTION: Rotate the crankshaft pulley installation tool anti-clockwise until the pulley is fully located, do not over tighten. Failure to do this may result in damage to the components.



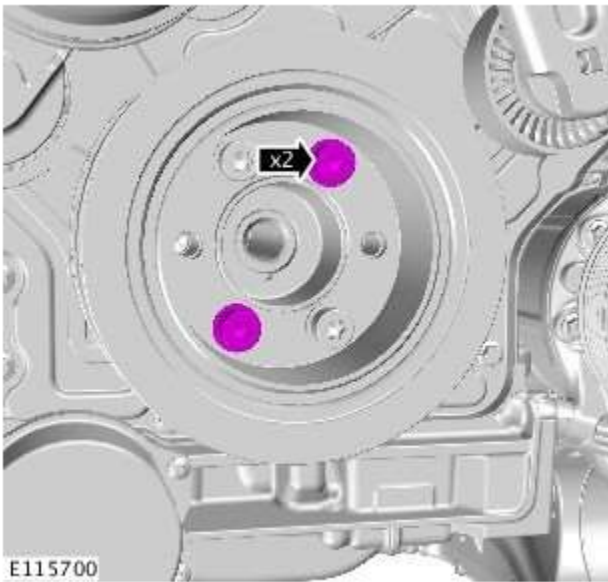
7. Remove the special tool.




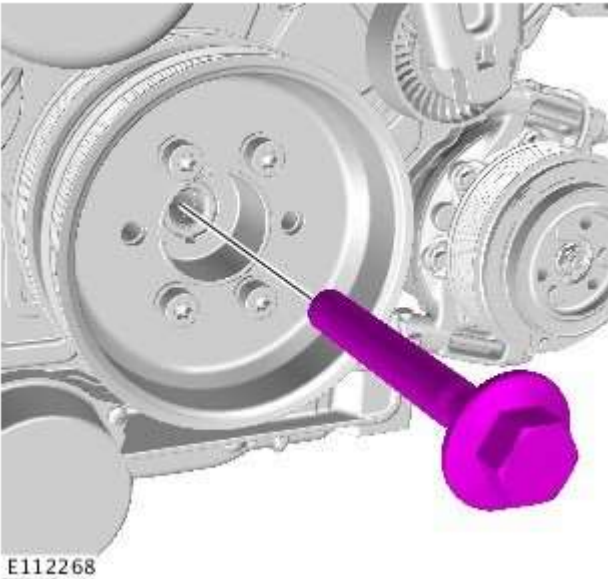
8. Remove the special tool.




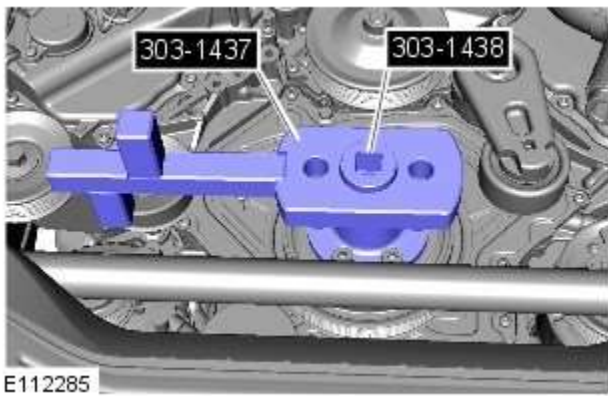
9. Remove the special tool.



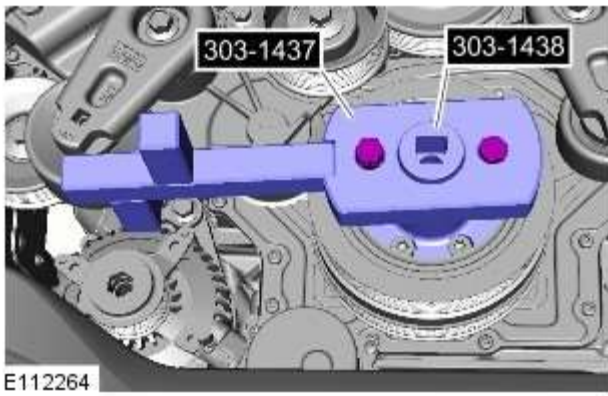
10.  **WARNING:** Make sure that a new bolt is installed.
- Apply loctite 270 to the thread of the bolts.
 - *Torque:* 65 Nm



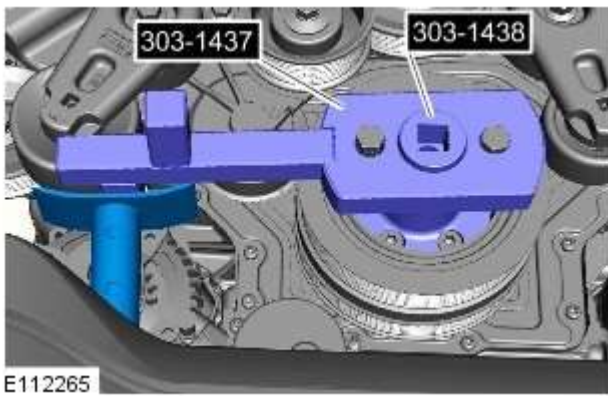
11.  **WARNING:** Make sure that a new bolt is installed.



12. Install the special tool.

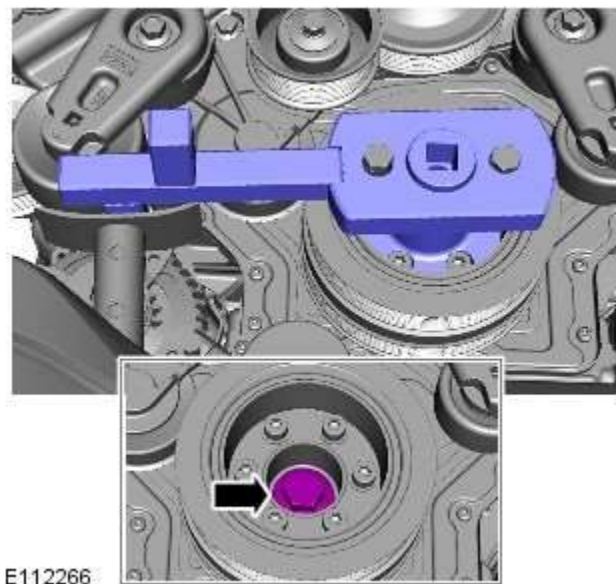



13. Torque: 65 Nm



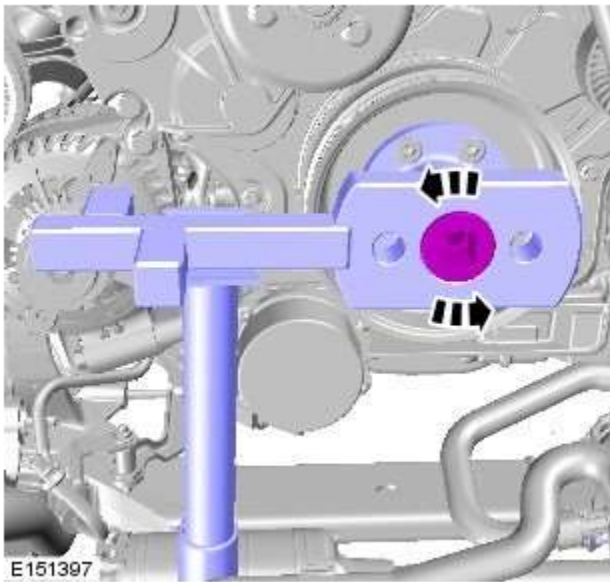
14.  NOTE: The graphic shows the tool position for LH thread only, RH thread will be the opposite.

Using a suitable stand, support the special tool.




15.  NOTE: The graphic shows the step for LH thread only, RH thread will be the opposite.

Torque: 200 Nm



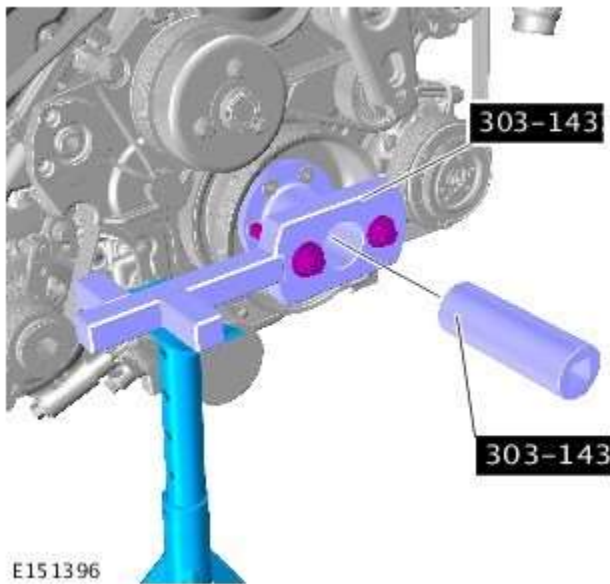
16. NOTES:

 The graphic shows the step for LH thread only, RH thread will be the opposite.

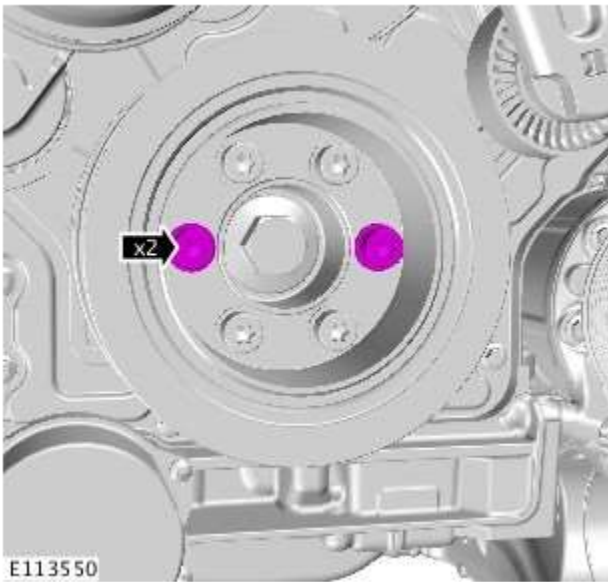
 The use of a torque multiplier capable of 600Nm will be required.


 Make sure that the socket is turned through 270 degrees not the torque wrench.

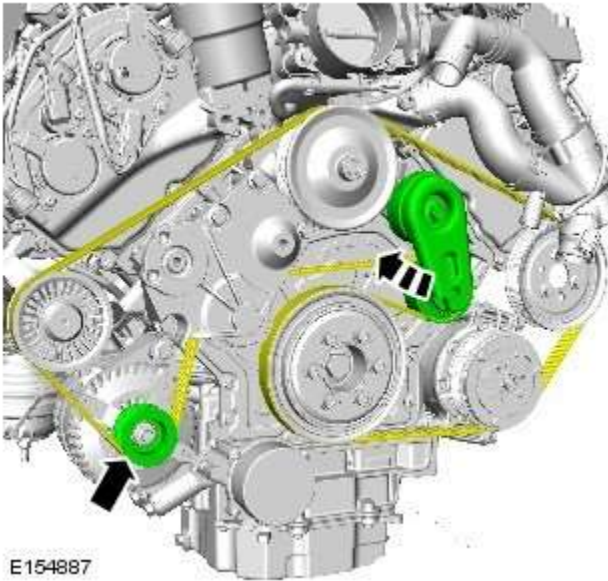
- Torque: 270°



17. Remove the special tools.

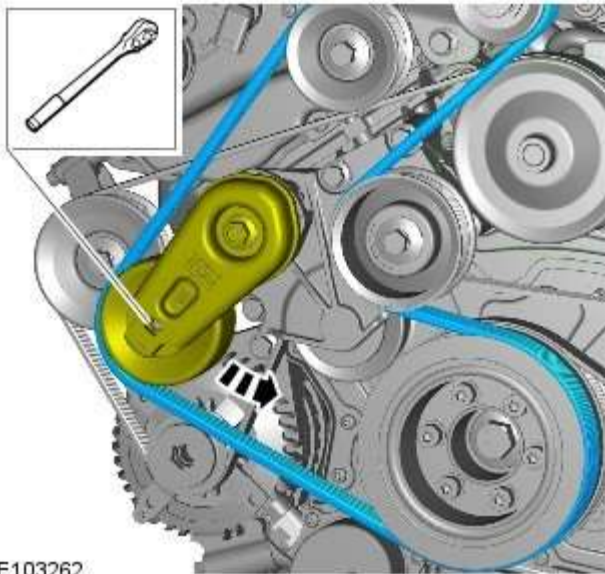


18.  **WARNING:** Make sure that a new bolt is installed.
Apply loctite 270 to the thread of the bolts.
Torque: 65 Nm



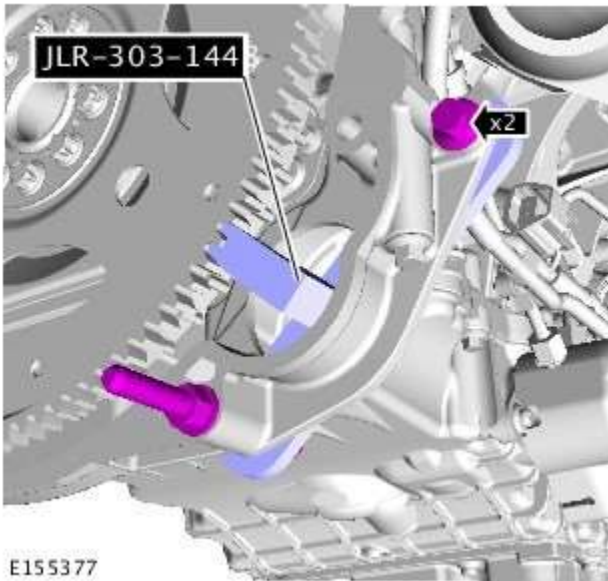
- 19.

20.



E103262

21. Remove the special tool.



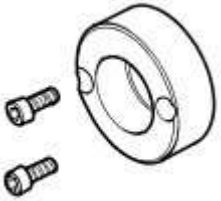
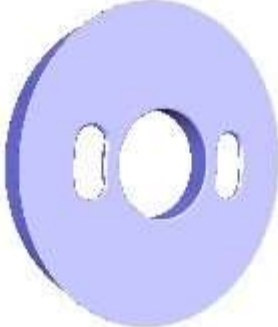
E155377

22. Refer to: [Starter Motor](#) (303-06C Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
23. Refer to: [Cooling Fan Motor and Shroud - Vehicles With: Supercharger](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
24. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Crankshaft Rear Seal

Removal and Installation

Special Tool(s)

 <p>E107678</p>	303-1442 Rear Crankshaft Seal Installer
 <p>E154431</p>	JLR-303-1622 Alignment Tool, Engine Rear Oil Seal

Removal



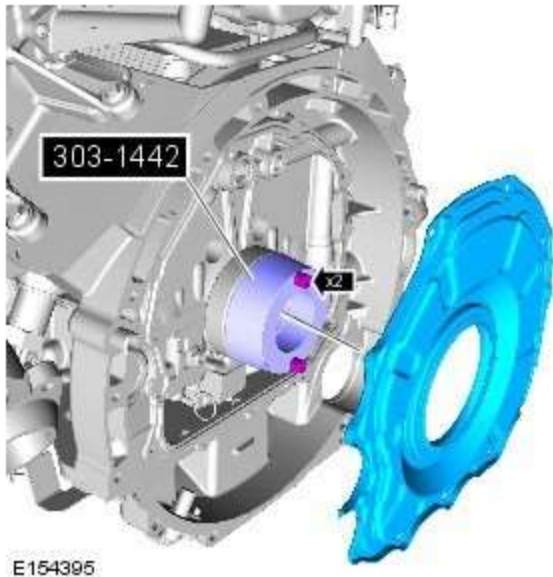
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Flexplate](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

2.



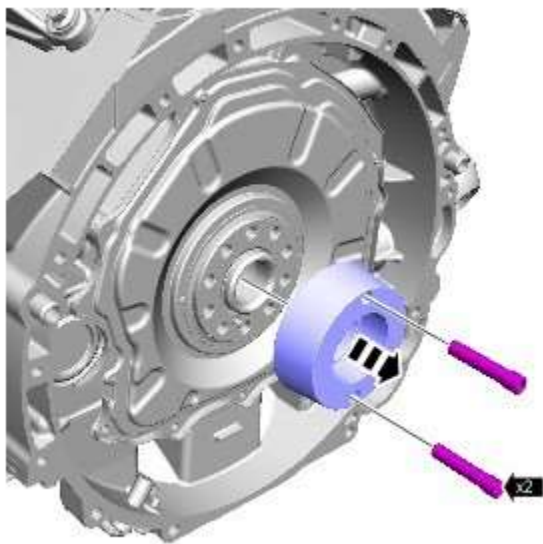
Installation



E154395

1. Install the special tool.

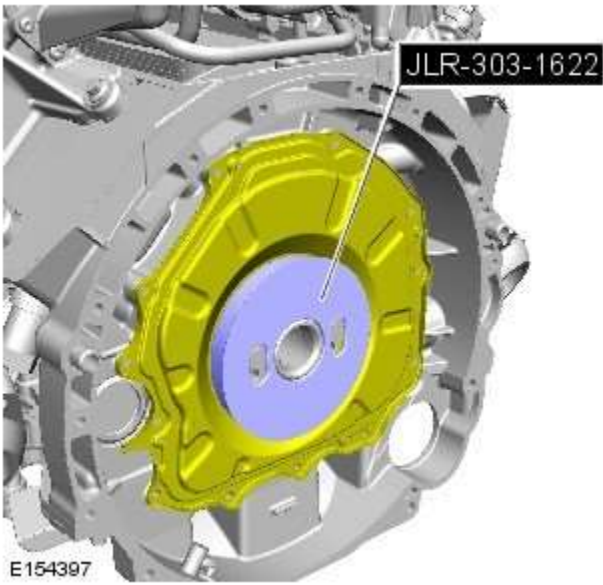
Special Tool(s): [303-1442](#)



E154396

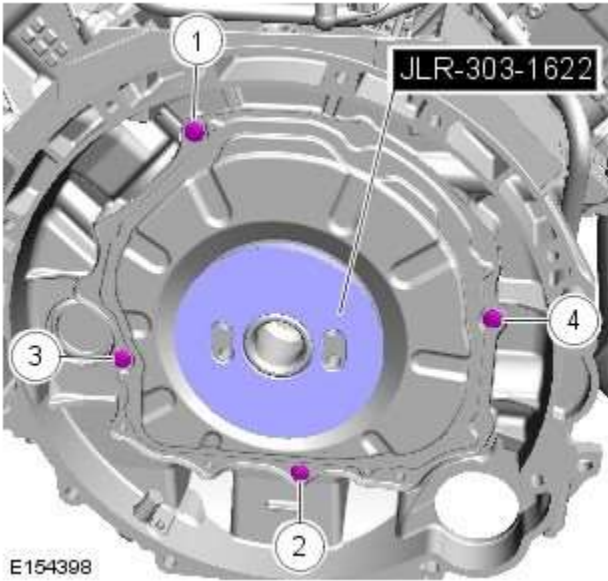
2. Remove the special tool.

Special Tool(s): [303-1442](#)



3. Install the special tool.

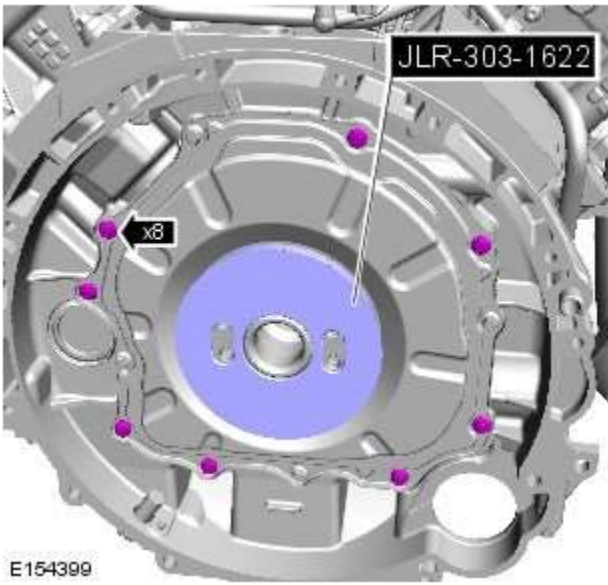
Special Tool(s): [JLR-303-1622](#)



4.  NOTE: Tighten the bolts in the indicated sequence.

Special Tool(s): [JLR-303-1622](#)

Torque: 11 Nm



5. *Special Tool(s):* [JLR-303-1622](#)
Torque: 11 Nm

6. Refer to: [Flexplate](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

Engine - V8 S/C 5.0L Petrol - Cylinder Head LH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



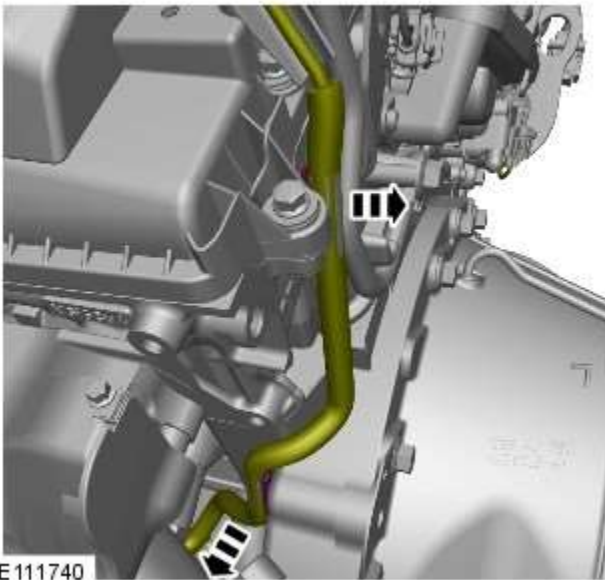
2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

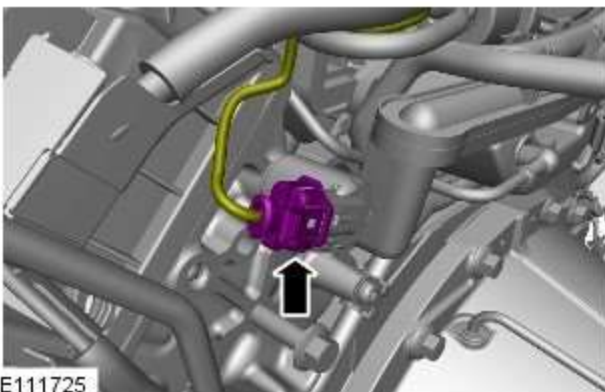
3. Refer to: [Camshaft LH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

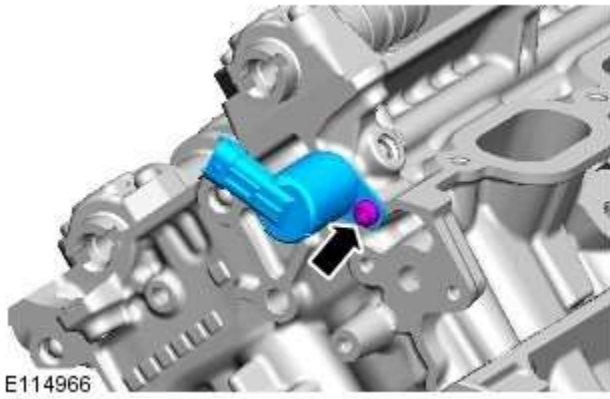
4. Refer to: [Exhaust Manifold LH](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).

5.



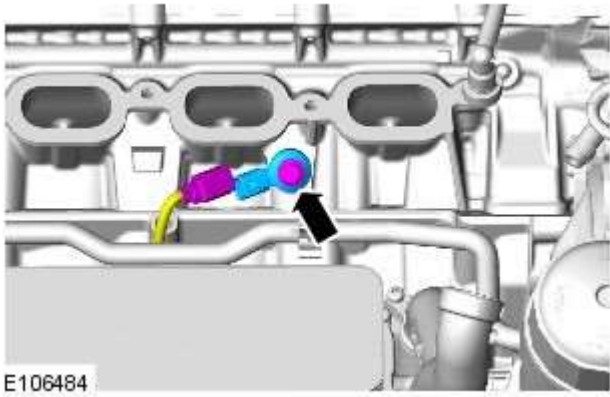
6.



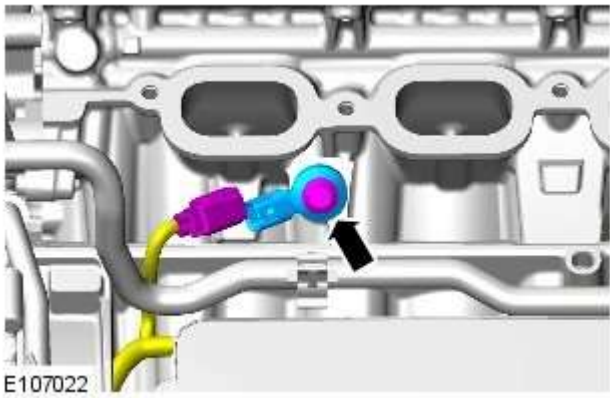


7.  CAUTION: Discard the seal.

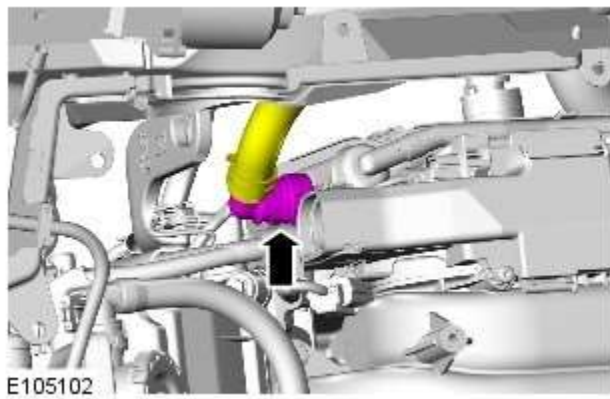
 NOTE: Engine shown removed for clarity.




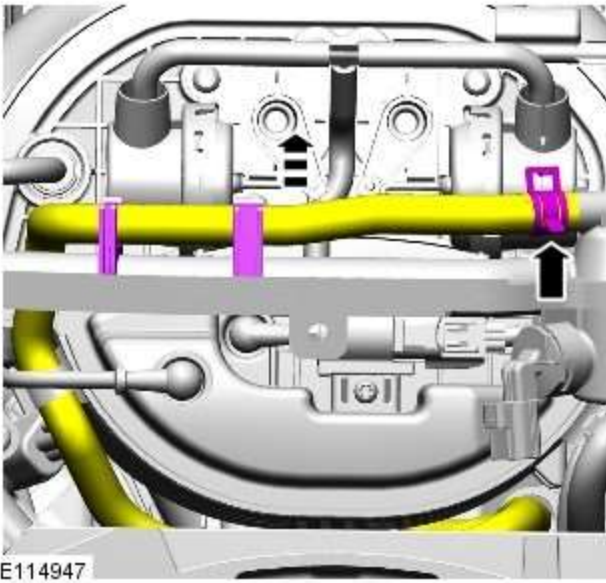
8.




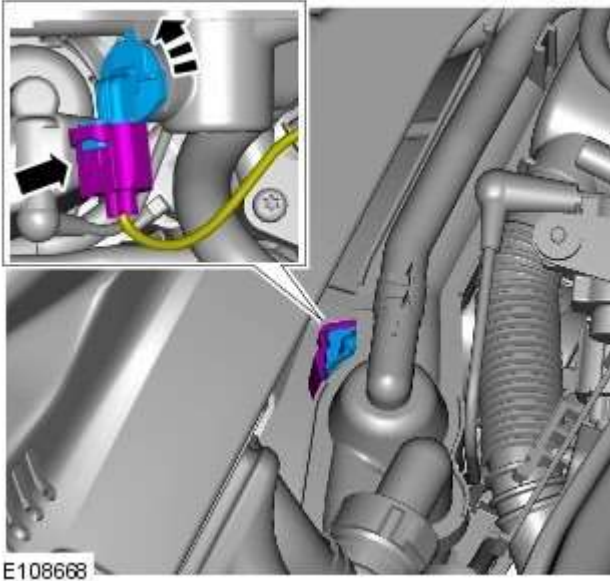
9.



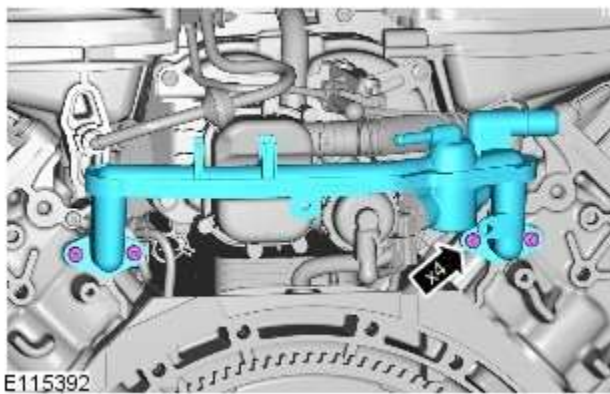
10.  NOTE: Clamp the hose to minimize coolant loss.



11.  NOTE: Clamp the hose to minimize coolant loss.

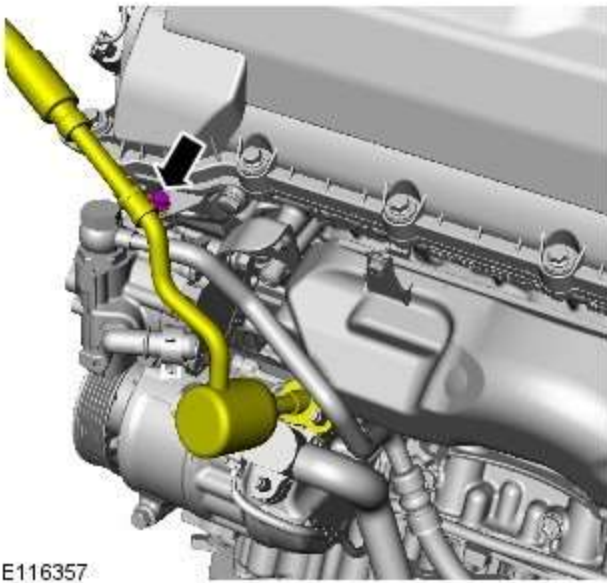


- 12.



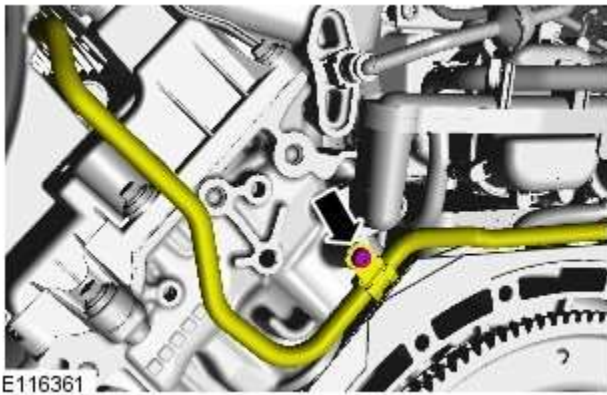
13.  CAUTION: Discard the seals.

14.



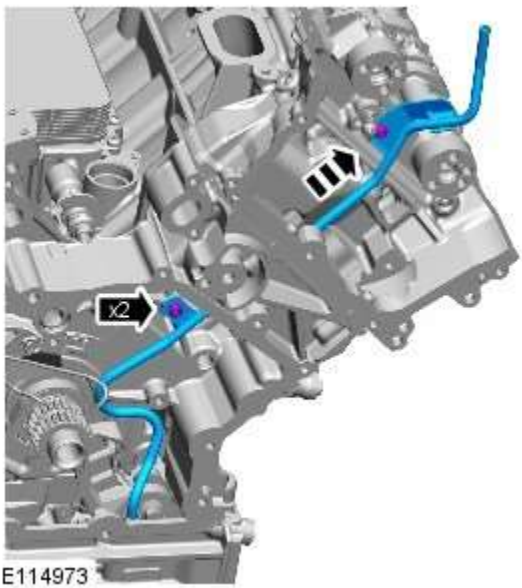
E116357

15.

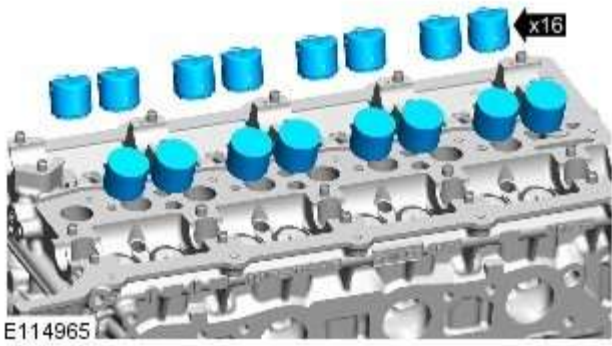


E116361


16.




E114973



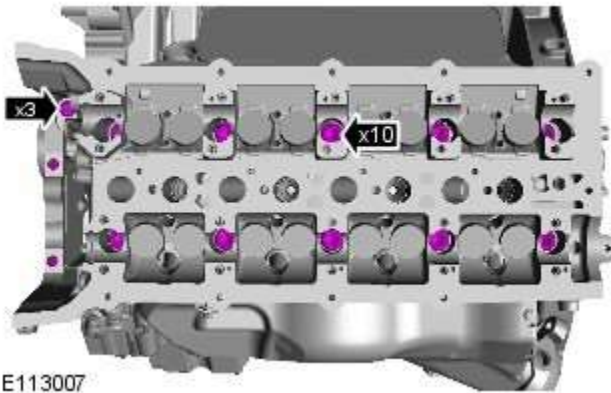
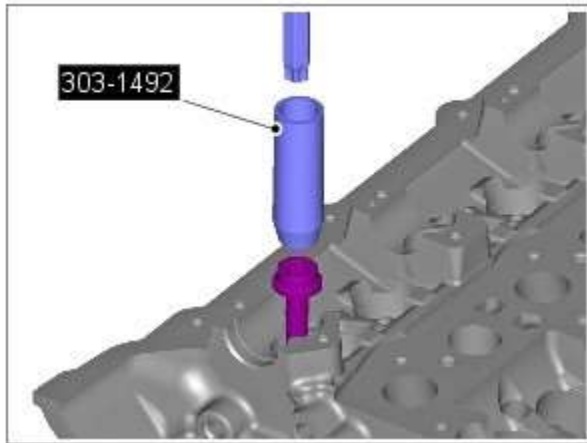
17. CAUTIONS:

 If a new cylinder head has been installed then new tappets must be installed.

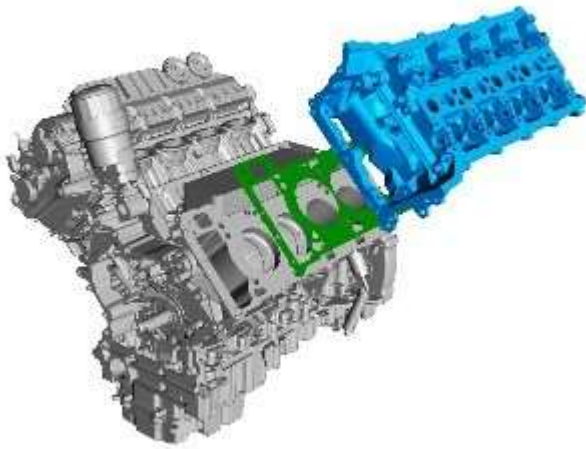
 If the cylinder head is being removed without a new component being installed, the tappets must be installed in their original positions.

 NOTE: Left-hand shown, right-hand similar.

18.

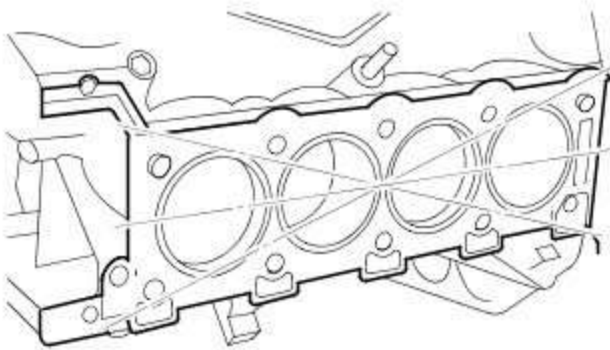


19.



E113006

Installation



E46855



1. **CAUTION:** An acceptable flatness of the cylinder head is 0.1mm.

Check cylinder head face for distortion, across the center and from corner to corner.



2. **WARNING:** Make sure care is taken when handling the cylinder head gasket.

CAUTIONS:



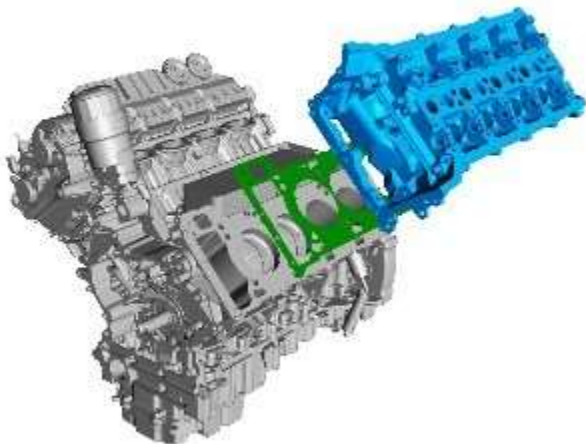
The head gasket must be installed over the cylinder block dowels.



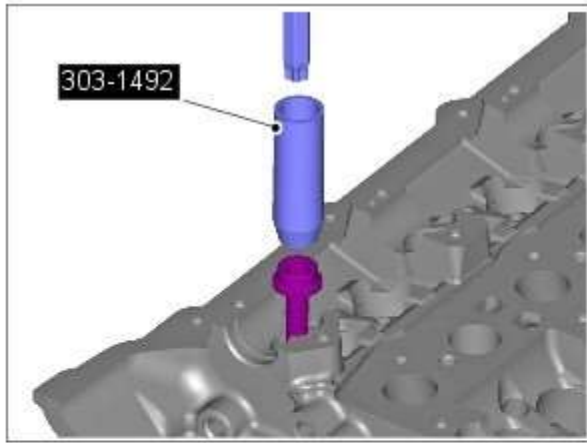
Make sure that the mating faces are clean and free of foreign material.




NOTE: Install a new cylinder head gasket.



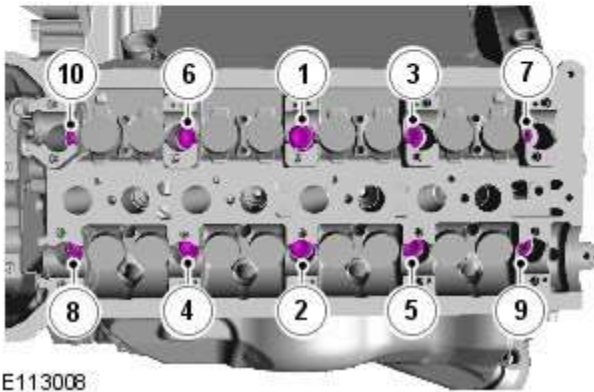
E113006



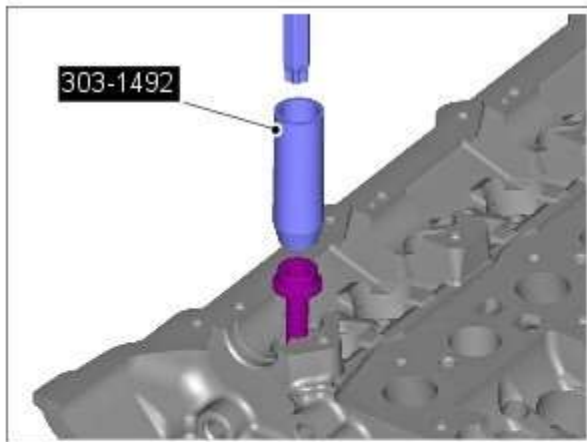
3.  CAUTION: Make sure that new cylinder head bolts are installed.

 NOTE: Tighten the bolts in the indicated sequence.

Torque: 20 Nm

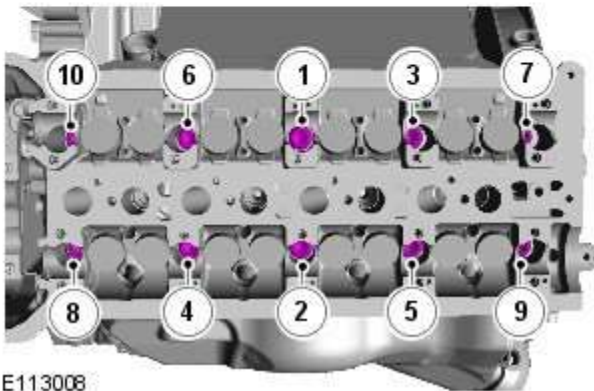


E113008

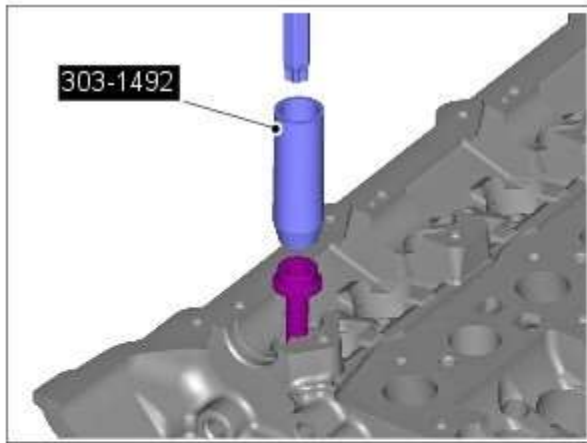



4.  NOTE: Tighten the bolts in the indicated sequence.

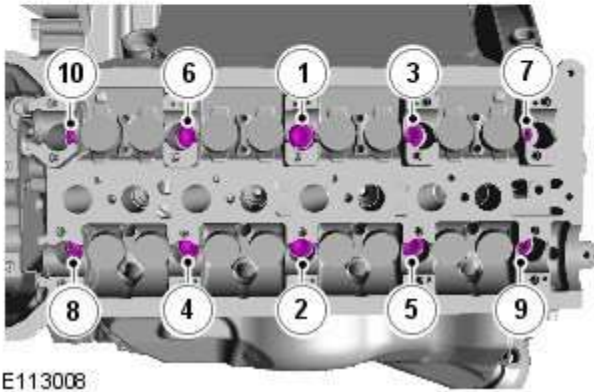
Torque: 35 Nm



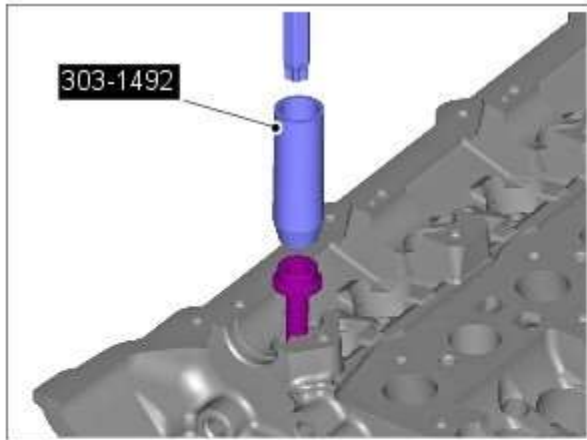
E113008




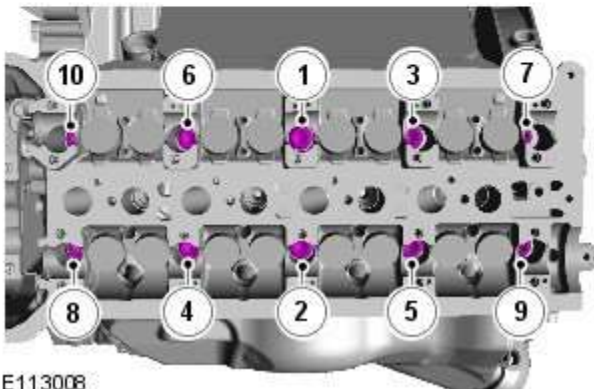
5.  NOTE: Tighten the bolts in the indicated sequence.
Tighten the bolts 1 to 10, a further 90 degrees.



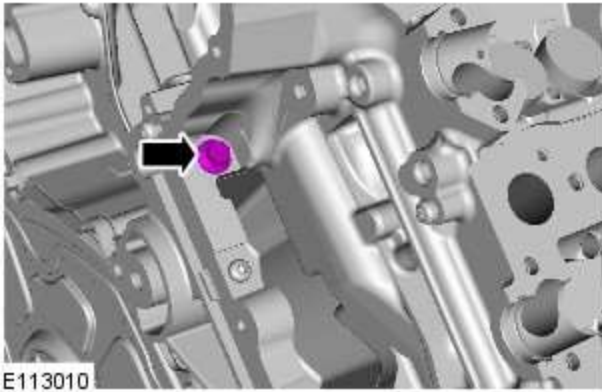
E113008



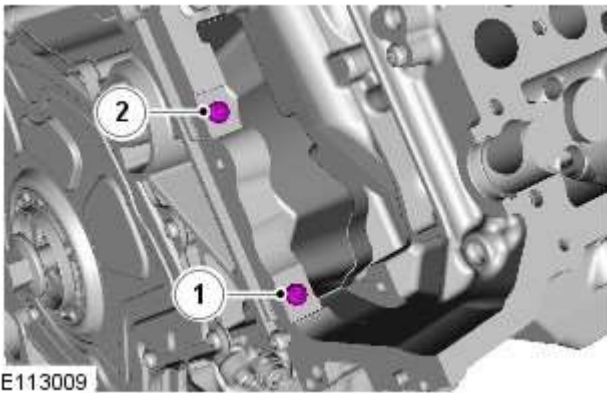
6.  NOTE: Tighten the bolts in the indicated sequence.
Tighten the bolts 1 to 10, a further 120 degrees.



E113008




7. Torque: 25 Nm




8.  NOTE: Tighten the bolts in the indicated sequence.
Torque: 12 Nm

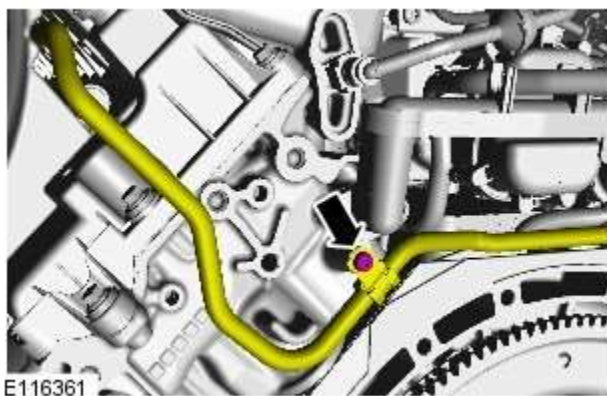


9. CAUTIONS:

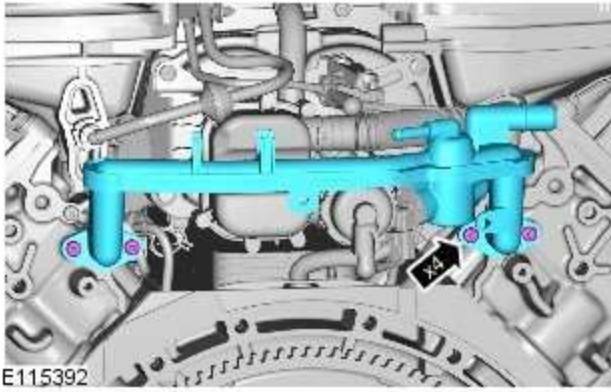
 If a new cylinder head has been installed then new tappets must be installed.

 If the cylinder head is being removed without a new component being installed, the tappets must be installed in their original positions.

Lubricate the valve tappets with clean engine oil.

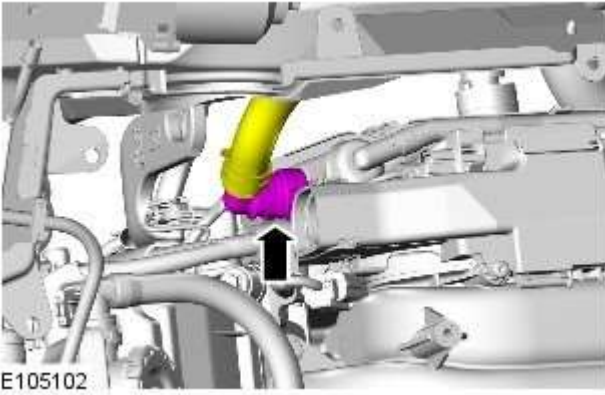


10. Torque: 10 Nm

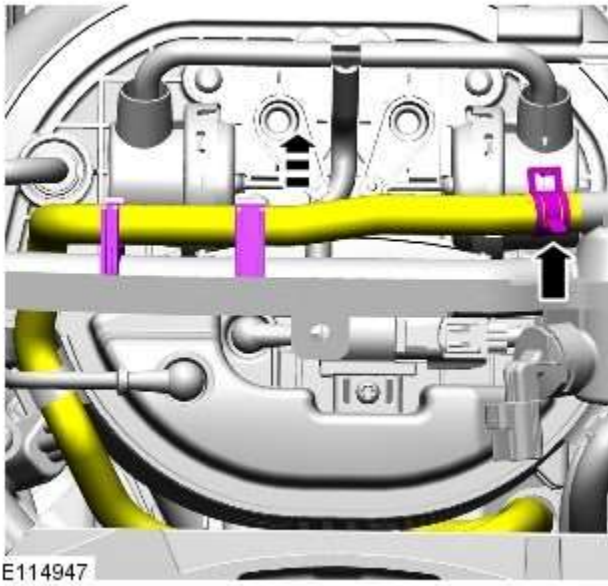


11.  CAUTION: Install the new seals.

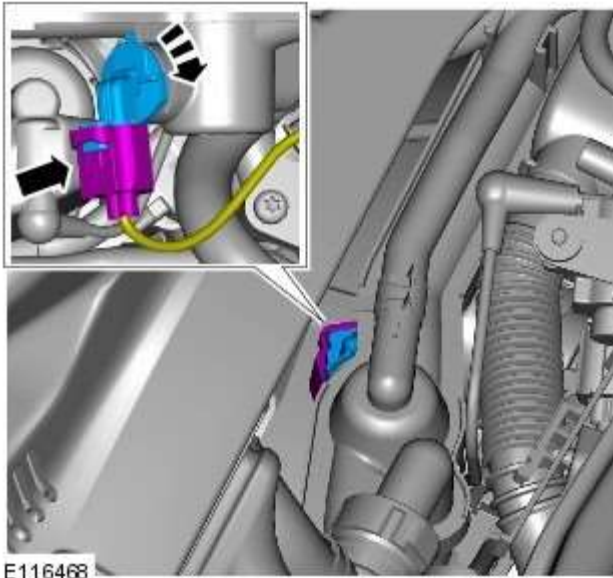
Torque: 10 Nm



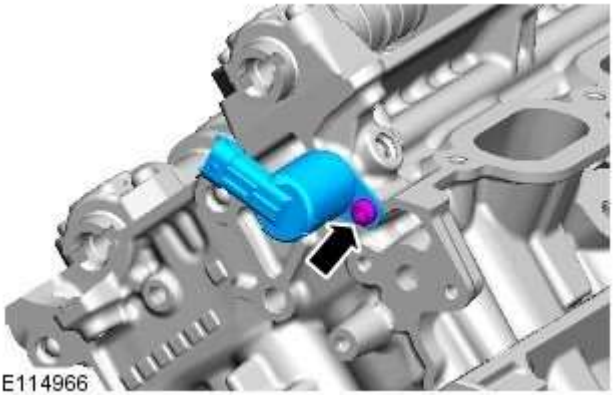
12.



13.



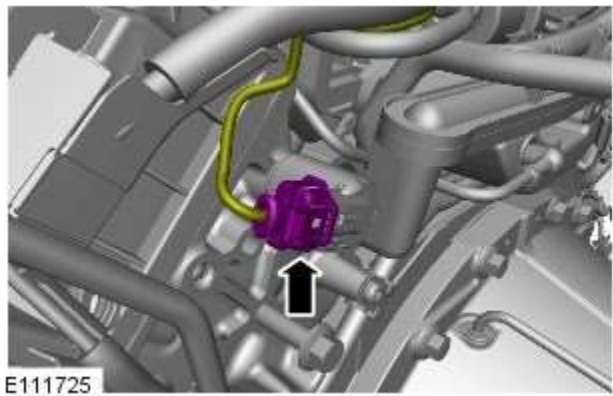
14.



15.  CAUTION: Install a new seal.

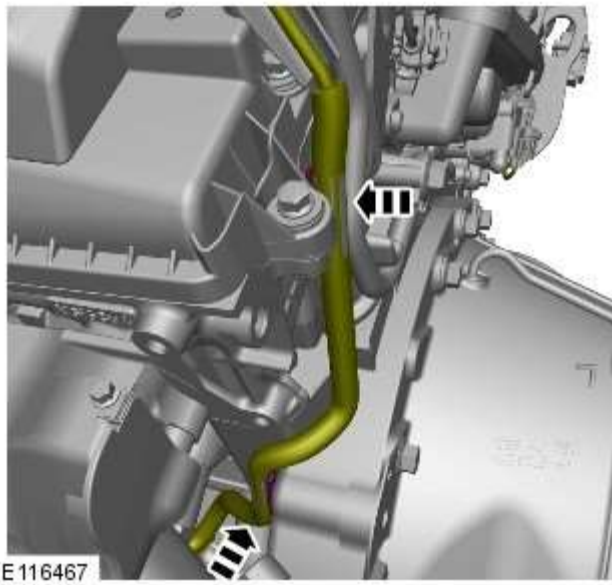
 NOTE: Engine shown removed for clarity.

Torque: 12 Nm

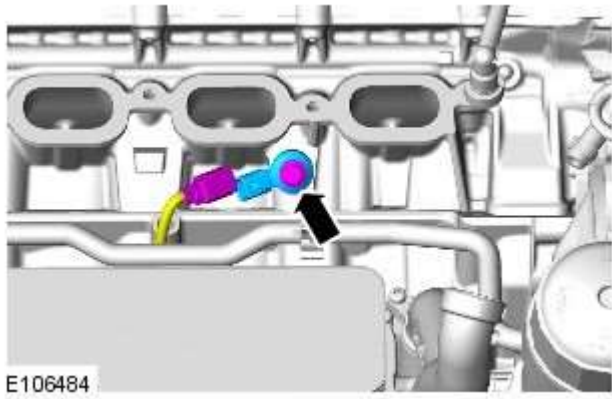


16.

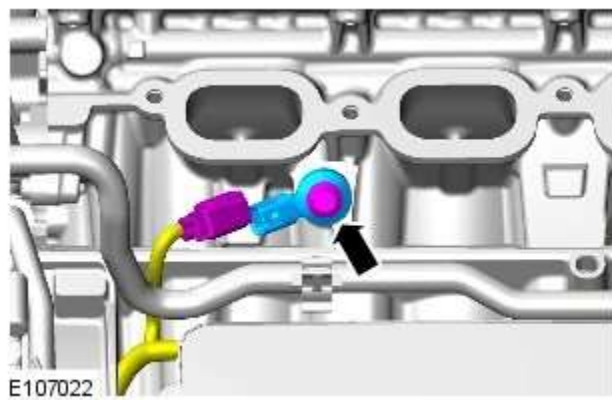
17.

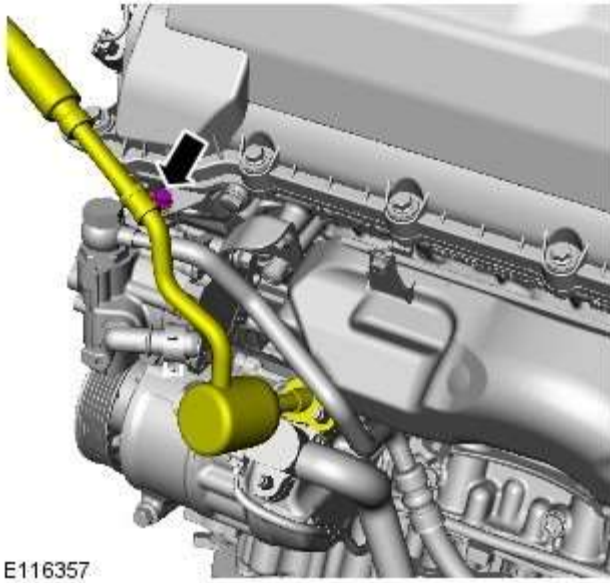


18. Torque: 20 Nm



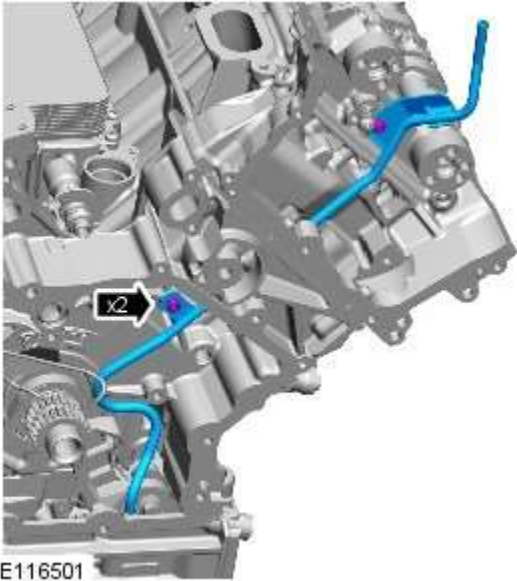
19. Torque: 20 Nm





E116357

20. Torque: 12 Nm



E116501

21. Torque: 12 Nm

22. Refer to: [Exhaust Manifold LH](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).
23. Refer to: [Camshaft LH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
24. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Cylinder Head RH

Removal and Installation

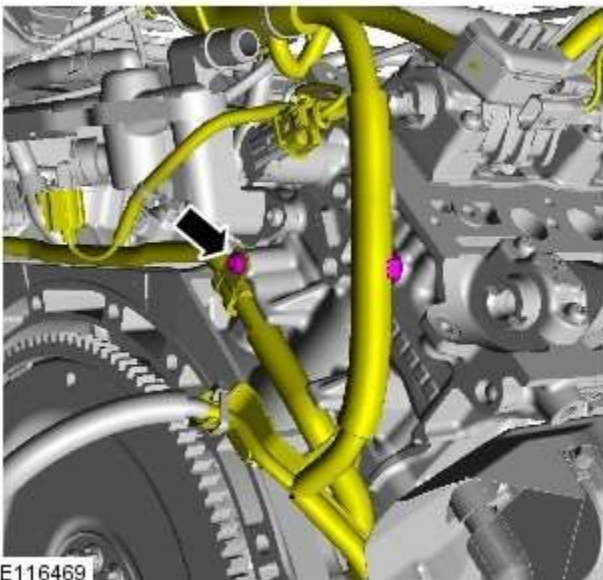
Removal

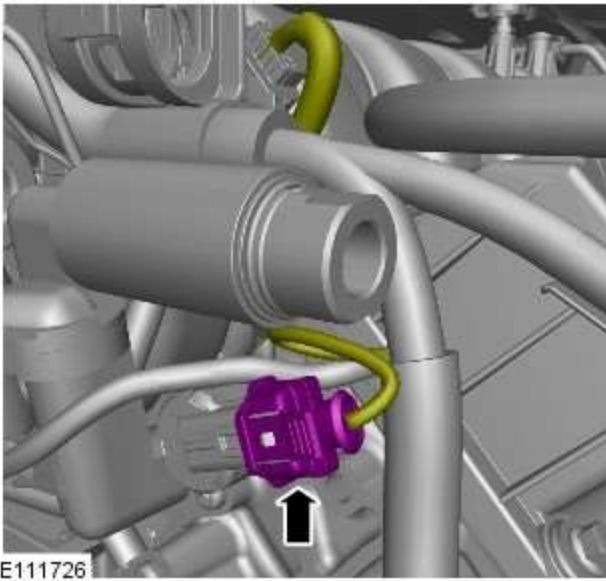


NOTE: Removal steps in this procedure may contain installation details.

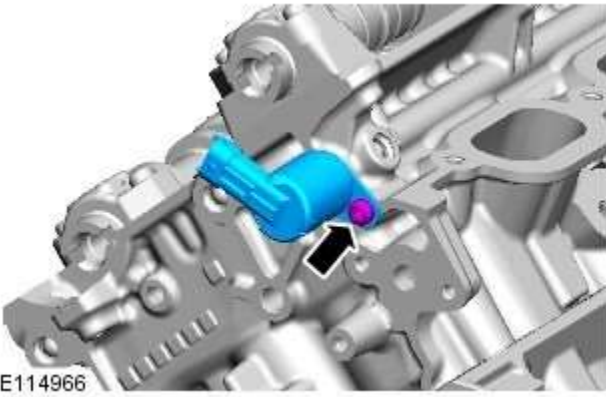
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Raise and support the vehicle.
3. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
4. Refer to: [Camshaft RH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
5. Refer to: Exhaust Manifold (303-01A, Removal and Installation).

6.





7.

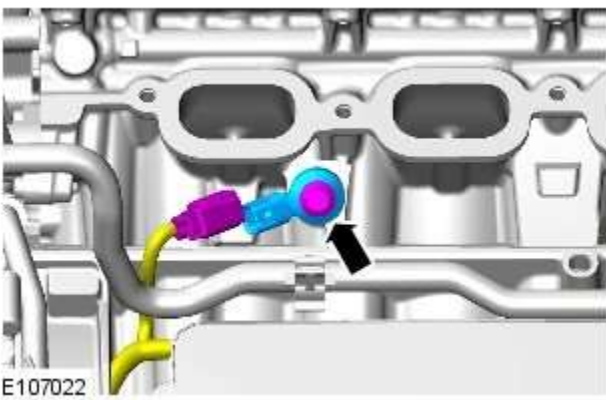


8. CAUTIONS:

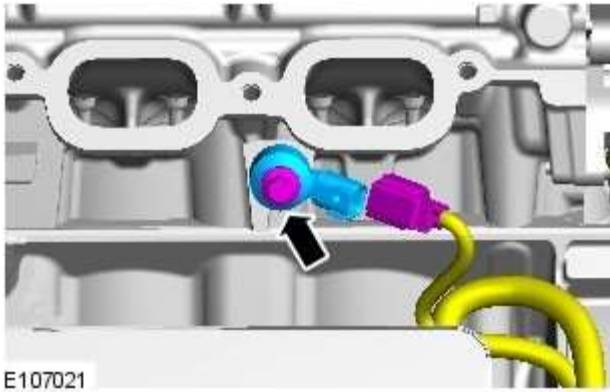
 Discard the seal.

 LH illustration shown, RH is similar.

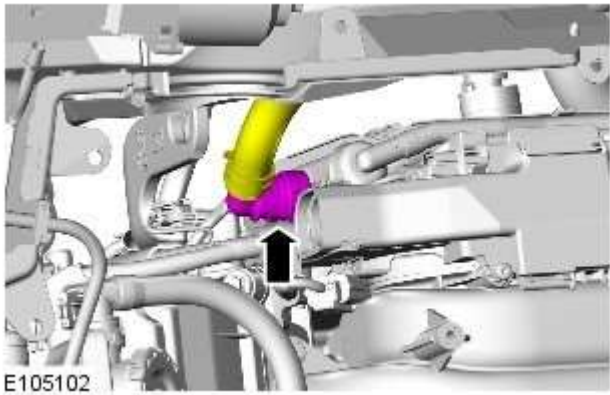
 NOTE: Engine shown removed for clarity.




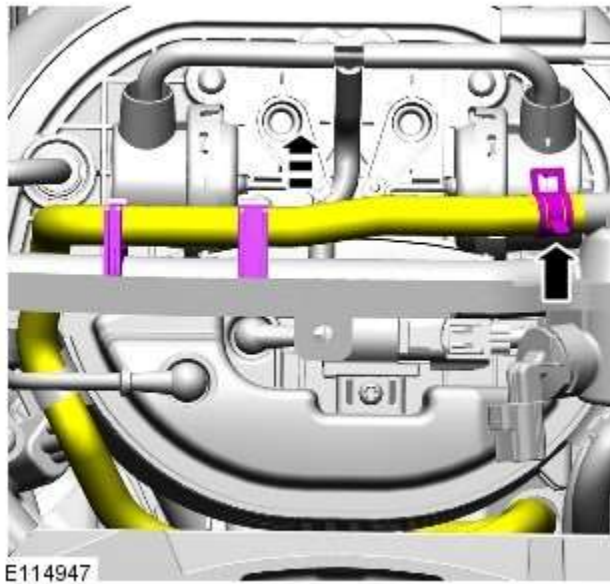
9.




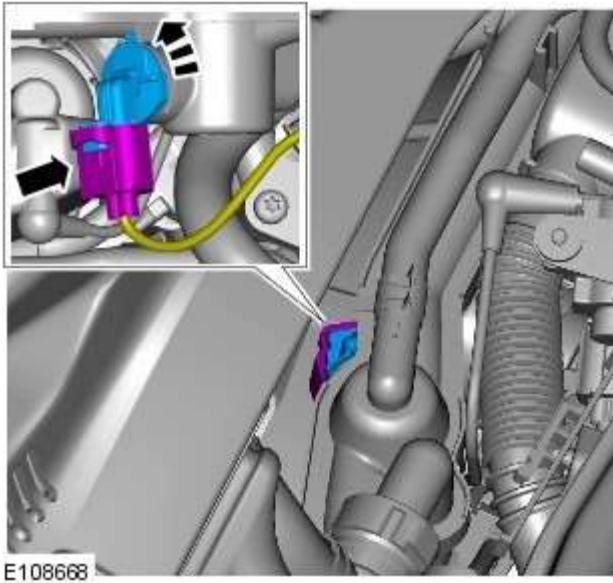
10.



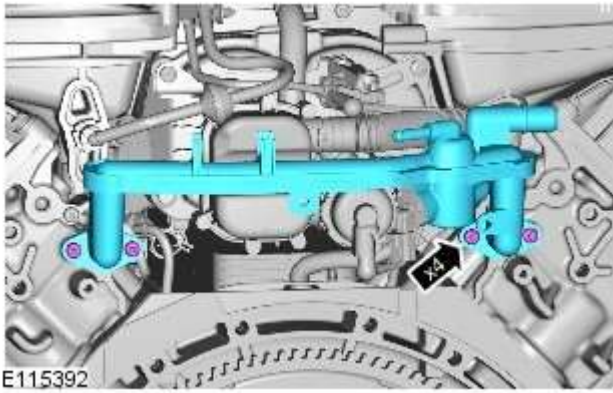
11.  NOTE: Clamp the hose to minimize coolant loss.



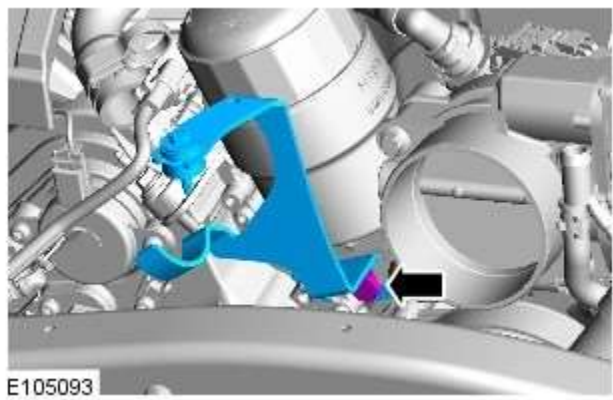
12.  NOTE: Clamp the hose to minimize coolant loss.



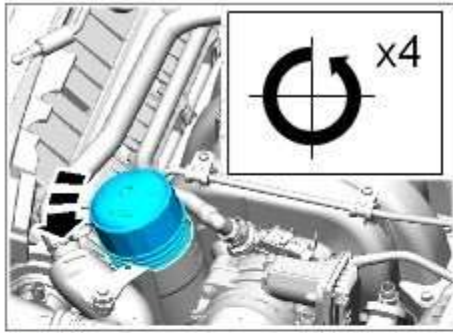
13.




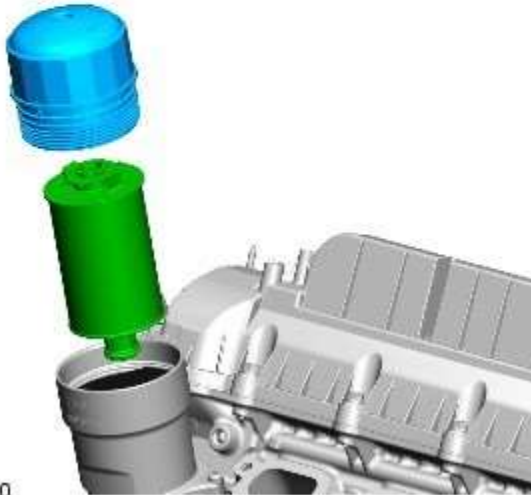
14.  CAUTION: Discard the seals.



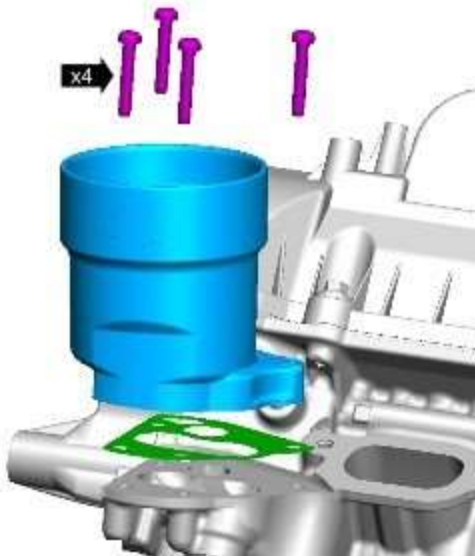
15.



16.  NOTE: Remove and discard the O-ring seal.



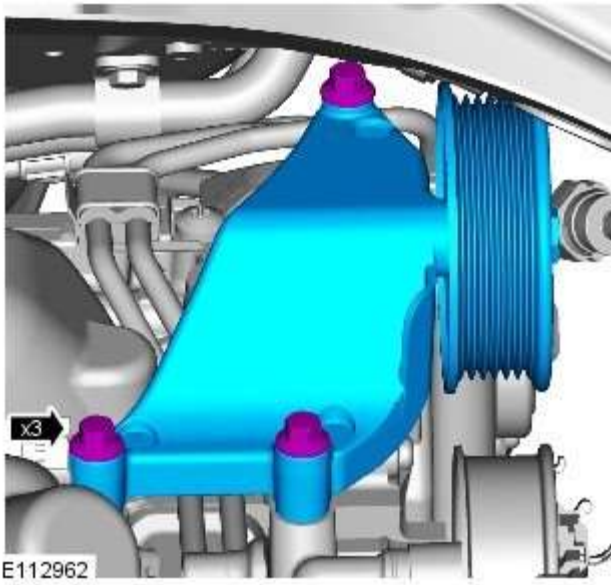
E114960



17.  NOTE: Discard the gasket.

E114959

18.



19. CAUTIONS:

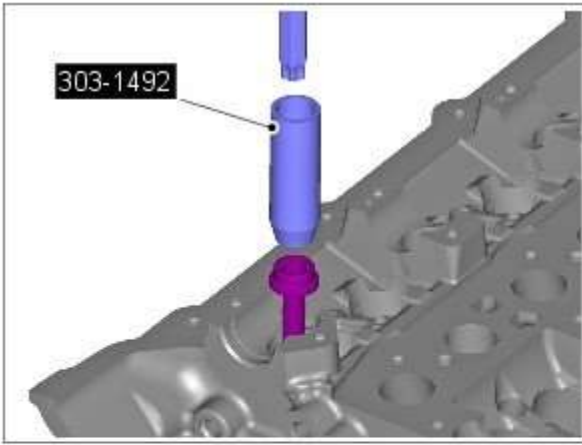


If a new cylinder head has been installed then new tappets must be installed.

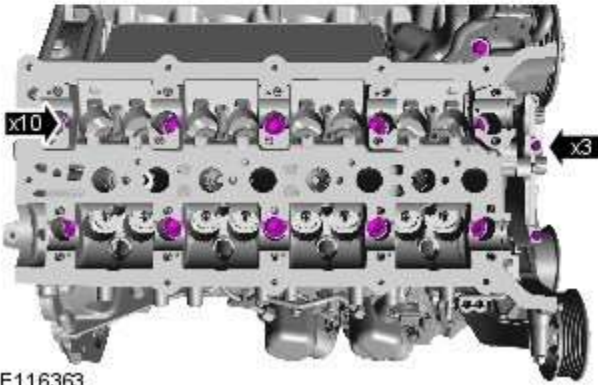


If the cylinder head is being removed without a new component being installed, the tappets must be installed in their original positions.



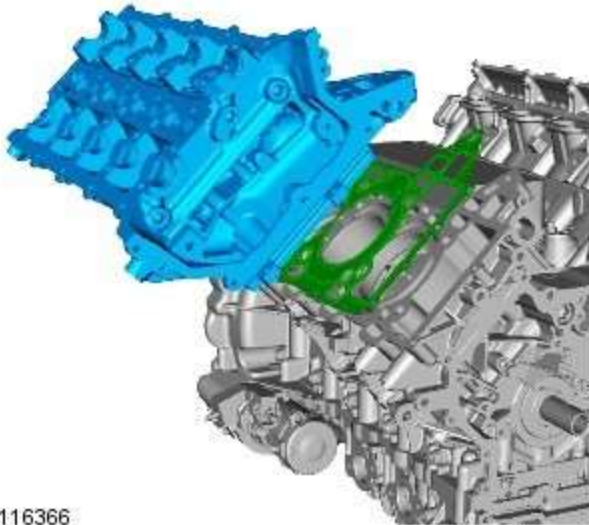


20.  CAUTION: Discard the bolts.



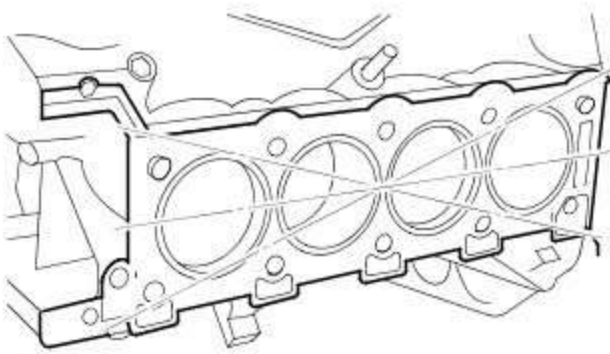
E116363

21.  NOTE: Discard the gasket.




E116366

Installation

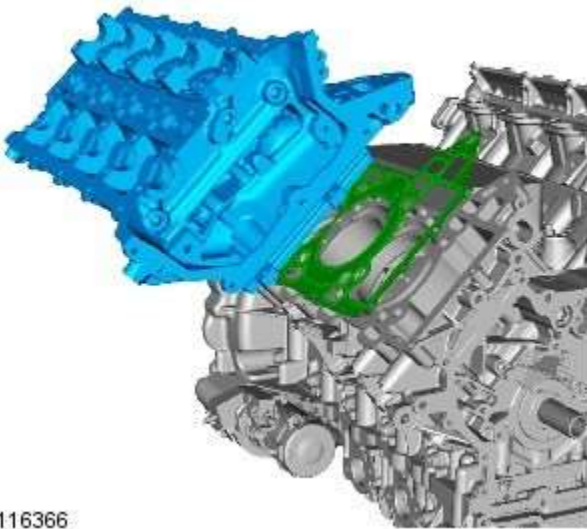


E46855

1.  **CAUTION:** An acceptable flatness of the cylinder head is 0.1mm.

 **NOTE:** For cylinder head with distortion above the maximum allowance, the cylinder head material must be measured.

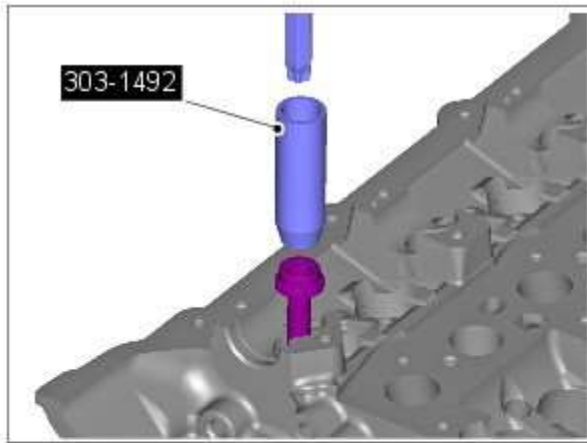
Check cylinder head face for distortion, across the center and from corner to corner.




E116366

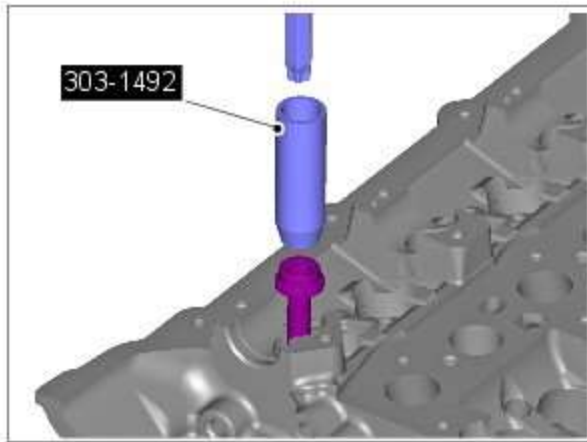
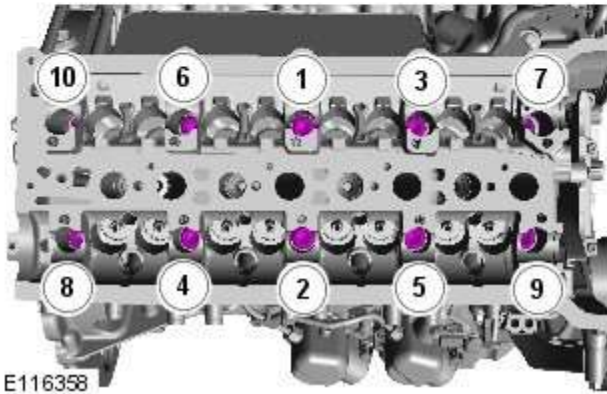
2.  **WARNING:** Make sure care is taken when handling the cylinder head gasket.

 **NOTE:** Install a new gasket.

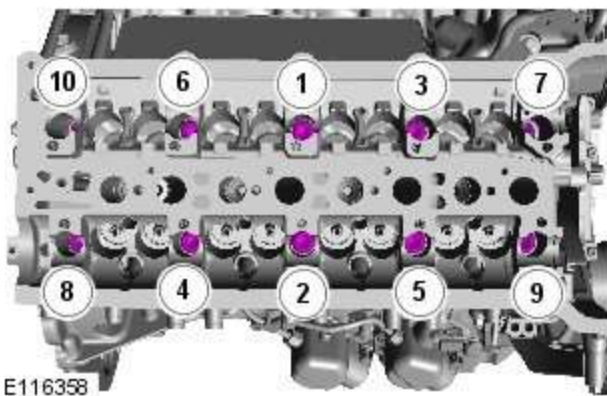


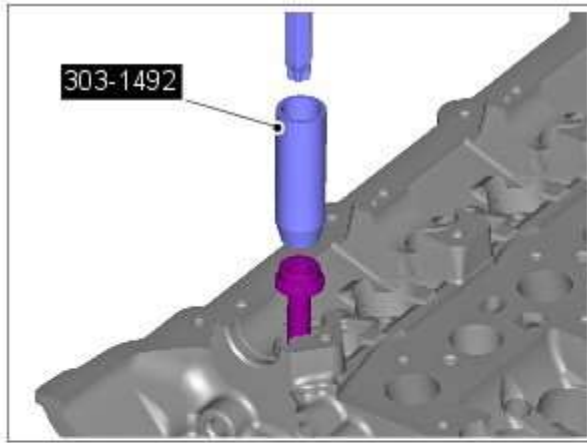
3.  CAUTION: Make sure that new cylinder head bolts are installed.

Torque: 20 Nm

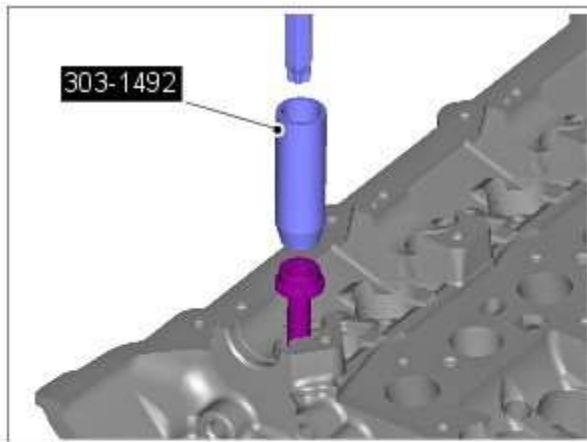
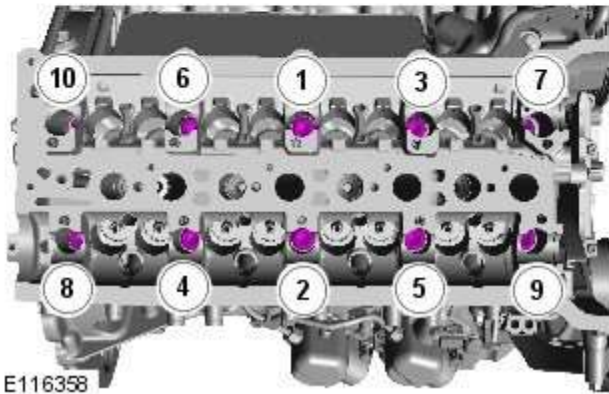


4. *Torque: 35 Nm*

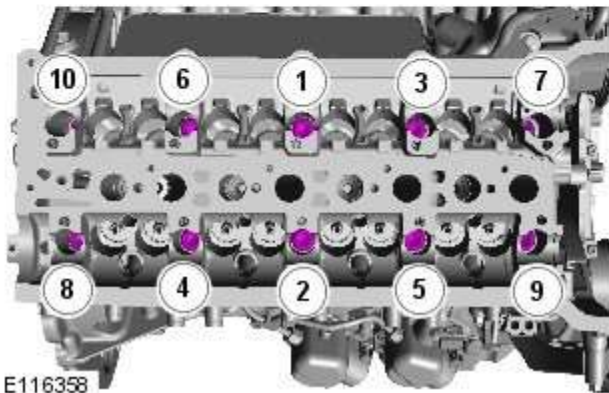


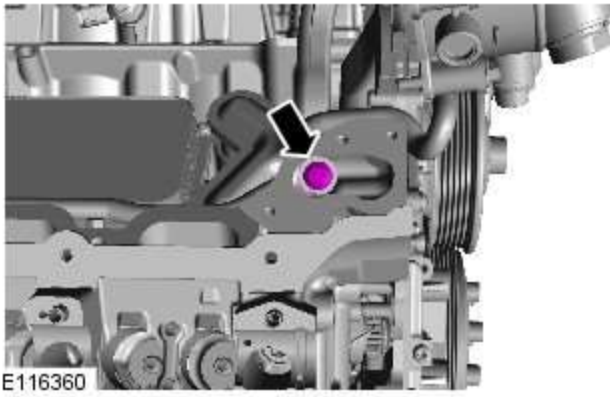


5. Tighten the bolts 1 to 10, a further 90 degrees.

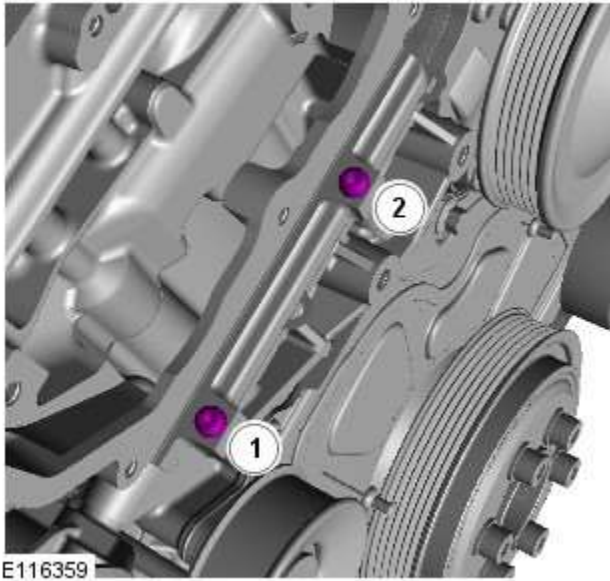


6. Tighten the bolts 1 to 10, a further 120 degrees.





7. Torque: 25 Nm



8. Torque: 12 Nm



9. CAUTIONS:

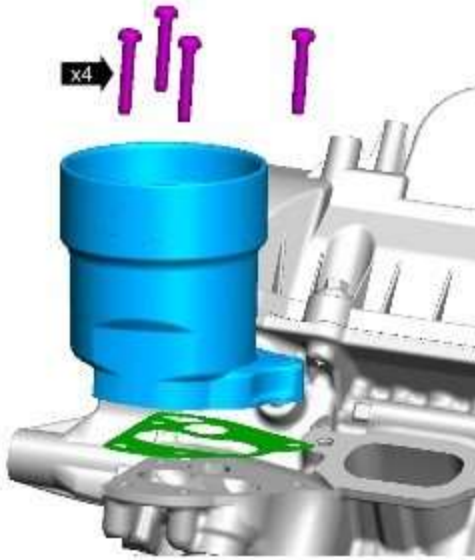


If a new cylinder head has been installed then new tappets must be installed.



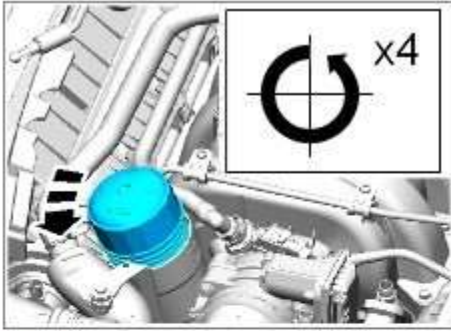
If the cylinder head is being removed without a new component being installed, the tappets must be installed in their original positions.

Lubricate the valve tappets with clean engine oil.



E114959

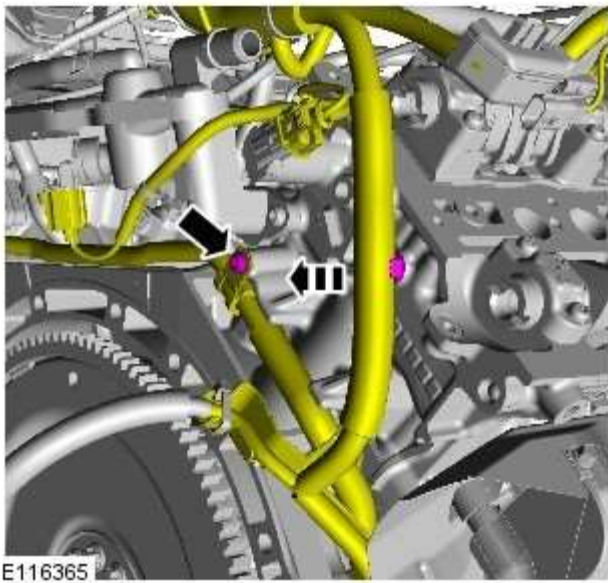
10.  NOTE: Install a new gasket.



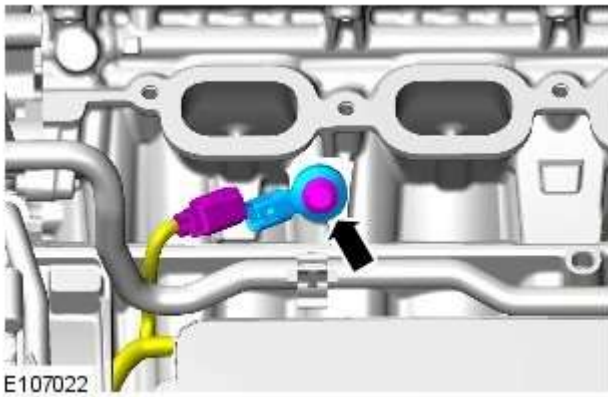
E114960

11.  CAUTION: A new O-ring seal is to be installed.

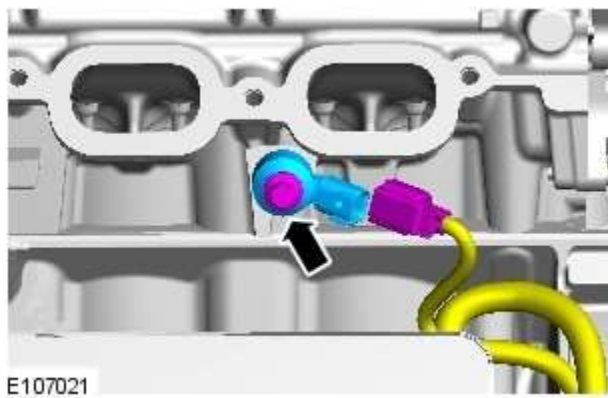
 NOTE: Install a new engine oil filter.



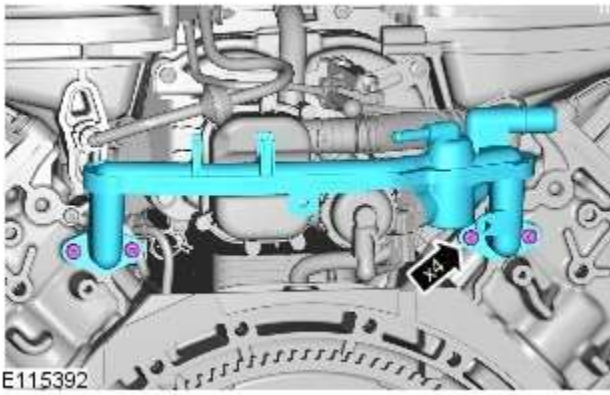
12. Torque: 12 Nm



13. Torque: 20 Nm

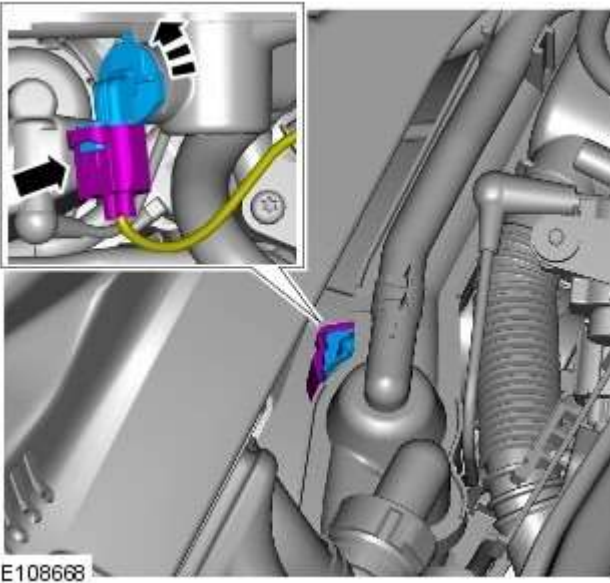


14. Torque: 20 Nm

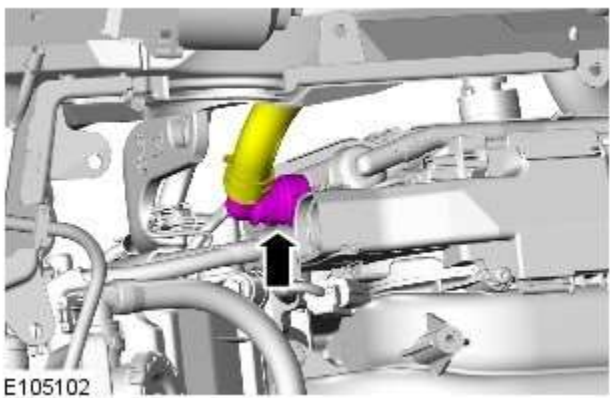



15.  CAUTION: Install the new seals.

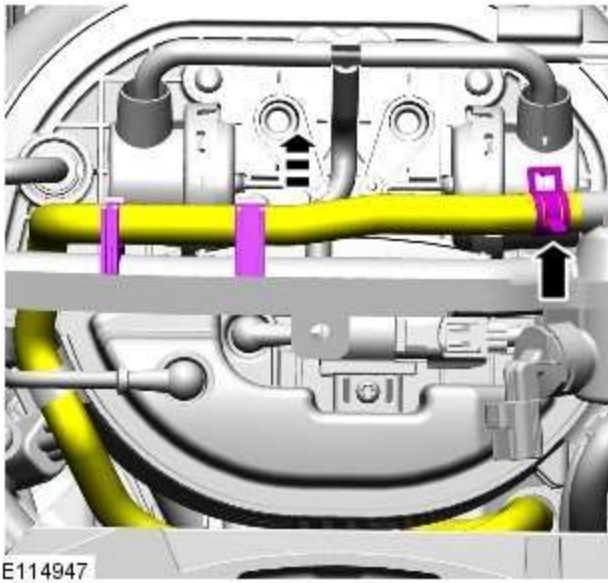
Torque: 10 Nm




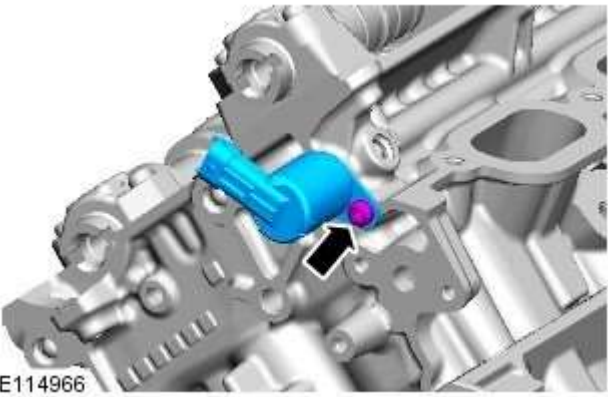
16.




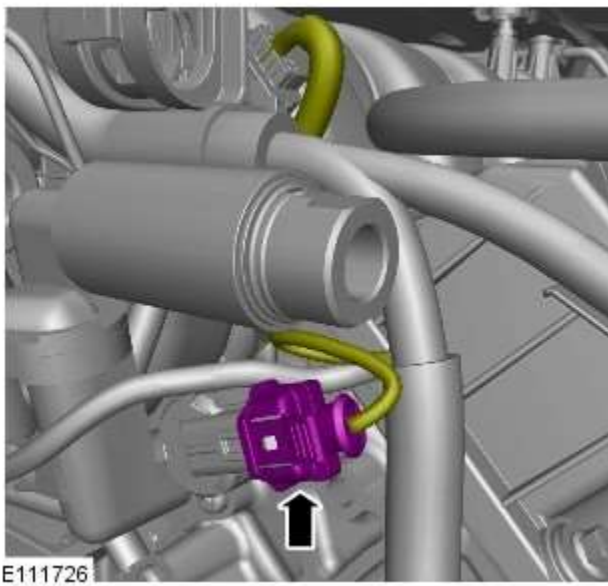
17.  NOTE: Clamp the hose to minimize coolant loss.



18.  NOTE: Clamp the hose to minimize coolant loss.

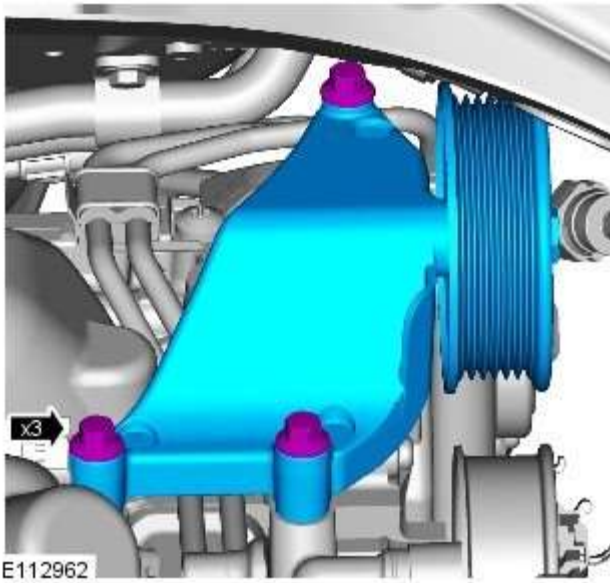


19.  CAUTION: Install a new seal.
Torque: 12 Nm

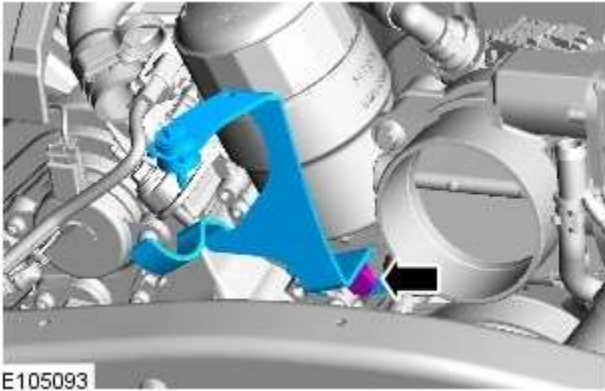


- 20.

21. Torque: 25 Nm



22. Torque: 25 Nm



23. Refer to: Exhaust Manifold (303-01A, Removal and Installation).

24. Refer to: [Camshaft RH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

25. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

26. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Engine Mount LH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Air Conditioning \(A/C\) Compressor - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (412-03 Air Conditioning, Removal and Installation).

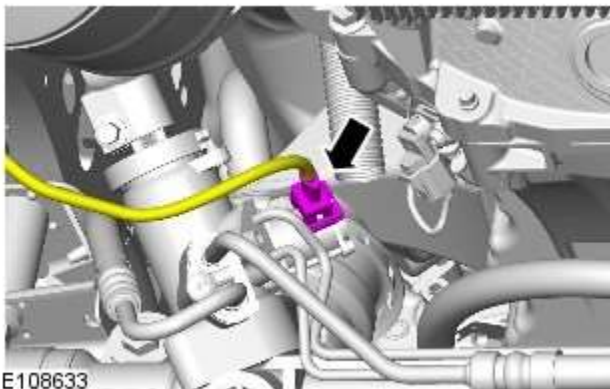



4. **CAUTION:** Support the engine on a jack. The angle may need to be adjusted during this procedure.

Support the engine with the lifting equipment.

Left-hand drive vehicles

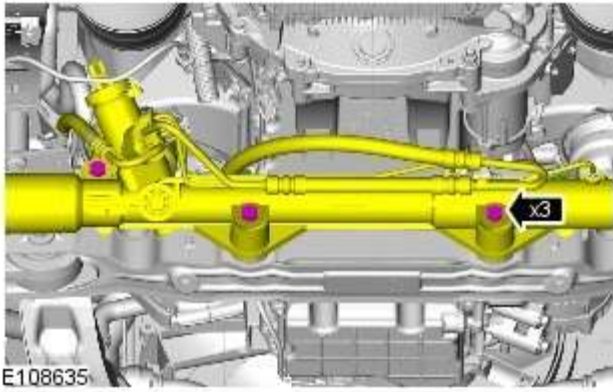
5.



6.  NOTE: Note the fitted position.

- Torque: 35 Nm
- Right-hand side shown, left-hand side similar.

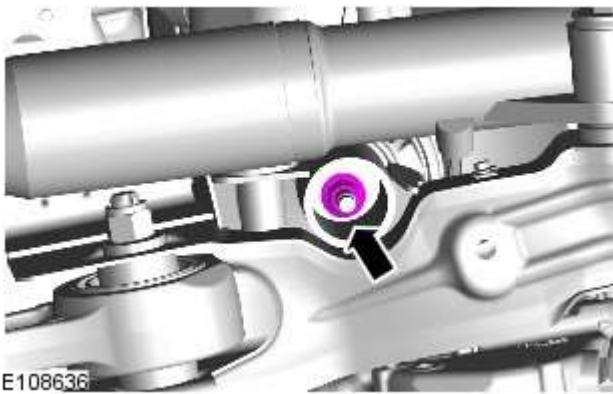




7.

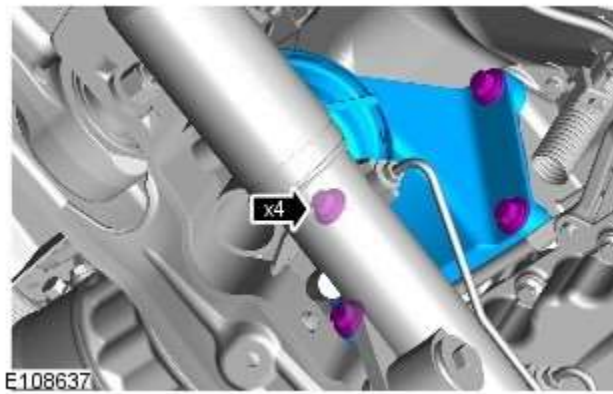
- Torque: 100 Nm
- Support and release the power steering rack.

All vehicles



8.

- Torque: 63 Nm
- Remove and discard the nut.




9.

- Torque: 48 Nm
- Raise the engine.



E108537

10.  NOTE: Do not disassemble further if the component is removed for access only.
- Torque: 48 Nm
 - Remove and discard the nut.

Installation

1. To install, reverse the removal procedure.

Engine - V8 S/C 5.0L Petrol - Engine Mount RH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

All vehicles

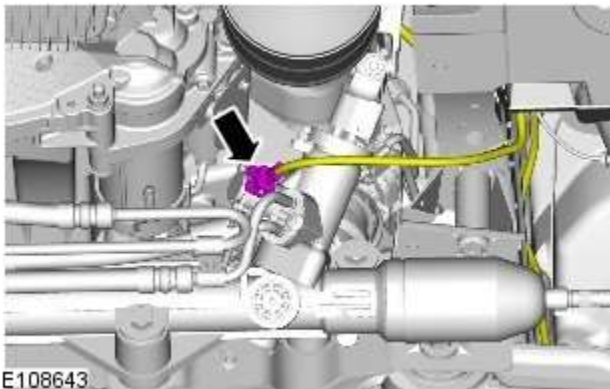


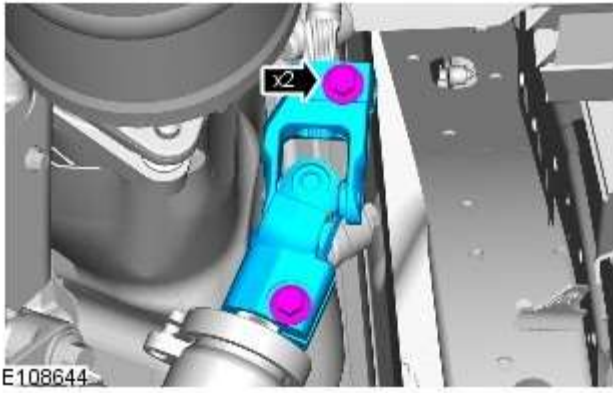
4. **CAUTION:** Support the engine on a jack. The angle may need to be adjusted during this procedure.


Support the engine with the lifting equipment.

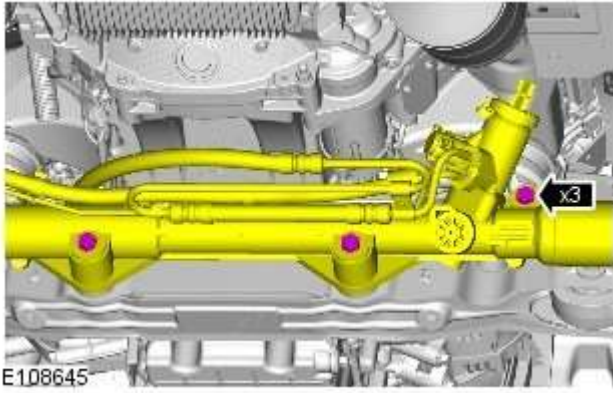
Right-hand drive vehicles

5.



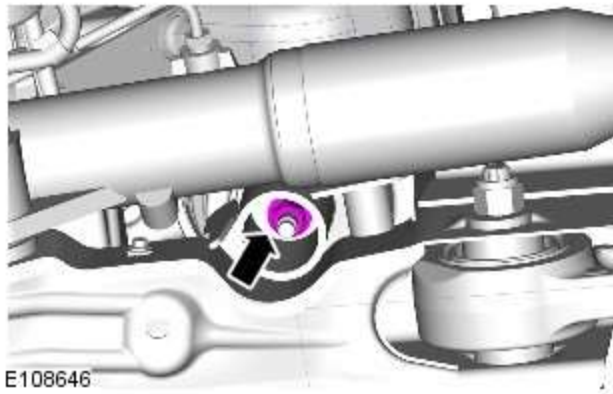


6.  NOTE: Note the fitted position.
Torque: 35 Nm

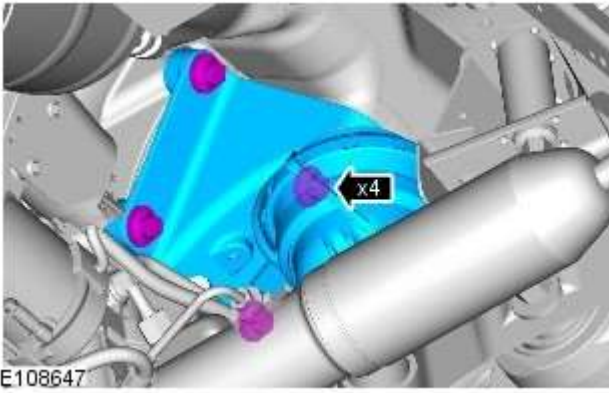


7. Torque: 100 Nm

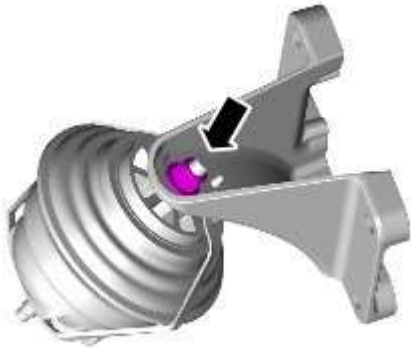
All vehicles




8. Torque: 63 Nm



9. Torque: 48 Nm



10.  NOTE: Do not disassemble further if the component is removed for access only.

Torque: 48 Nm

Installation

1. To install, reverse the removal procedure.

Engine - V8 S/C 5.0L Petrol - Exhaust Manifold LH

Removal and Installation

Special Tool(s)

 <p>E115261</p>	<p>303-1444-01 Exhaust Manifold Installation Guide Pins - Threaded</p>
 <p>E115262</p>	<p>303-1444-02 Exhaust Manifold Installation Guide Pins - Unthreaded</p>

Removal

NOTES:



Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

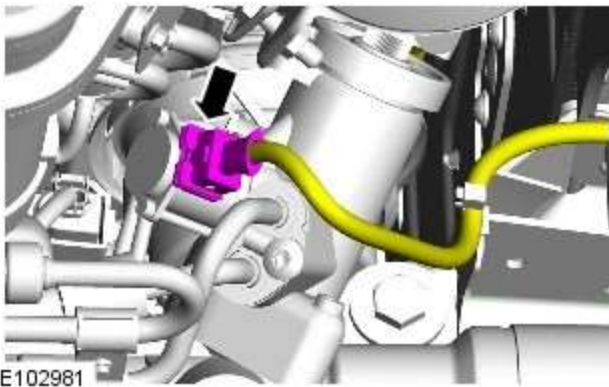
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

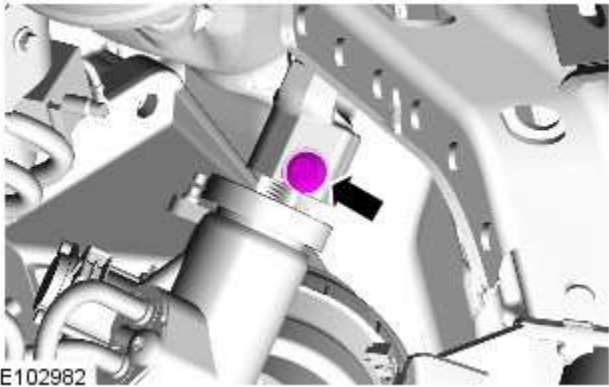
Raise and support the vehicle.

3. Refer to: [Power Steering Pump - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (211-02 Power Steering, Removal and Installation).
4. Refer to: [Catalytic Converter LH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).




E102981

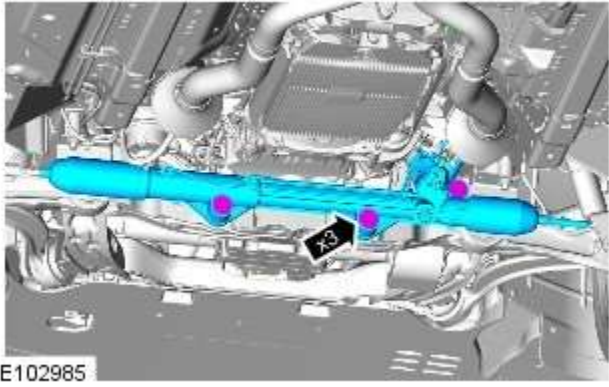
5.



E102982

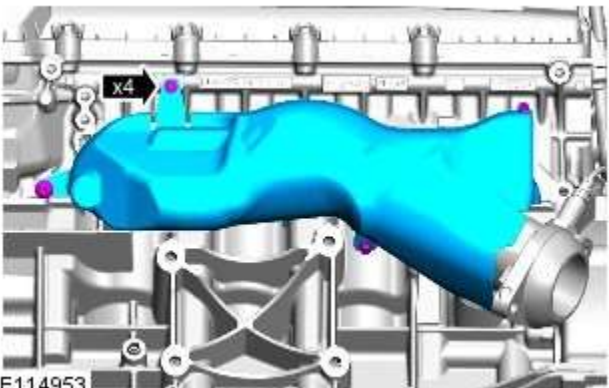
6.  CAUTION: Discard the bolt.

 NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



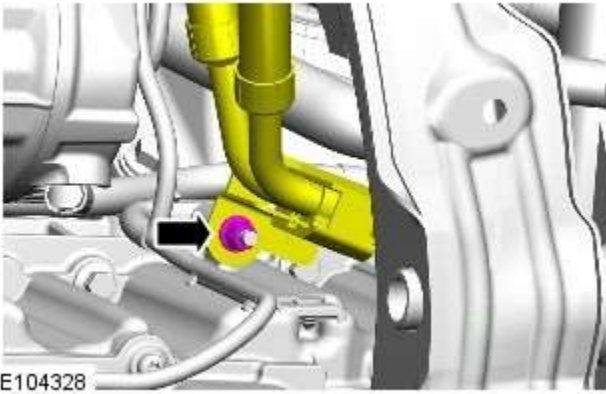
E102985

7.



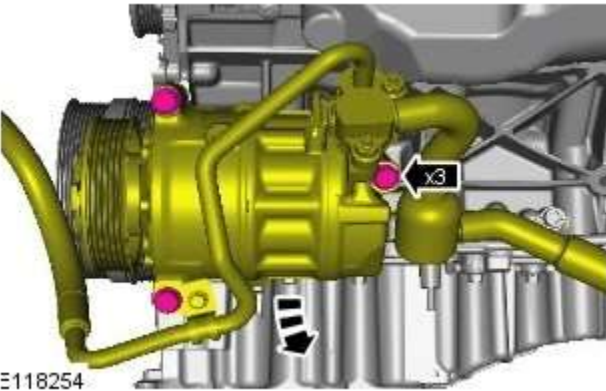
E114953

8.



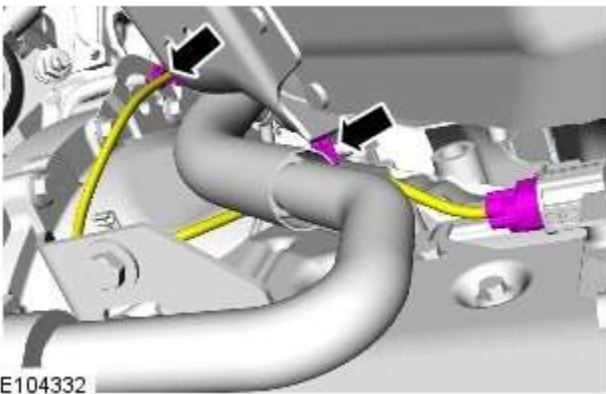
E104328

9.



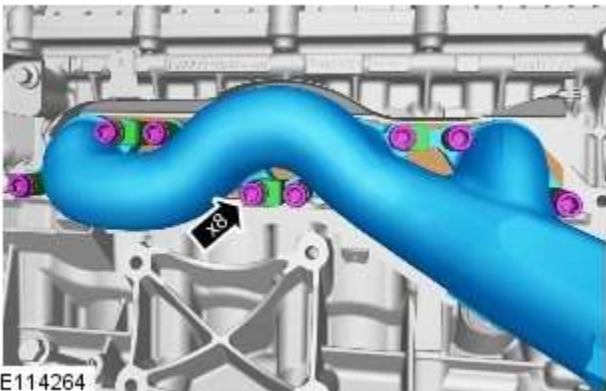
E118254

10.



E104332


11.



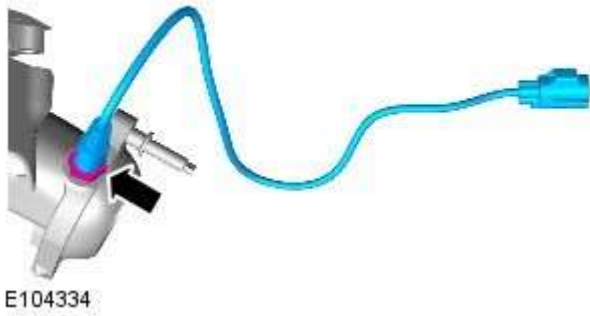
E114264


 CAUTION: Discard the bolts.

12. NOTES:

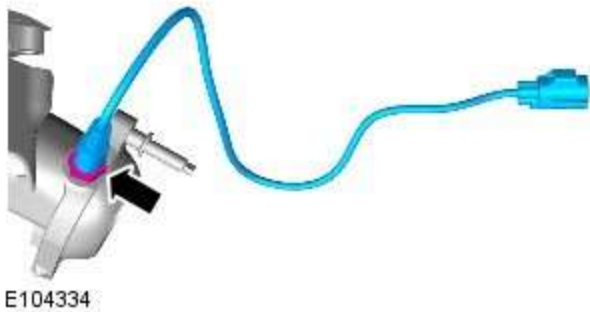
 Discard the gasket.

 Make sure that the position of the spacers is noted before removal of the manifold.




13.  NOTE: Do not disassemble further if the component is removed for access only.

Installation



1. CAUTIONS:

 Make sure that the mating faces are clean and free of foreign material.


 Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

 If accidentally dropped or knocked install a new sensor.

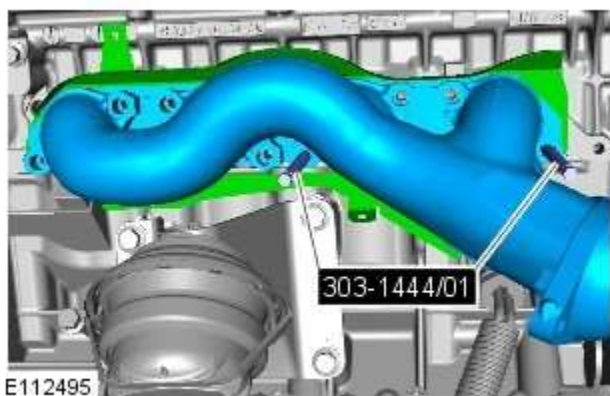
 Make sure the catalyst monitor sensor wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.

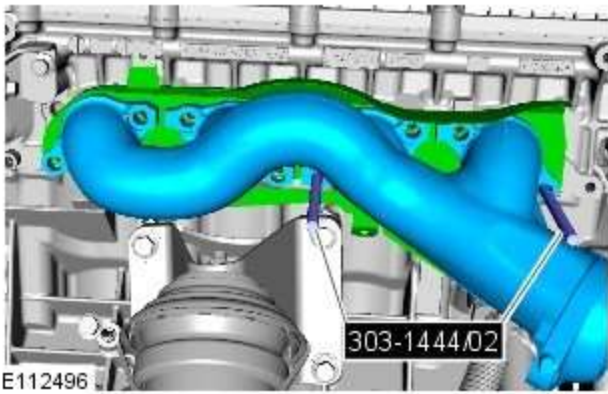
 NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

Torque: 45 Nm

 2. NOTE: Install a new gasket.

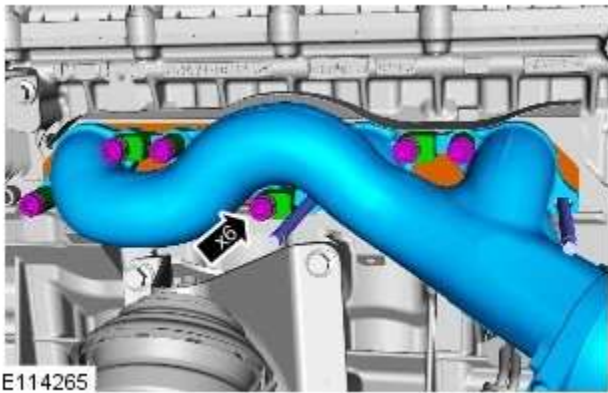
Special Tool(s): [303-1444-01](#)






3. NOTE: If a new cylinder head is installed use the special tools in the illustration.

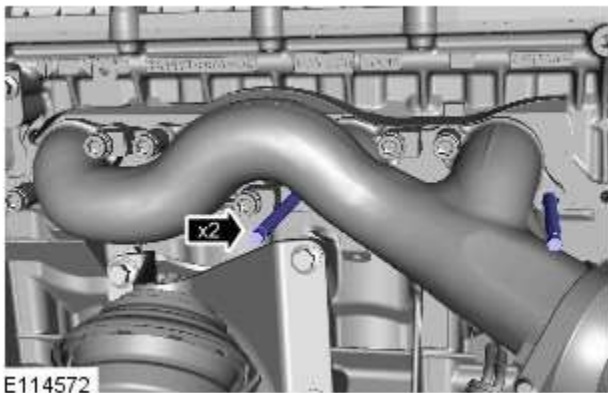
Special Tool(s): [303-1444-02](#)



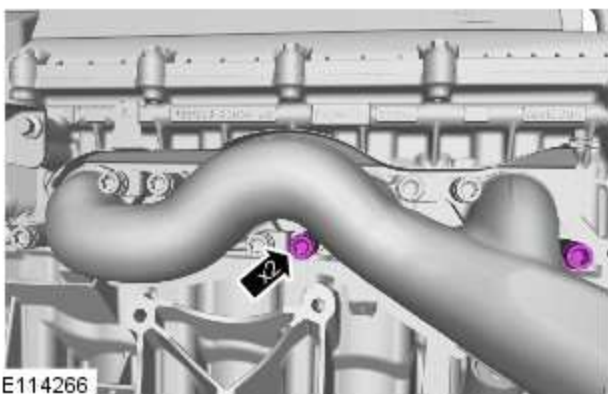
4.  CAUTION: Make sure that new bolts are installed.


 NOTE: Install the spacers in the noted position.

Torque: 10 Nm



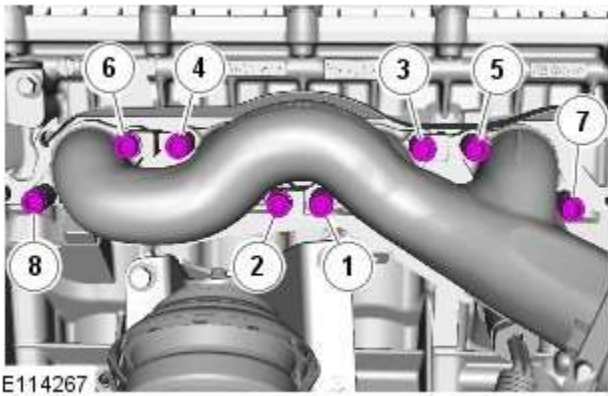
5. Remove the special tool.



6.  CAUTION: Make sure that new bolts are installed.

 NOTE: Install the spacers in the noted position.

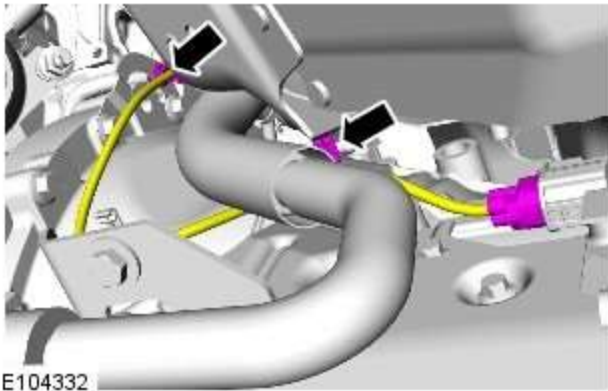
Torque: 10 Nm



E114267

7.

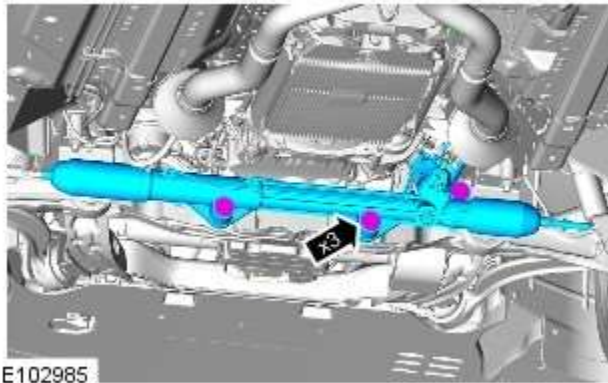
Torque: 18 Nm



E104332


8.


Torque: 100 Nm



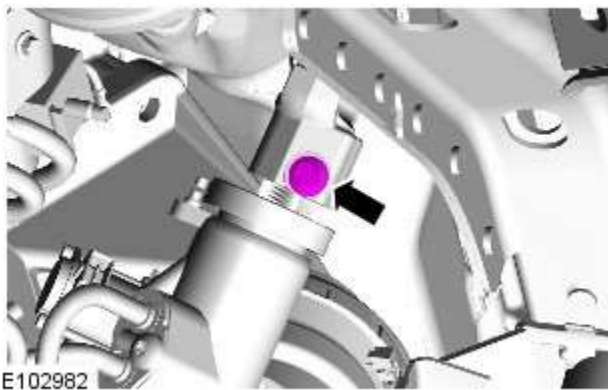
E102985

9.

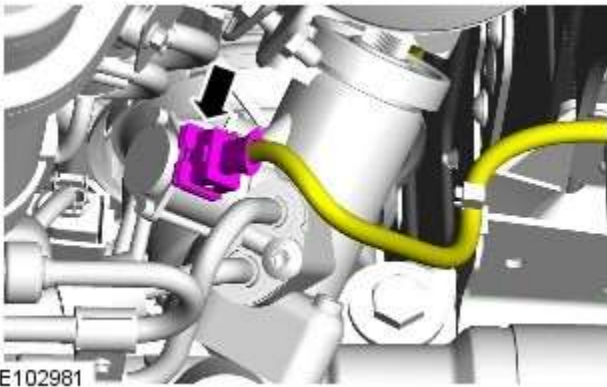
 **WARNING:** Make sure that a new bolt is installed.

10.  **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 35 Nm



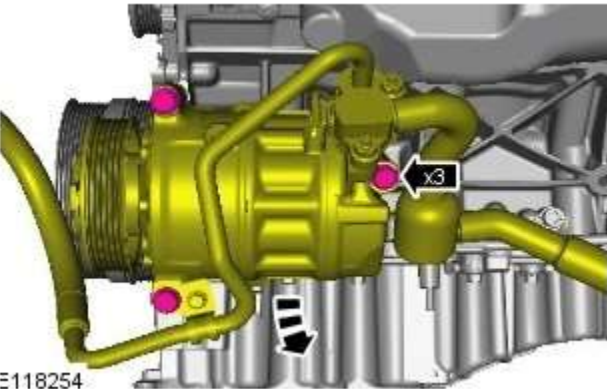
E102982



E102981

11.

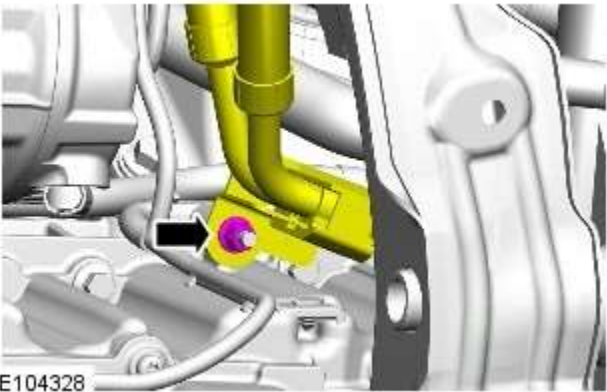
Torque: 25 Nm



E118254

12.

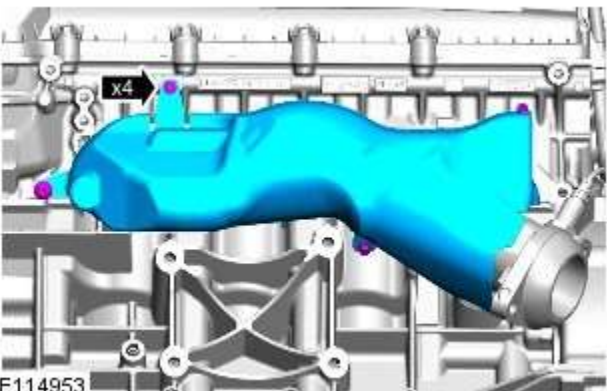
Torque: 10 Nm



E104328

13.

Torque: 3 Nm



E114953

14.

15. Refer to: [Catalytic Converter LH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
16. Refer to: [Power Steering Pump - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (211-02 Power Steering, Removal and Installation).
17. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Exhaust Manifold RH

Removal and Installation

Special Tool(s)

 <p>E115261</p>	<p>303-1444-01 Exhaust Manifold Installation Guide Pins - Threaded</p>
 <p>E115262</p>	<p>303-1444-02 Exhaust Manifold Installation Guide Pins - Unthreaded</p>

Removal



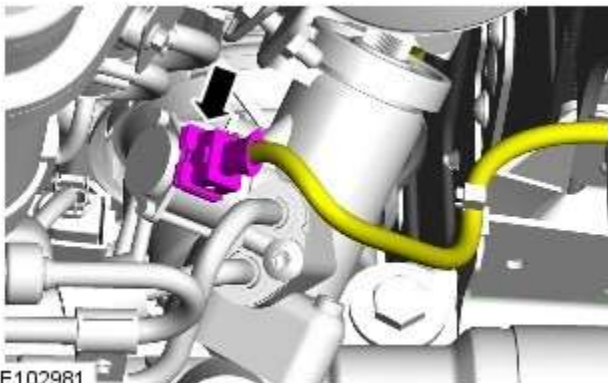
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

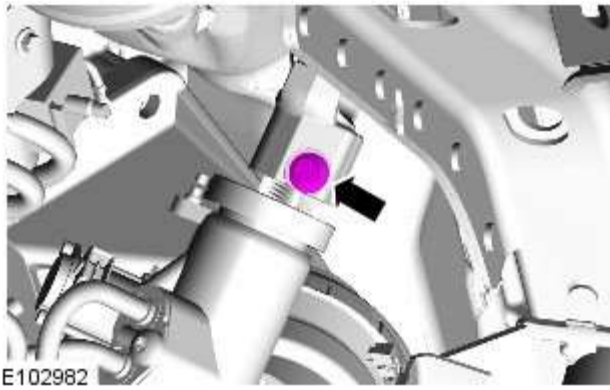
All vehicles


1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. **NOTE:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
Raise and support the vehicle.
3. Refer to: [Catalytic Converter RH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

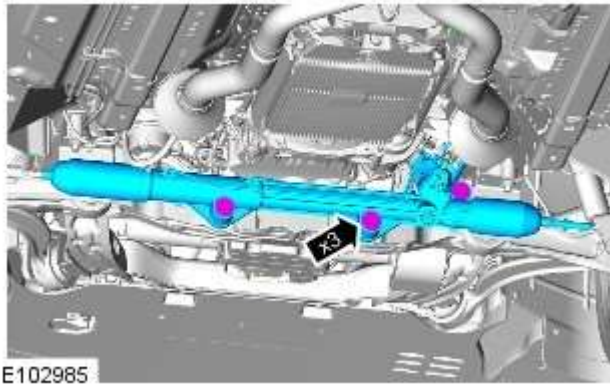
Right-hand drive vehicles

4.



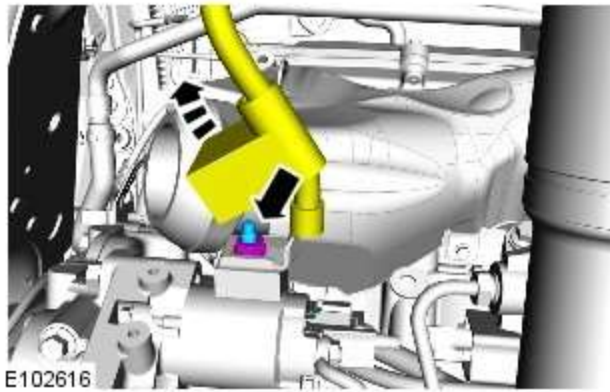


5.  CAUTION: Discard the bolt.
Torque: 35 Nm



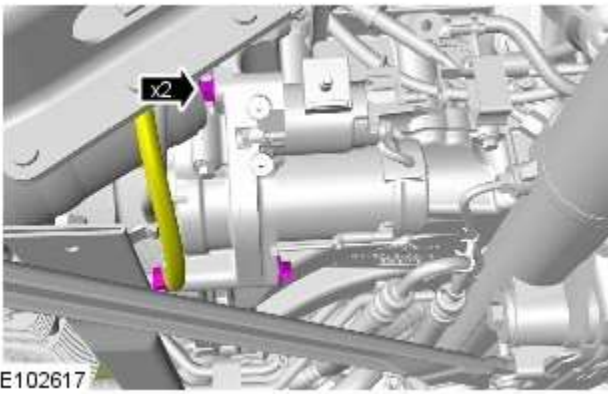
6. Torque: 100 Nm

All vehicles

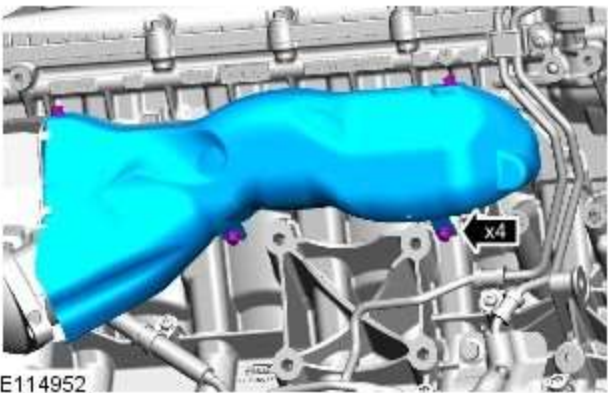


7. Torque: 12 Nm

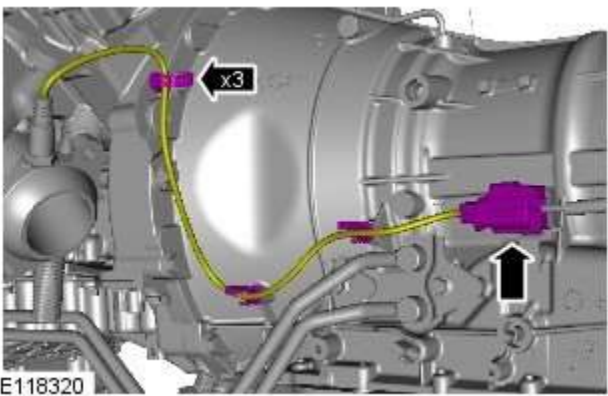
Torque: 48 Nm



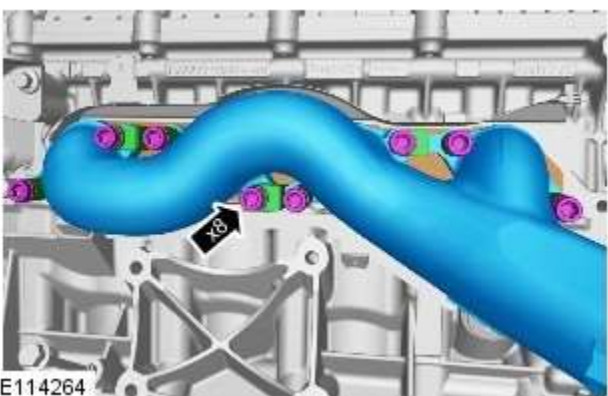
8.



9.



10.




CAUTIONS:


11.  Discard the bolts.

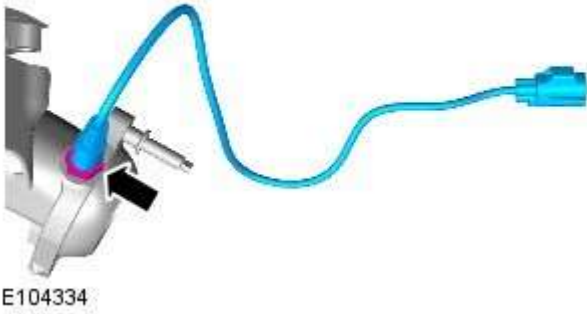
 LH illustration shown, RH is similar.

NOTES:

 Discard the gasket.

 Make sure that the position of the spacers is noted before removal of the manifold.

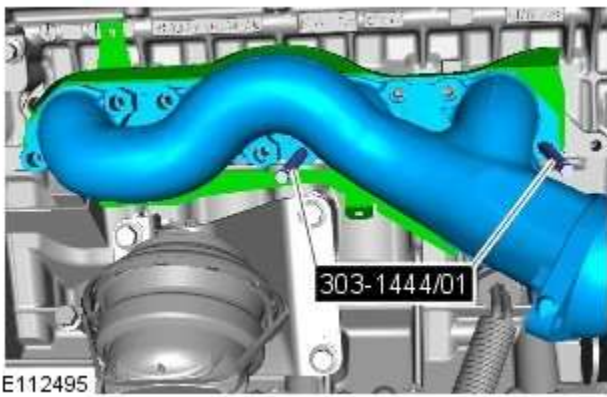
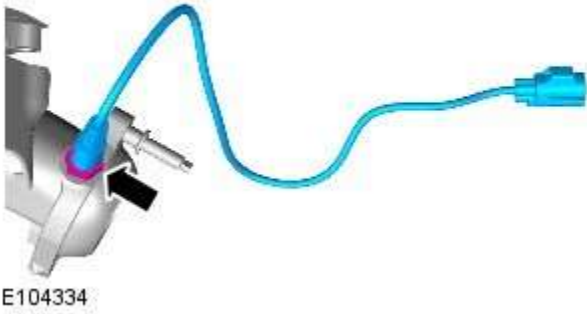
12.  NOTE: Do not disassemble further if the component is removed for access only.



Installation

All vehicles

1. *Torque:* 45 Nm

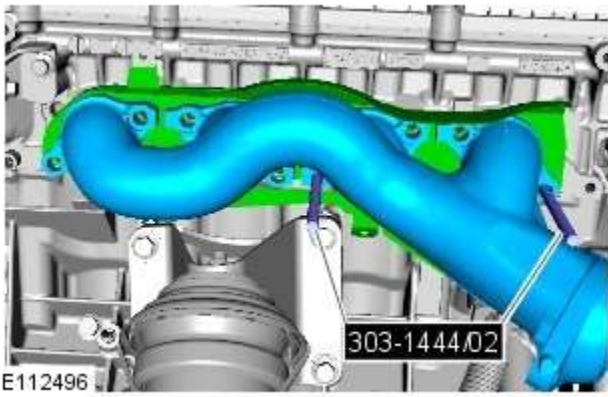


2.  CAUTION: LH illustration shown, RH is similar.

 NOTE: Install a new gasket.

Install the special tool.

Special Tool(s): [303-1444-01](#)

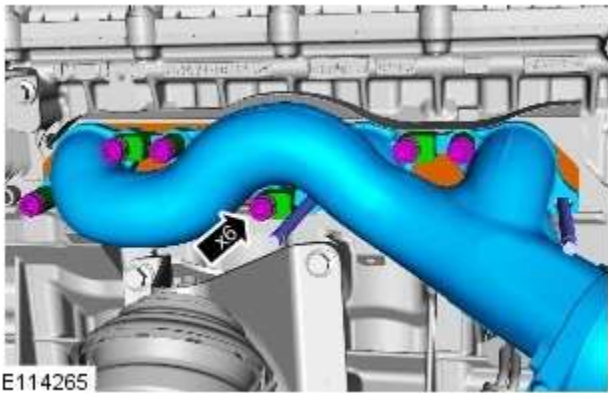


3.  CAUTION: LH illustration shown, RH is similar.

 NOTE: If a new cylinder head is installed use the special tools in the illustration.

Install the special tool.

Special Tool(s): [303-1444-02](#)



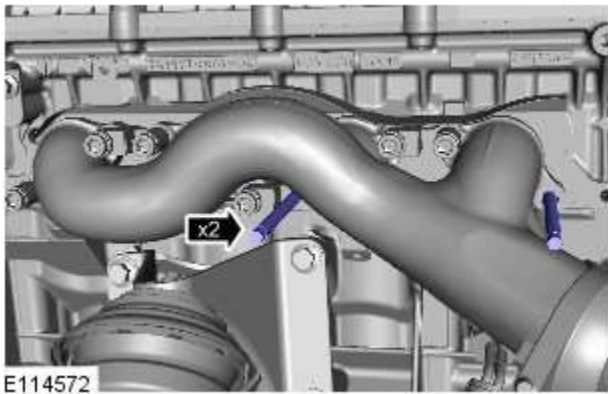
4. CAUTIONS:

 Make sure that new bolts are installed.

 LH illustration shown, RH is similar.

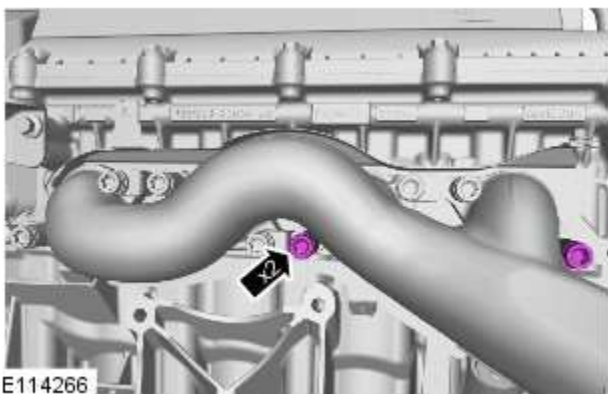
 NOTE: Install the spacers in the noted position.

Torque: 10 Nm



5.  CAUTION: LH illustration shown, RH is similar.

Remove the special tool.



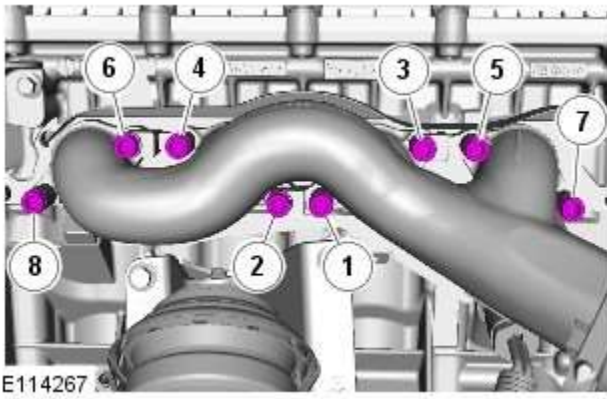
6. CAUTIONS:

 Make sure that new bolts are installed.

 LH illustration shown, RH is similar.

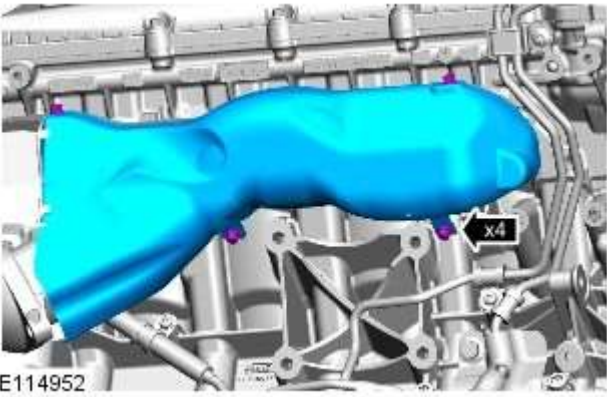
 NOTE: Install the spacers in the noted position.

Torque: 10 Nm



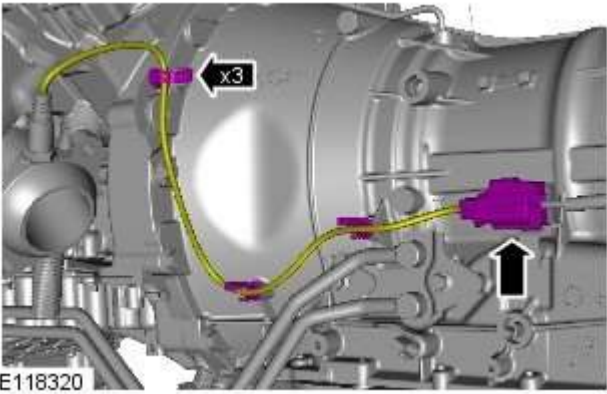
E114267

7.  CAUTION: LH illustration shown, RH is similar.
Torque: 18 Nm



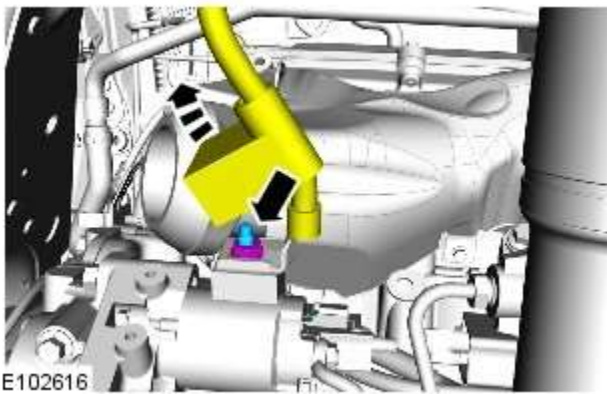
E114952

- 8.



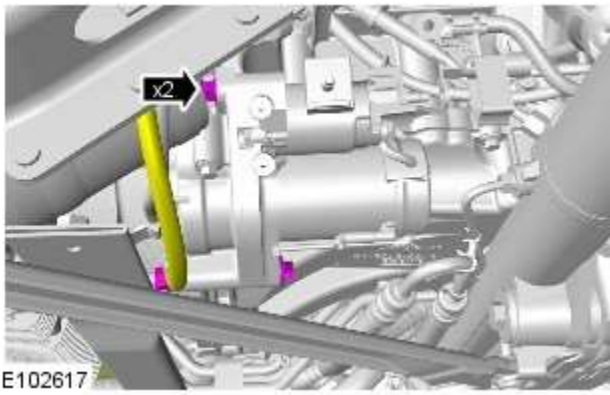
E118320

- 9.



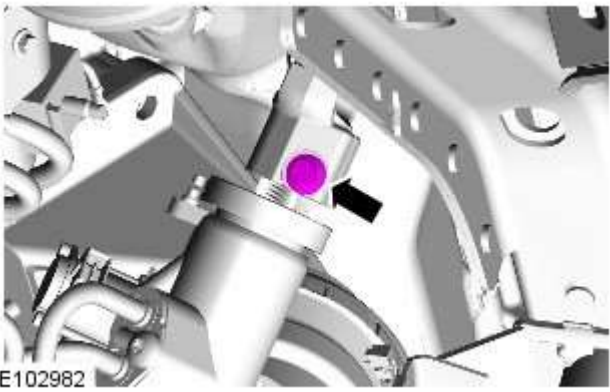
E102616

10. Torque: 12 Nm

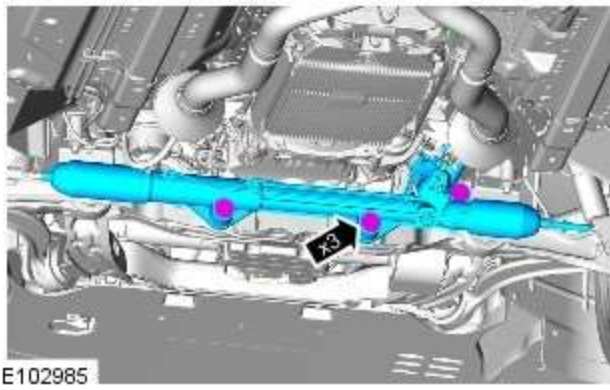


11. Torque: 48 Nm

Right-hand drive vehicles

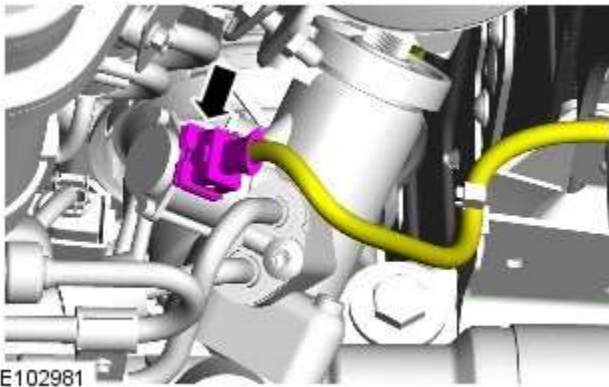


12.  CAUTION: Discard the bolt.
Torque: 35 Nm



13. Torque: 100 Nm

14.



All vehicles

15. Refer to: [Catalytic Converter RH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
16. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Flexplate

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. CAUTION: Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

3. Refer to: [Transmission - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal).



4. CAUTIONS:



Install all the bolts finger tight before final tightening.



The bolts can only be used 3 times, mark the bolts with a center punch. If 2 punch marks are visible, discard the bolts.



Make sure that no components fall off during removal.



Install the bolts in the noted position.

NOTES:



Make sure the crankshaft and flexplate mating faces are clean before installation.



Make sure that the crankshaft is not rotated.



Tighten the retaining bolts working diagonally.

Torque:

Stage 1: 45 Nm

Stage 2: 90°

Installation

1. To install, reverse the removal procedure.

Engine - V8 S/C 5.0L Petrol - Oil Cooler

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



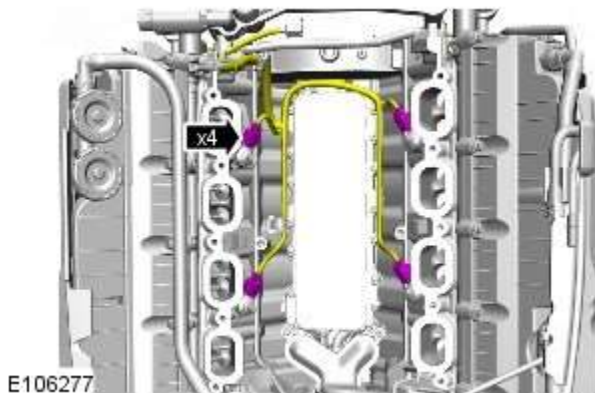
2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

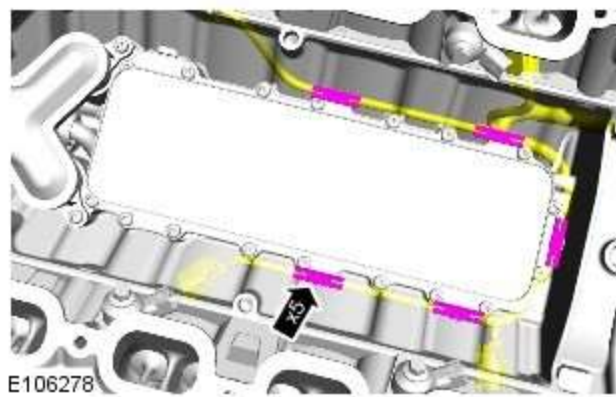
3. Refer to: [Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

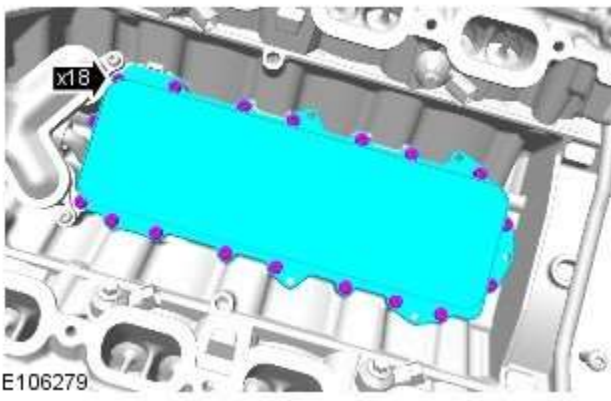
4. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

5.



6.



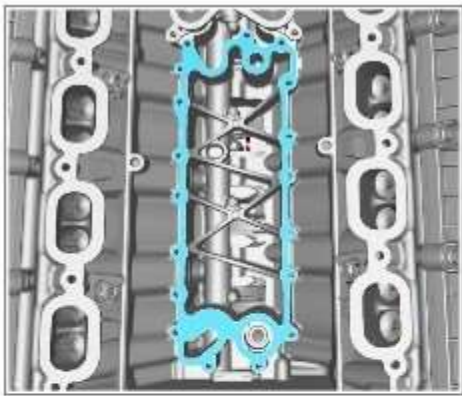



7. CAUTIONS:

 Be prepared to collect escaping oil.

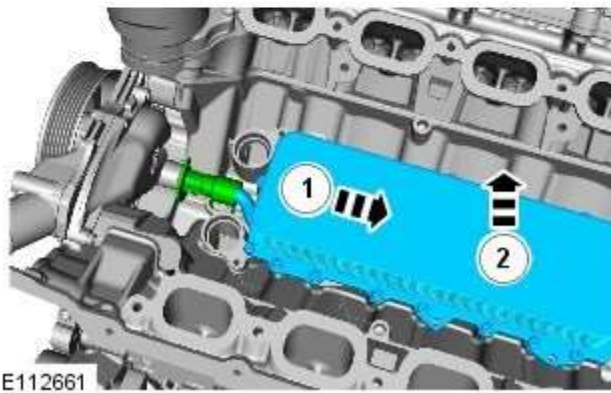
 Be prepared to collect escaping coolant.

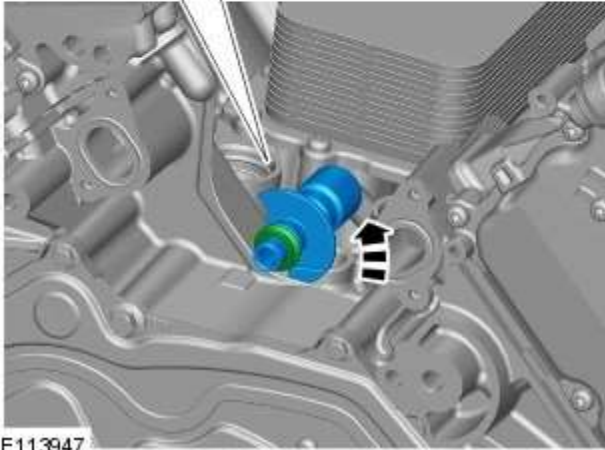
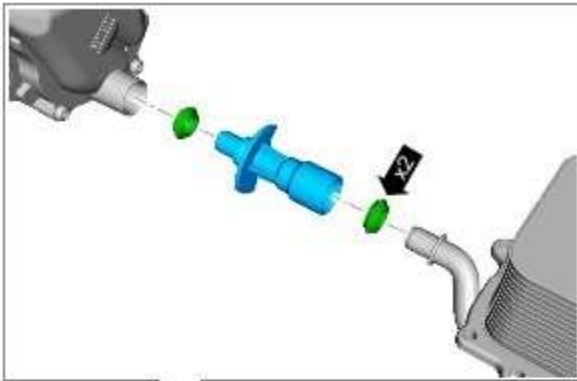
Torque: 13 Nm



8.  CAUTION: Make sure that these components are installed to the noted removal position.

 NOTE: Install a new gasket.





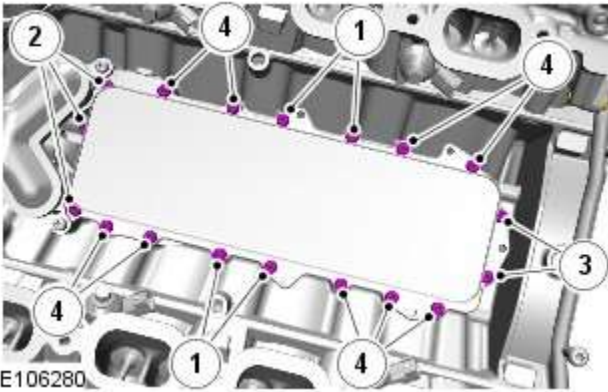
E113947

9. CAUTIONS:

 Make sure that these components are installed to the noted removal position.

 Install new o-ring seals


Installation




E106280

1. CAUTIONS:

 Install all the bolts finger tight before final tightening.

 Make sure that the area around the component is clean and free of foreign material.

 Install the new seals.

 NOTE: Tighten the bolts in the indicated sequence.

To install, reverse the removal procedure.

Engine - V8 S/C 5.0L Petrol - Oil Filter Element

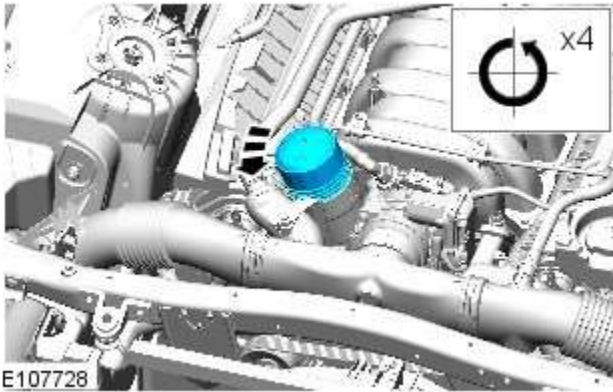
Removal and Installation

Removal



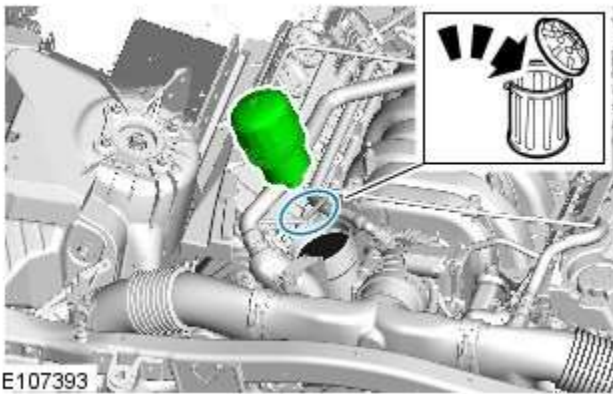
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



2.

- Allow the engine oil to drain from the oil filter element housing for two minutes.



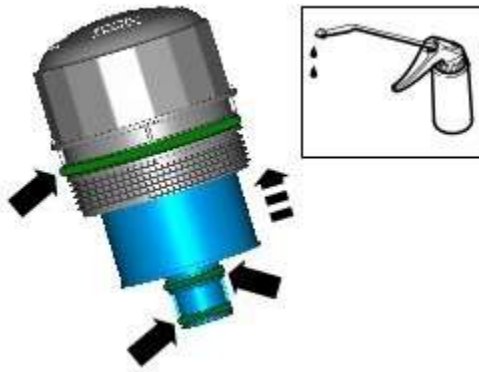
3.



4.

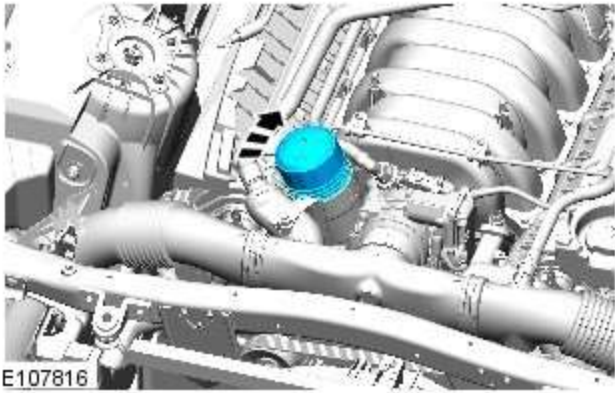
E107394

Installation



E107727

1.



E107816

2. Torque: 25 Nm

3. Check and top-up the engine oil.

4. Start and run the engine.

5. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

Engine - V8 S/C 5.0L Petrol - Oil Pan

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

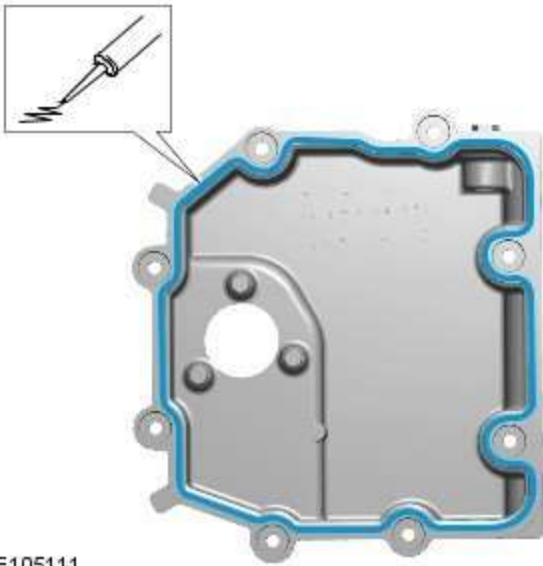
3. Refer to: [Engine Oil Level Sensor](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Removal and Installation).

4.

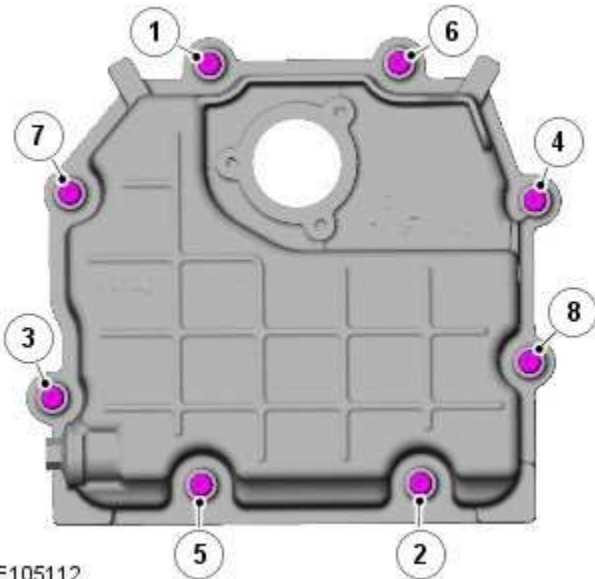


E105110

Installation






E105111



E105112

1. CAUTIONS:

-  Use only a plastic scraper when removing the sealing material.
-  Use lint free cloth.
-  Make sure that the mating faces are clean and free of corrosion and foreign material.

- Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.
- Apply a bead of sealant, 2.5 mm diameter, to the area indicated.

2. NOTE: Tighten the bolts in the sequence shown.

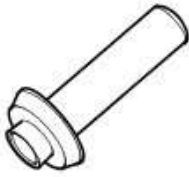
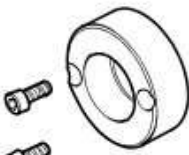

Torque: 12 Nm

- ### 3. Refer to: [Engine Oil Level Sensor](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Removal and Installation).

Engine - V8 S/C 5.0L Petrol - Oil Pan Extension

Removal and Installation

Special Tool(s)

 <p>E107676</p>	<p>303-1433 Lower Timing Cover Alignment tool</p>
 <p>E107678</p>	<p>303-1442 Rear Crankshaft Seal Installer</p>
 <p>E107679</p>	<p>303-1443 Rear Crankshaft Cover Alignment Tool</p>

Removal


NOTES:



Removal steps in this procedure may contain installation details.




Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
Raise and support the vehicle.
3. Refer to: [Crankshaft Pulley](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
4. Refer to: [Engine](#) (303-01D Engine - V8 S/C 5.0L Petrol, Installation).




5. CAUTIONS:

 The bolts can only be used 3 times, mark the bolts with a center punch. If 2 punch marks are visible, discard the bolts.

 Make sure that no components fall off during removal.

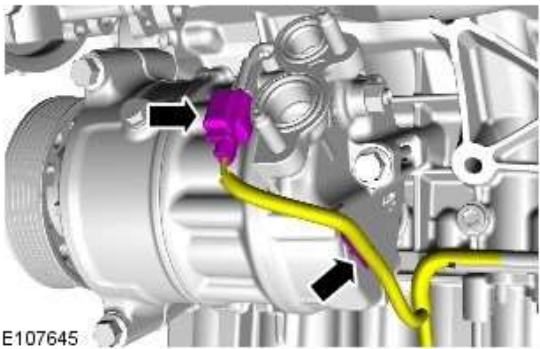
NOTES:

 Make sure that the crankshaft is not rotated.

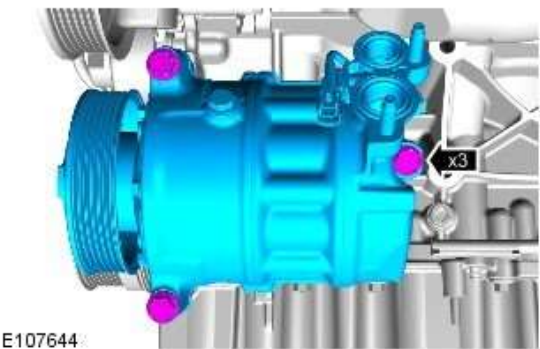
 Make sure the crankshaft and flexplate mating faces are clean before installation.



6.

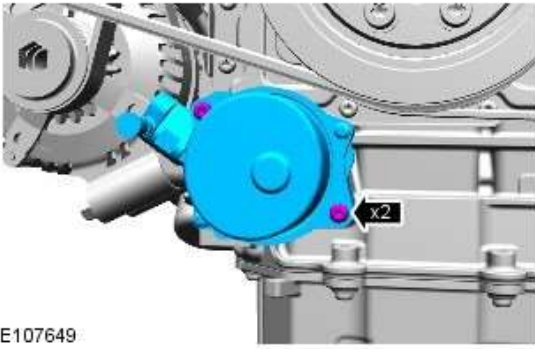


7.



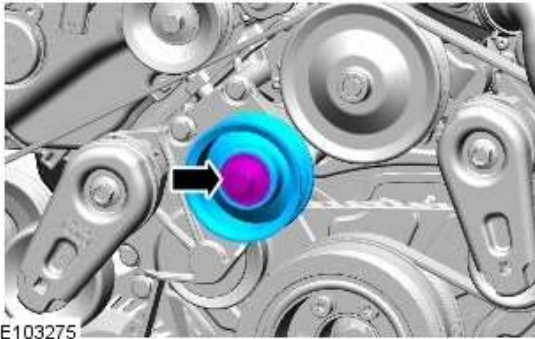
8.

9.



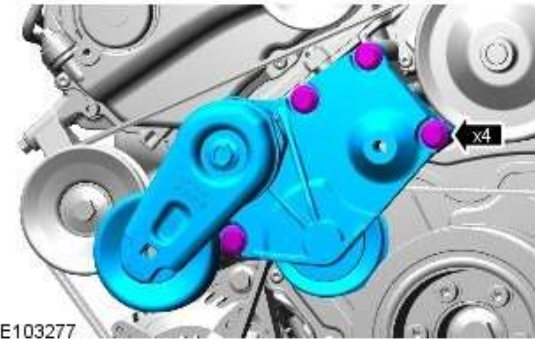
E107649

10.



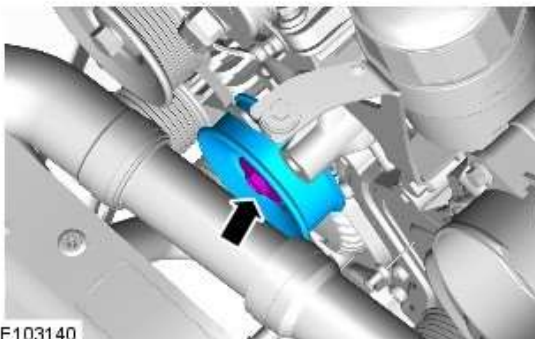
E103275

11.

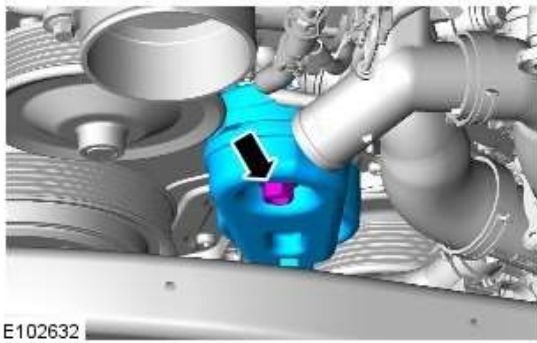


E103277

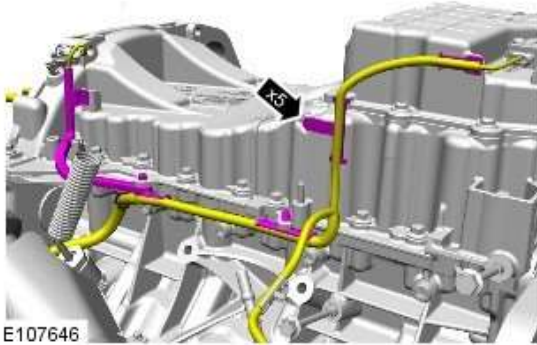
12.



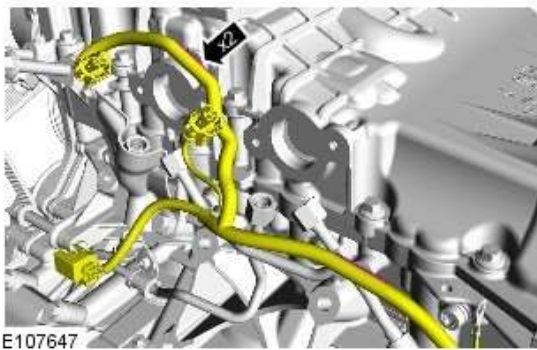
E103140



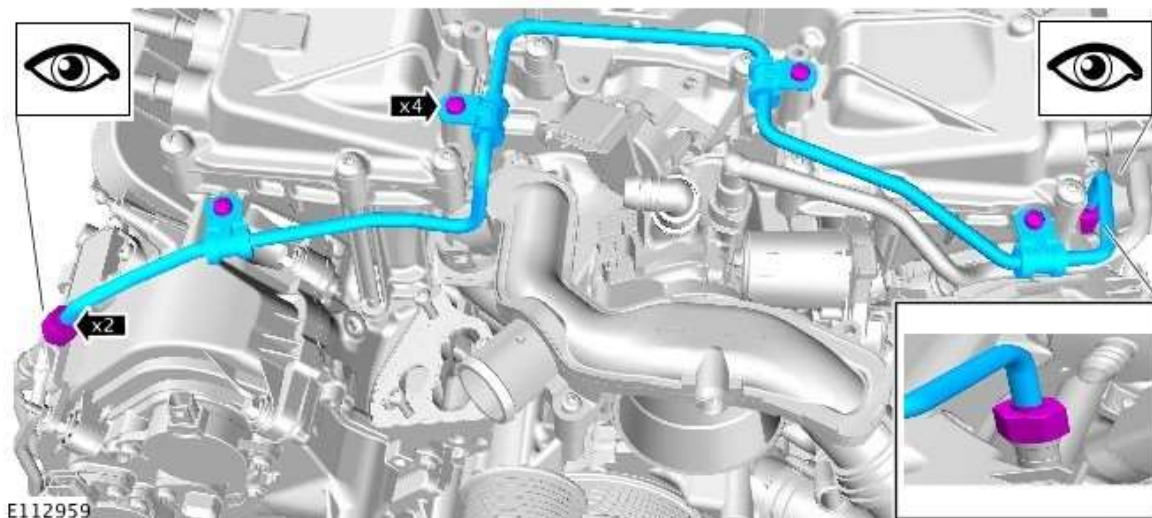
13.




14.



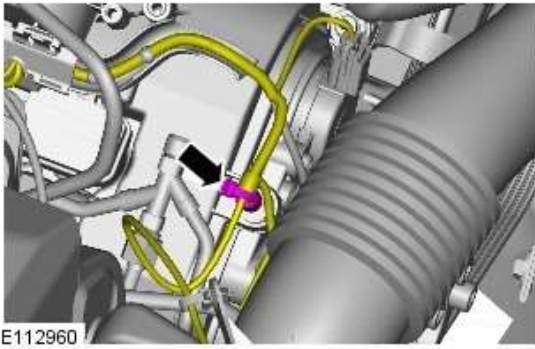
15.  NOTE: The high-pressure fuel pumps are removed from the illustration for clarity.



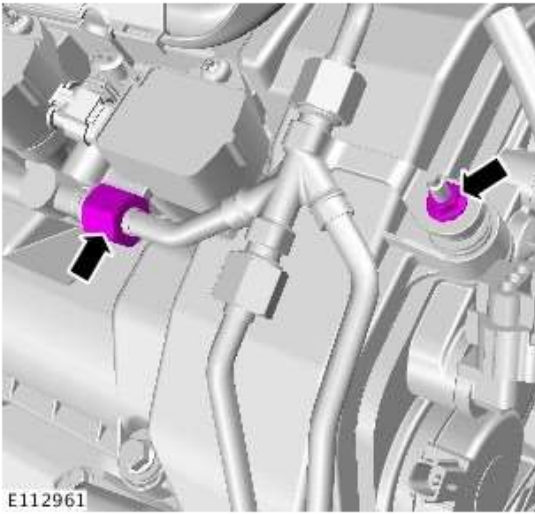
16. CAUTIONS:

 Be prepared to collect escaping fluids.

 Make sure that all openings are sealed. Use new blanking caps.



17.



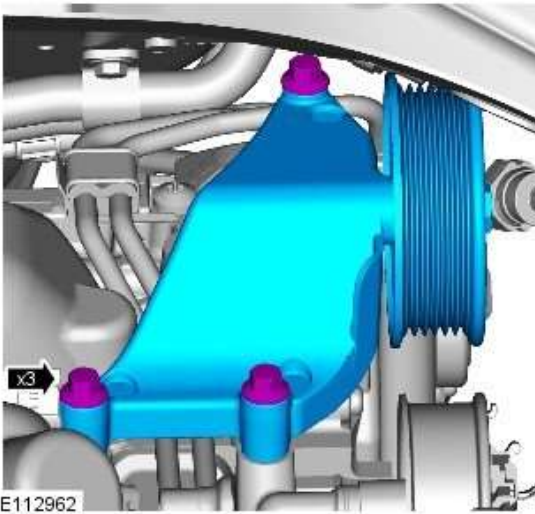
18. CAUTIONS:



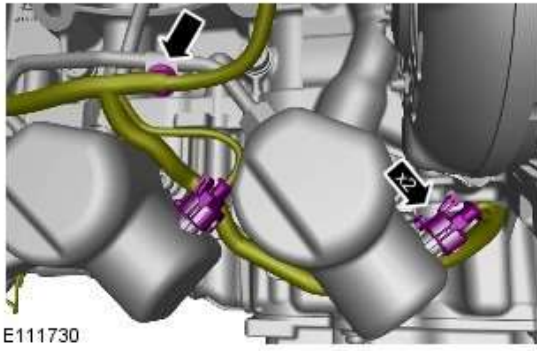
Be prepared to collect escaping fluids.



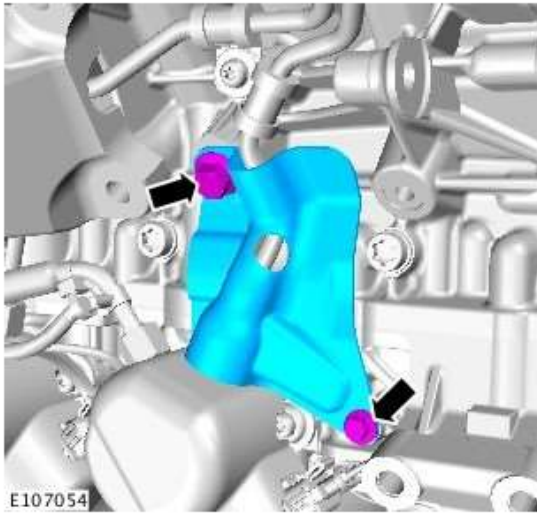
Make sure that all openings are sealed. Use new blanking caps.



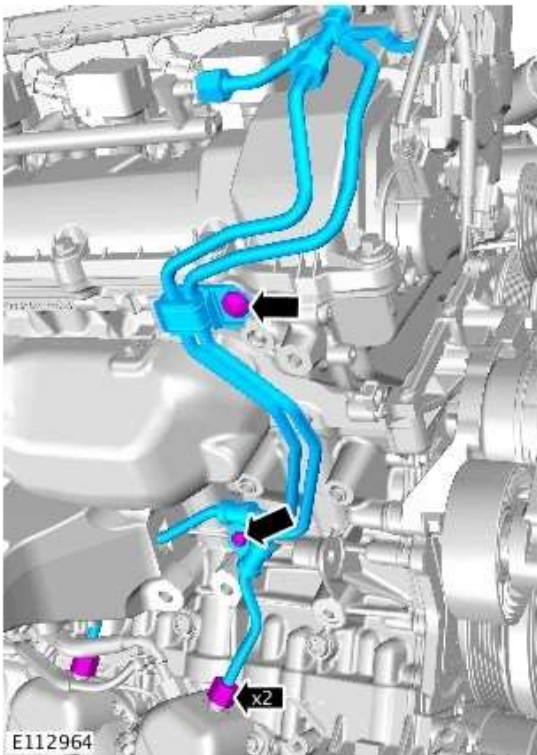
19.






20.

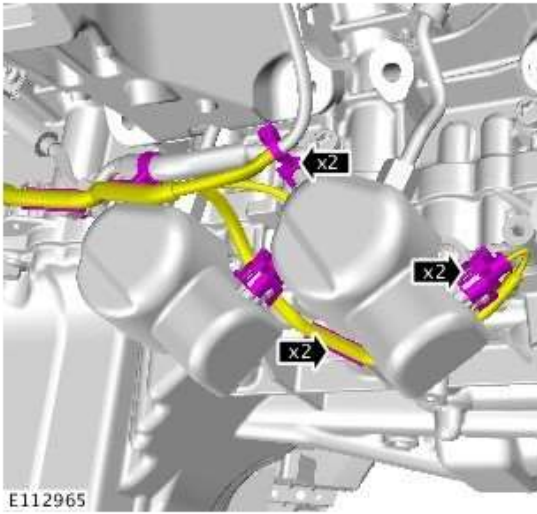


21.





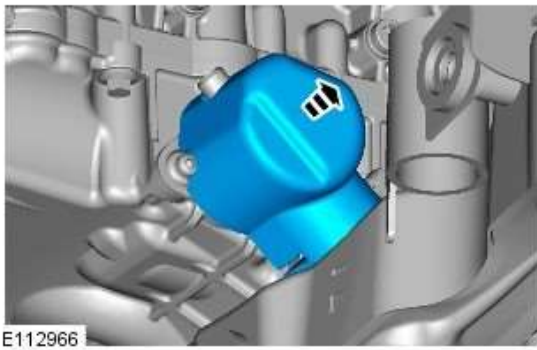
22. CAUTIONS:

-  Be prepared to collect escaping fluids.
-  Make sure that all openings are sealed. Use new blanking caps.
-  Discard the fuel pipes.

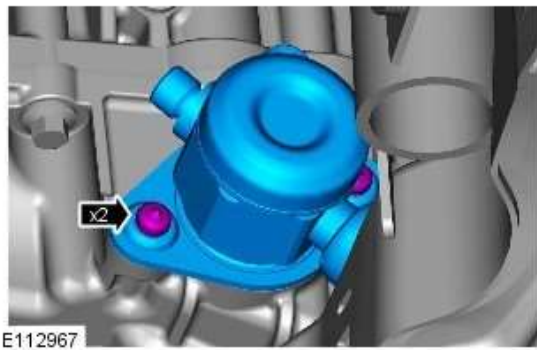


23. CAUTIONS:

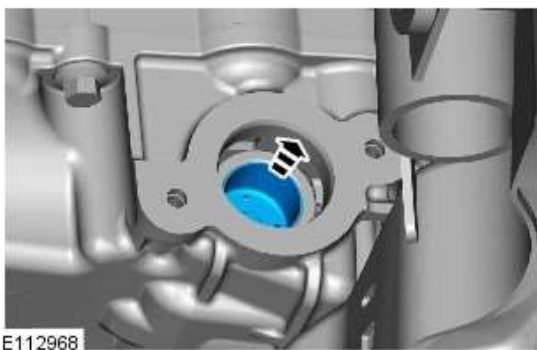
-  Be prepared to collect escaping fluids.
-  Make sure that all openings are sealed. Use new blanking caps.



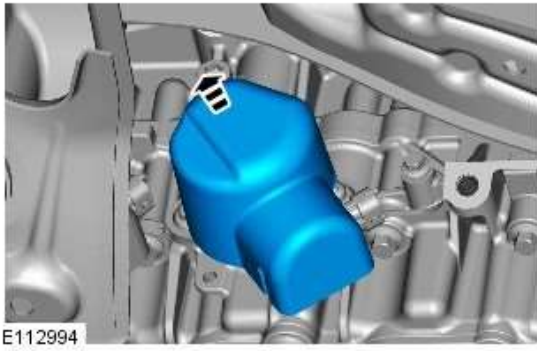
24.



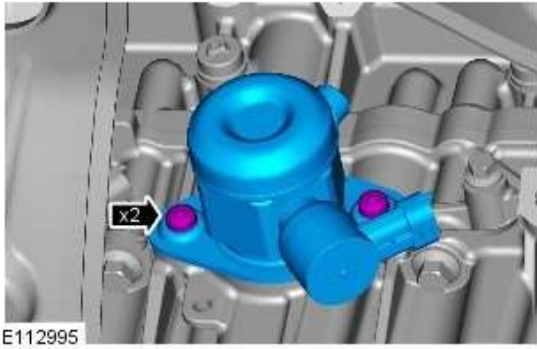
25.  CAUTION: Be prepared to collect escaping fluids.



26.  CAUTION: Be prepared to collect escaping fluids.



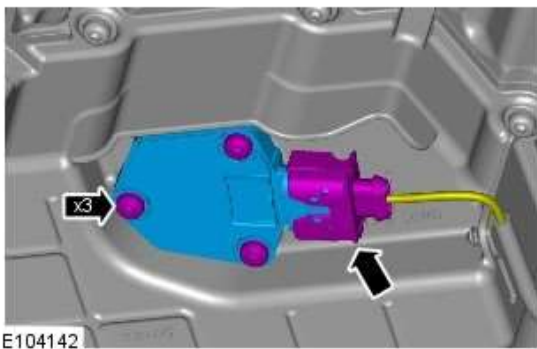
27.



28.  CAUTION: Be prepared to collect escaping fluids.



29.  CAUTION: Be prepared to collect escaping fluids.



30.  CAUTION: Be prepared to collect escaping fluids.

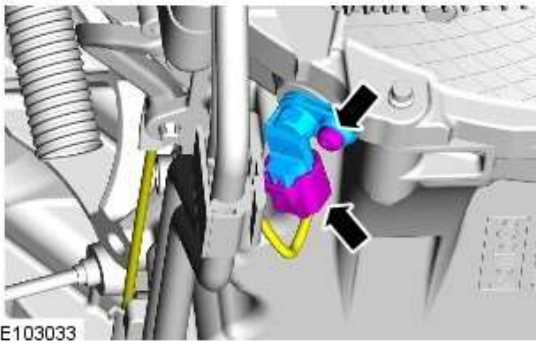
31.

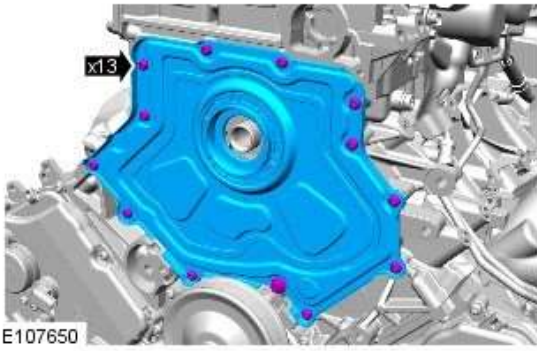


32.



33.  NOTE: Clean the components general area prior to dismantling.





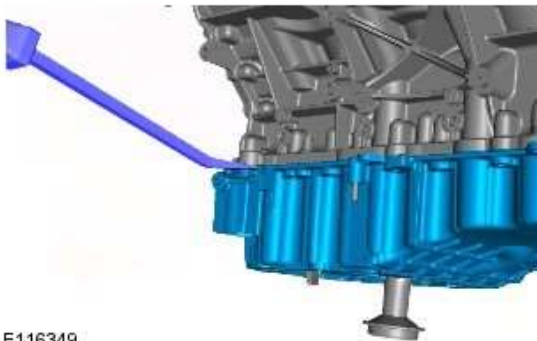
E107650

34.  NOTE: Discard component.



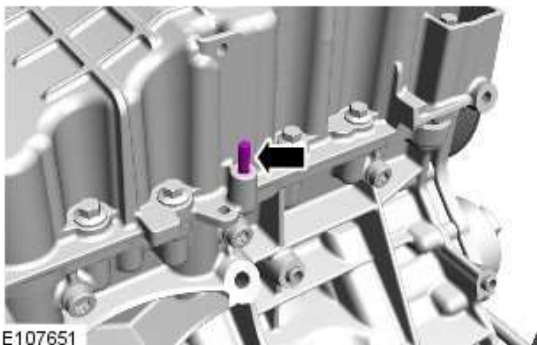
E107652

35.



E116349

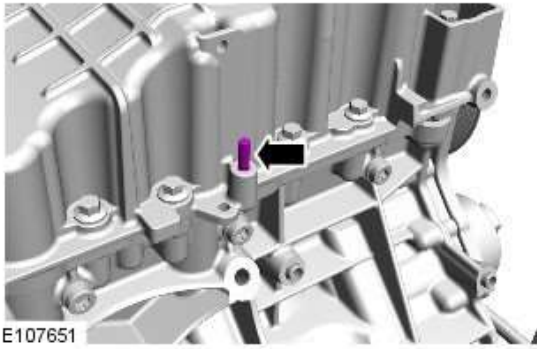
36.  NOTE: Make sure to use the aluminium lug provided on the oil pan extension to lever against.



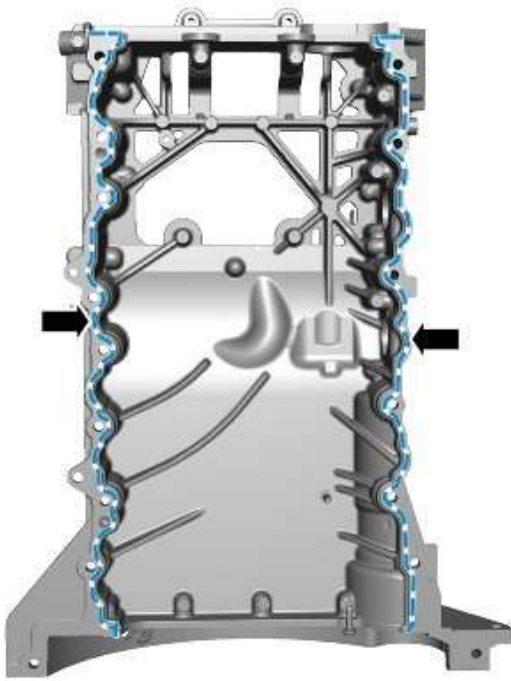
E107651

37.  NOTE: Do not disassemble further if the component is removed for access only.



Installation



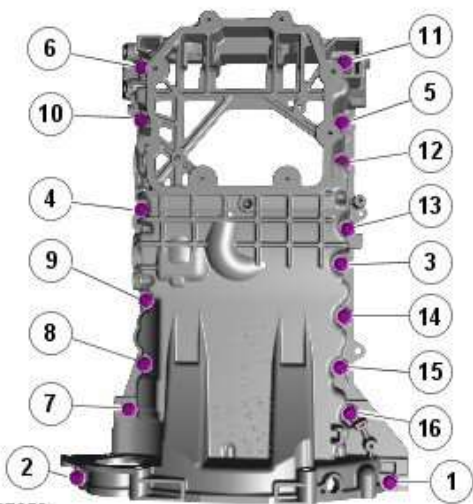
1. Torque: 8 Nm



2. CAUTIONS:

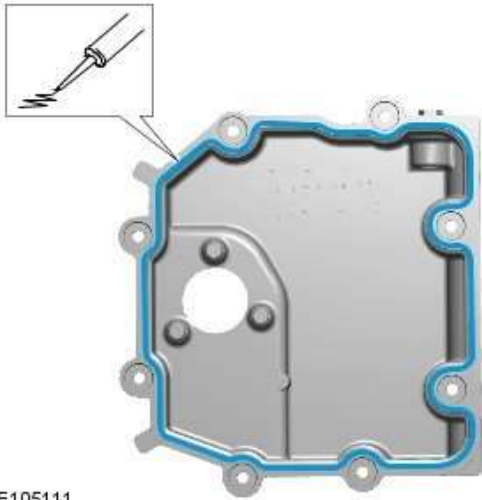
-  Make sure that the mating faces are clean and free of foreign material.
-  Use only a plastic scraper when removing the sealing material.
 - Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.

E107654





3.  NOTE: Tighten the bolts in the indicated sequence.
Torque: 25 Nm

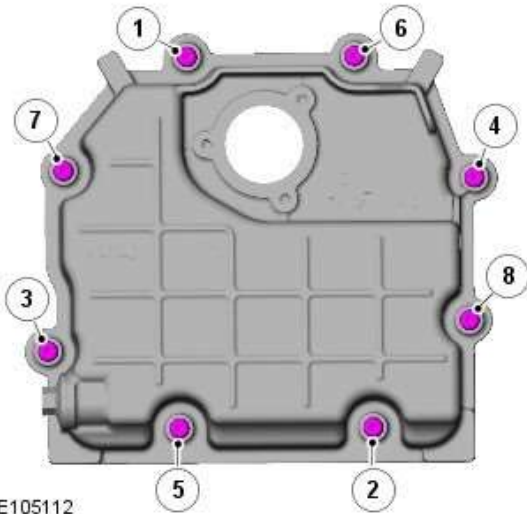
E107653



E105111

4. CAUTIONS:

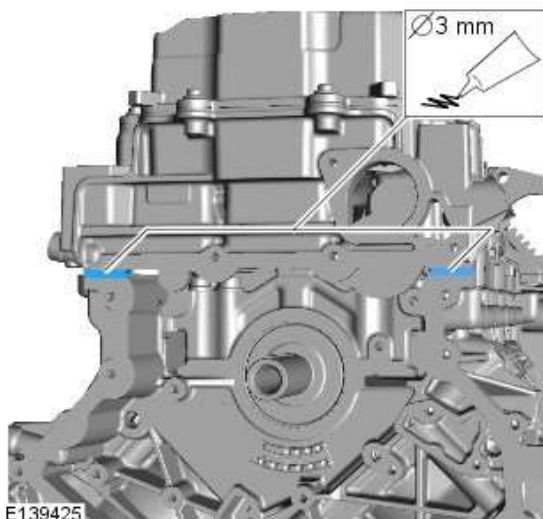
-  Make sure that the mating faces are clean and free of foreign material.
-  Use only a plastic scraper when removing the sealing material.
 - Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.




E105112

5.  NOTE: Tighten the bolts in the indicated sequence.

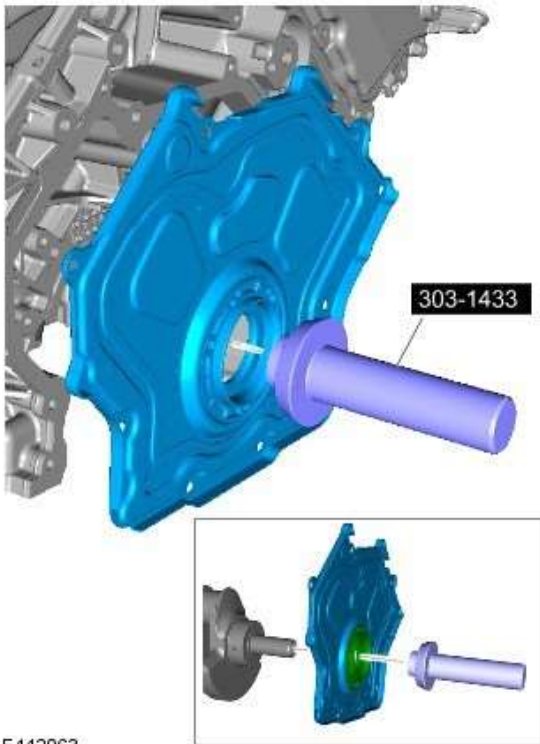
Torque: 12 Nm




E139425

6.  CAUTION: Make sure that the mating faces are clean and free of foreign material.

Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.



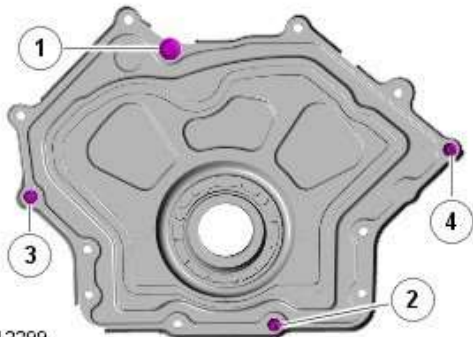
E112063

7.  CAUTION: Make sure that the mating faces are clean and free of foreign material.

 NOTE: Install new lower timing cover.

Install the bolts, but do not tighten fully at this stage.

Special Tool(s): [303-1433](#)



E112299

8.  NOTE: Tighten the bolts in the indicated sequence.

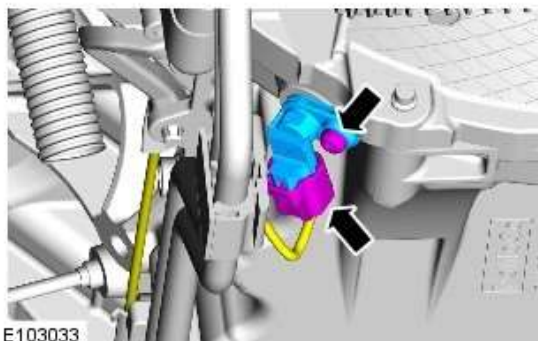
Torque:
M6 12 Nm
M8 20 Nm

9. Remove the special tool.

10. Torque: 12 Nm



E112300

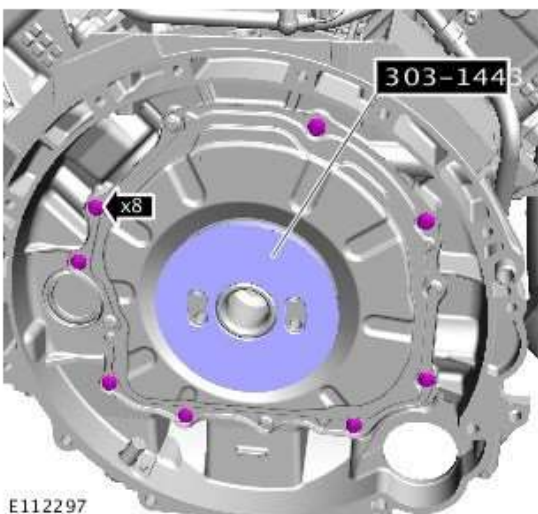


11. Torque: 10 Nm

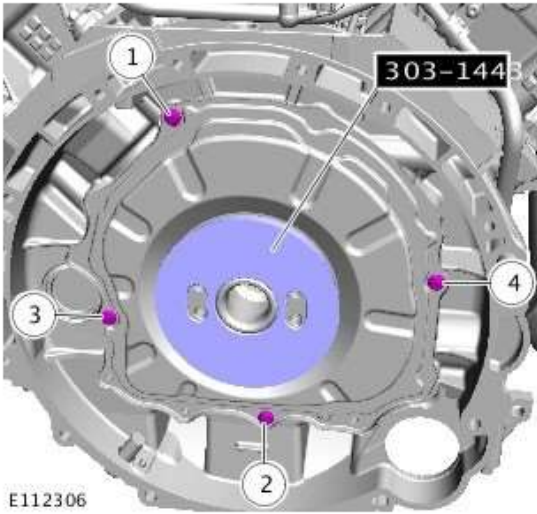


12. Special Tool(s): [303-1442](#), [303-1443](#)

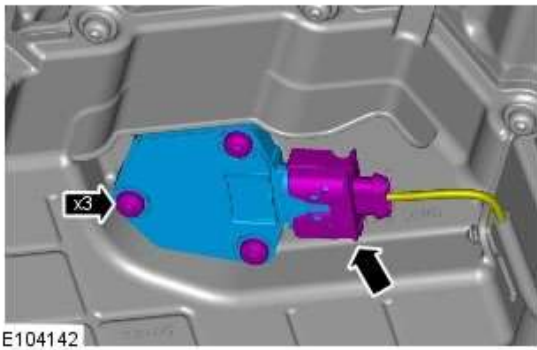
13. Remove the special tools.



14.  NOTE: Tighten the bolts in the indicated sequence.
Torque: 11 Nm

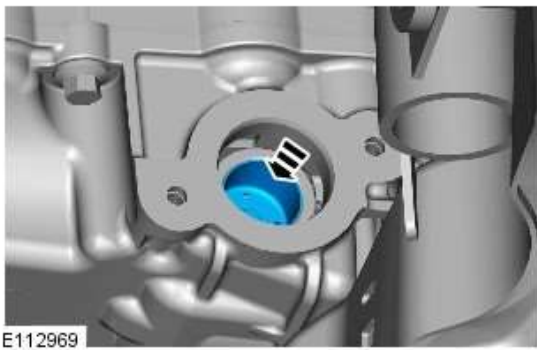


15. Torque: 11 Nm

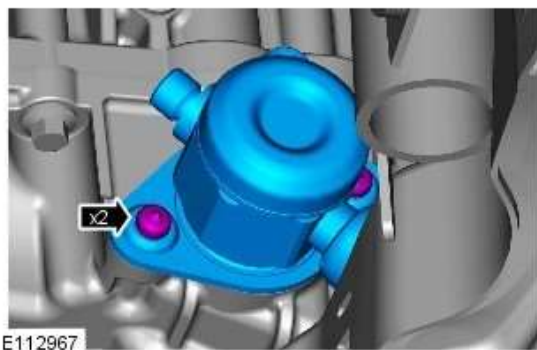


16.

- Torque: 11 Nm



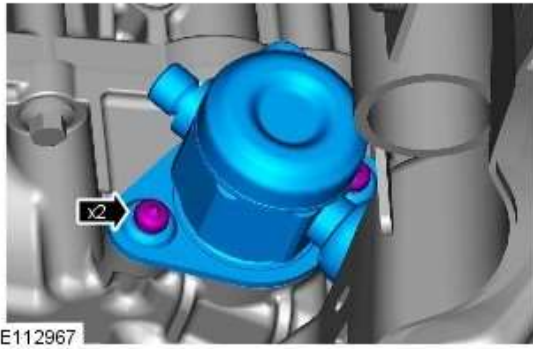
17.  NOTE: Lubricate the fuel rail high-pressure fuel pump bucket with clean engine oil.



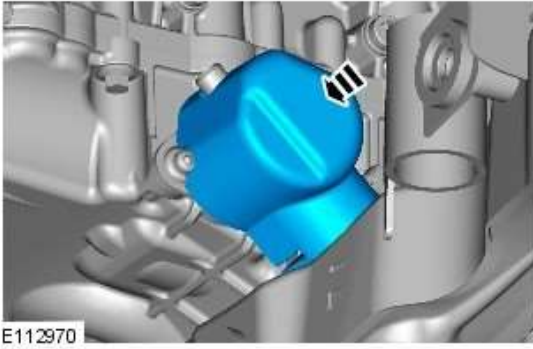
18.  CAUTION: Tighten the Torx screws a turn at a time until the correct torque is achieved.

 NOTE: Lubricate the fuel rail high-pressure fuel pump O-ring seal with clean engine oil.

- Torque: 11 Nm



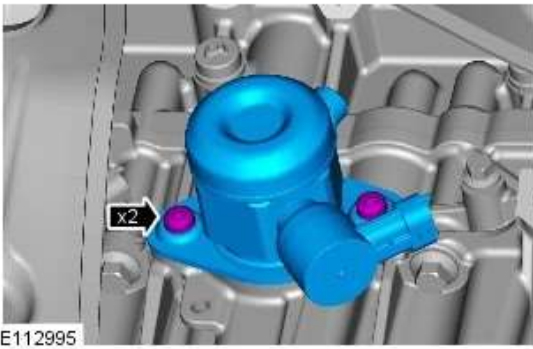
19. Loosen the Torx screws half a turn each.



20.



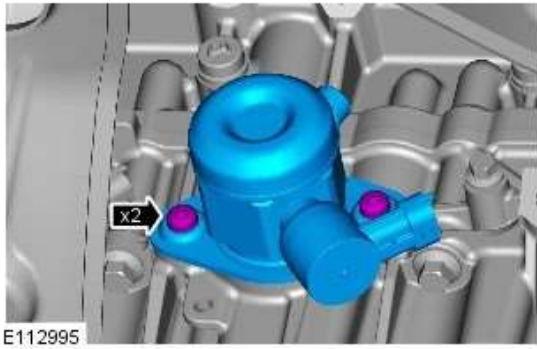
21.  NOTE: Lubricate the fuel rail high-pressure fuel pump bucket with clean engine oil.



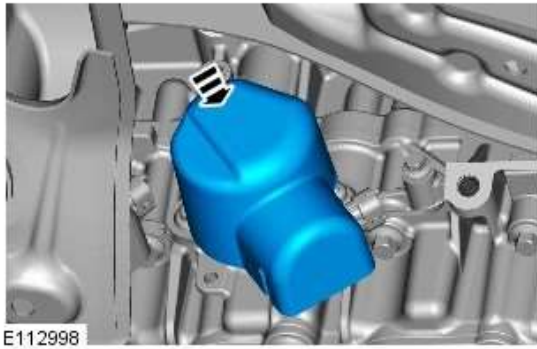
22.  CAUTION: Tighten the Torx screws a turn at a time until the correct torque is achieved.

 NOTE: Lubricate the fuel rail high-pressure fuel pump O-ring seal with clean engine oil.

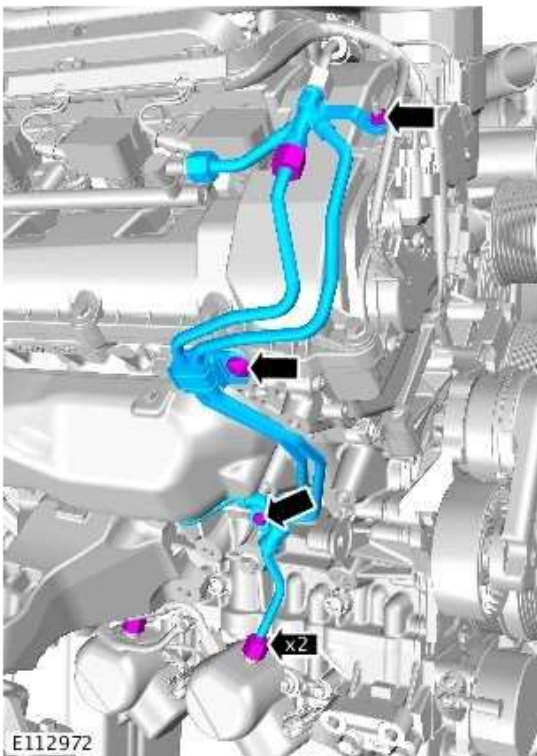
- Torque: 11 Nm



23. Loosen the Torx screws half a turn each.



24.



25. CAUTIONS:



Install new high-pressure fuel supply lines.



Lubricate only the union threads with clean engine oil.

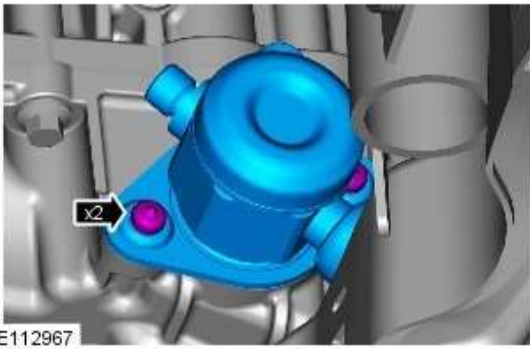
NOTES:





Remove and discard the blanking caps.



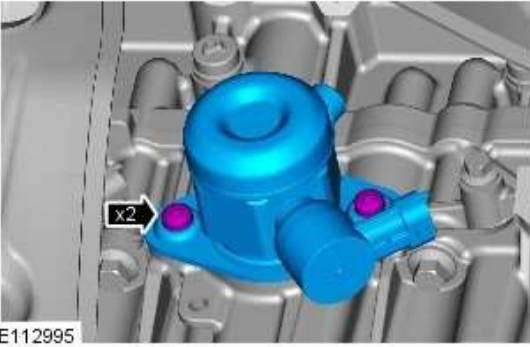
Install the bolt and unions fully finger tight before final tightening.




26.  CAUTION: Care must be taken when positioning the fuel rail high-pressure fuel pump cover to one side.

 NOTE: Fuel rail high-pressure fuel pump cover shown removed for clarity.

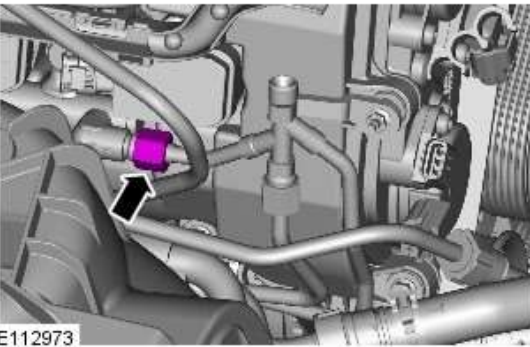
- Torque: 11 Nm



27.  CAUTION: Care must be taken when positioning the fuel rail high-pressure fuel pump cover to one side.

 NOTE: Fuel rail high-pressure fuel pump cover shown removed for clarity.

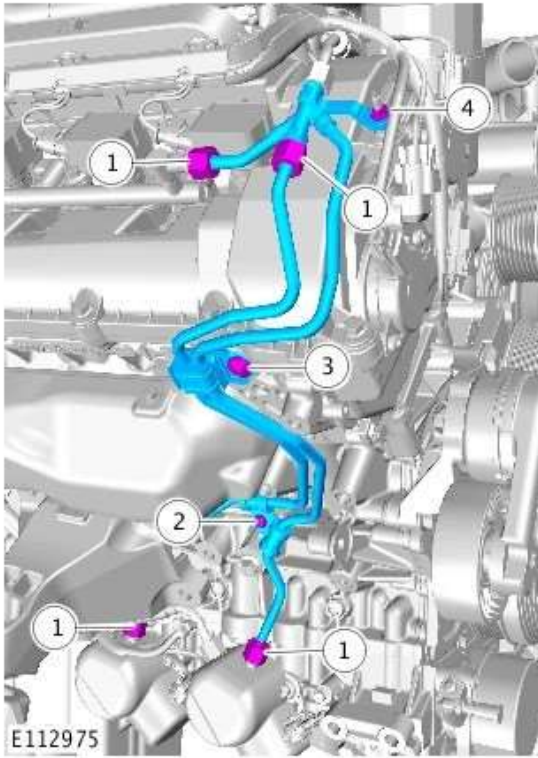
- Torque: 11 Nm



28. NOTES:

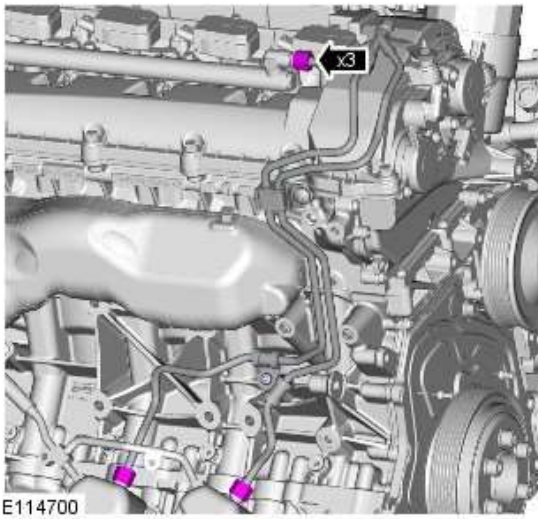
 Do not tighten at this stage.

 Remove and discard the blanking caps.



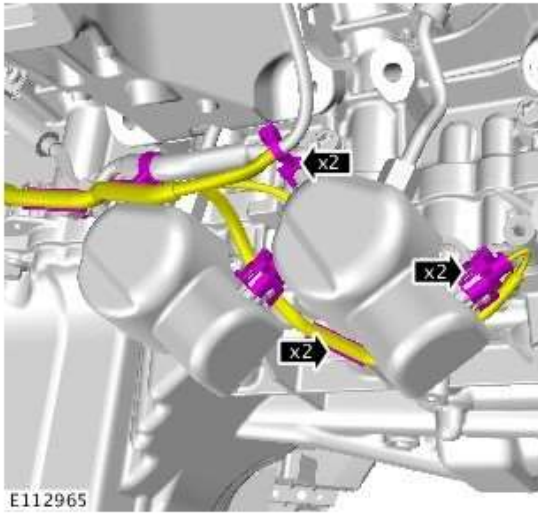
29.

- **Torque:**
Unions (1) 21 Nm
M6 (2) 11 Nm
M8 (3) 25 Nm
M5 nut (4) 6 Nm



30.

- **Torque:**
Unions 21 Nm

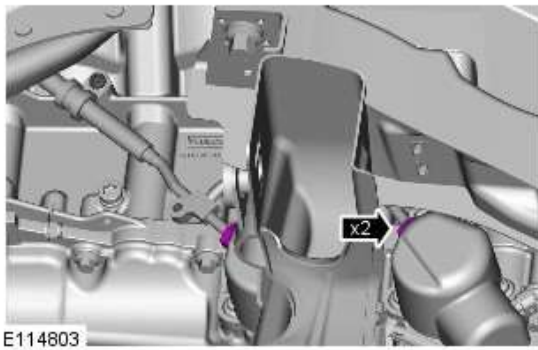


31. NOTES:

 Install the bolt and unions finger tight before final tightening.

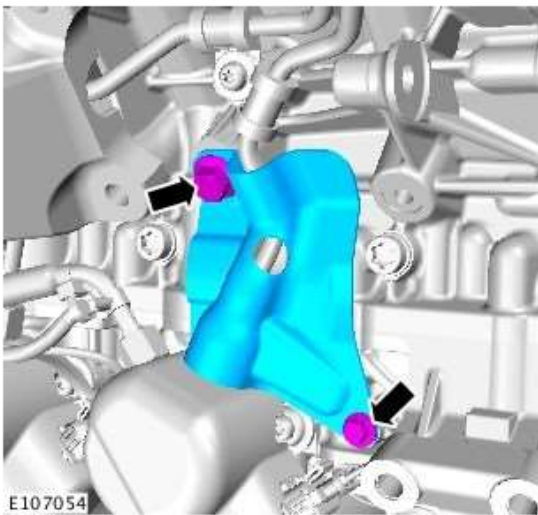
 Remove and discard the blanking caps.

- Torque:
Unions 21 Nm
M6 11 Nm



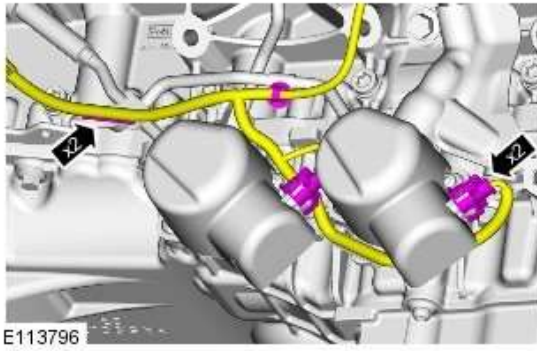
32.

- Torque:
Unions 21 Nm

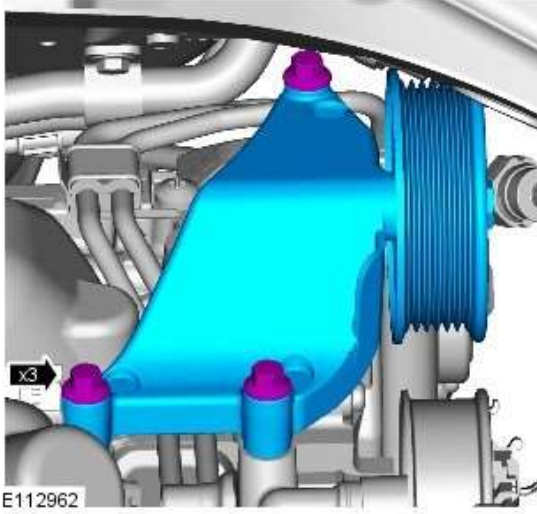


33. Torque:
M10 29 Nm
M6 11 Nm

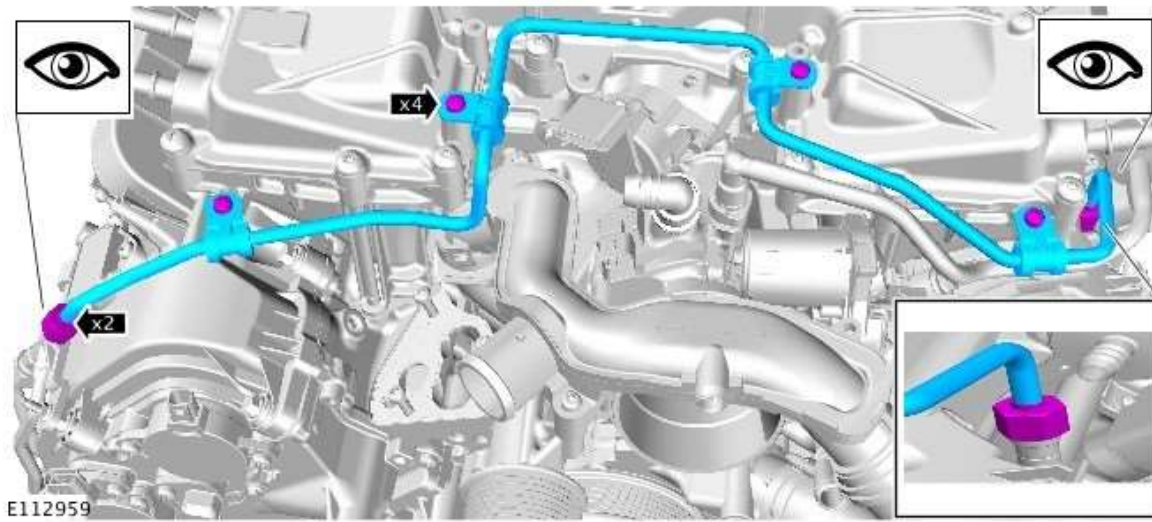
34.

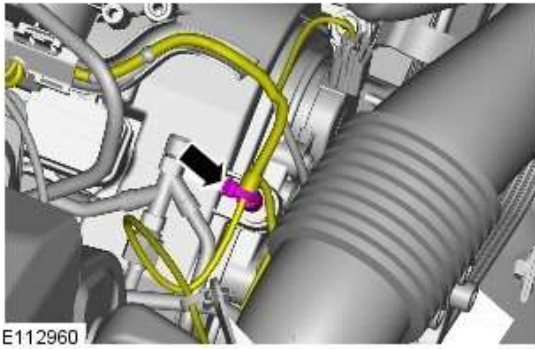


35. Torque: 25 Nm

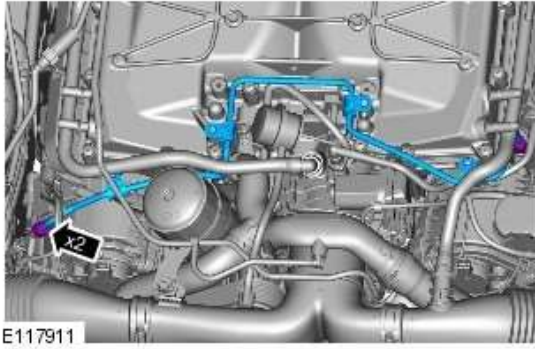


36. Torque:
Unions 21
Nm
M6 11 Nm

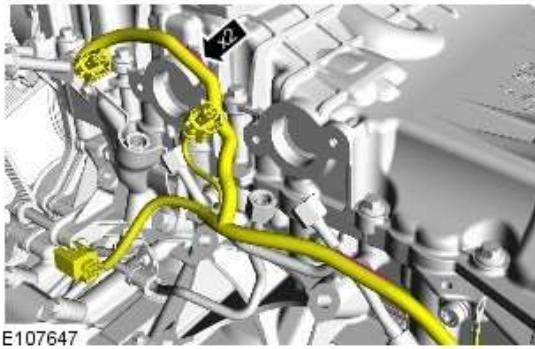




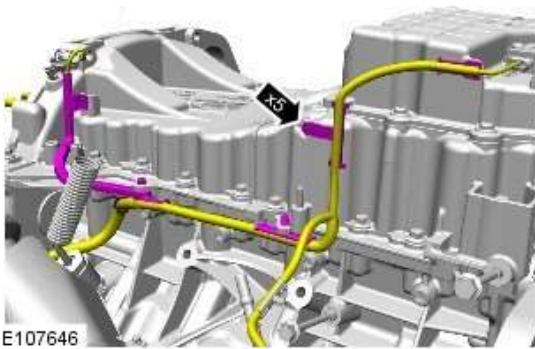
37.



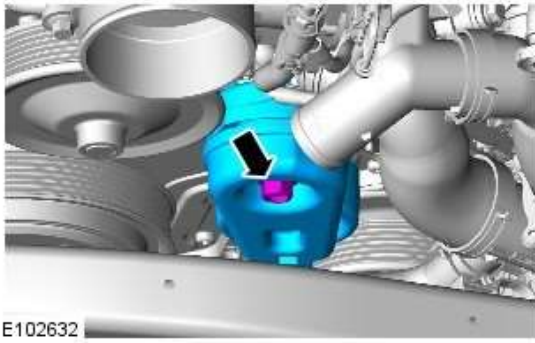
38. *Torque:*
Unions 21 Nm



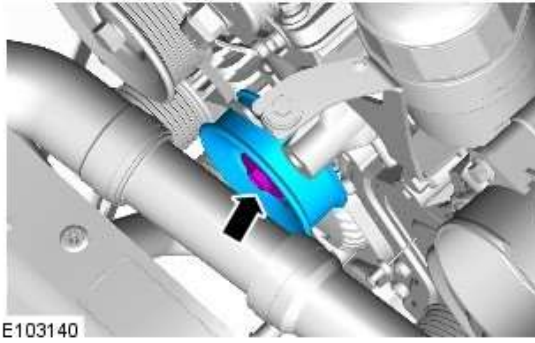
39.  NOTE: The high-pressure fuel pumps are removed from the illustration for clarity.



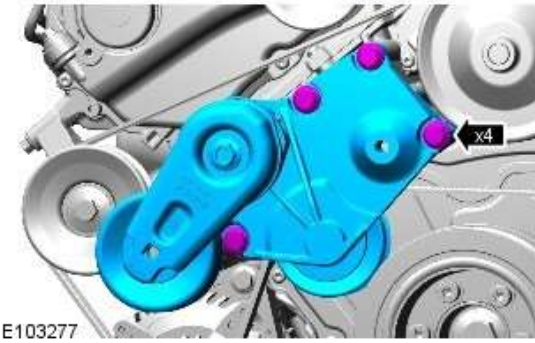
40.



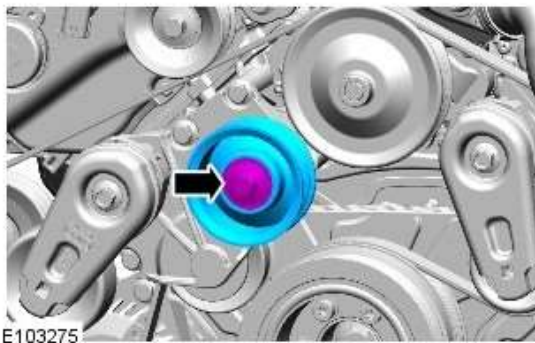
41. Torque: 40 Nm



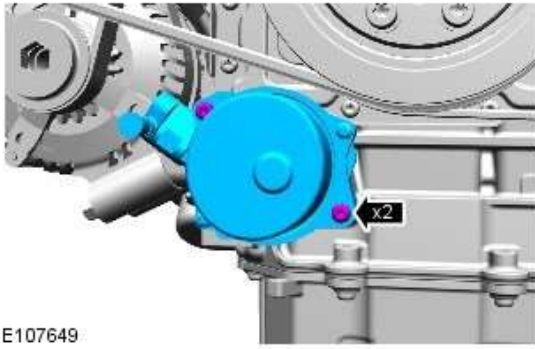
42. Torque: 25 Nm



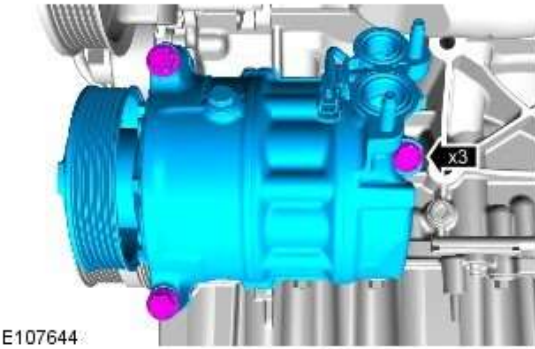
43. Torque: 25 Nm



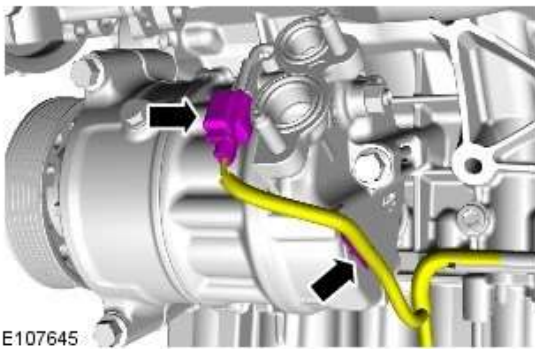
44. Torque: 55 Nm



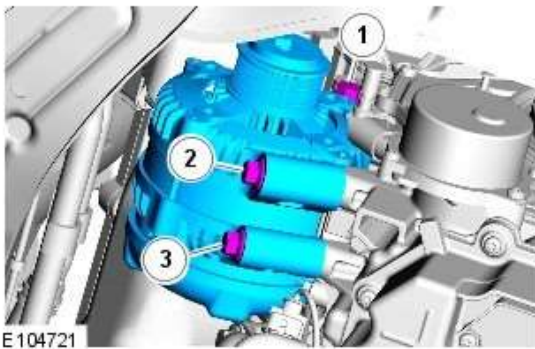
45. Torque: 12 Nm





46.  CAUTION: Install all the bolts finger tight before final tightening.
Torque: 25 Nm






47.






48.  CAUTION: Install all the bolts finger tight before final tightening.
 NOTE: Tighten the bolts in the indicated sequence.
Torque: 48 Nm



49. CAUTIONS:

-  Install all the bolts finger tight before final tightening.
-  The bolts can only be used 3 times, mark the bolts with a center punch. If 2 punch marks are visible, discard the bolts.
-  Install the bolts in the noted position.

NOTES:

-  Make sure that the crankshaft is not rotated.
-  Make sure the crankshaft and flexplate mating faces are clean before installation.
-  Tighten the retaining bolts working diagonally.

Torque:

Stage 1: 45 Nm
Stage 2: 90°

50. Refer to: [Engine](#) (303-01D Engine - V8 S/C 5.0L Petrol, Installation).
51. Refer to: [Crankshaft Pulley](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
52. Lower the vehicle.
53. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Oil Pump

Removal and Installation

Removal

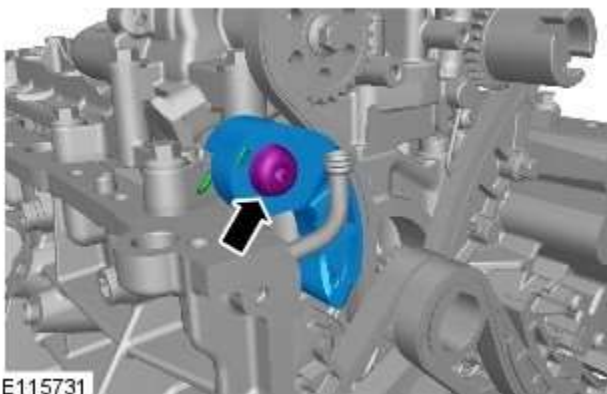
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



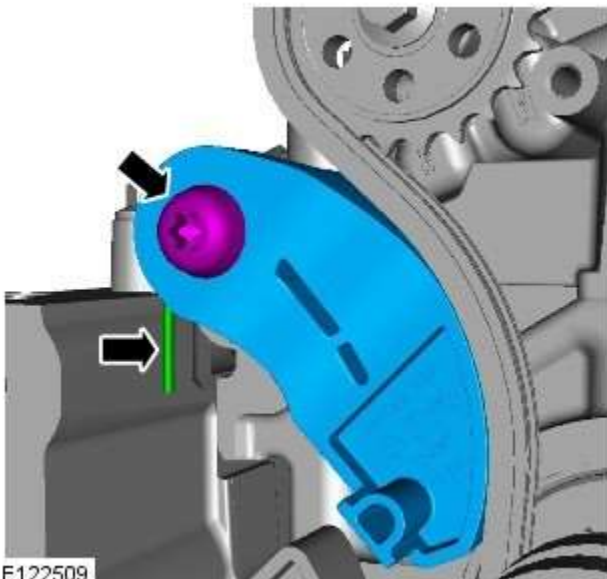
2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

3. Refer to: [Oil Pan Extension](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).

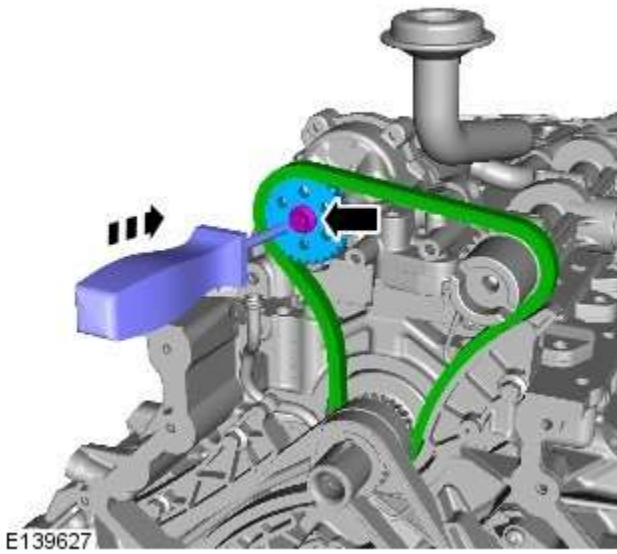



4.  NOTE: Tsubaki timing drive only.

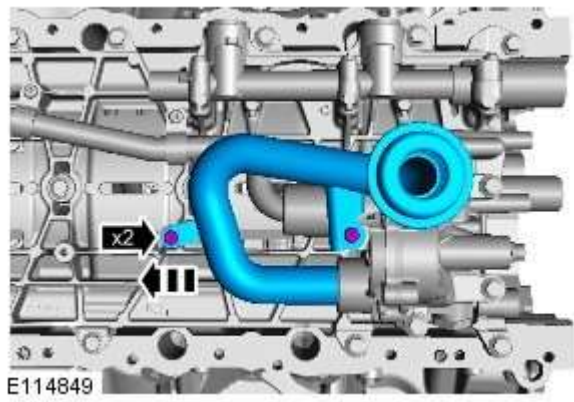


5.  NOTE: INA timing drive only.

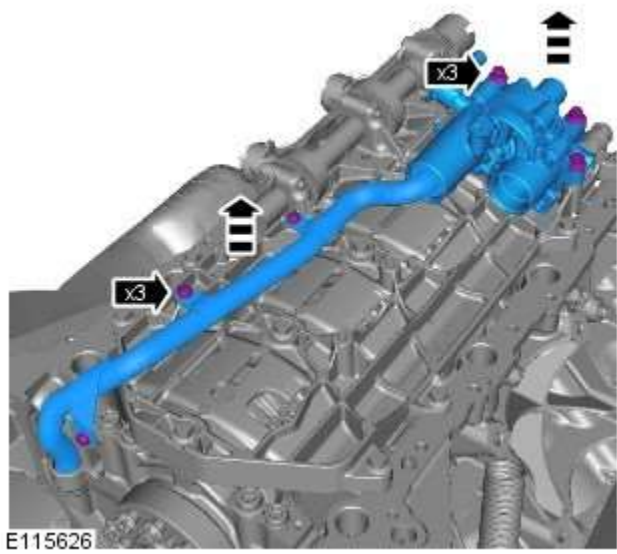
6.




7.  CAUTION: Remove and discard the O-ring seal.



8.  CAUTION: Remove and discard the O-ring seals.



9.  CAUTION: Remove and discard the O-ring seal.



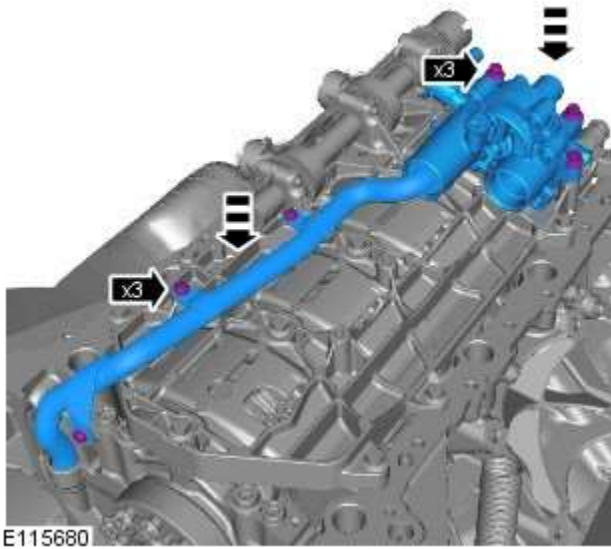
E139628

Installation

1.  NOTE: Lubricate and install the new O-ring seals.

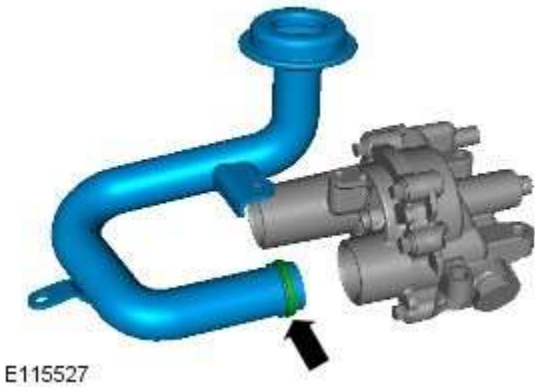


E139628

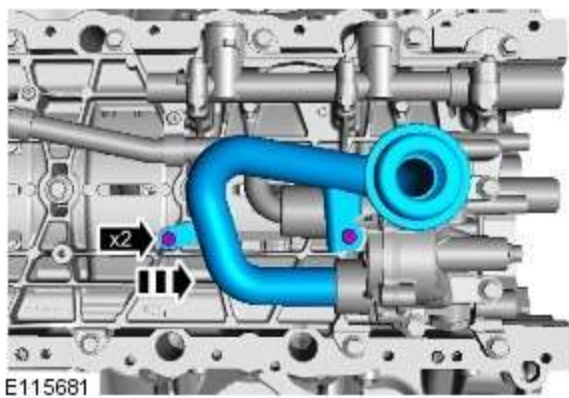


2.  NOTE: Lubricate and install the new O-ring seals.

Torque:
M8 25 Nm
M6 12 Nm

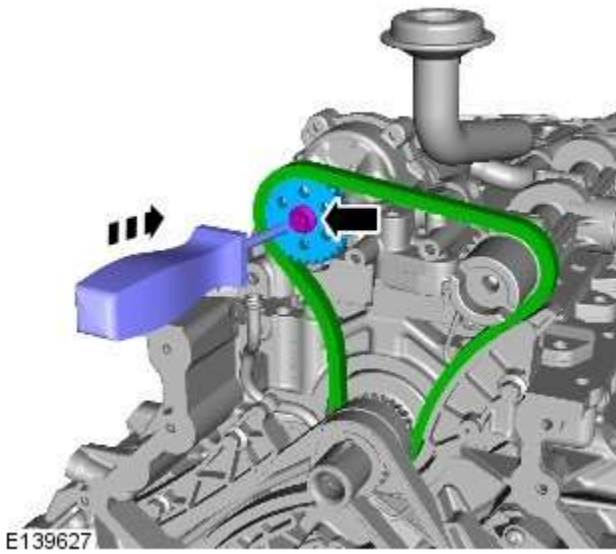


3.  NOTE: Lubricate and install the new O-ring seals.



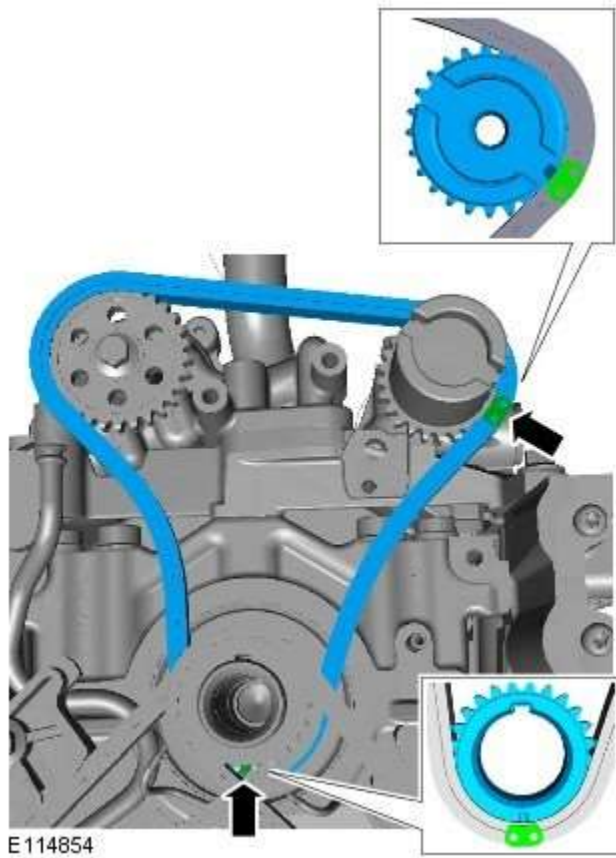
4. Torque: 12 Nm

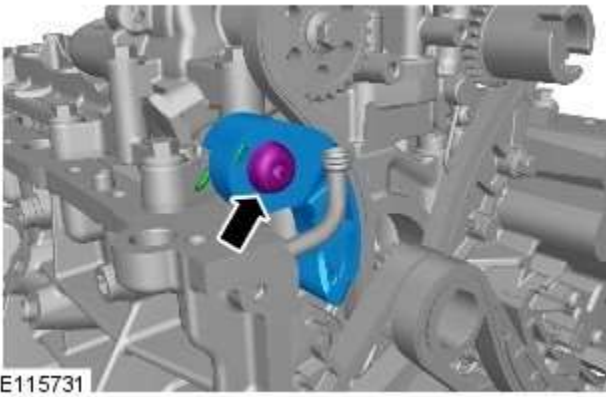
5. Torque: 21 Nm




6.  NOTE: Tsubaki timing drive only.

Install the lower timing chain making sure the coloured chain links align correctly with the fuel rail high-pressure fuel pumps camshaft and crankshaft sprocket markings.

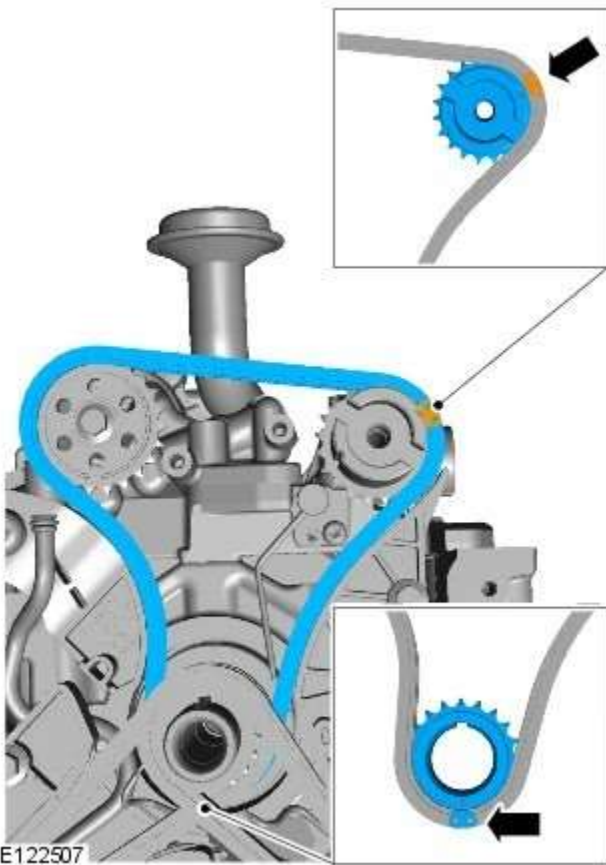




7.  **CAUTION:** Make sure that the tensioner spring is correctly located.

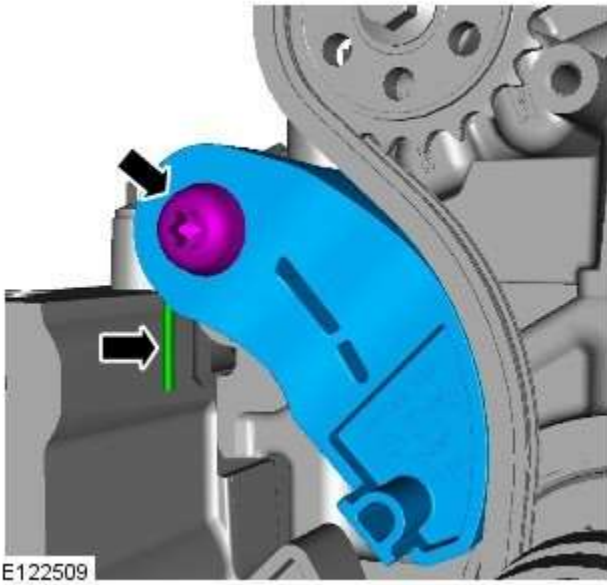
 **NOTE:** Tsubaki timing drive only.


Torque: 21 Nm



8.  **NOTE:** INA timing drive only.

Install the lower timing chain making sure the coloured chain links align correctly with the fuel rail high-pressure fuel pumps camshaft and crankshaft sprocket markings.



9.  CAUTION: Make sure that the tensioner spring is correctly located.

 NOTE: INA timing drive only.

Torque: 21 Nm

10. Refer to: [Oil Pan Extension](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).
11. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Timing Cover

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



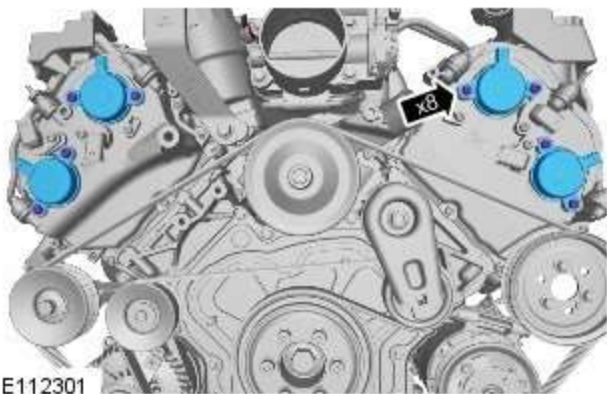
2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

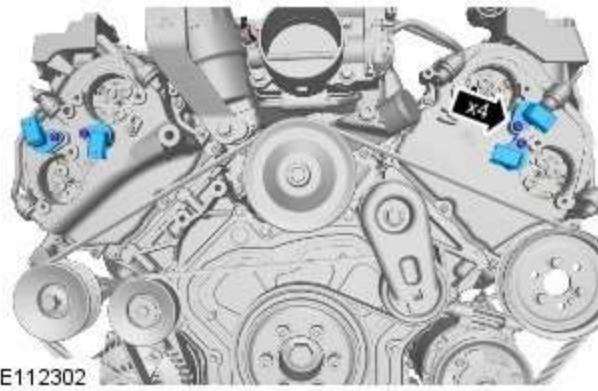
3. Refer to: [Accessory Drive Belt](#) (303-05D Accessory Drive - V8 S/C 5.0L Petrol, Removal and Installation).
4. Refer to: [Accessory Drive Belt Tensioner](#) (303-05D Accessory Drive - V8 S/C 5.0L Petrol, Removal and Installation).
5. Refer to: [Thermostat Housing - Vehicles With: Supercharger](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
6. Refer to: [Valve Cover LH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
7. Refer to: [Valve Cover RH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
8. Refer to: [Crankshaft Pulley](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).




9. NOTE: Engine shown removed for clarity.



E112301




E112302

10.  NOTE: Engine shown removed for clarity.




E116364

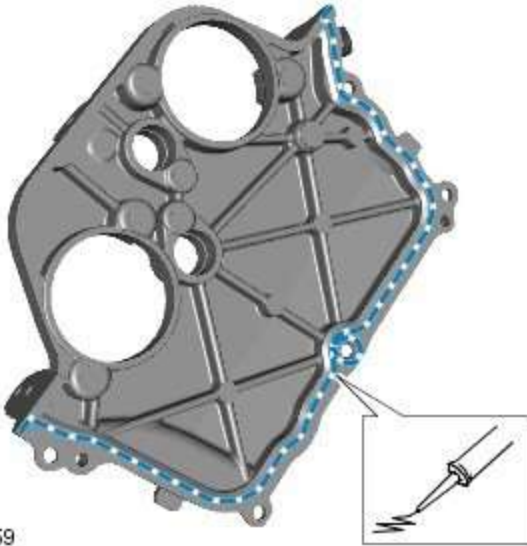
11.  NOTE: Engine shown removed for clarity.



E112055

12.  NOTE: Engine shown removed for clarity.

Installation



E112059

1.

- Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.



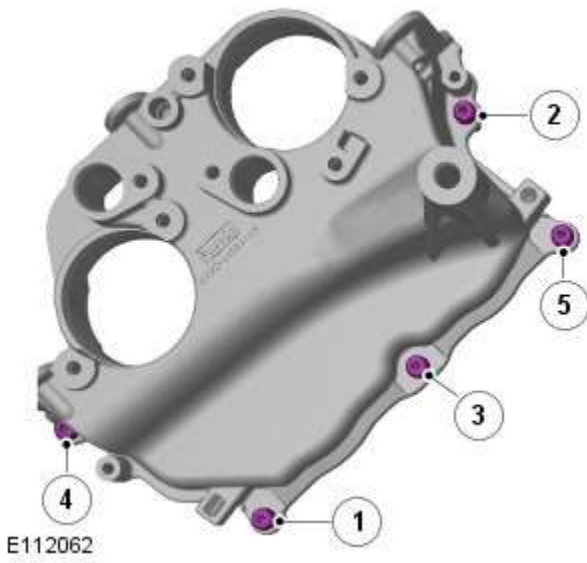
E112060

2.

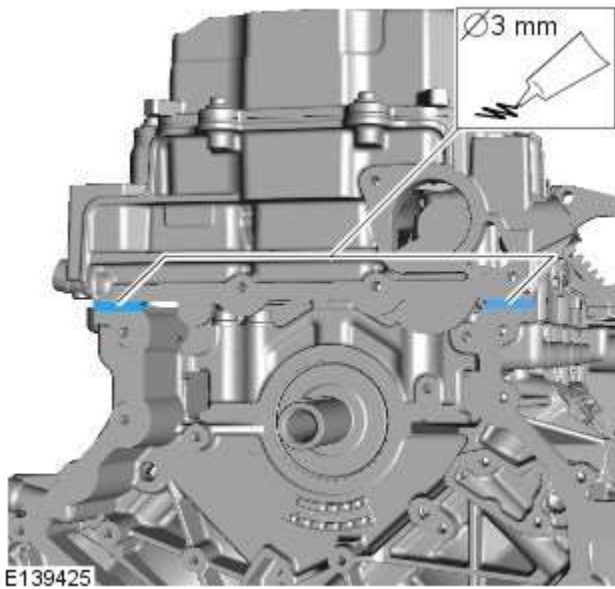
- Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.




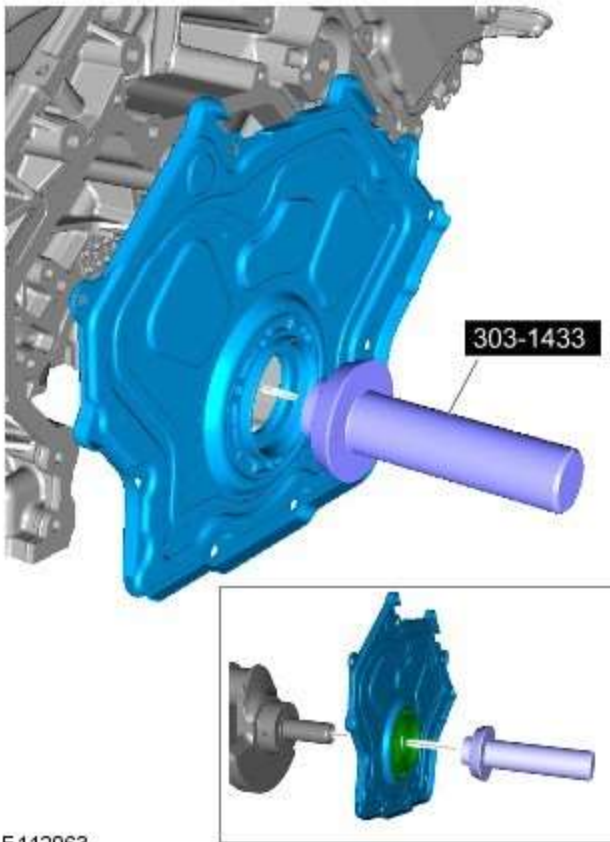
3.  NOTE: Tighten the bolts in the indicated sequence.
Torque: 12 Nm




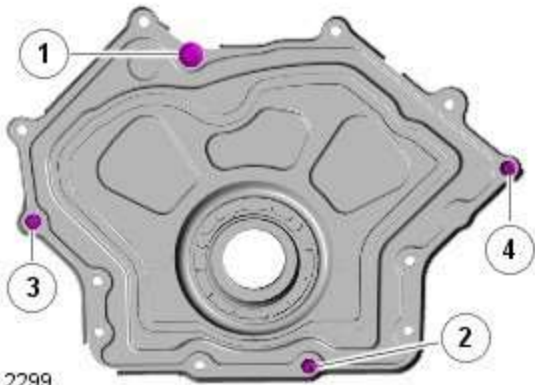
4.  NOTE: Tighten the bolts in the indicated sequence.
Torque: 12 Nm



5.  **CAUTION:** Make sure that the mating faces are clean and free of foreign material.
Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.



6.  **CAUTION:** Make sure that the mating faces are clean and free of foreign material.
Install the bolts, but do not tighten fully at this stage.



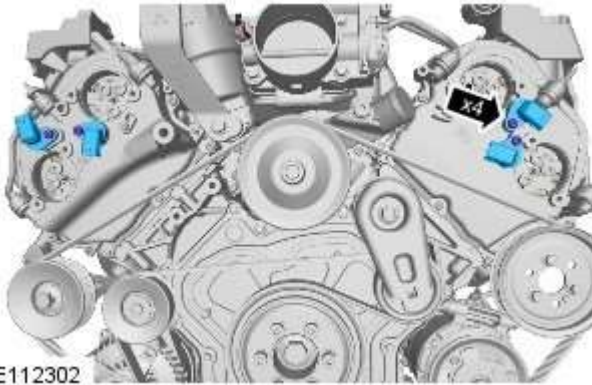
E112299

7.  NOTE: Tighten the bolts in the indicated sequence.
Torque: 12 Nm



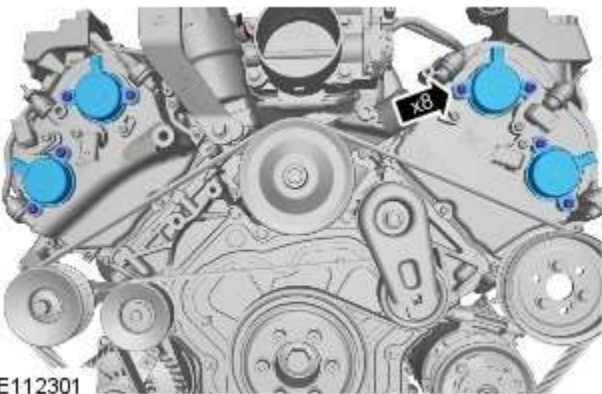
E112300

8. Torque: 12 Nm



E112302

9. Torque: 12 Nm



E112301

10. Torque: 12 Nm








11. Torque: 25 Nm

12. Refer to: [Crankshaft Pulley](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
13. Refer to: [Valve Cover RH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
14. Refer to: [Valve Cover LH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
15. Refer to: [Thermostat Housing - Vehicles With: Supercharger](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
16. Refer to: [Accessory Drive Belt Tensioner](#) (303-05D Accessory Drive - V8 S/C 5.0L Petrol, Removal and Installation).
17. Refer to: [Accessory Drive Belt](#) (303-05D Accessory Drive - V8 S/C 5.0L Petrol, Removal and Installation).
18. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Timing Drive Components

Removal and Installation

Special Tool(s)

 <p>E115263</p>	<p>303-1445 Timing Tool – Camshaft Alignment</p>
 <p>E115265</p>	<p>303-1447 Timing Tool</p>
 <p>E115266</p>	<p>303-1448 Locking Tool</p>
 <p>E115270</p>	<p>303-1452 Camshaft Rotating Tool</p>
 <p>E115271</p>	<p>303-1482 Tensioner Tool</p>

Removal



CAUTION: Check all timing components for wear and install new components if required.

NOTES:



Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

1. Disconnect the battery ground cable.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.

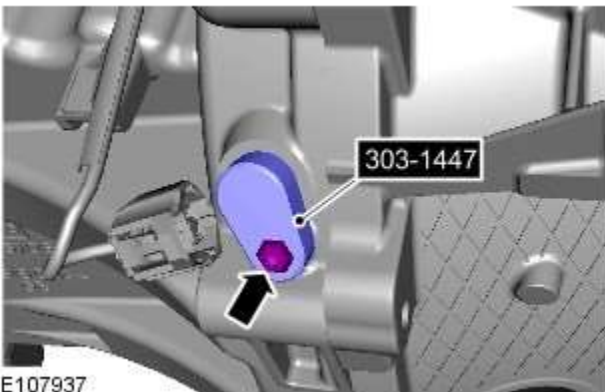
Raise and support the vehicle.

3. Refer to: [Timing Cover](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).

4.



E103033

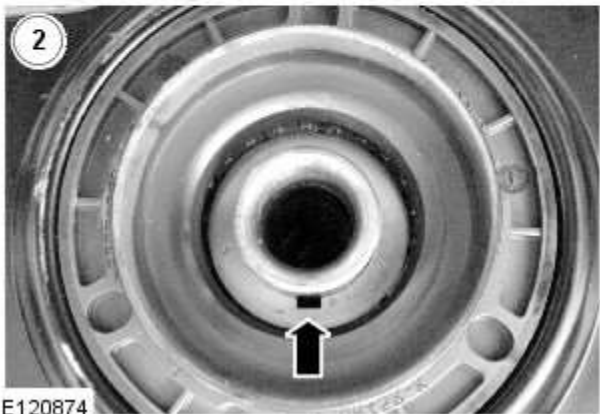
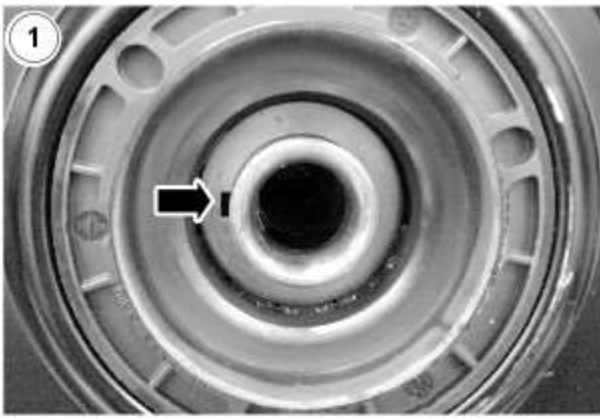



E107937

5.  **CAUTION:** Only rotate the crankshaft clockwise.

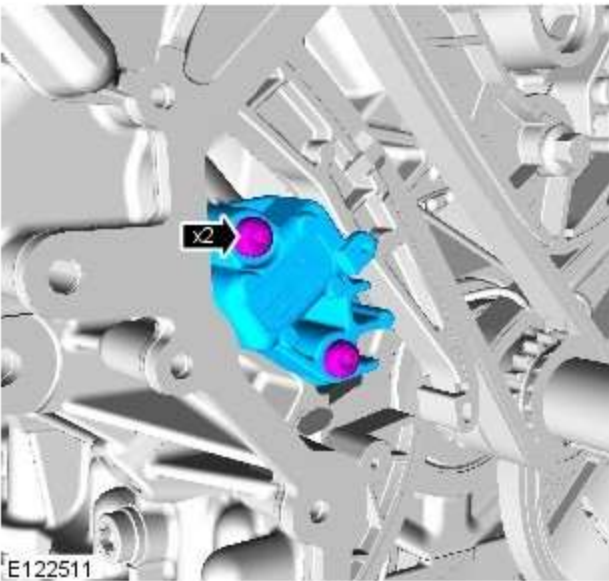
Install the special tool.

Special Tool(s): [303-1447](#)



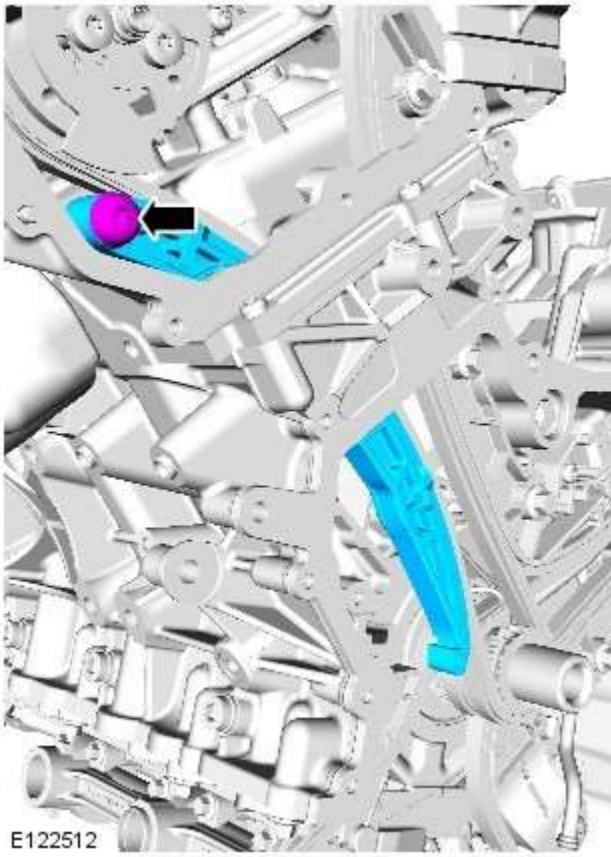
6.  CAUTION: If the noted position of the woodruff key is at the 9 o'clock position, then a new flexplate must be installed. If the woodruff key is in the 6 o'clock position then proceed with the next step.

Note the position of the crankshaft woodruff key.

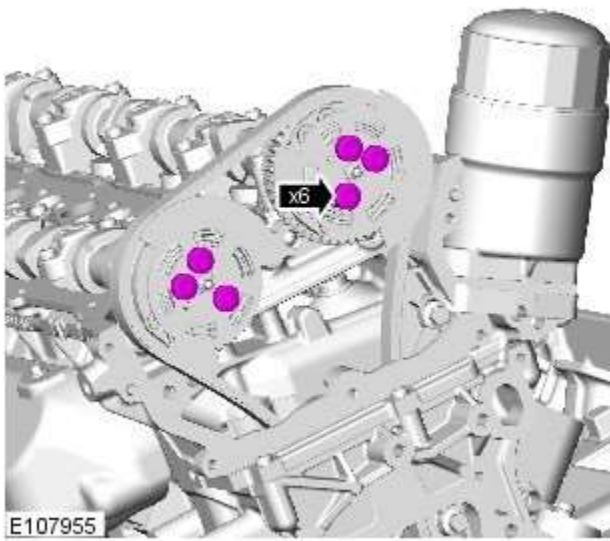


7.


8.



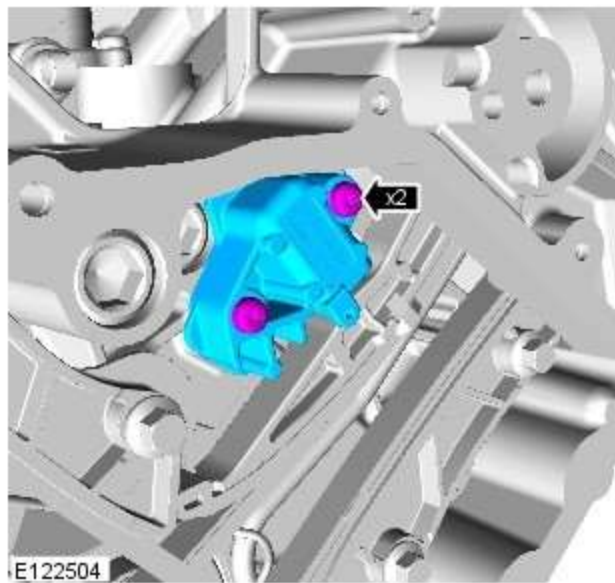
9.





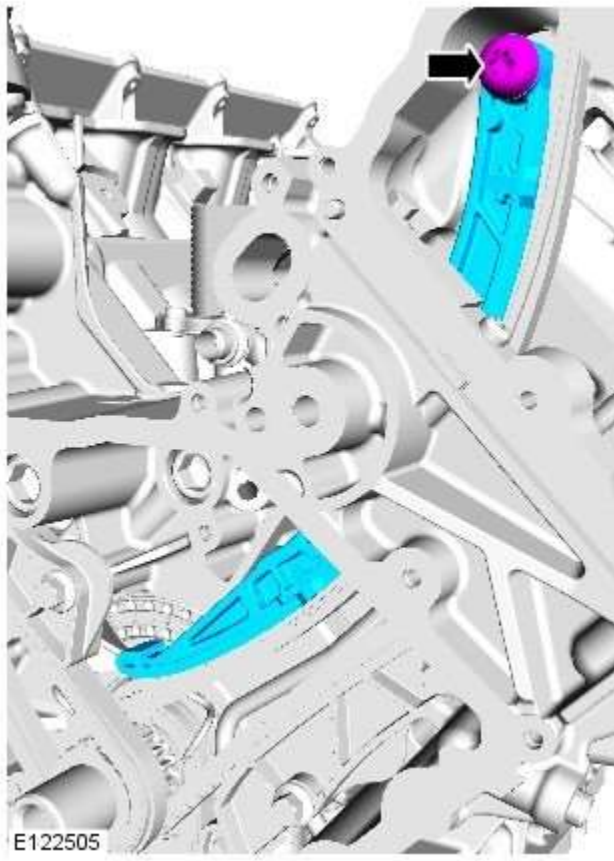
10.  CAUTION: If the variable valve timing (VVT) units are knocked or dropped then the VVT must be replaced.

Remove the timing chain with the VVT units.

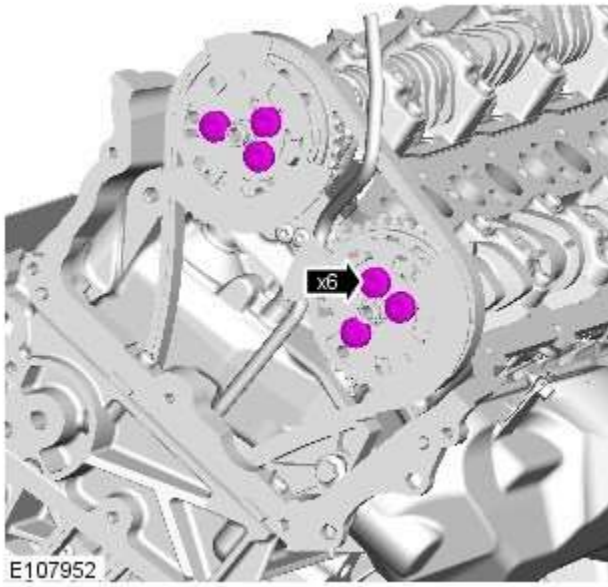


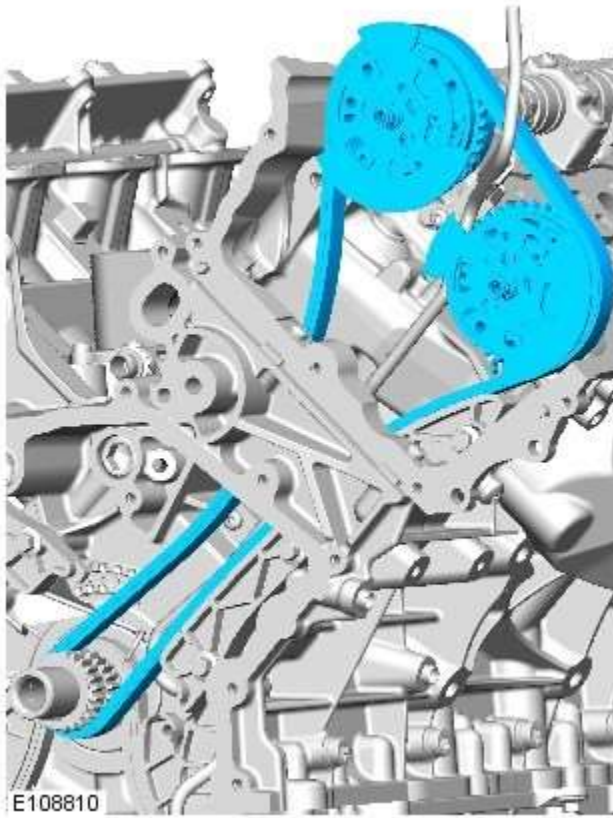
- 11.

12.



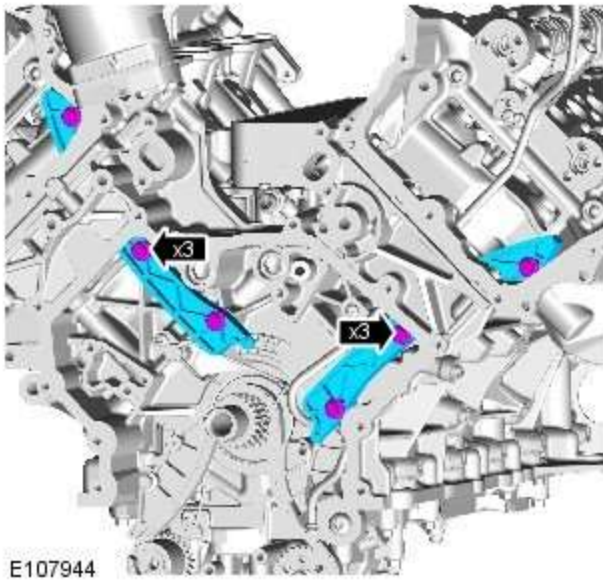
13.



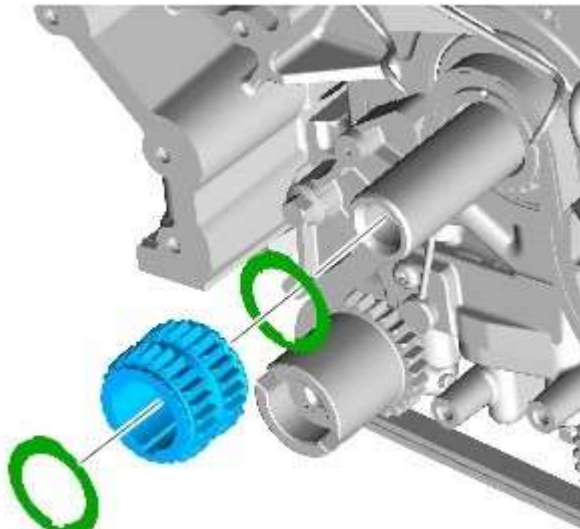


14.  CAUTION: If the VVT is knocked or dropped then the VVT must be replaced.

Remove the timing chain with the VVT units.



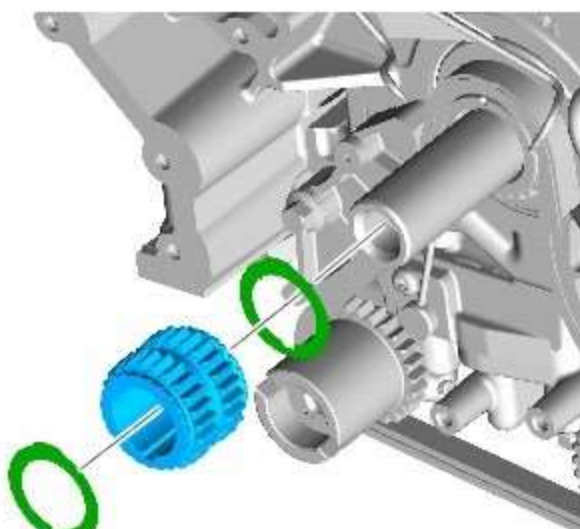
- 15.



E107945

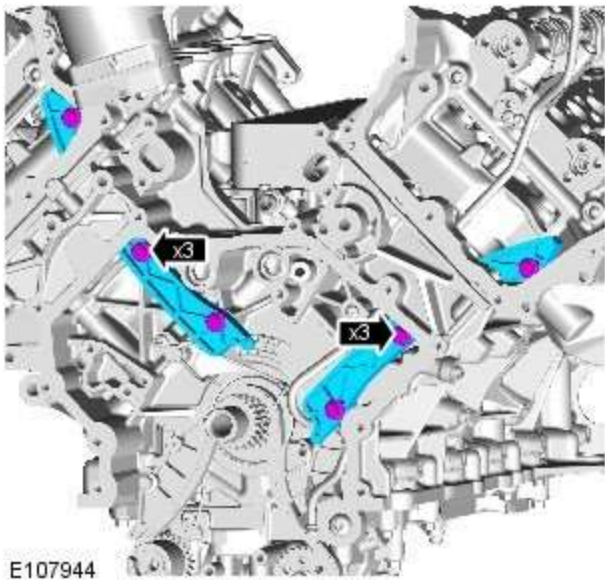
16.  CAUTION: Discard the friction washer.

Installation

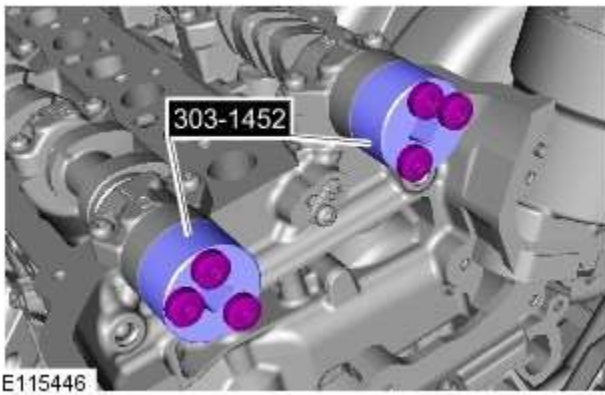


E107945

1.  CAUTION: Install a new friction washer.



2. Torque: 12 Nm

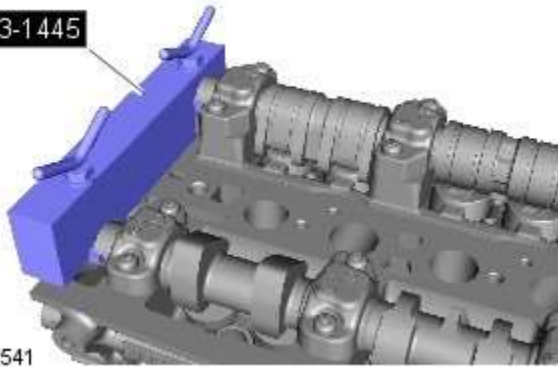


- 3.
- Install the special tool to each Camshaft.
 - *Special Tool(s)*: [303-1452](#)
 - *Torque*: 10 Nm



- 4.
- Carefully rotate the camshafts if the position is not as shown.

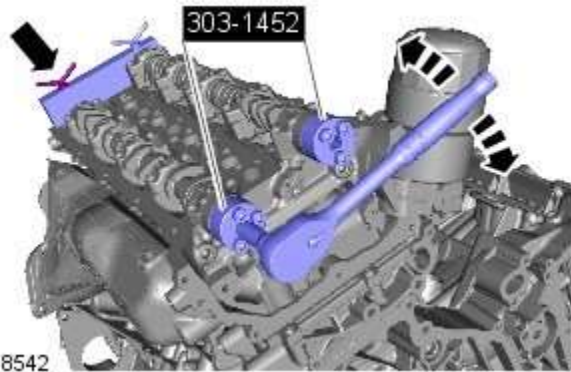
303-1445



E118541

5.

- Install the special tool 303-1445 to the rear of the camshafts making sure the key way's are correctly located into each slot on each of the camshafts.



E118542

6. CAUTIONS:



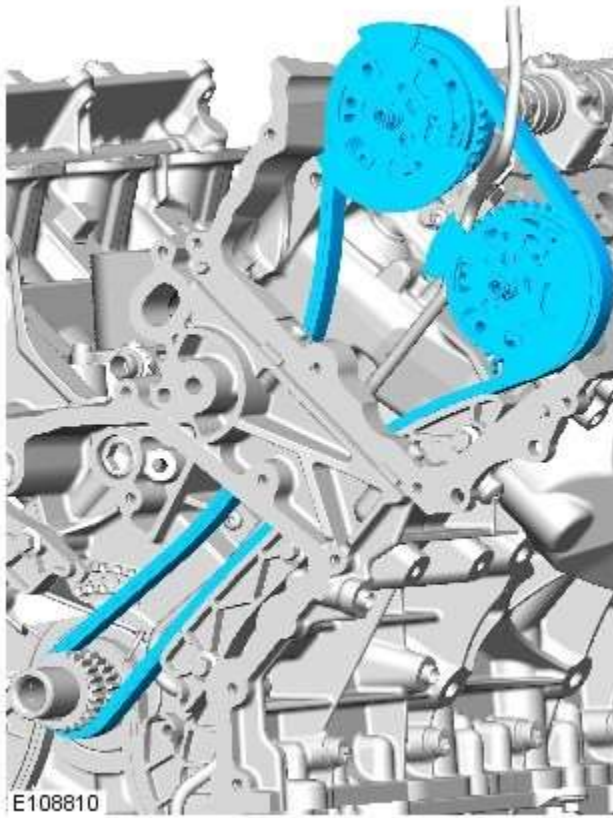
Do not overturn the camshafts.



Tighten the wing nuts finger tight. Failure to follow this instruction may result in damage to the components.

- Using a suitable tool, carefully rock the camshaft clockwise then anti-clockwise. Turn the special tool locking nuts until there is no movement left in camshafts.
- Repeat steps 3- 6 for the camshafts on the other cylinder head.





7. CAUTIONS:



Do not allow the camshaft to rotate.



If the VVT is knocked or dropped then the VVT must be replaced.

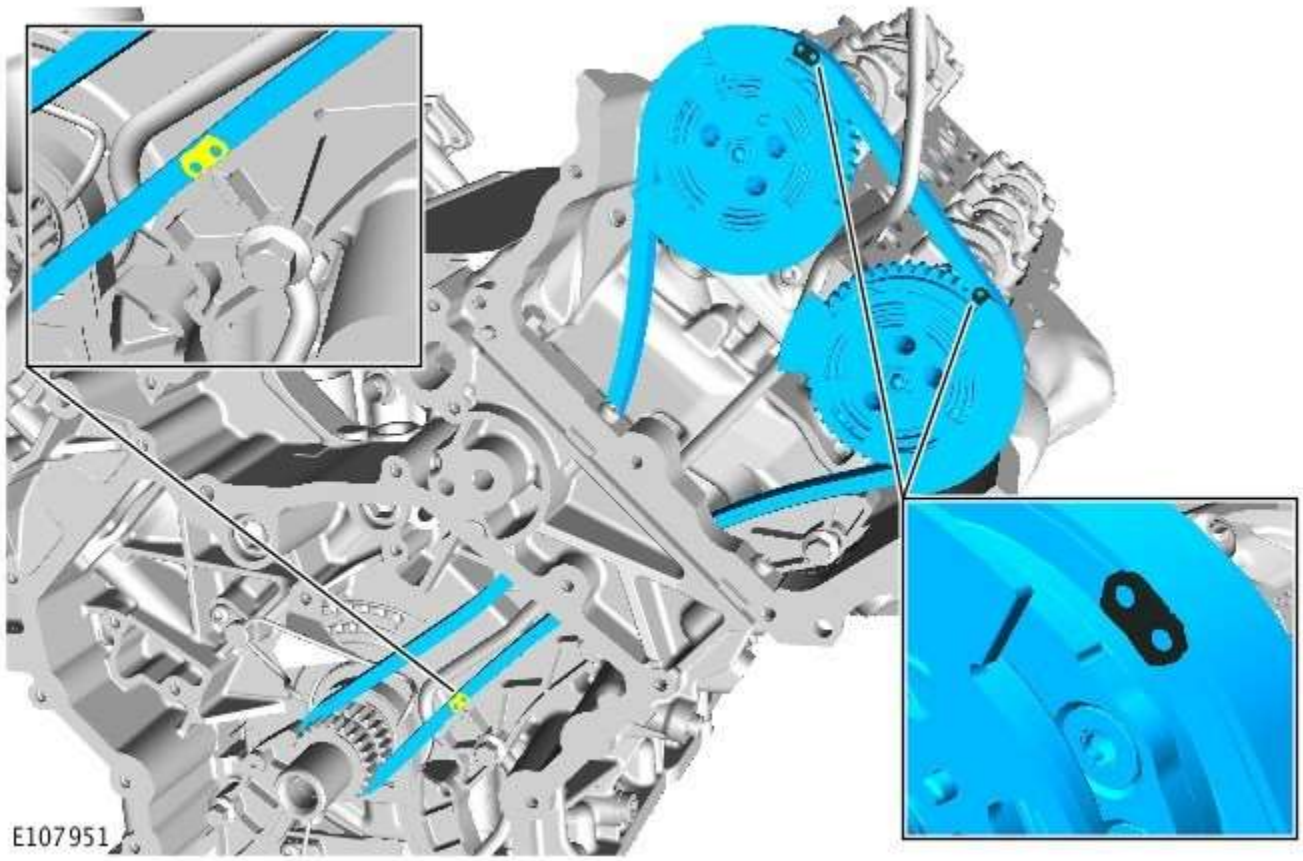


NOTE: Do not tighten at this stage.

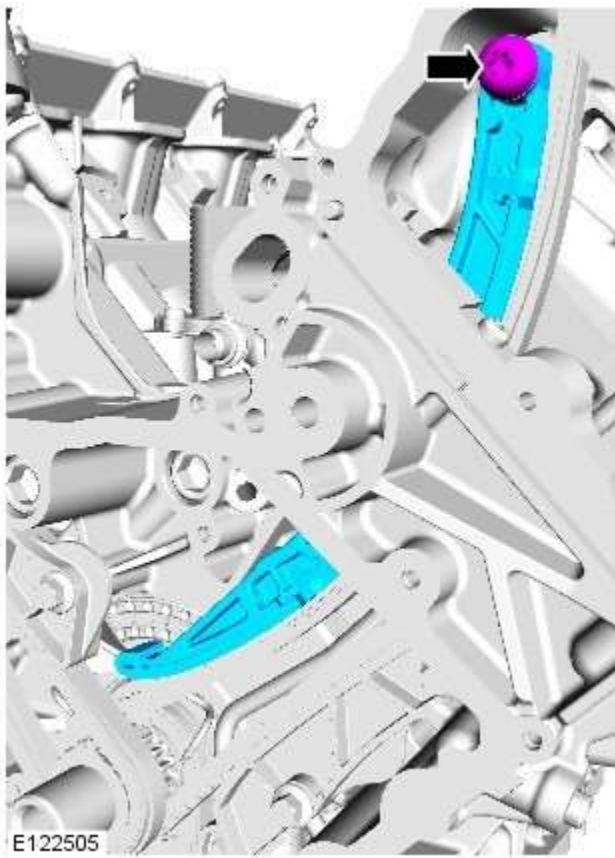
- Install the timing chain with the variable valve timing (VVT) units.

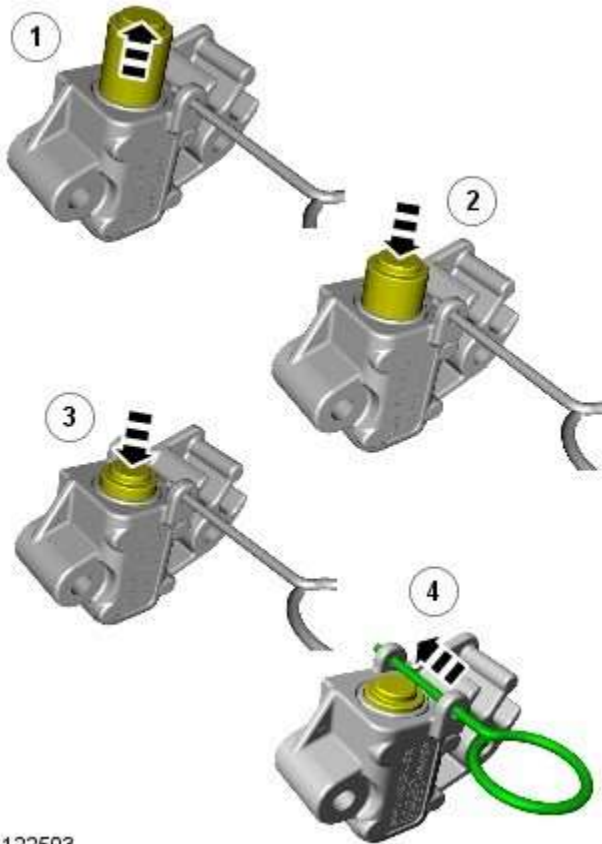
8.

- Make sure that all the timing chain alignment marks are in the positions shown.



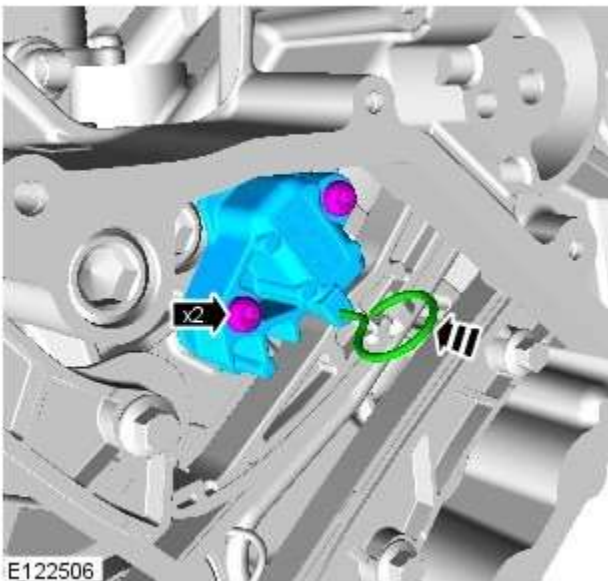
9. Torque: 25 Nm






E122503

10. Make sure the tensioner piston is fully extended. Then fully depress and lock the tensioner piston with the grenade pin before installation, failure to do this may result in damage to the engine.




E122506


11.  CAUTION: Do not release the timing chain tensioner locking pin at this stage.

Torque: 10 Nm



12. CAUTIONS:

 Do not allow the camshafts to rotate.

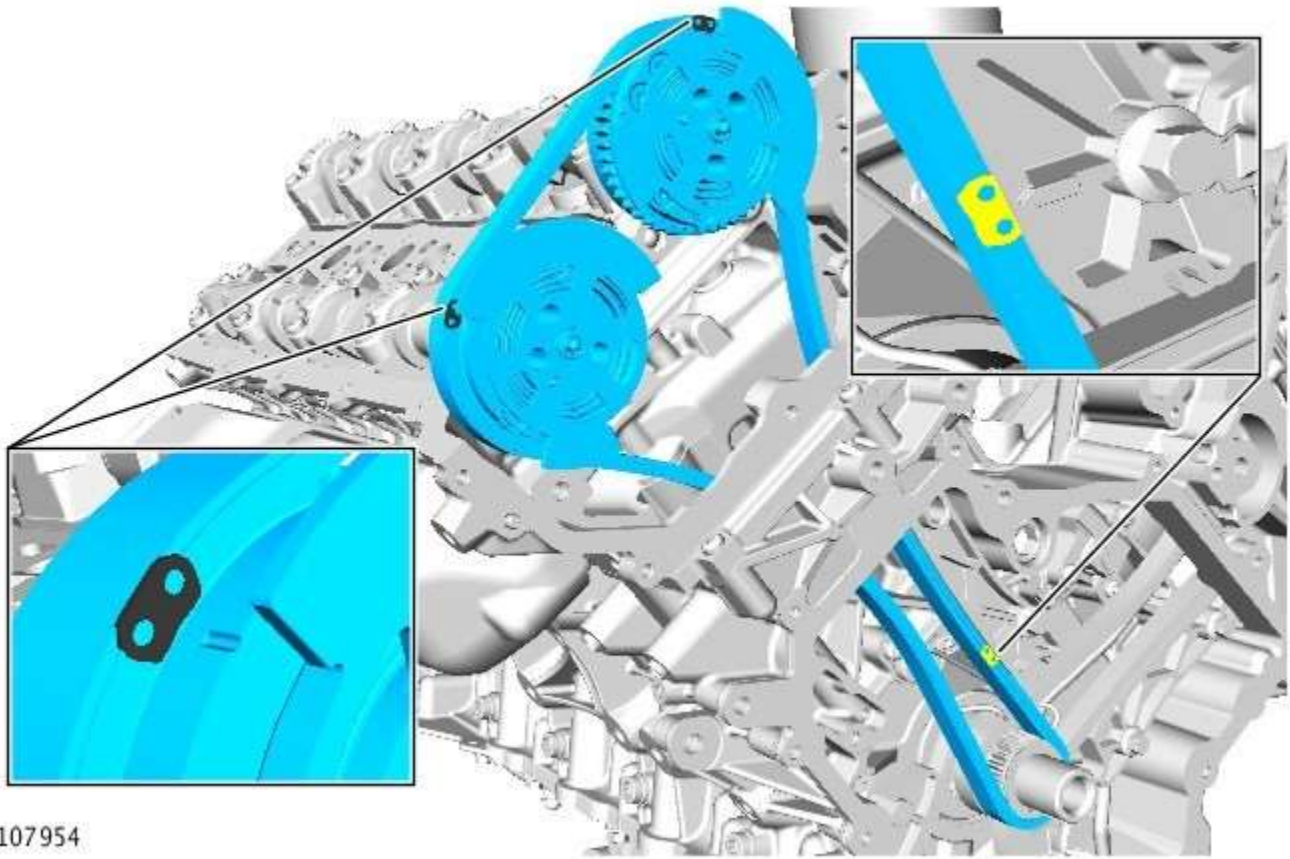
 If the VVT is knocked or dropped then the VVT must be replaced.

 NOTE: Do not tighten at this stage.

- Install the timing chain with the VVT units.

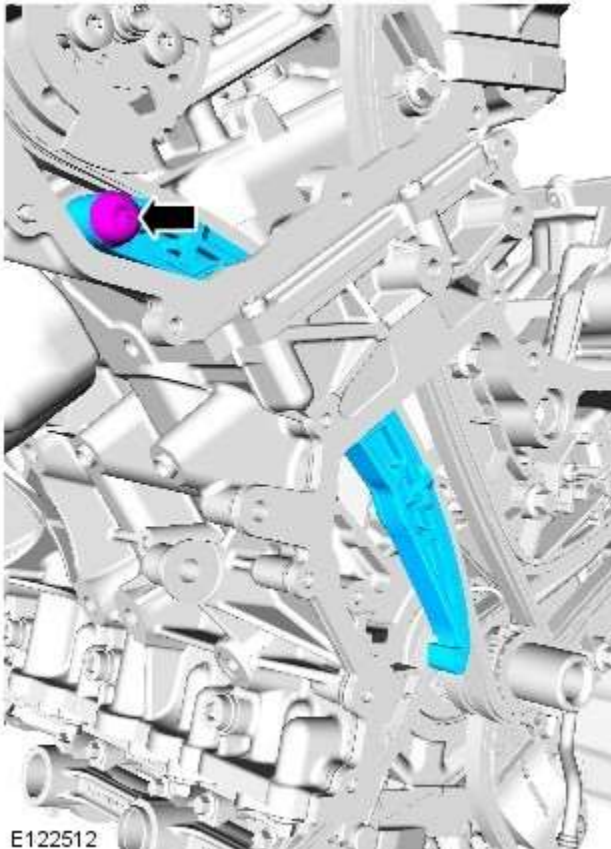
13.

- Make sure that all the timing chain alignment marks are in the positions shown.

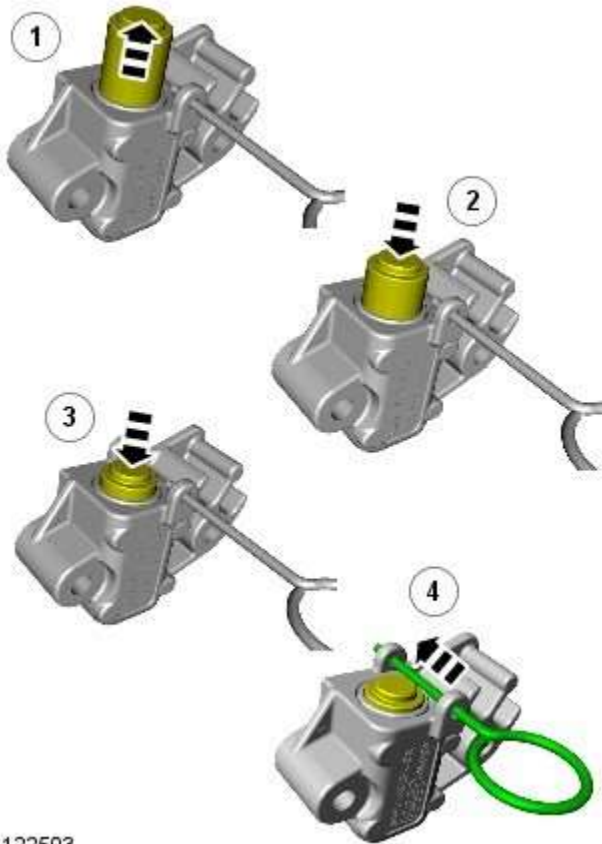


E107954

14. *Torque: 25 Nm*

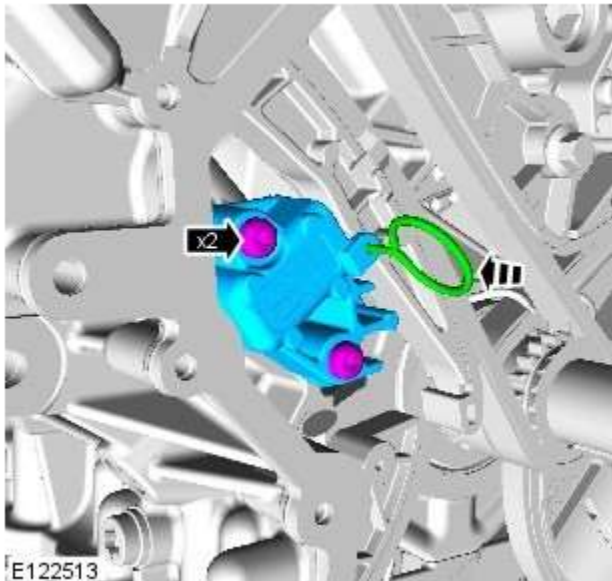


E122512




E122503

15. Make sure the tensioner piston is fully extended. Then fully depress and lock the tensioner piston with the grenade pin before installation, failure to do this may result in damage to the engine.

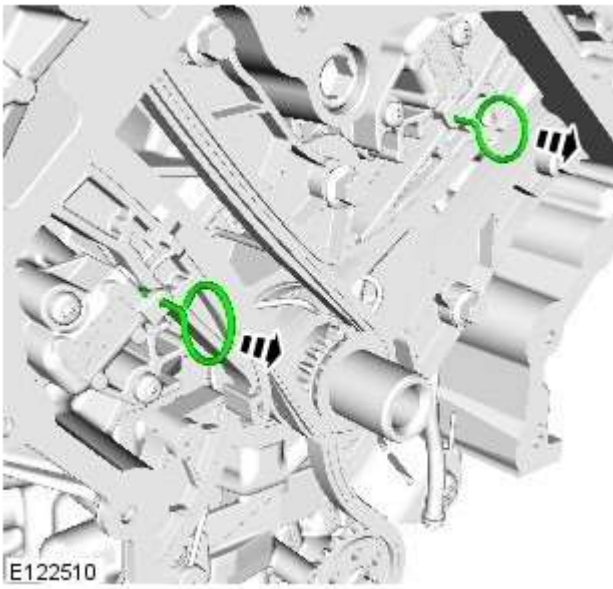



E122513

16.  CAUTION: Do not release the timing chain tensioner locking pin at this stage.

Torque: 10 Nm

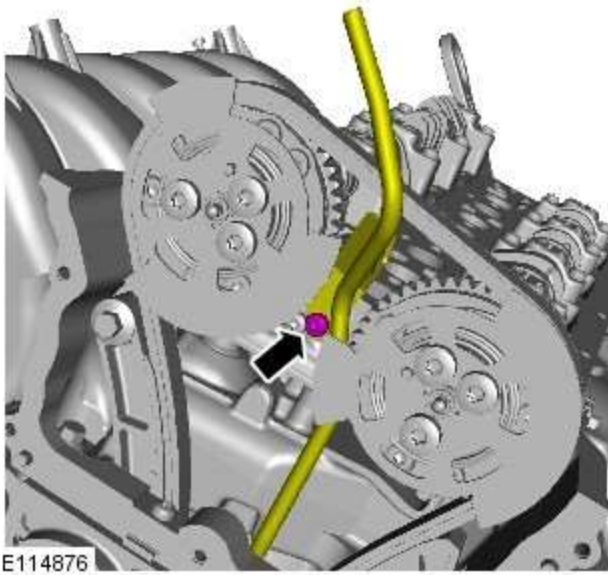
17.

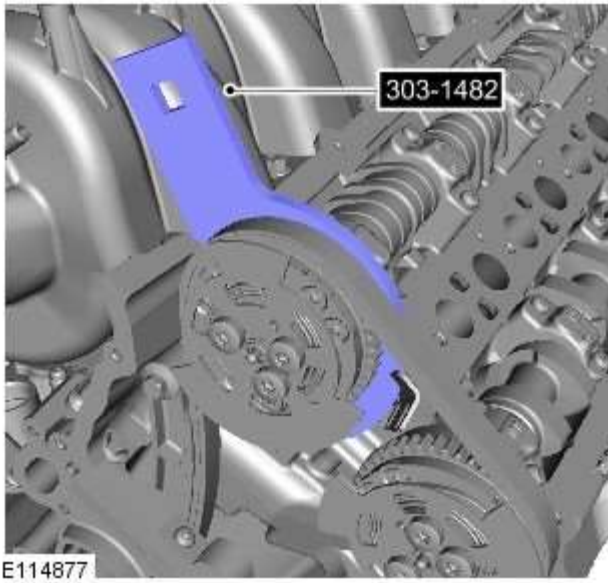


18.  **CAUTION: Do not use mechanical force.**
Make sure that the tensioners are fully deployed.

19.

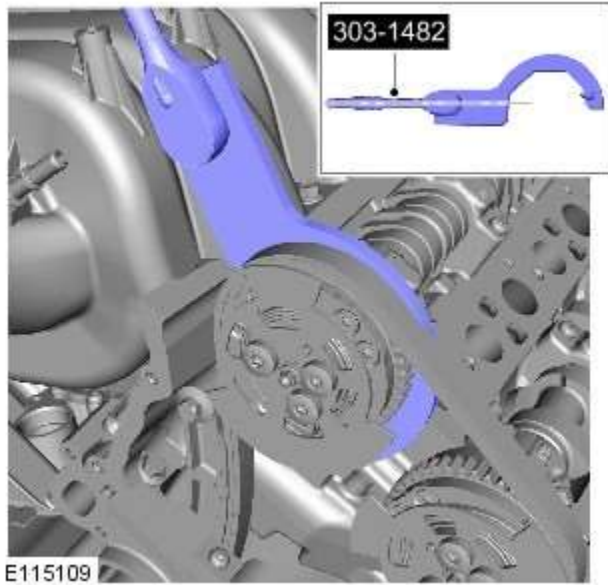
- Release and reposition the oil suction tube to one side.





20.

- Install the special tool.
- *Special Tool(s):* [303-1482](#)



21. CAUTIONS:

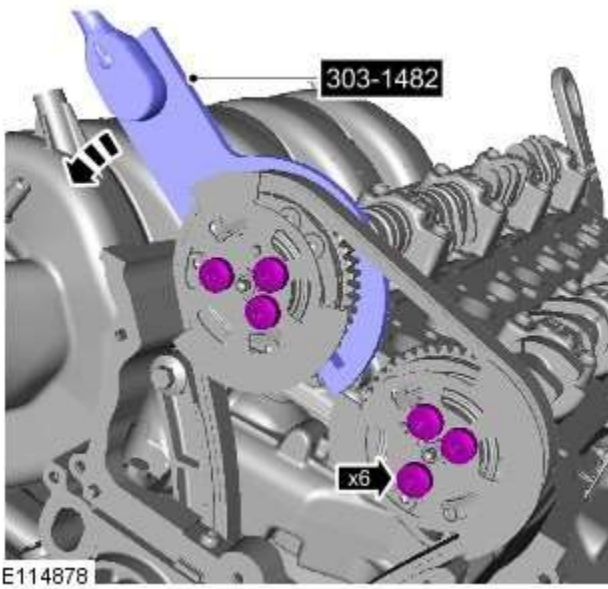



Apply the torque to the end of the special tool.



Make sure that the torque wrench is aligned with the special tool as illustrated in the graphic.

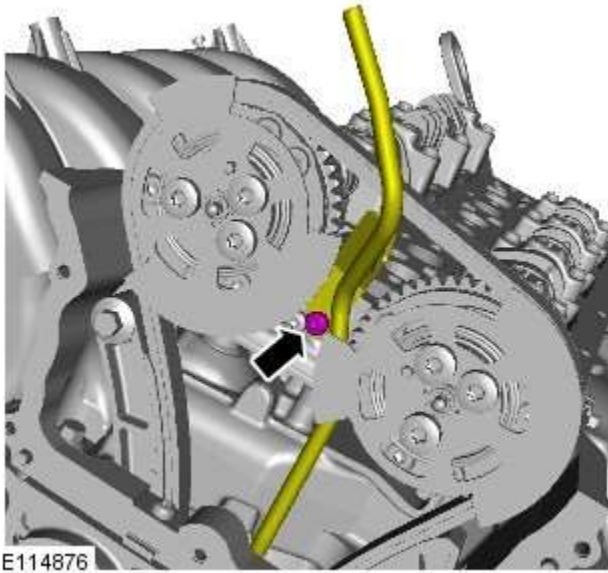
- Install the torque wrench to the special tool.
- *Torque:* 35 Nm



22.  **CAUTION:** Make sure that the torque wrench does not move whilst tightening the VVT bolts.

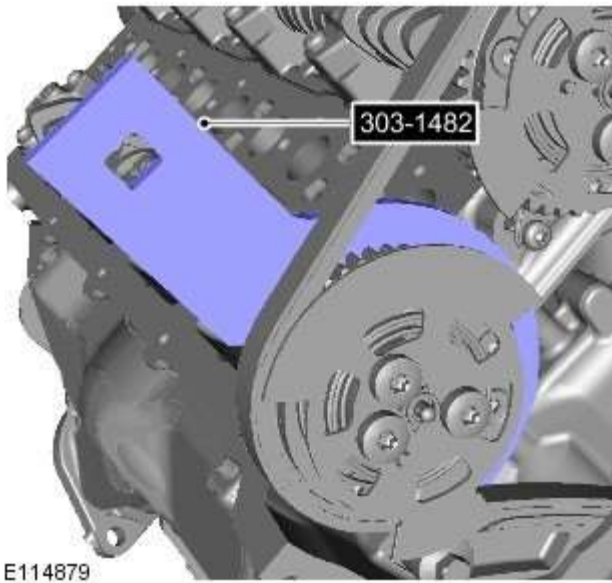
 **NOTE:** Make sure to tighten the exhaust VVT unit bolts first.

- Torque: 32 Nm
- Special Tool(s): 303-1482



23.

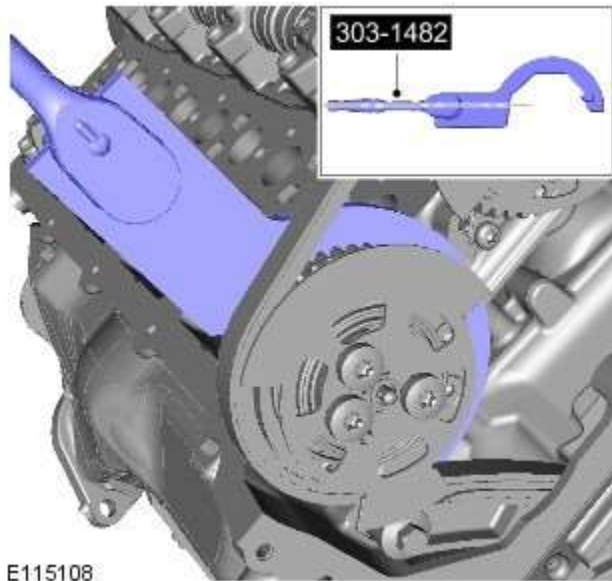
- Install the oil suction tube.
- Torque: 10 Nm



E114879

24.

- Install the special tool.
- *Special Tool(s):* [303-1482](#)



E115108

25. CAUTIONS:

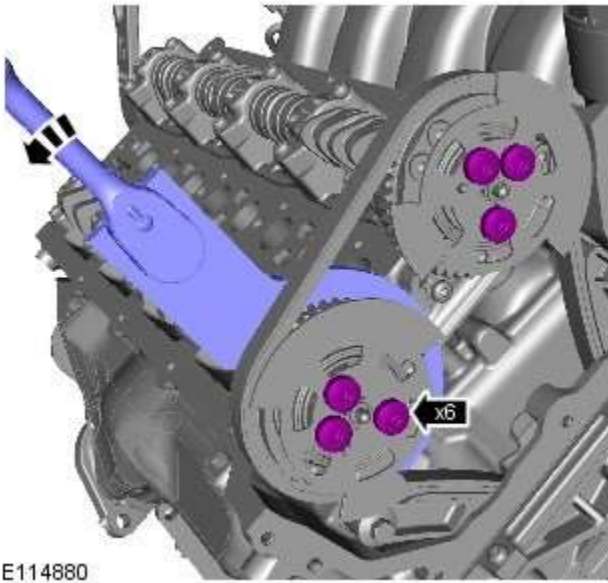



Apply the torque to the end of the special tool.



Make sure that the torque wrench is aligned with the special tool as illustrated in the graphic.

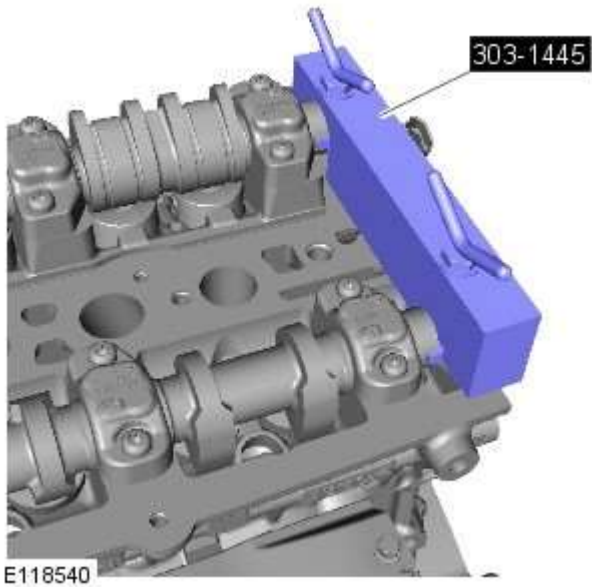
- Install the torque wrench to the special tool.
- *Torque:* 35 Nm



26.  CAUTION: Make sure that the torque wrench does not move whilst tightening the VVT bolts.

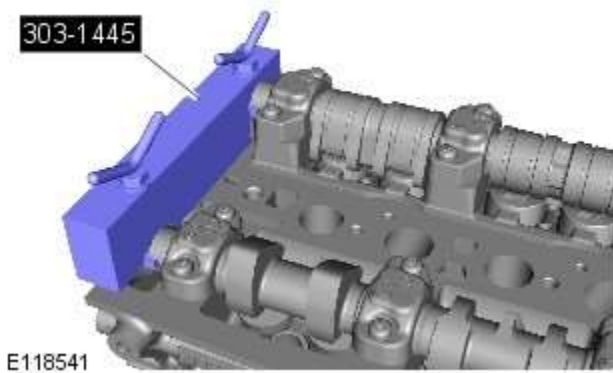
 NOTE: Make sure to tighten the inlet VVT unit bolts first.

Torque: 32 Nm



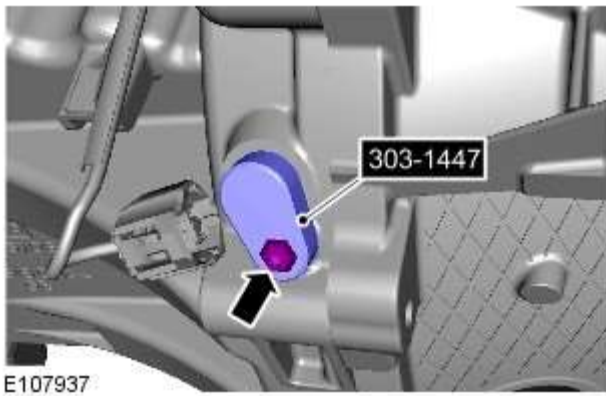
27.

- Remove the special tool.



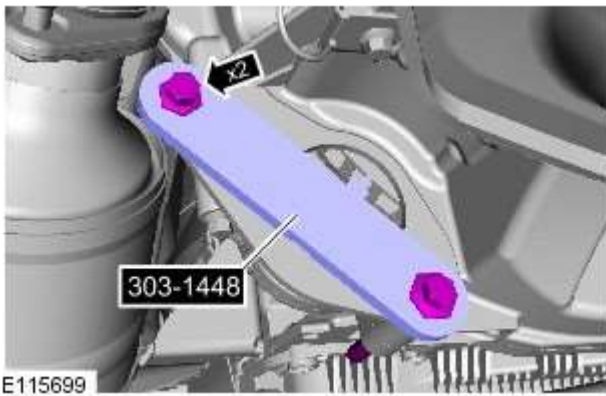
28.

- Remove the special tool.



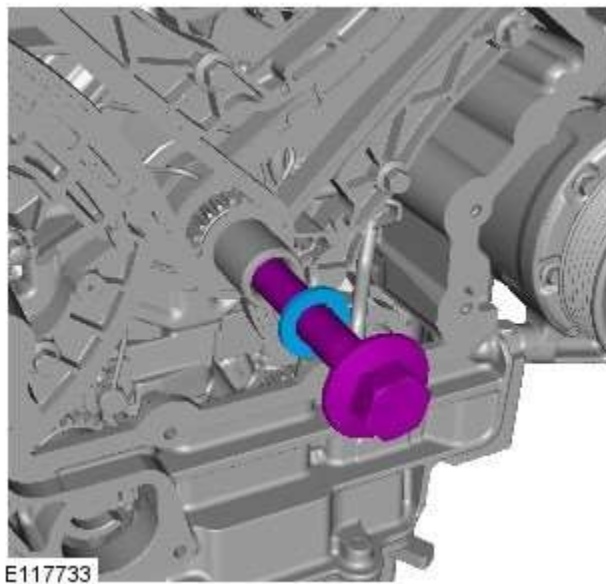
29.


- Remove the special tool.
- *Special Tool(s):* [303-1447](#)



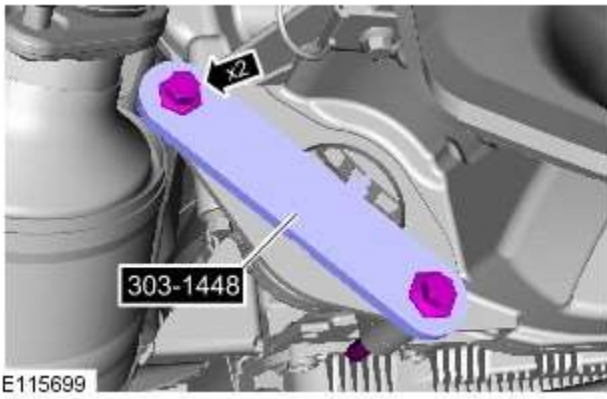
30.

- Install the special tool.
- *Special Tool(s):* [303-1448](#)



31.  **CAUTION:** Install the crankshaft pulley bolt with an M16 washer to prevent damage to the crankshaft on installation.

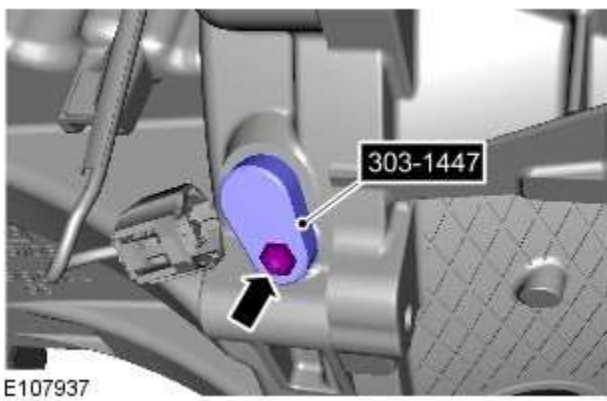
Torque: 50 Nm




32.

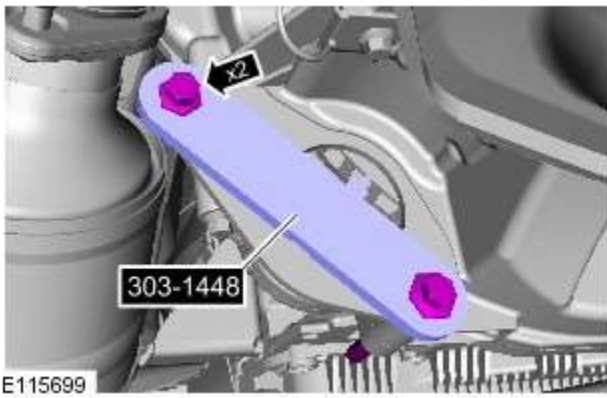
- Remove the special tool.
- *Special Tool(s):* [303-1448](#)

33. Rotate the engine two complete turns clockwise.



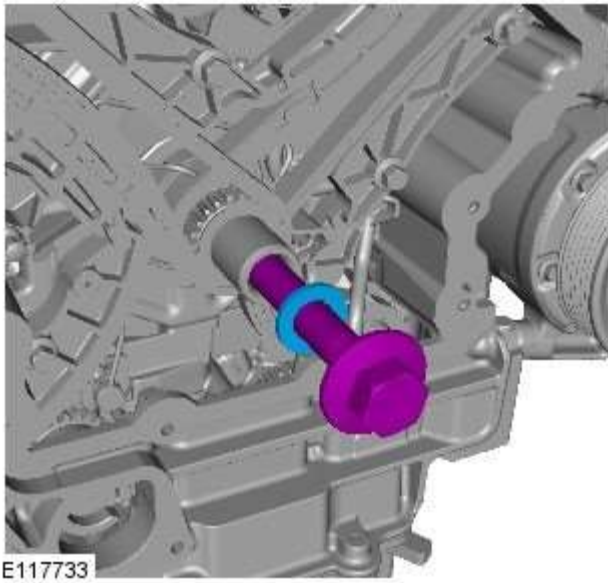
34.  **CAUTION:** Only rotate the crankshaft clockwise.

- Install the special tool.
- *Special Tool(s):* [303-1447](#)

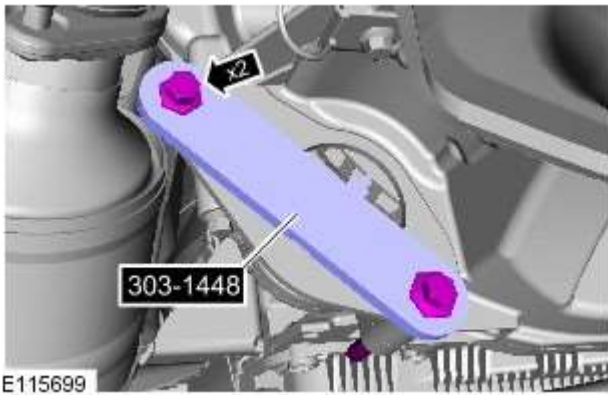


35.

- Install the special tool.
- *Special Tool(s):* [303-1448](#)

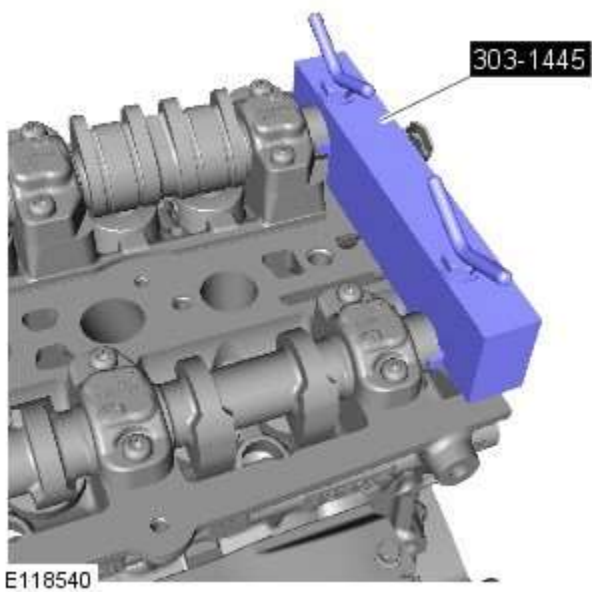


36.





37.

- Remove the special tool.
- *Special Tool(s):* [303-1448](#)



38. CAUTIONS:

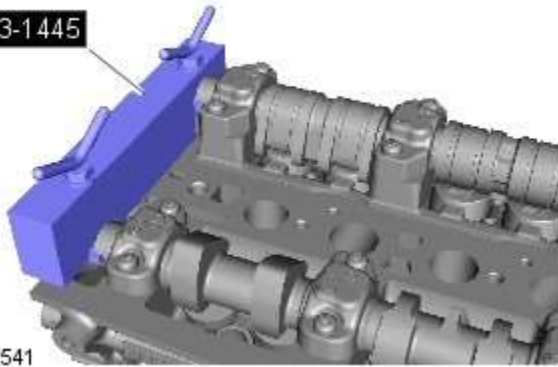
 If the special tool cannot be installed, return to step 22 of the installation until the special tool 303-1445 is installed correctly.

 If directed to step 22, make sure that the VVT unit retaining bolts are loosened prior to installing the special tool(s).

Install the special tool.

Special Tool(s): [303-1445](#)

303-1445



E118541

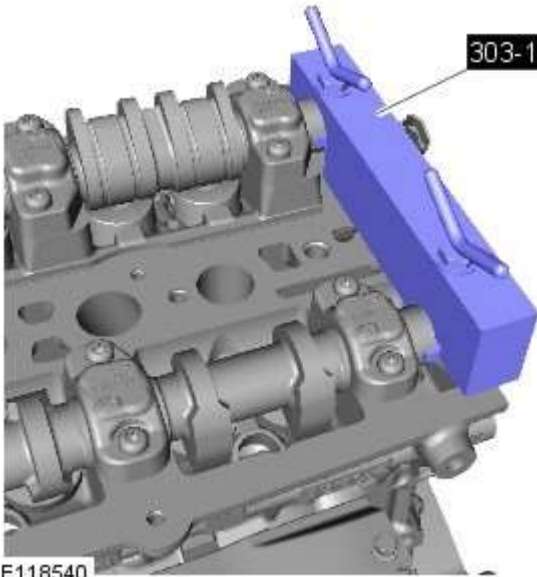
39.  **CAUTION:** If the special tool cannot be installed, the timing chain installation steps must be repeated.

Install the special tool.

40.

- Remove the special tool.

303-1445

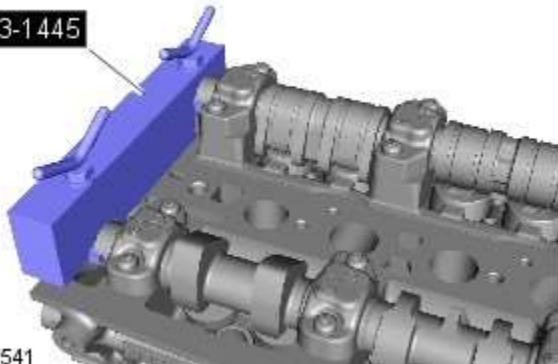


E118540

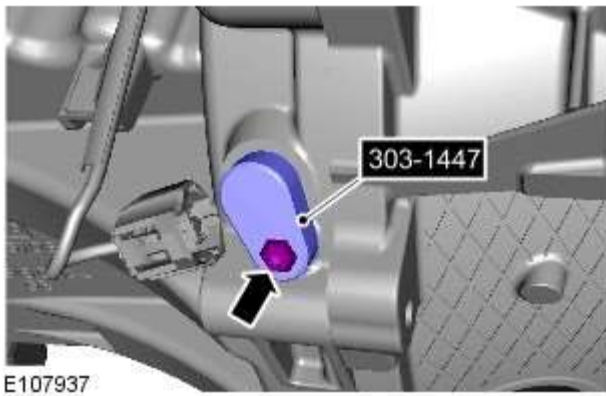
41.

- Remove the special tool.

303-1445



E118541



42.

- Remove the special tool.
- *Special Tool(s):* [303-1447](#)



43. *Torque:* 10 Nm

44. Refer to: [Timing Cover](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).

45. Connect the battery ground cable.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Valve Cover LH

Removal and Installation

Special Tool(s)

 <p>E116982</p>	<p>303-1446 Valve Cover Alignment Tool</p>
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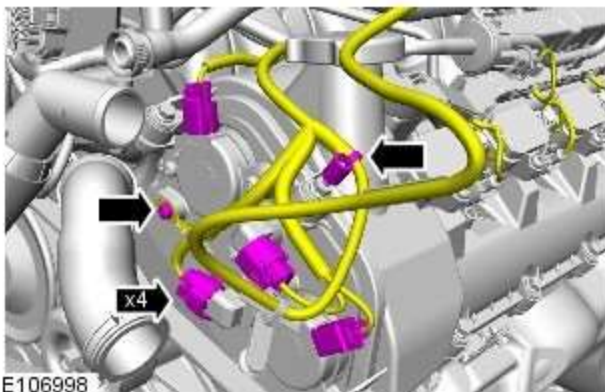
Removal

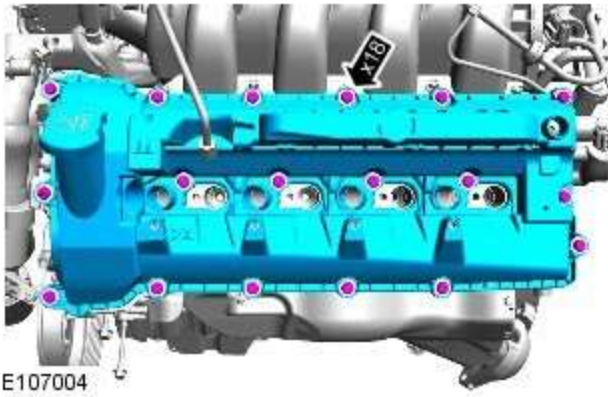


NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
3. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Air Cleaner Outlet Pipe LH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
5. Refer to: [Fuel Rail LH](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Removal and Installation).

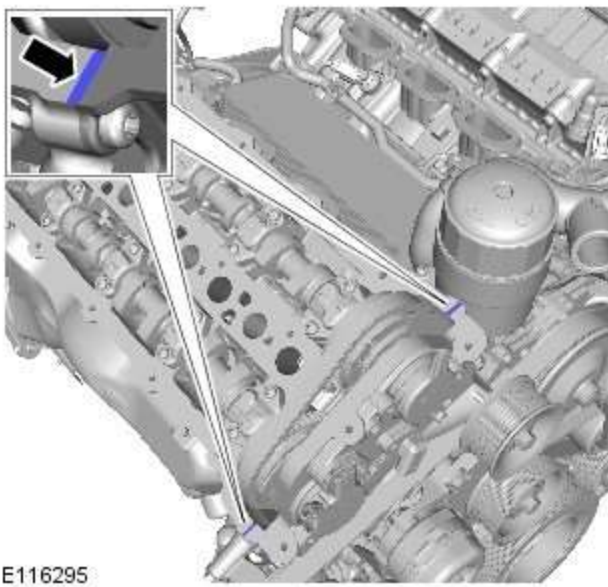
6. Torque: 10 Nm









7.



Installation



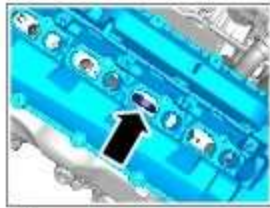
1. CAUTIONS:

-  Use only a plastic scraper when removing the sealing material.
-  Use lint free cloth.
-  Make sure that the mating faces are clean and free of corrosion and foreign material.
-  Installation of the valve cover and tightening must be carried out within 7 minutes of applying the sealant.

NOTES:

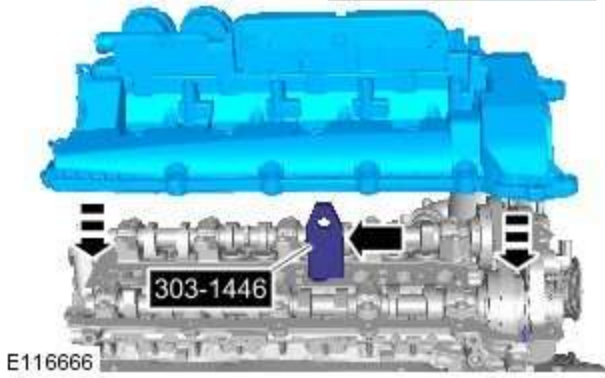
-  Some variation in the illustrations may occur, but the essential information is always correct.
-  Apply two beads of silicone gasket sealant (Loctite 5901) as shown on the illustration. The application of the sealant must be 1.5mm diameter 12mm long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

To install, reverse the removal procedure.

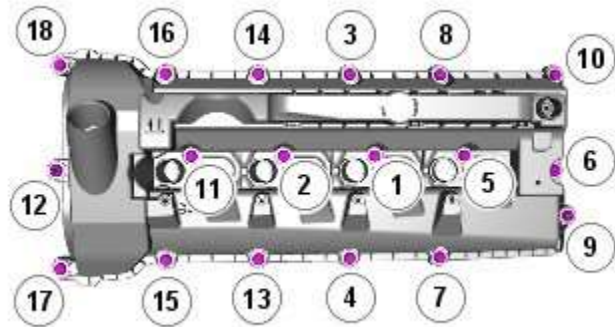


- NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Special Tool(s): [303-1446](#)



E116666



E107006

-  NOTE: Tighten the bolts in the indicated sequence.

Torque: 13 Nm

Engine - V8 S/C 5.0L Petrol - Valve Cover RH

Removal and Installation

Special Tool(s)

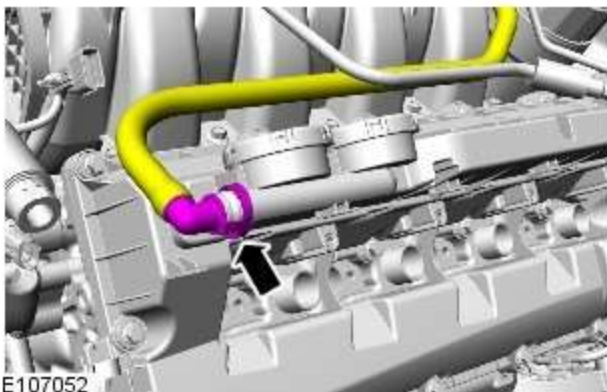
 <p>E116982</p>	<p>303-1446 Valve Cover Alignment Tool</p>
--	--

Removal



NOTE: Removal steps in this procedure may contain installation details.


1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
3. Refer to: [Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
5. Refer to: [Fuel Rail RH](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Removal and Installation).



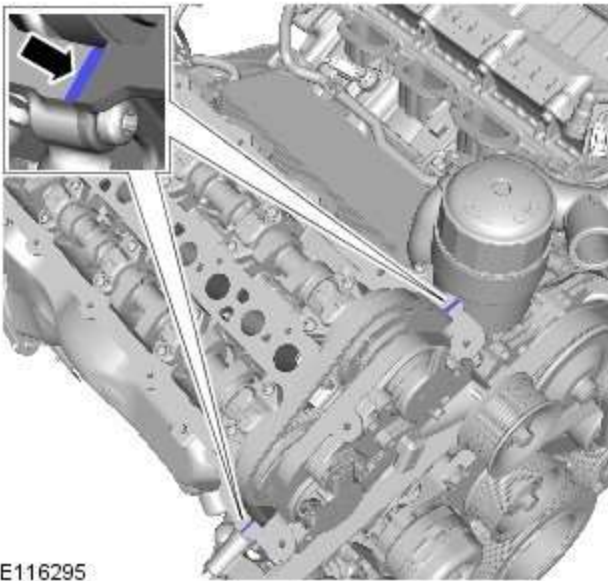
6. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E107057





7.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.


Installation



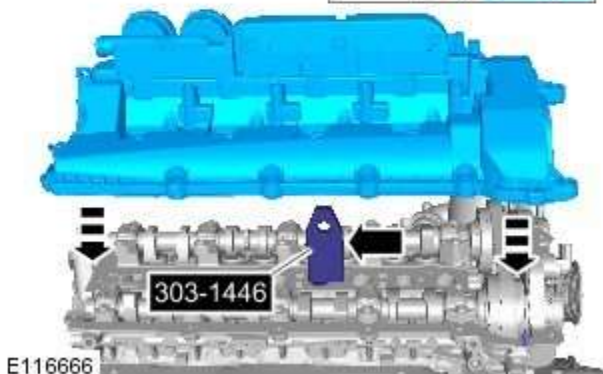
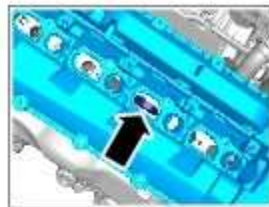
E116295

1. CAUTIONS:

-  Use only a plastic scraper when removing the sealing material.
-  Use lint free cloth.
-  Make sure that the mating faces are clean and free of corrosion and foreign material.
-  Installation of the valve cover and tightening must be carried out within 7 minutes of applying the sealant.

 NOTE: Apply two beads of silicone gasket sealant (Loctite 5901) as shown on the illustration. The application of the sealant must be 1.5mm diameter 12mm long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

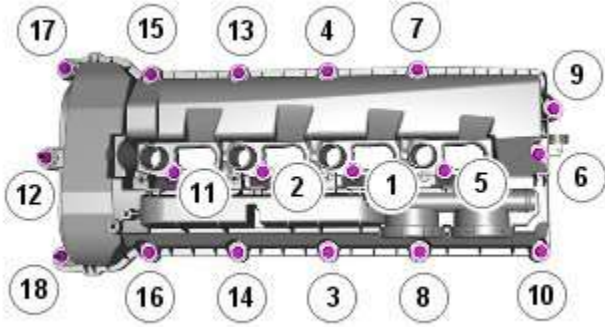
To install, reverse the removal procedure.



E116666

2. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Special Tool(s): [303-1446](#)



E107058

3.  NOTE: Tighten the bolts in the indicated sequence.

Torque: 13 Nm

Engine - V8 S/C 5.0L Petrol - Cylinder Block Oil Gallery Plug

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

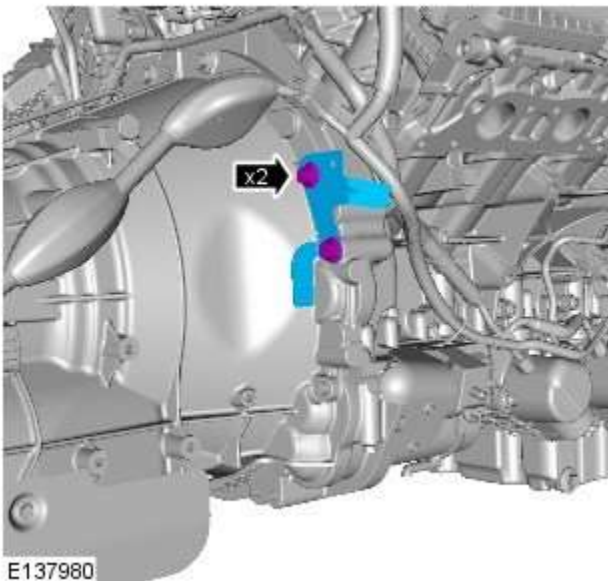


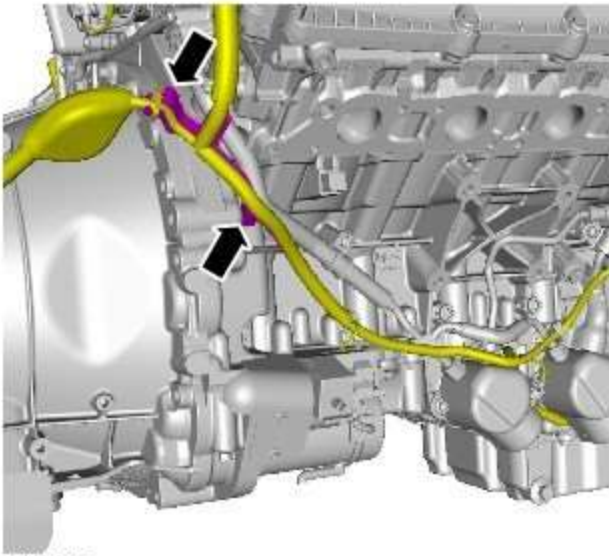
2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

3. Refer to: [Exhaust Manifold RH](#) (303-01C Engine - V8 5.0L Petrol, Removal and Installation).

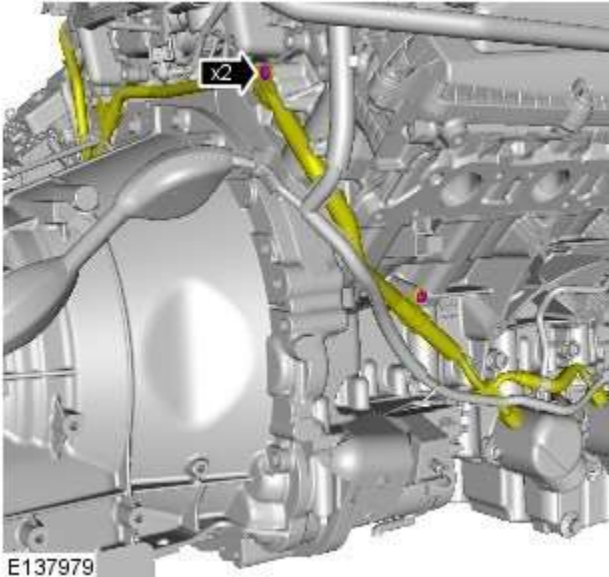
4.





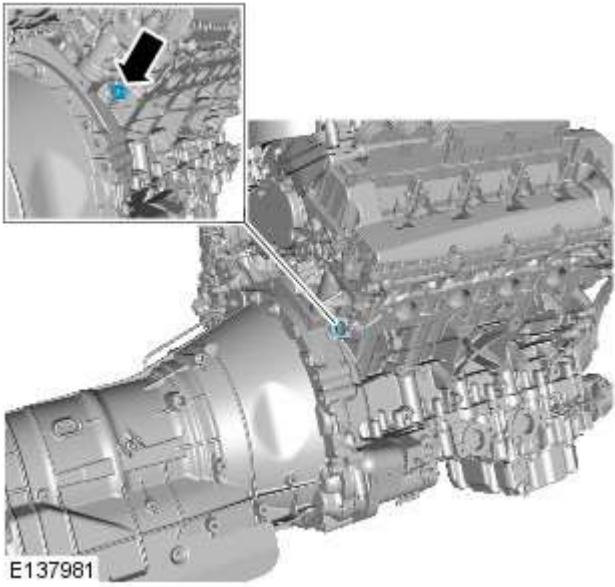
E137978


5.



E137979

6.



7.  **CAUTION:** Make sure that the mating faces are clean and free of corrosion and foreign material.

Torque:

Stage 1: 40 Nm

Stage 2: 180°

Installation

1. To install, reverse the removal procedure.

Engine - V8 S/C 5.0L Petrol - Fuel Pump Camshaft Assembly Part Number:

INA Timing Drive

Removal and Installation

Removal



NOTE: Some illustrations may show the engine removed for clarity.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

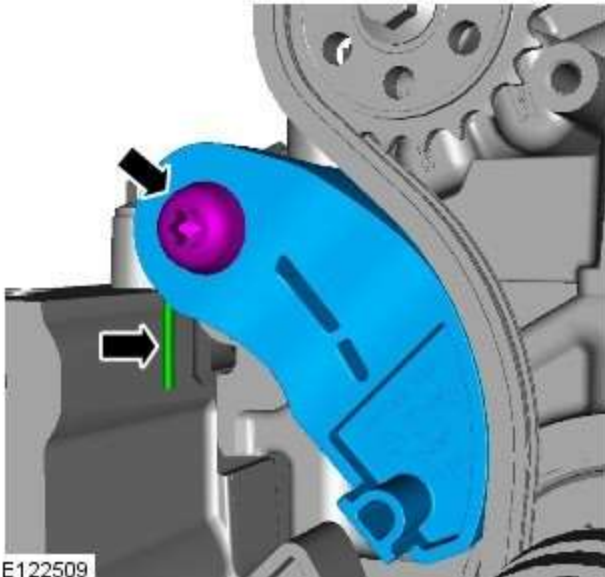


2. **WARNING:** Make sure to support the vehicle with axle stands.

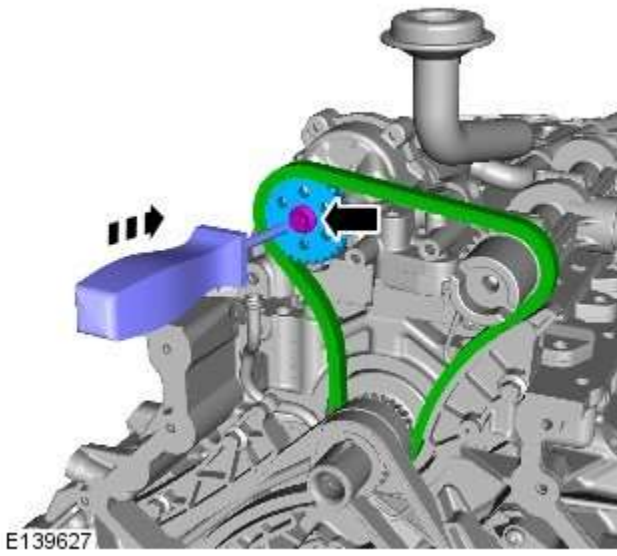
Raise and support the vehicle.

3. Refer to: [Oil Pan Extension](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

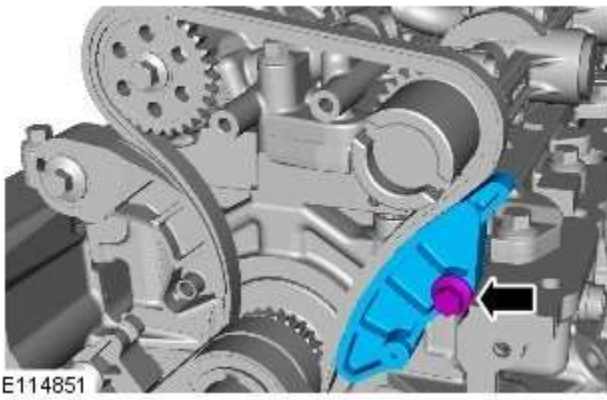
4.




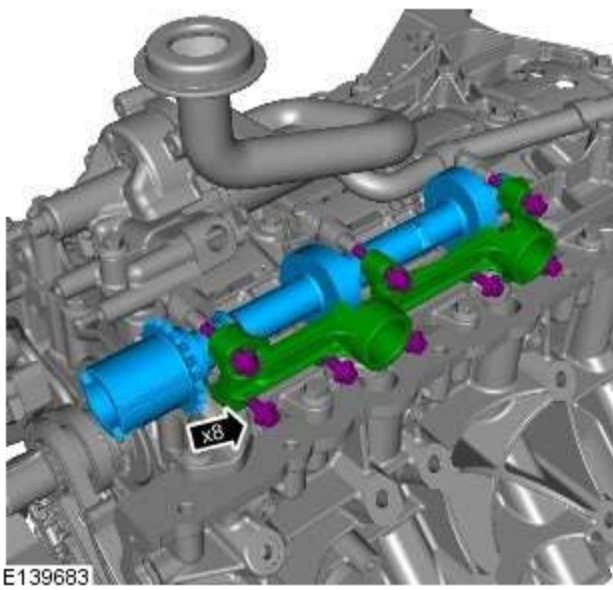
5.



6.



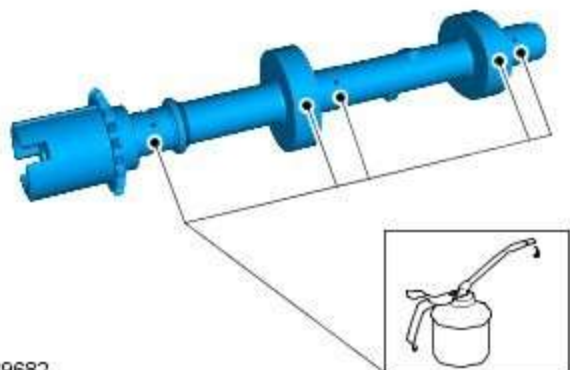
7.  CAUTION: Take extra care when removing the component, prevent damage to the mating faces.



Installation



1. CAUTION: Make sure that the mating faces are clean and free of foreign material.

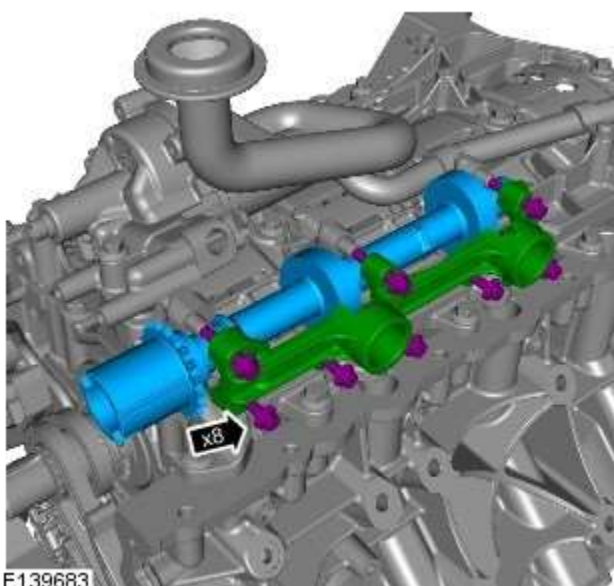


E139682



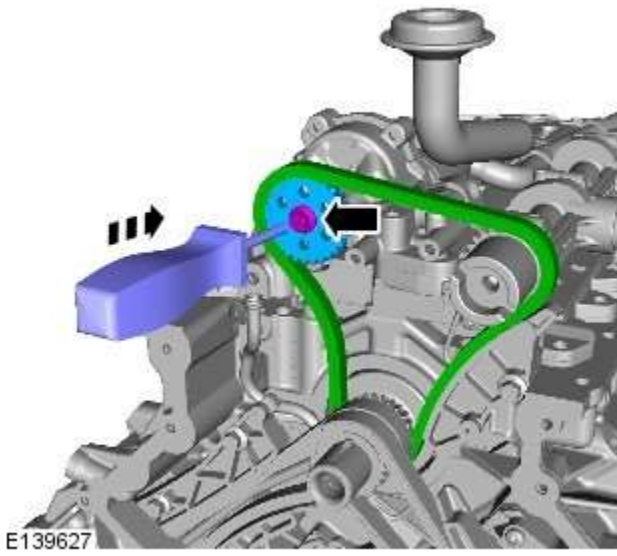
2. CAUTION: Take extra care not to damage the mating faces.

Torque: 12 Nm

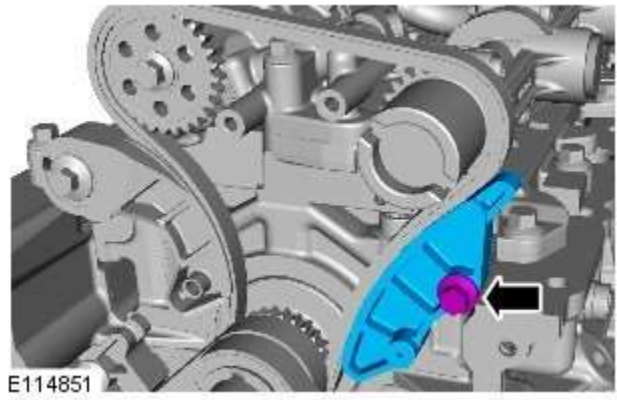


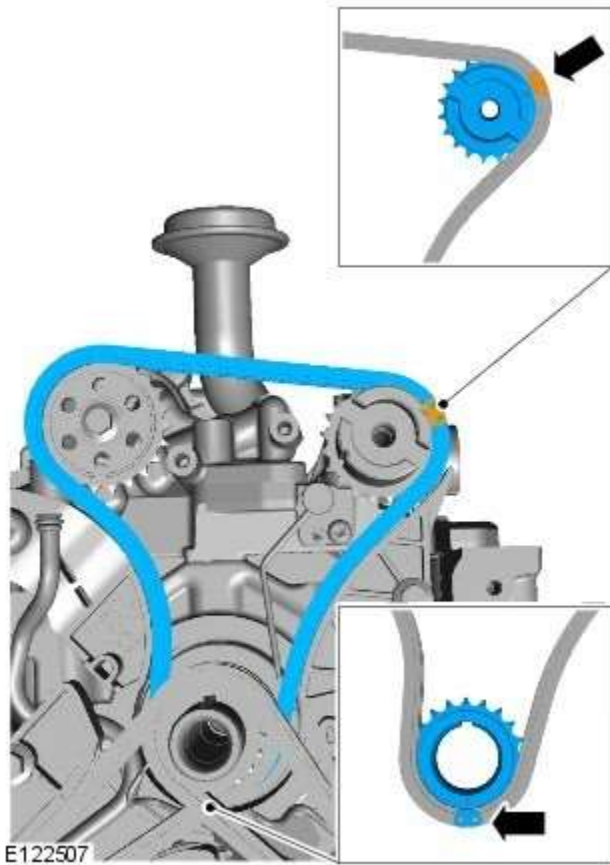
E139683

3. Torque: 21 Nm

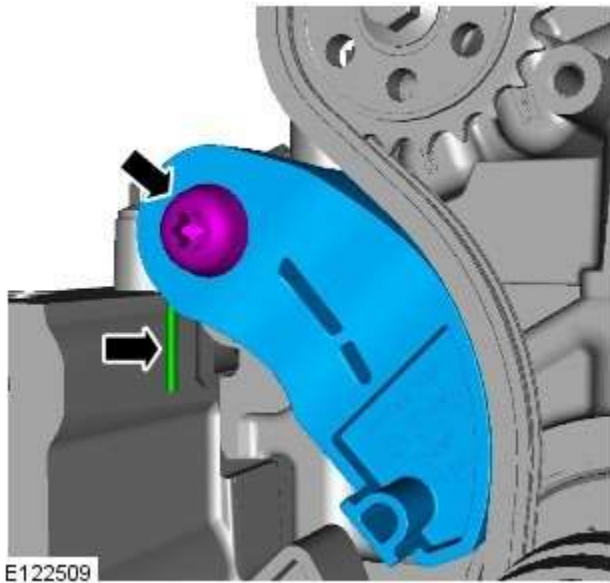



4. Torque: 12 Nm





5. Install the lower timing chain making sure the coloured chain links align correctly with the fuel rail high-pressure fuel pumps camshaft and crankshaft sprocket markings.



6.  **CAUTION:** Make sure that the tensioner spring is correctly located.

Torque: 21 Nm

7. Refer to: [Oil Pan Extension](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).
8. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Fuel Pump Camshaft Assembly Part Number: Tsubaki Timing Drive

Removal and Installation

Removal



NOTE: Some illustrations may show the engine removed for clarity.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

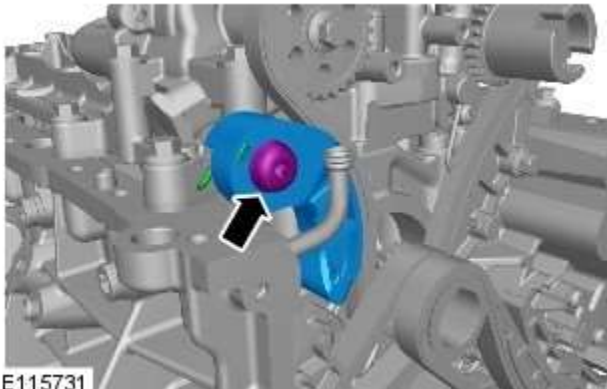


2. **WARNING:** Make sure to support the vehicle with axle stands.

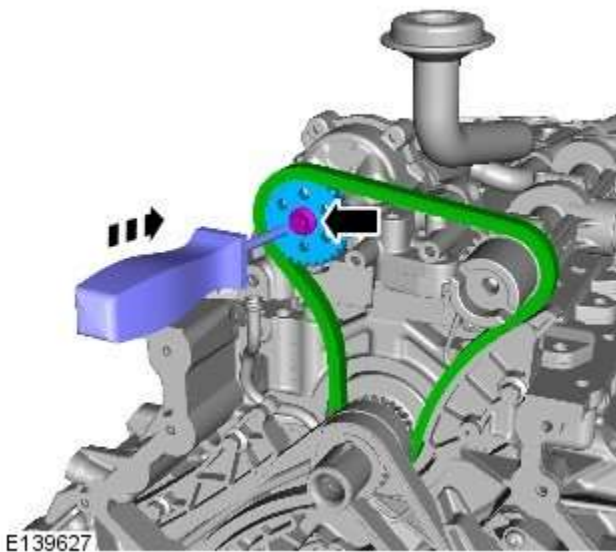
Raise and support the vehicle.

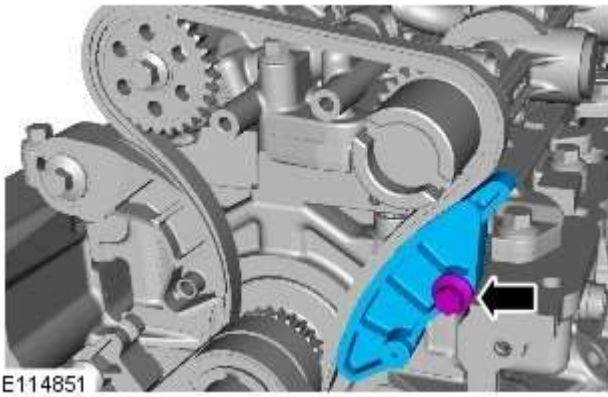
3. Refer to: [Oil Pan Extension](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

4.

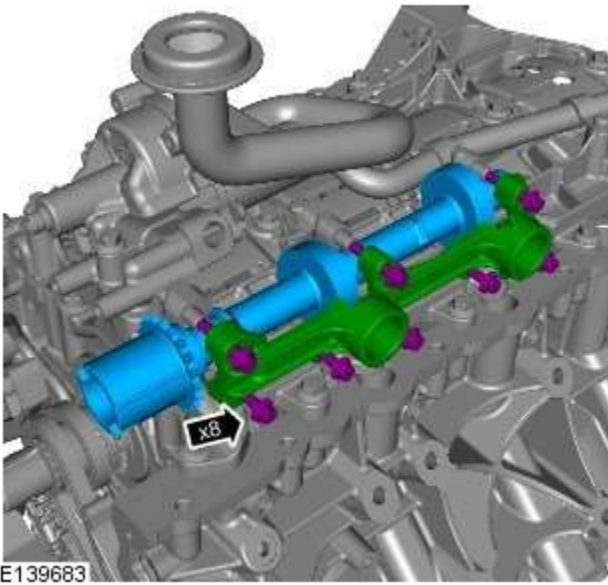


5.






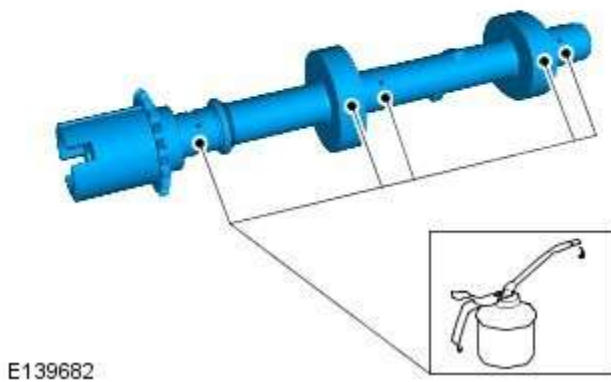
6.

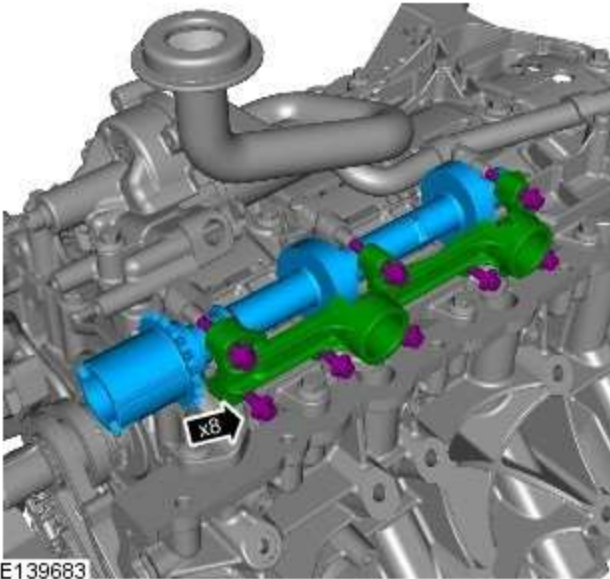


7.  CAUTION: Take extra care when removing the component, prevent damage to the mating faces.

Installation

1.  CAUTION: Make sure that the mating faces are clean and free of foreign material.

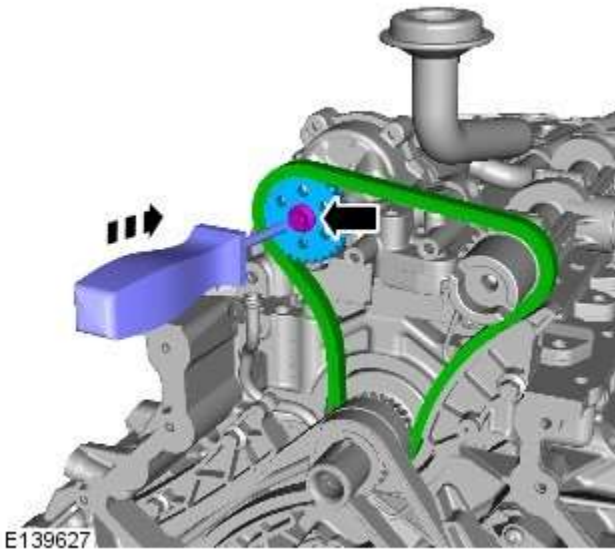




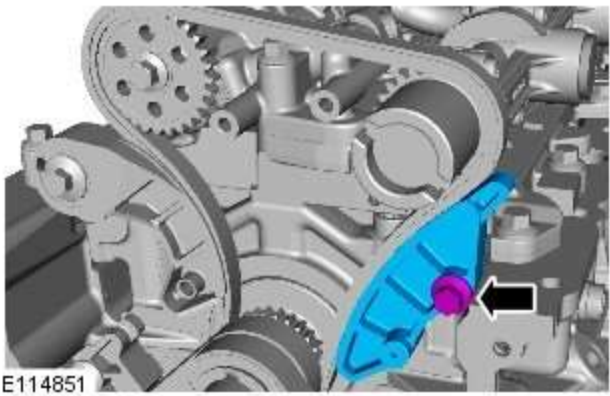
2.  CAUTION: Take extra care not to damage the mating faces.

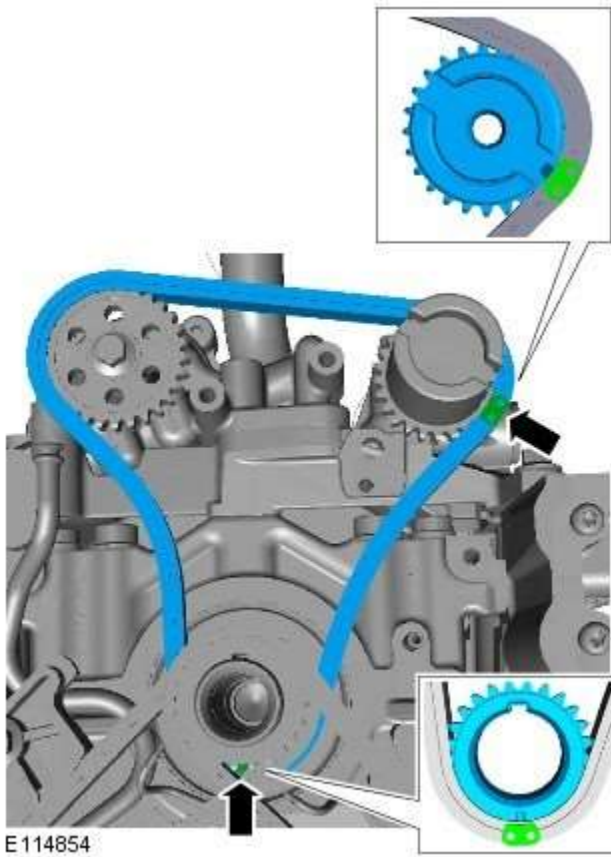
Torque: 12 Nm

3. Torque: 21 Nm

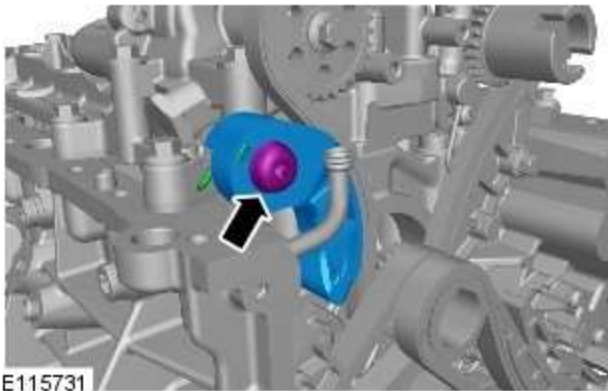



4. Torque: 12 Nm





5. Install the lower timing chain making sure the coloured chain links align correctly with the fuel rail high-pressure fuel pumps camshaft and crankshaft sprocket markings.



6.  CAUTION: Make sure that the tensioner spring is correctly located.

Torque: 21 Nm

7. Refer to: [Oil Pan Extension](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).


8. Connect the battery ground cable.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine - V8 S/C 5.0L Petrol - Lower Timing Cover

Removal and Installation

Special Tool(s)

 E107676	303-1433 Lower Timing Cover Alignment tool
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Removal

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

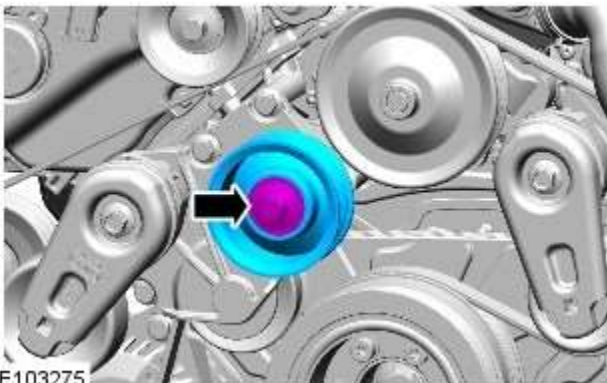


2. **WARNING:** Make sure to support the vehicle with axle stands.

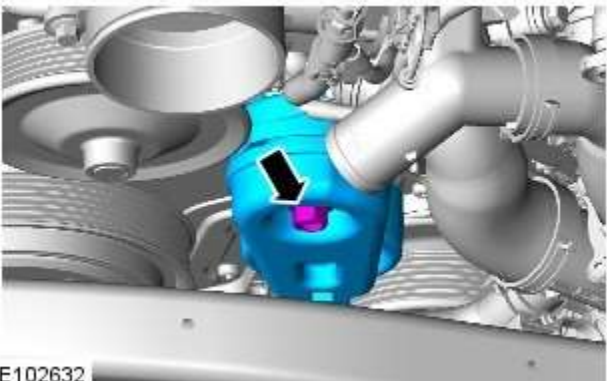
Raise and support the vehicle.

3. Refer to: [Crankshaft Pulley](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

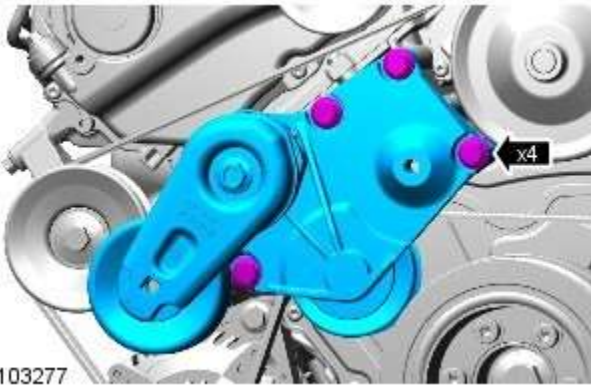
4.



5.



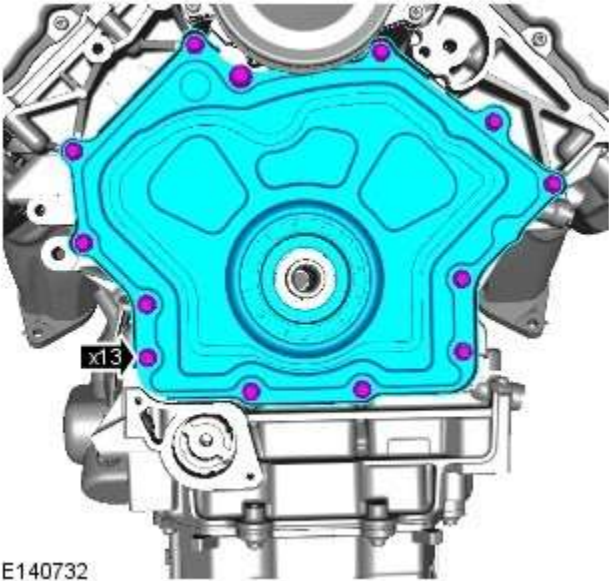
6.



E103277

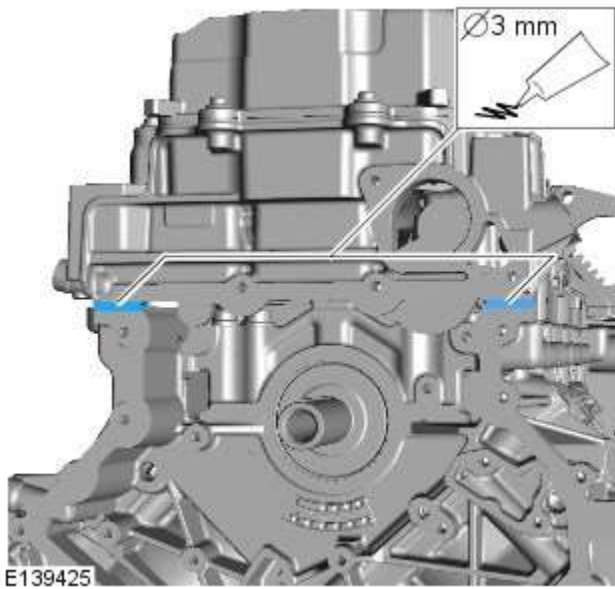
7. Refer to: [Brake Vacuum Pump - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (206-07 Power Brake Actuation, Removal and Installation).

8.

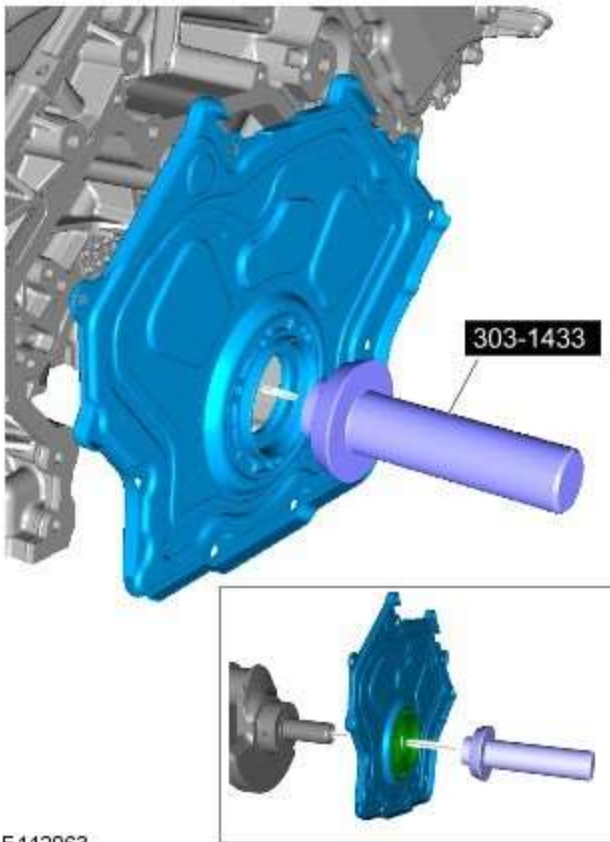



E140732

Installation



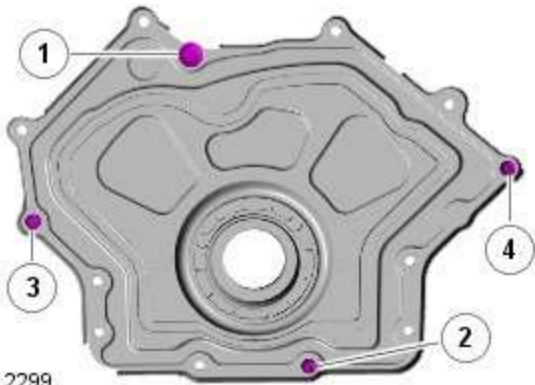
1. Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.



2.  **CAUTION:** Make sure that the mating faces are clean and free of foreign material.

Install the bolts, but do not tighten fully at this stage.

Special Tool(s): [303-1433](#)



E112299

3.  NOTE: Tighten the bolts in the indicated sequence.

Torque:

M6 12 Nm

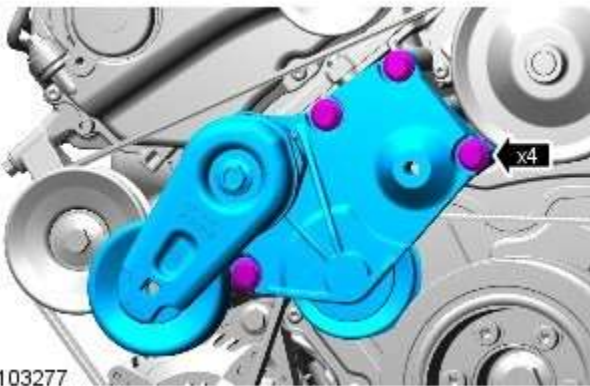
M8 20 Nm



E112300

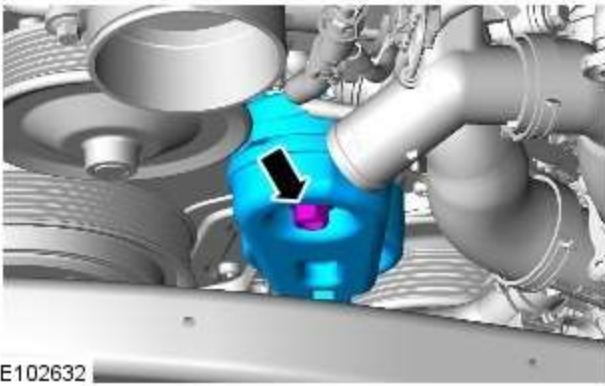
4. Torque: 12 Nm

5. Refer to: [Brake Vacuum Pump - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (206-07 Power Brake Actuation, Removal and Installation).



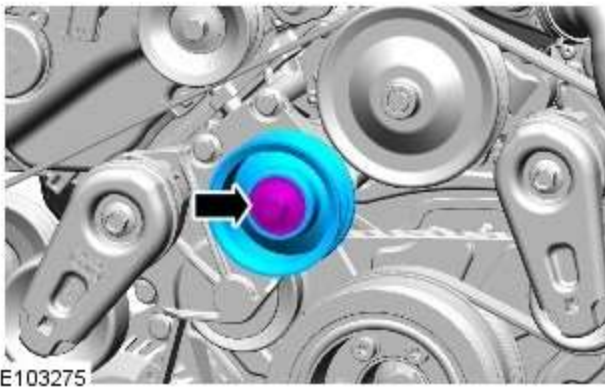
E103277

6. Torque: 25 Nm



7. NOTE: Install the bolt finger tight before final tightening.


Torque: 40 Nm



8. *Torque: 40 Nm*

9. Refer to: [Crankshaft Pulley](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

10. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

11.  CAUTION: Make sure that the vehicle is left for 5 minutes from filling with oil and that the engine oil level is reading at least minimum (by following Steps 14-18), before starting the engine.

- Fill the engine with oil - for filling values on vehicles without supercharger:

Refer to: [Specifications](#) (303-01C Engine - V8 5.0L Petrol, Specifications).

- Fill the engine with oil - for filling values on vehicles with supercharger:

Refer to: [Specifications](#) (303-01D Engine - V8 S/C 5.0L Petrol, Specifications).

- Clean any residual engine oil from the oil filler cap area.

12.  CAUTION: Make sure that the vehicle has been left for 5 minutes from filling with oil.

Follow the Steps 14-18 before starting the engine.

- 13.
- Start the engine and allow to run for 10 minutes, stop the engine.

- Check for leaks.

14. CAUTIONS:



Make sure that the selector lever and the gearshift mechanism are in the park (P) position.



Make sure that the hood is open.

- Turn the ignition on.

15.

- Scroll through the trip menu to access the engine oil level display.



E115112



16.

- Press the cruise control cancel button twice within 2 seconds.



17.


- The message center display will revert to the normal display in the trip computer.
- Scroll through the trip menu to access the engine oil level display.
- Check that the oil level display shows an oil level reading.
- Only after having started and run the engine for 10 minutes (as indicated in Step 13), switch off the engine, then stabilizing for 10 minutes, take a reading from the oil level display and, if necessary top up with engine oil.

18.  NOTE: If instructed to follow Steps 14-18 in a previous step, return to Step 13 and continue the procedure.

Turn the ignition off.

19. Allow 10 minutes for the engine oil level to stabilize if there has been additional oil top up.



20.  **NOTE:** The following steps are to update the average oil level value.
- Turn the ignition on.
 - Press and hold the cruise control cancel button for more than 2 seconds.

21.
 - The message center display will revert to the normal display in the trip computer.

22. Turn the ignition off.

23. Turn the ignition on.

24.
 - Scroll through the trip menu to access the engine oil level display.
 - Make sure that the average oil level value has now been updated.



25. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

Engine - V8 S/C 5.0L Petrol - Valves

Removal and Installation

Removal

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

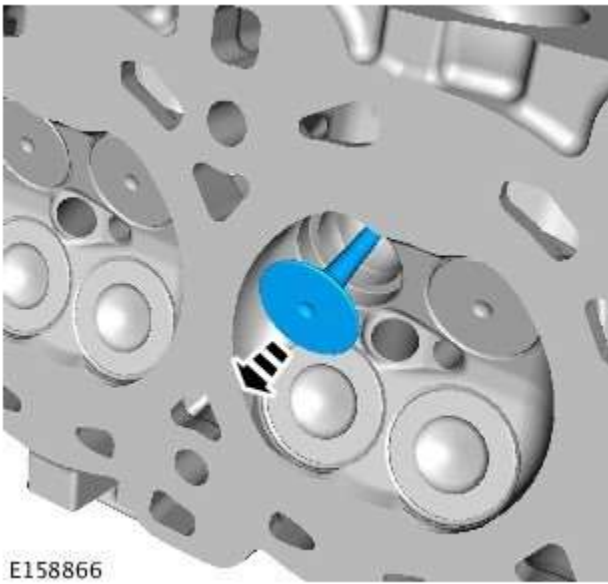
3. Refer to: [Cylinder Head LH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

4. Refer to: [Cylinder Head RH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

5.

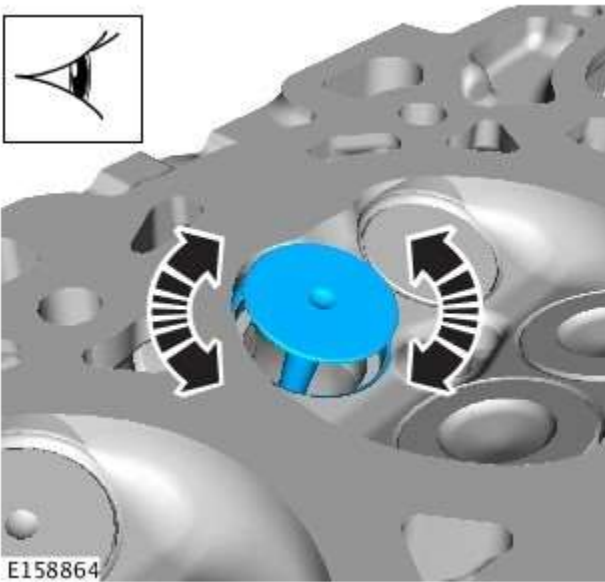


6.



7.





8. CAUTIONS:



Make sure that the area around the component is clean and free of foreign material.



Make sure the working surfaces are thoroughly clean to avoid contamination of the sensitive components.



Make sure that the valve grinding paste is kept away from the valve stem.

- Place a small amount of fine valve grinding paste evenly around the contact face of the valve.
- Place the valve in position and, using a suitable valve grinding tool, rotate the valve back and forth a few degrees on its seat, using light pressure.
- Raise the valve frequently during lapping and turn it into a new position after a few laps or rotations.
- Lap only until a continuous but narrow lapping mark is visible on both the valve seat and valve face.
- Thoroughly clean all surfaces to remove traces of valve grinding paste from the cylinder head, valve seat and valve face.
- Repeat steps 5 to 8 for the remaining valves.

Installation



1. CAUTION: Make sure the working surfaces are thoroughly clean to avoid contamination of the sensitive components.



NOTE: Make sure that all the component mating faces are clean.

To install reverse the removal procedure.

Engine - V8 S/C 5.0L Petrol - Engine

Removal

Special Tool(s)

 <p>E115254</p>	<p>303-1435 Engine Lifting Brackets Rear</p>
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NOTES:



Some variation in the illustrations may occur, but the essential information is always correct.



If a new engine is to be installed, remove the intake manifold to access the top transmission retaining bolts.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



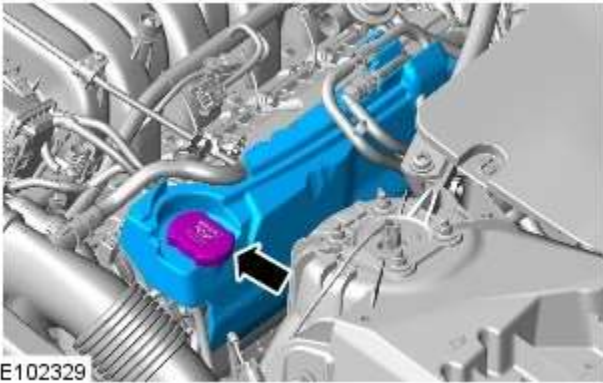
2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

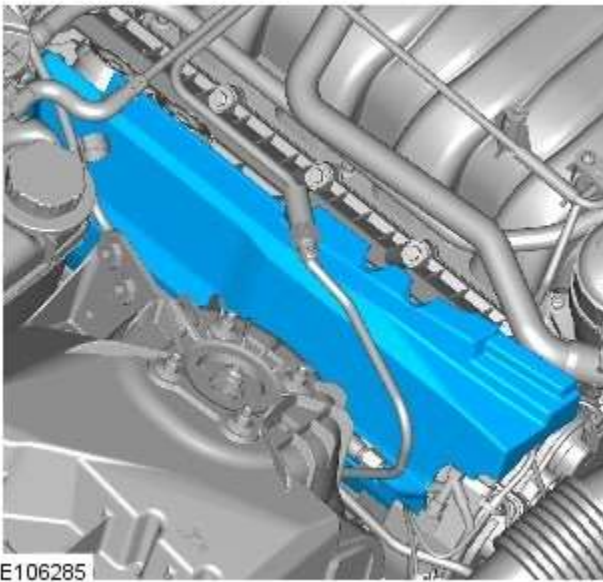
3. Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Air Cleaner LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
5. Refer to: [Air Cleaner RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
6. Refer to: [Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).
7. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
8. Refer to: [Hood](#) (501-02 Front End Body Panels, Removal and Installation).
9. Refer to: [Cooling Fan Motor and Shroud - Vehicles With: Supercharger](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
10. Refer to: [Transmission - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Installation).

11. Refer to: [Coolant Expansion Tank](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
12. Refer to: [Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
13. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
14. Refer to: [Power Steering Fluid Reservoir - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (211-02 Power Steering, Removal and Installation).

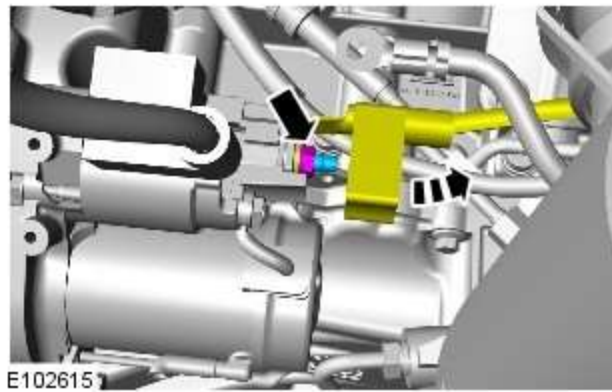
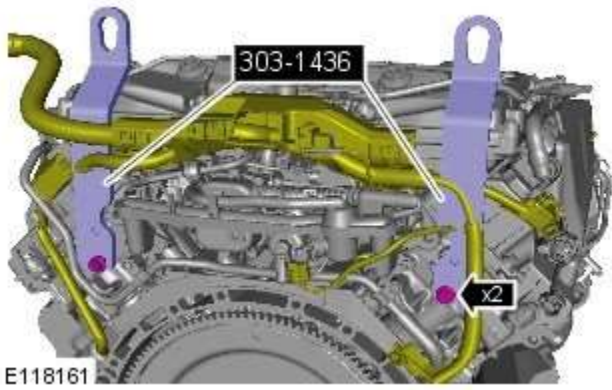
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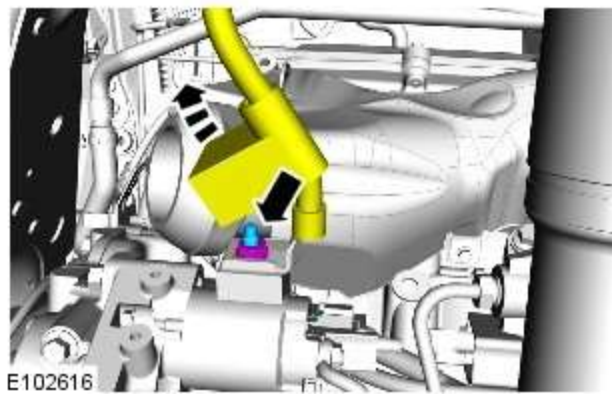
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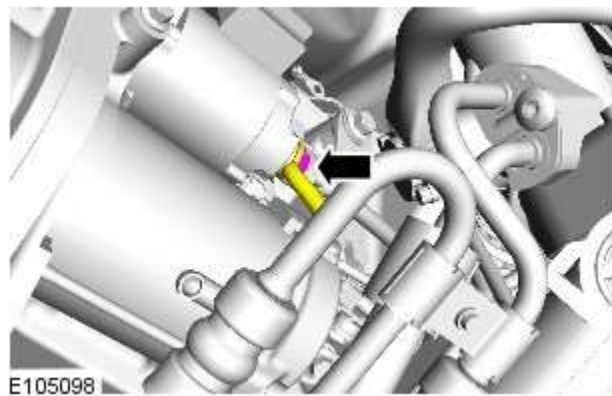
17. Torque: 40 Nm



18.

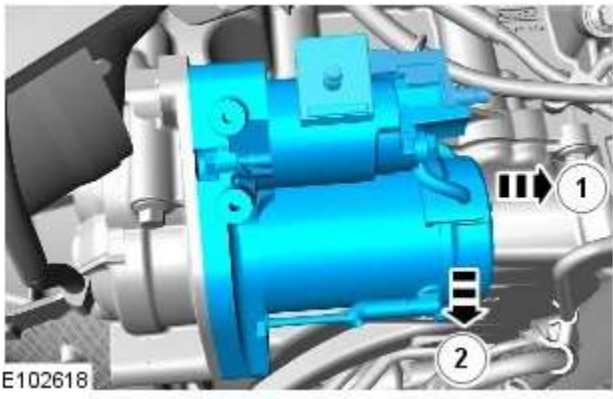


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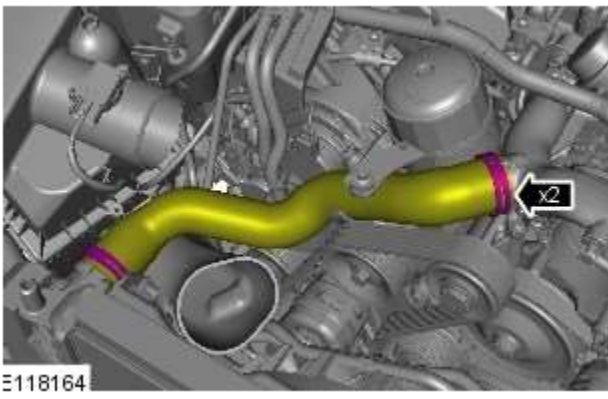
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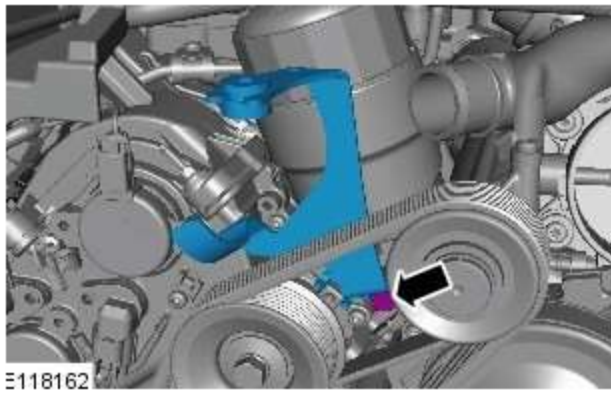


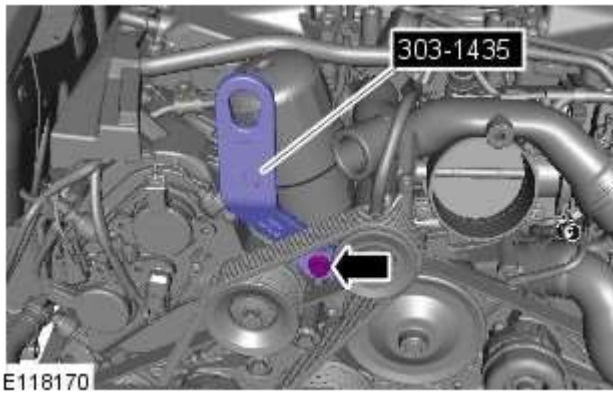
22. Lower the vehicle.

23.



24.

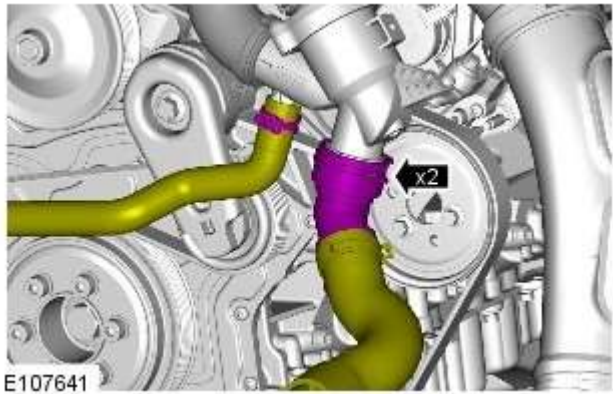




E118170

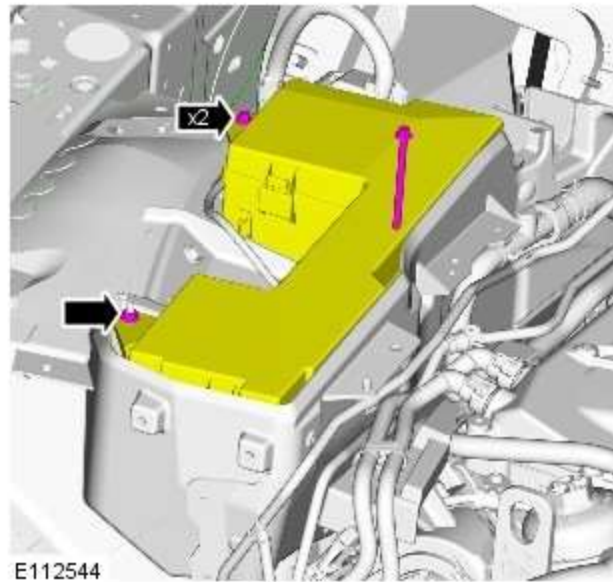
25.

- Special Tool(s): [303-1435](#)



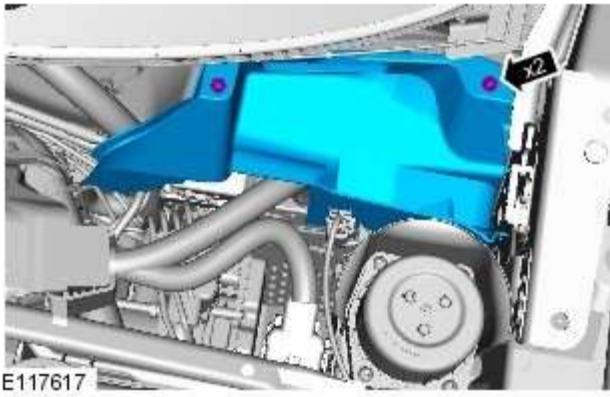
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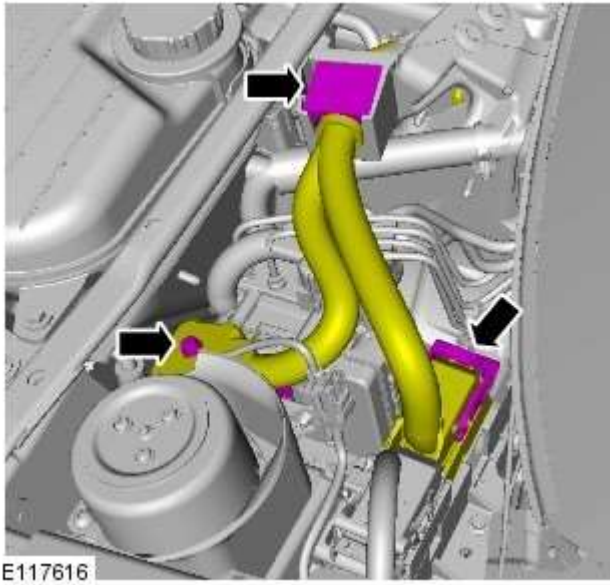


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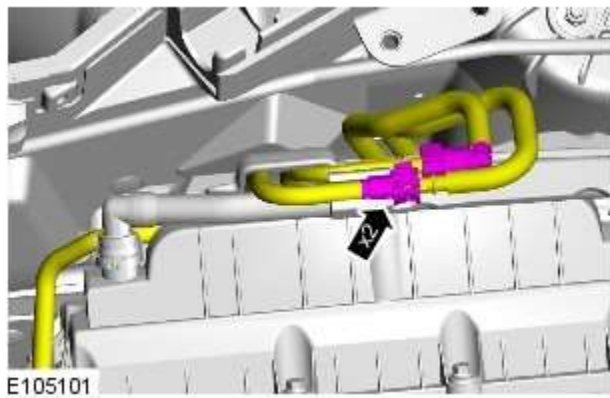
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28.



29.

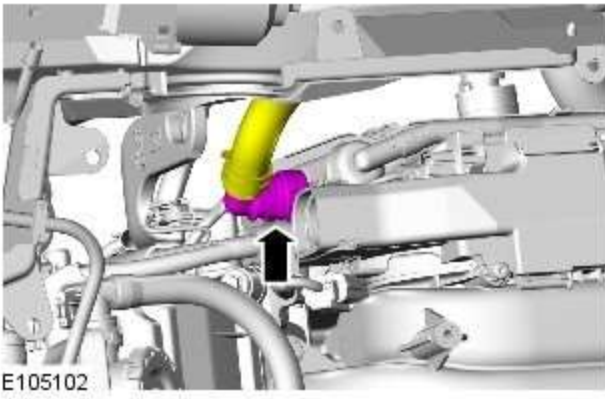


30. CAUTIONS:

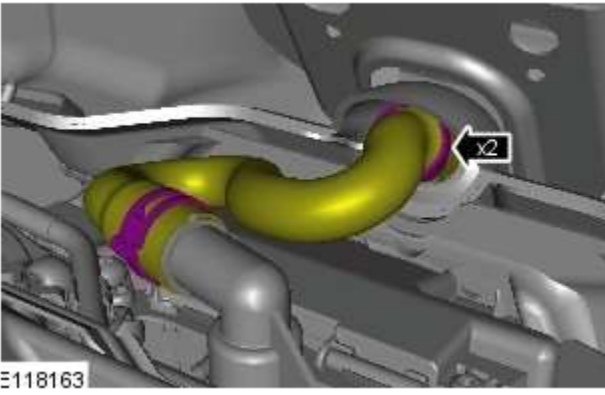
 Be prepared to collect escaping fluids.

 Make sure that all openings are sealed. Use new blanking caps.

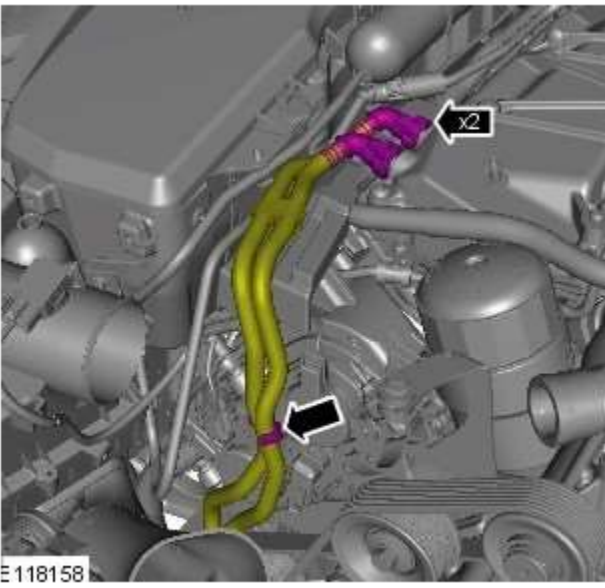
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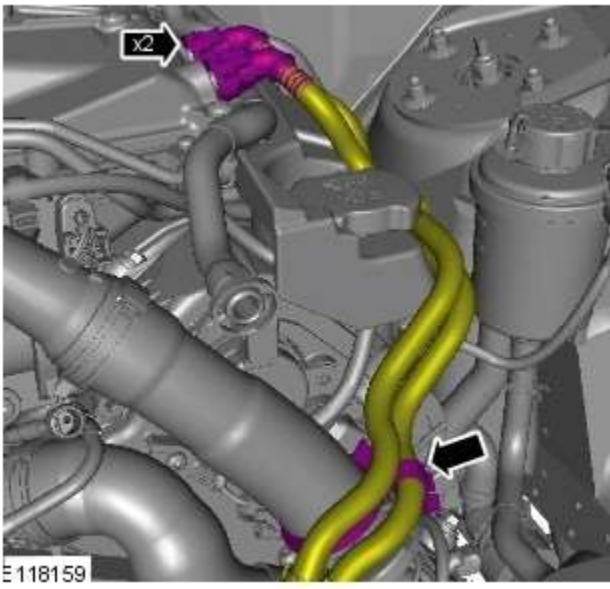
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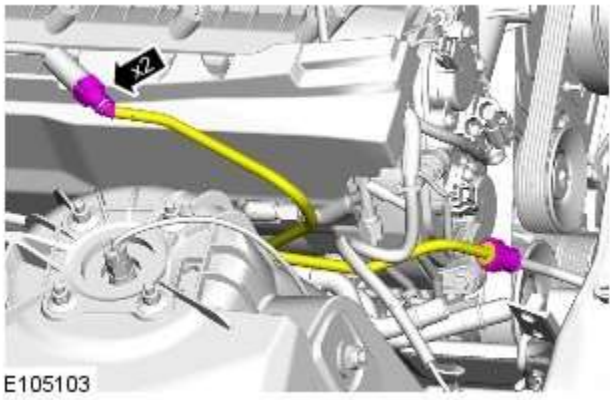
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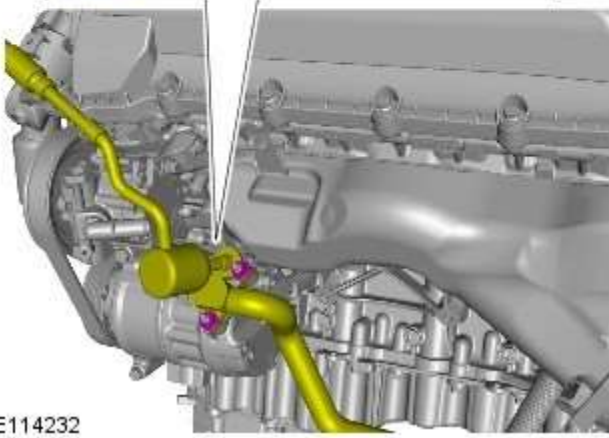
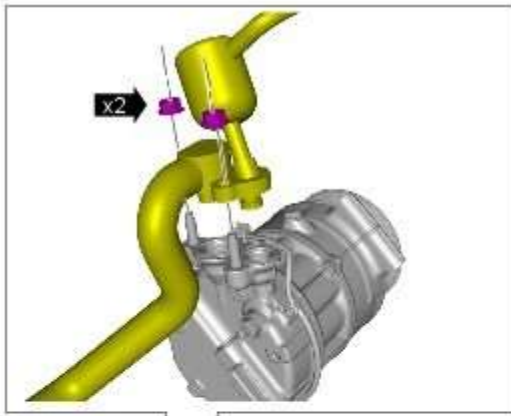
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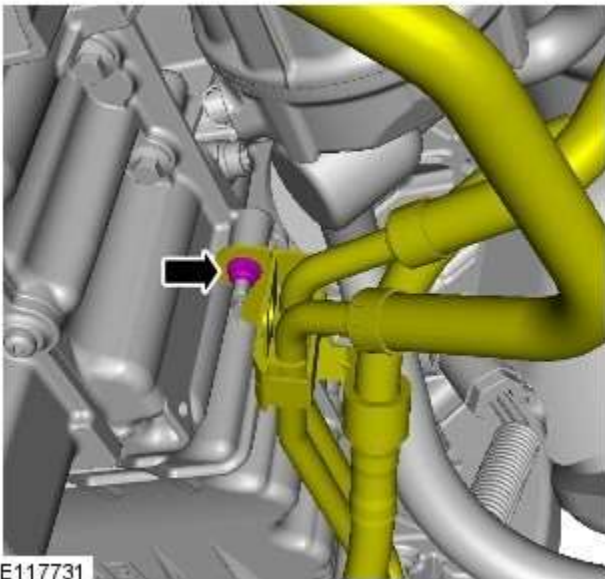


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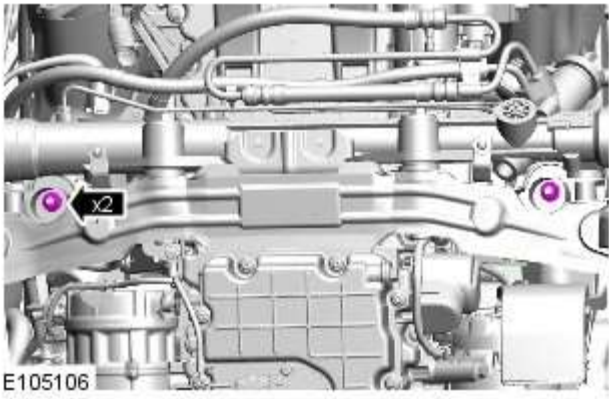
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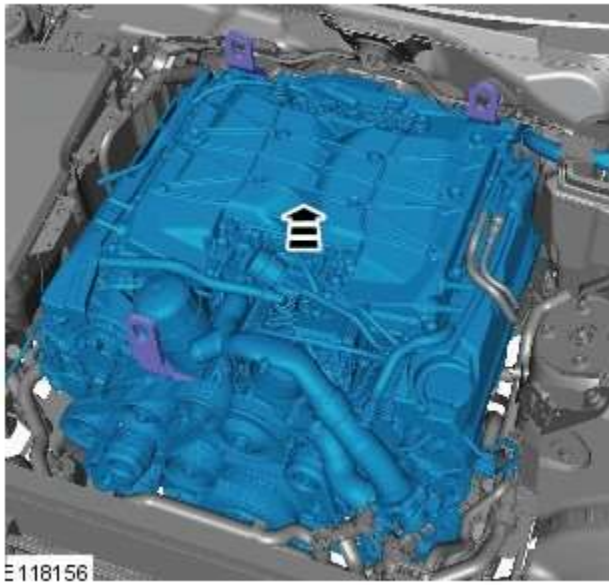


E117731

38.



39.  NOTE: This step requires the aid of another technician.
Using a suitable tool, remove the engine.



Engine - V8 S/C 5.0L Petrol - Engine

Installation

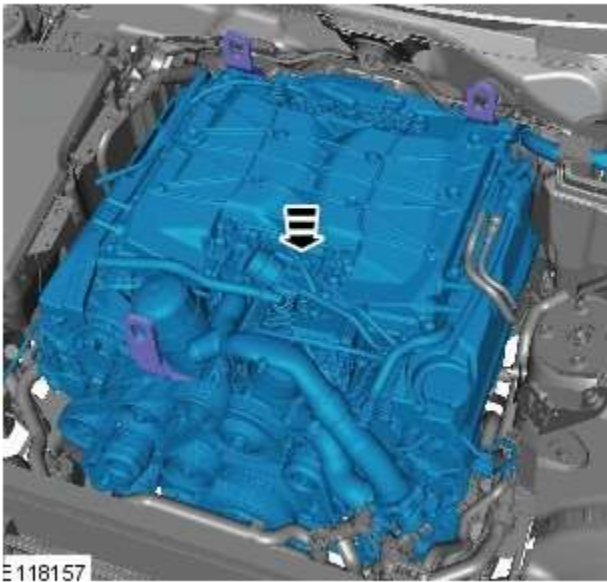
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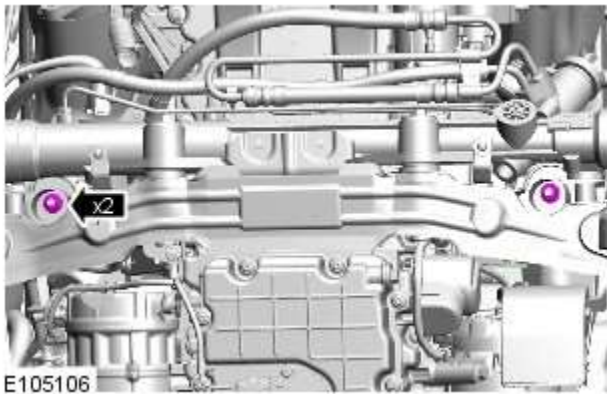
Some variation in the illustrations may occur, but the essential information is always correct.



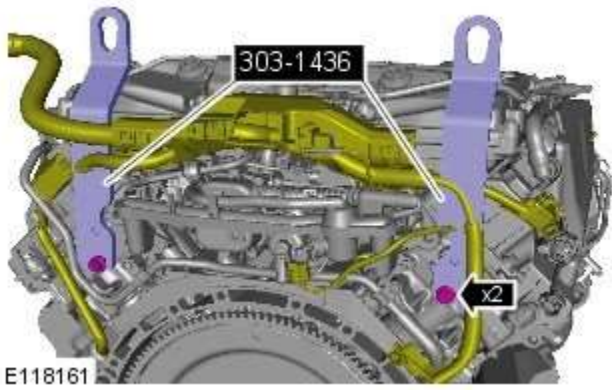
If a new engine is to be installed, remove the intake manifold to access the top transmission retaining bolts.



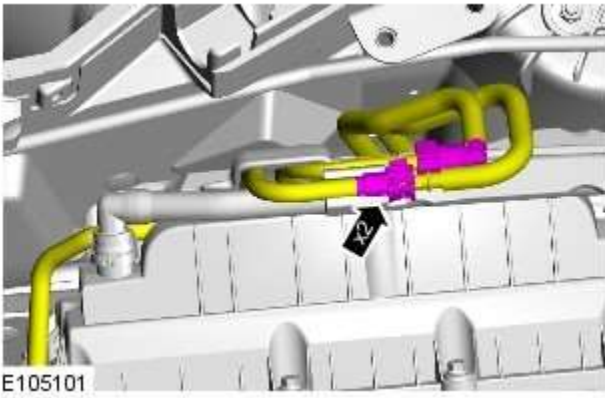
1. NOTE: This step requires the aid of another technician.
Install the engine assembly.



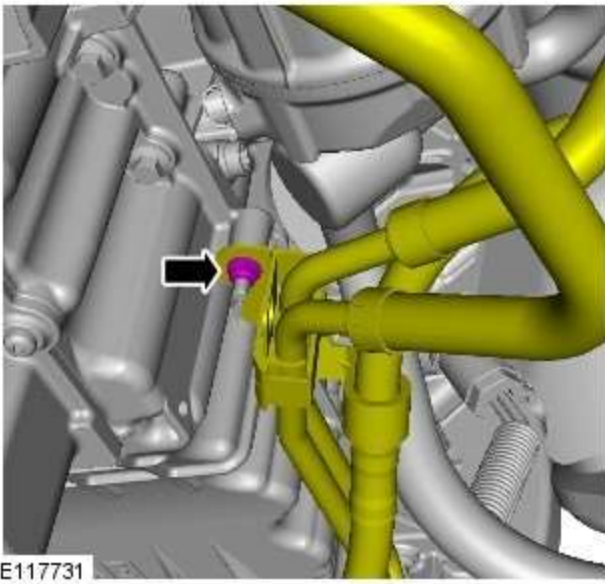
2. Torque: 45 Nm



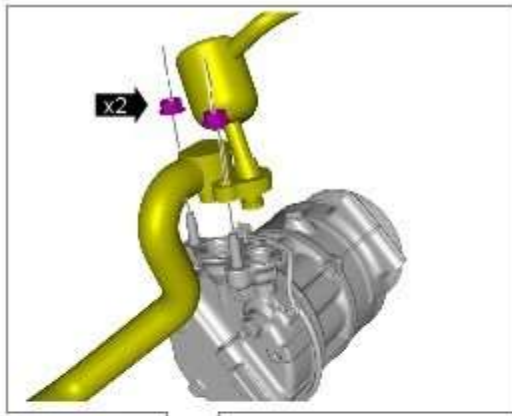
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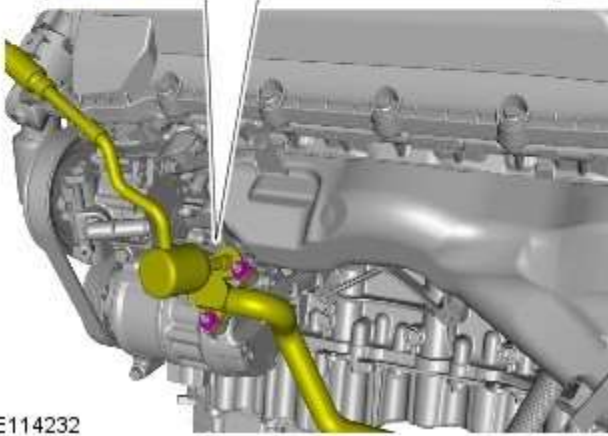
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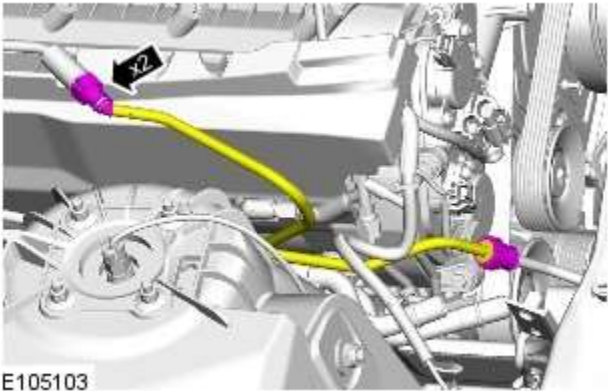
5. Torque: 12 Nm



6.  CAUTION: Install new o-ring seals
Torque: 9 Nm

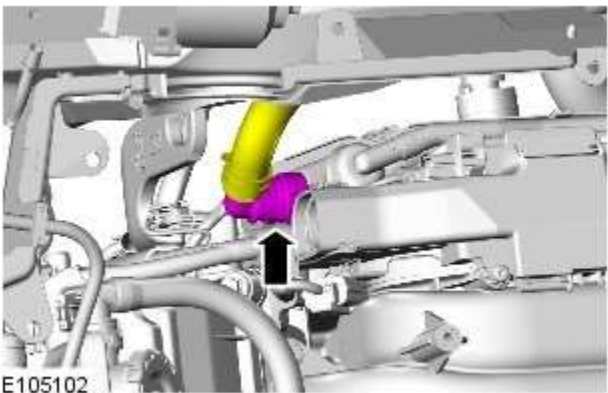


E114232



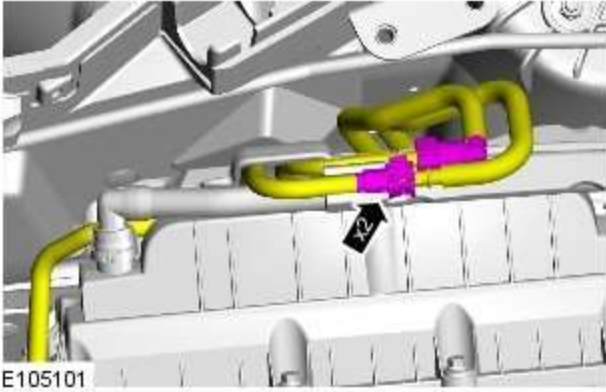
E105103


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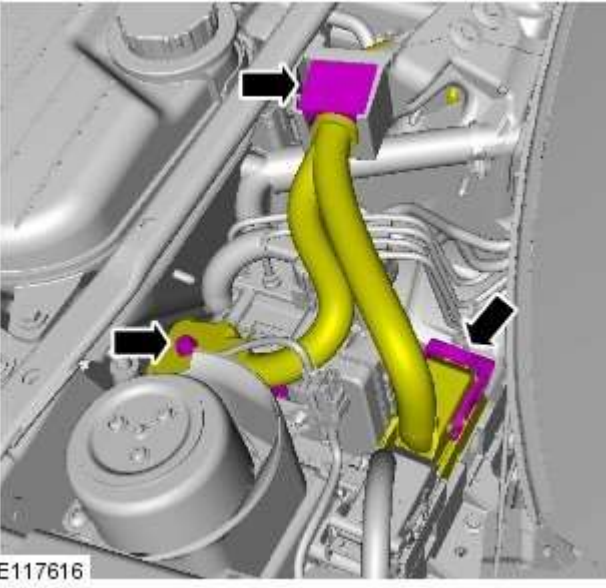


E105102

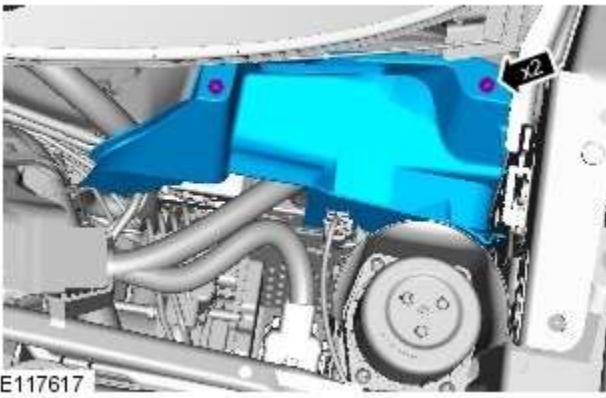
8.



9.  NOTE: Remove and discard the blanking caps.

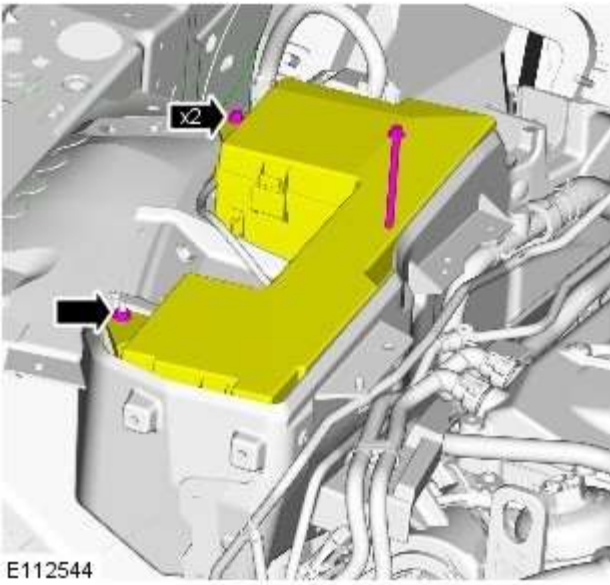


10. Torque: 3 Nm

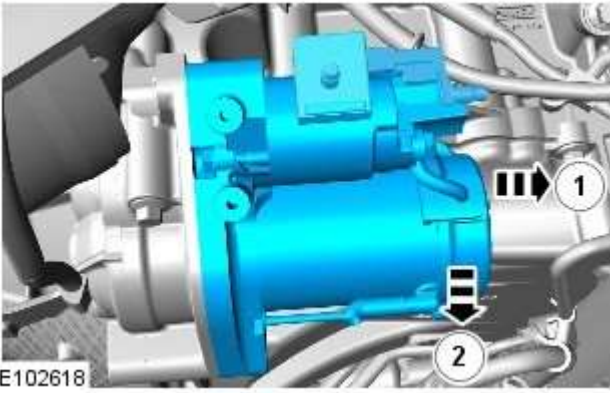


11. Torque: 9 Nm

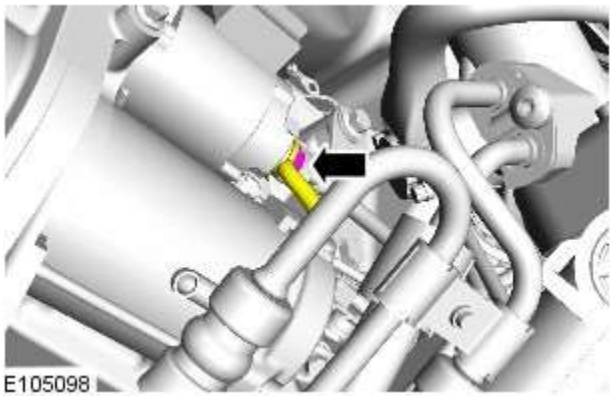
12. Torque: 9 Nm

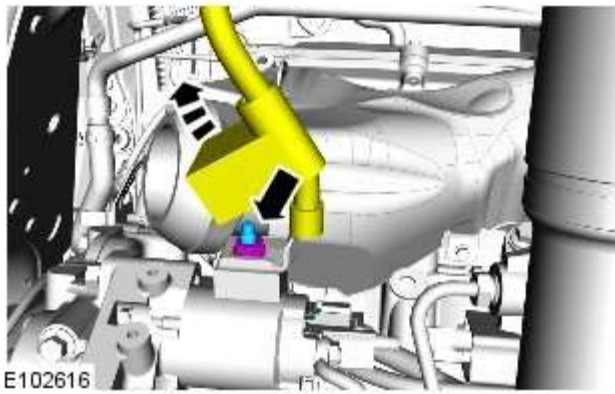


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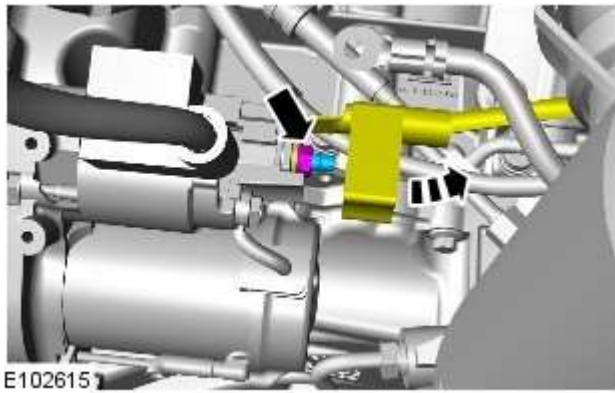


14. Torque: 10 Nm

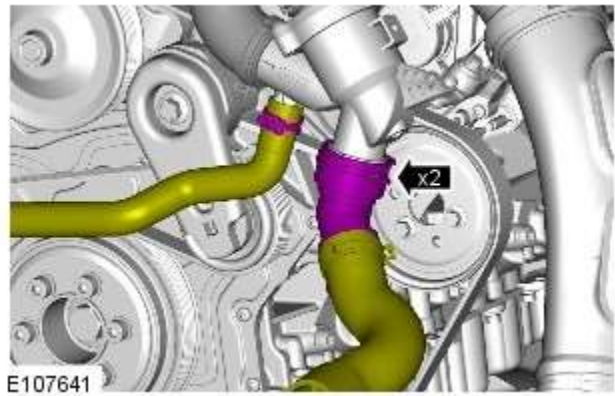




15. Torque: 12 Nm

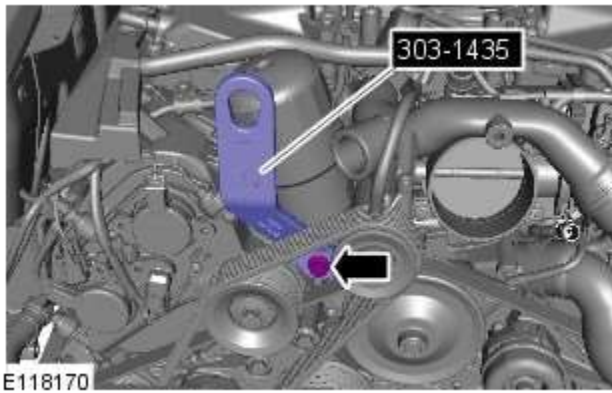


16. Torque: 12 Nm

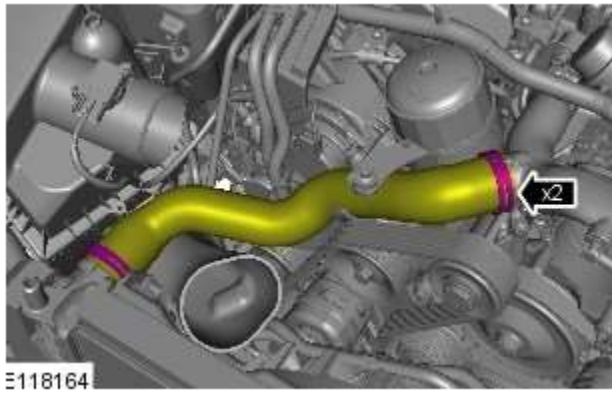


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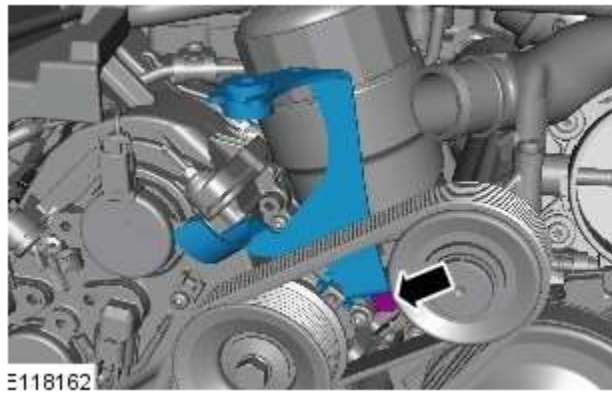
18. Lower the vehicle.



19.

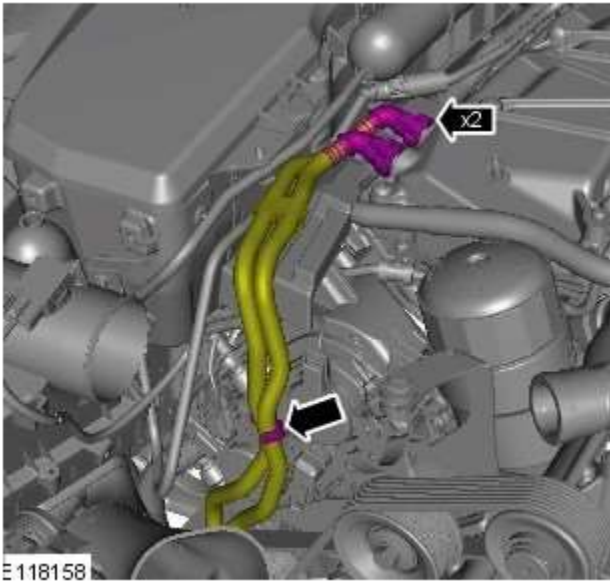


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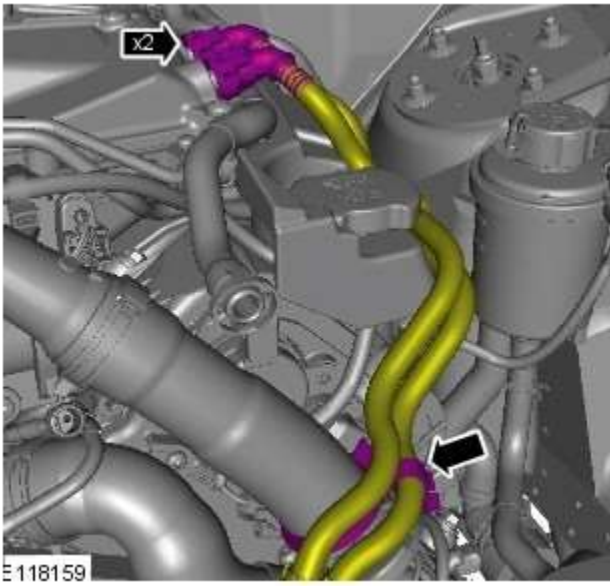


21. Torque: 25 Nm

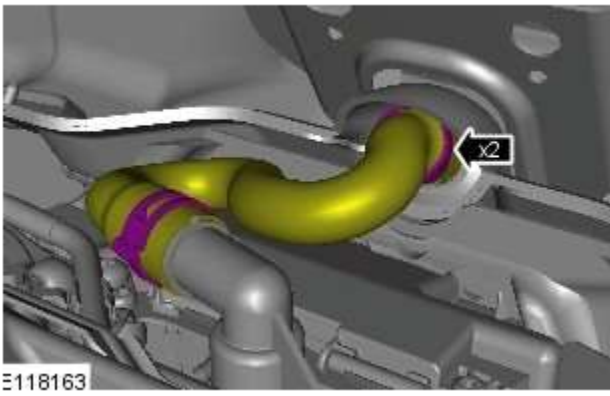
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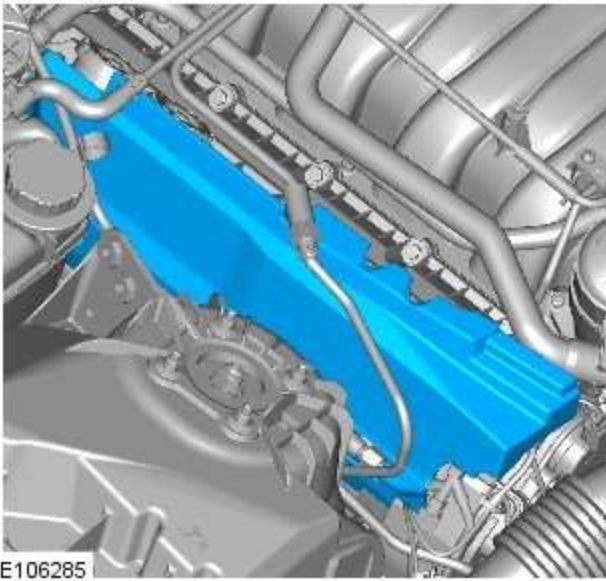
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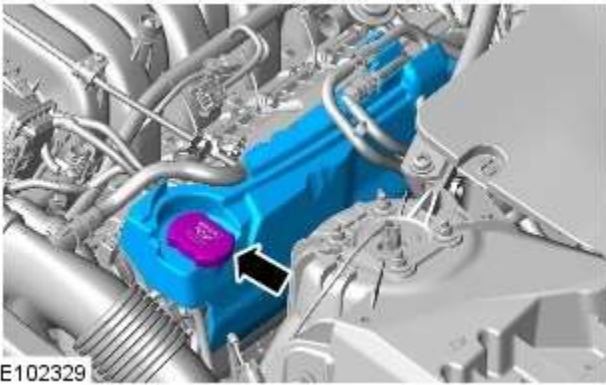
24.



25.



26.



27. Refer to: [Power Steering Fluid Reservoir - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (211-02 Power Steering, Removal and Installation).
28. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
29. Refer to: [Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
30. Refer to: [Transmission - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Installation).
31. Refer to: [Cooling Fan Motor and Shroud - Vehicles With: Supercharger](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
32. Refer to: [Hood](#) (501-02 Front End Body Panels, Removal and Installation).
33. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and](#)

[Charging](#) (412-00 Climate Control System - General Information, General Procedures).

34. Refer to: [Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).
35. Refer to: [Air Cleaner RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
36. Refer to: [Air Cleaner LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
37. Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).
38. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol -

Description	Specification
Jaguar Premium Cooling System Fluid	WSS-M97B44-D
Jaguar Premium Cooling System Flush	EGR-M14P7-A

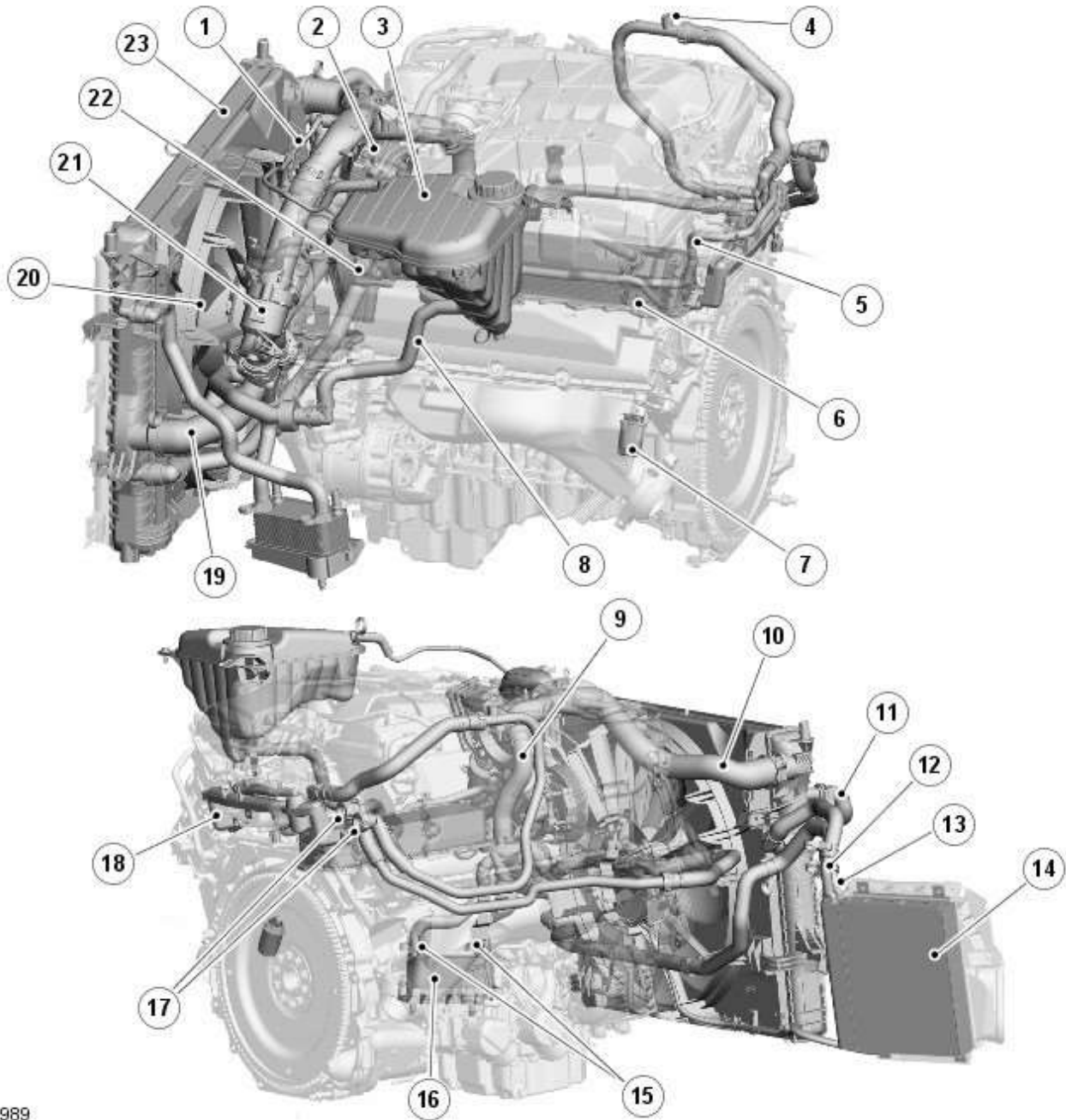
Engine	Capacity
5.0L with supercharger	12.32L
5.0L without supercharger	12.5L

Description	Nm	lb-ft	lb-in
Coolant expansion tank retaining bolt	7	-	62
Cooling fan motor and shroud retaining nuts	7	-	62
Thermostat housing retaining bolts	10	7	-
Coolant pump retaining bolts	11	8	-
Radiator retaining bolts	9	-	80
Radiator drain plug	2	-	18
Coolant bleed screw(s)	3	-	27

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Cooling - Component Location

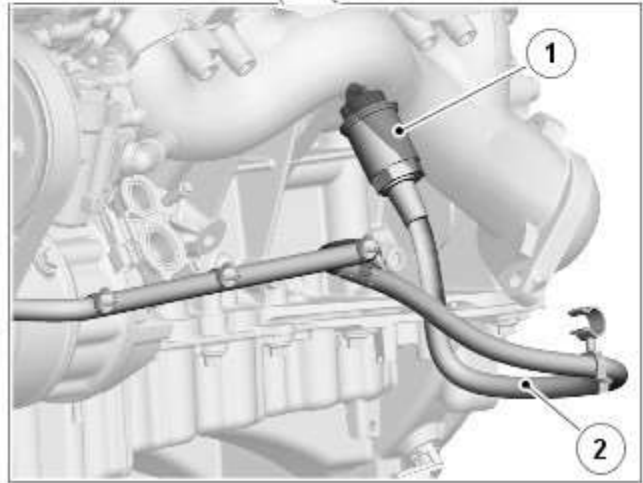
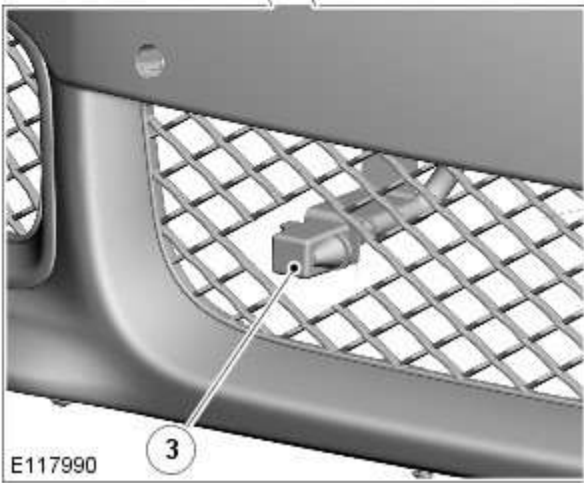
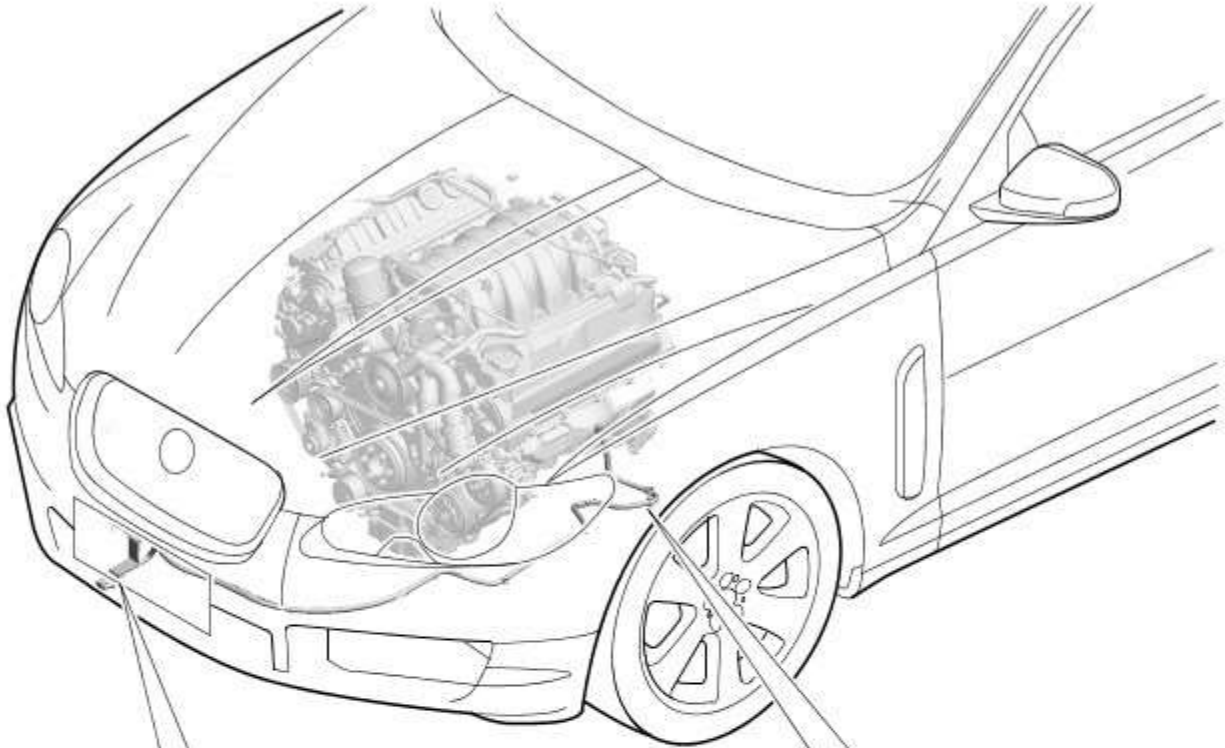
Description and Operation

COMPONENT LOCATION - SHEET 1 OF 2 (SUPERCHARGER VEHICLES)



E117989

Item	Description
1	Engine vent hose
2	Throttle
3	Coolant expansion tank
4	Bleed point
5	Throttle body heater hose
6	Engine oil cooler
7	Engine block heater (110 V version shown) or drain plug
8	Coolant supply/expansion hose
9	Outlet tube
10	Radiator upper hose
11	Supercharger cooling system connecting hose
12	Auxiliary radiator supply hose
13	Auxiliary radiator return hose
14	Auxiliary radiator
15	Transmission fluid cooler supply and return hoses
16	Transmission fluid cooler
17	Heater core supply and return hoses
18	Heater manifold
19	Radiator lower hose
20	Cooling fan
21	Thermostat
22	Coolant pump
23	Radiator



Item	Description
1	Engine block heater Comments: 110 V ac version shown, 240 V ac version similar.
2	Harness
3	Connector

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Cooling -

Overview

Description and Operation

OVERVIEW

The engine cooling system maintains the engine within an optimum temperature range under changing ambient and engine operating conditions. The system is a pressurized expansion tank system with continuous bleeds to separate air from the coolant and prevent the formation of air locks. The engine cooling system also provides:

- Heating for:
 - The passenger compartment. For additional information, refer to 412-01 Climate Control.
 - The throttle body.
- Cooling for:
 - The engine oil cooler. For additional information, refer to 303-01F Engine - 5.0L, Vehicles With: Supercharger or 303-01E Engine - 5.0L, Vehicles Without: Supercharger.
 - The transmission fluid cooler. For additional information, refer to 307-02B Transmission/Transaxle Cooling - 5.0L/3.0L Diesel.

The primary components of the engine cooling system are the:

- Coolant pump.
- Thermostat.
- Radiator.
- Auxiliary radiator (SC (supercharger) vehicles only).
- Cooling fan.
- Expansion tank.
- Engine oil cooler.
- Outlet tube and heater manifold.
- Connecting hoses and pipes.

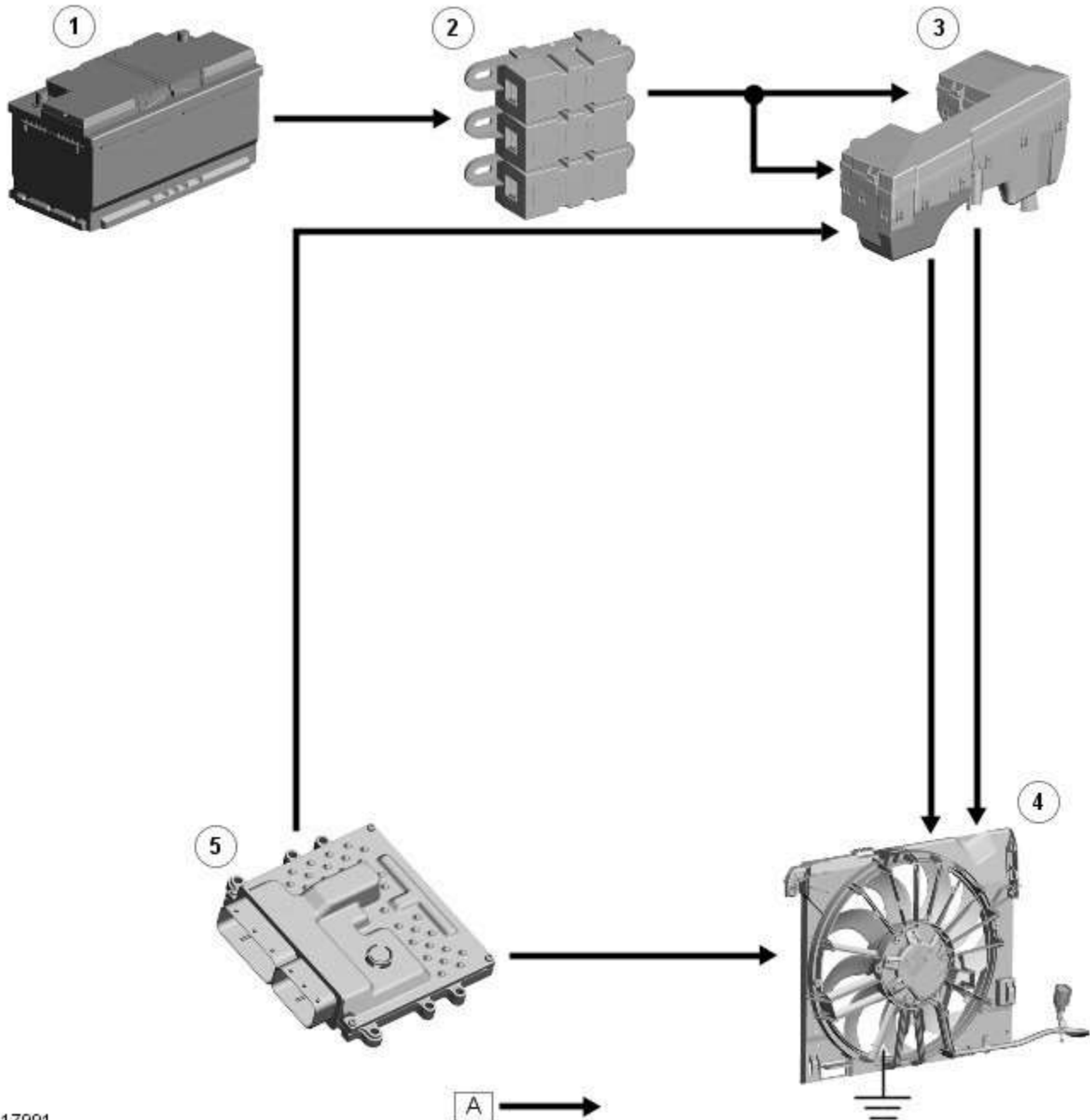
Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Cooling - System Operation and Component Description

Description and Operation

Control Diagram



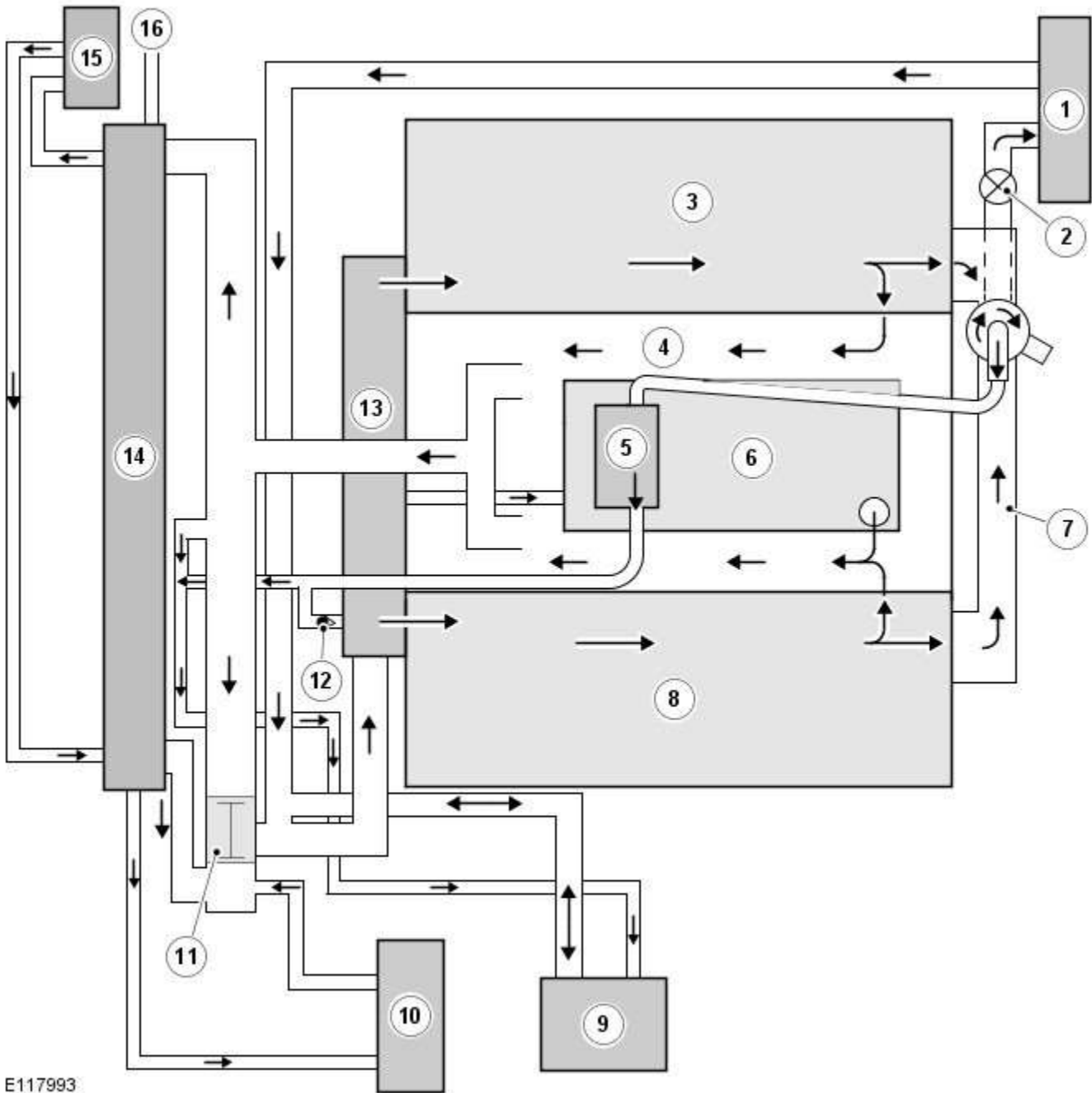
NOTE: A = Hardwired



E117991

Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse)
3	EJB (engine junction box)
4	Cooling fan
5	ECM (engine control module)

Engine Cooling Flow Diagram - Supercharger Vehicles



E117993

Item	Description
1	Heater core
2	Bleed screw
3	RH cylinder head
4	Cylinder block
5	Throttle
6	Engine oil cooler
7	Heater manifold
8	LH cylinder head
9	Expansion tank
10	Transmission fluid cooler
11	Thermostat
12	Check valve

13	Coolant pump
14	Radiator
15	Auxiliary radiator
16	Connection with supercharger cooling system

System Operation

When the engine is running, the coolant is circulated around the engine cooling system by the coolant pump. From the coolant pump, coolant flows through the cylinder heads and the engine oil cooler into the cylinder block and the heater manifold.

In the cylinder block, the coolant flows forwards to the outlet tube. When the coolant is cold, the thermostat is closed and the coolant flows direct from the outlet tube back to the coolant pump. Once the coolant reaches operating temperature the thermostat begins to open, to control system temperature, and coolant flows from the outlet tube to the coolant pump via the radiator and, on [SC \(supercharger\)](#) vehicles, the auxiliary radiator. When the thermostat is open, the coolant flow through the radiator(s) also generates a coolant flow through the transmission fluid cooler.

From the heater manifold the coolant flows through the electronic throttle and the heater core, in parallel circuits that are unaffected by the position of the thermostat. From the electronic throttle, the coolant merges with bleed coolant from the coolant pump and the outlet tube and flows to the expansion tank. From the heater core, the coolant flows back to the inlet of the coolant pump.

Expansion and contraction of the coolant is accommodated by an air space in the expansion tank and the compliance of the flexible hoses.

If the coolant level in the expansion tank decreases below a predetermined value, the level sensor connects a ground to the instrument cluster, which activates the appropriate warning. For additional information, refer to 413-01 Instrument Cluster.

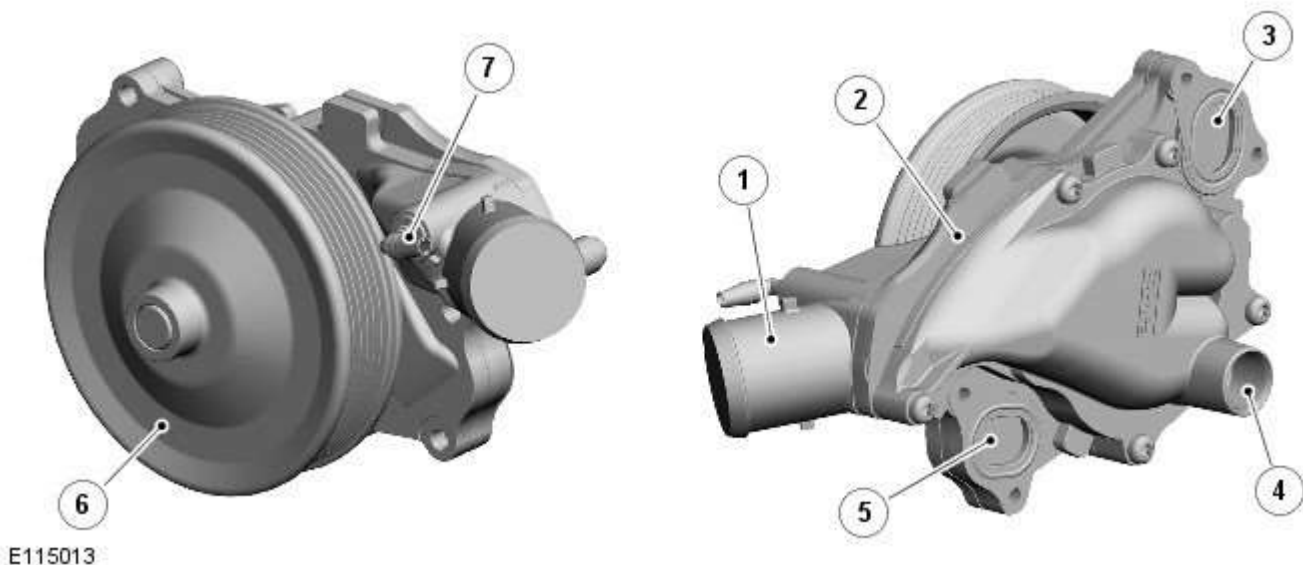
The cooling fan is operated by a fan control module integrated into the cooling fan motor. The fan control module regulates the voltage, and thus speed, of the cooling fan motor in response to a [PWM \(pulse width modulation\)](#) signal from the [ECM \(engine control module\)](#).

The cooling fan receives a battery feed and an ignition feed from the [EJB \(engine junction box\)](#). The ignition feed is supplied from the main relay in the [EJB](#), which is controlled by the [ECM](#).

The [ECM](#) calculates the required fan speed from the engine temperature, [A/C \(air conditioning\)](#) system pressure and transmission fluid temperature. Under hot operating conditions, the fan may continue to operate for 4 minutes after the engine has been switched off.

Component Description

COOLANT PUMP



Item	Description
1	Inlet connection
2	Pump body
3	Outlet flange to RH cylinder head
4	Outlet to engine oil cooler
5	Outlet flange to LH cylinder head

6	Pulley
7	Bleed pipe connection (containing check valve)

The body of the coolant pump contains an impeller attached to a shaft supported in a bearing assembly. The impeller is driven by a pulley, pressed on to the front of the shaft, which is driven by the accessory drive belt. For additional information, refer to 303-05E Accessory Drive - 5.0L, Vehicles Without: Supercharger or 303-05F - 5.0L, Vehicles With: Supercharger.

Two coolant outlet flanges attach the coolant pump to the front of the cylinder heads. A pipe connects a further coolant outlet to a pipe from the engine oil cooler. A bleed connector is installed in the front of the coolant pump, adjacent to the coolant inlet connection from the thermostat. A check valve is incorporated into the bleed connection.

THERMOSTAT



E115014

Item	Description
1	Screw (3 off)
2	Lower body
3	Upper body
4	Thermostat
5	Seal

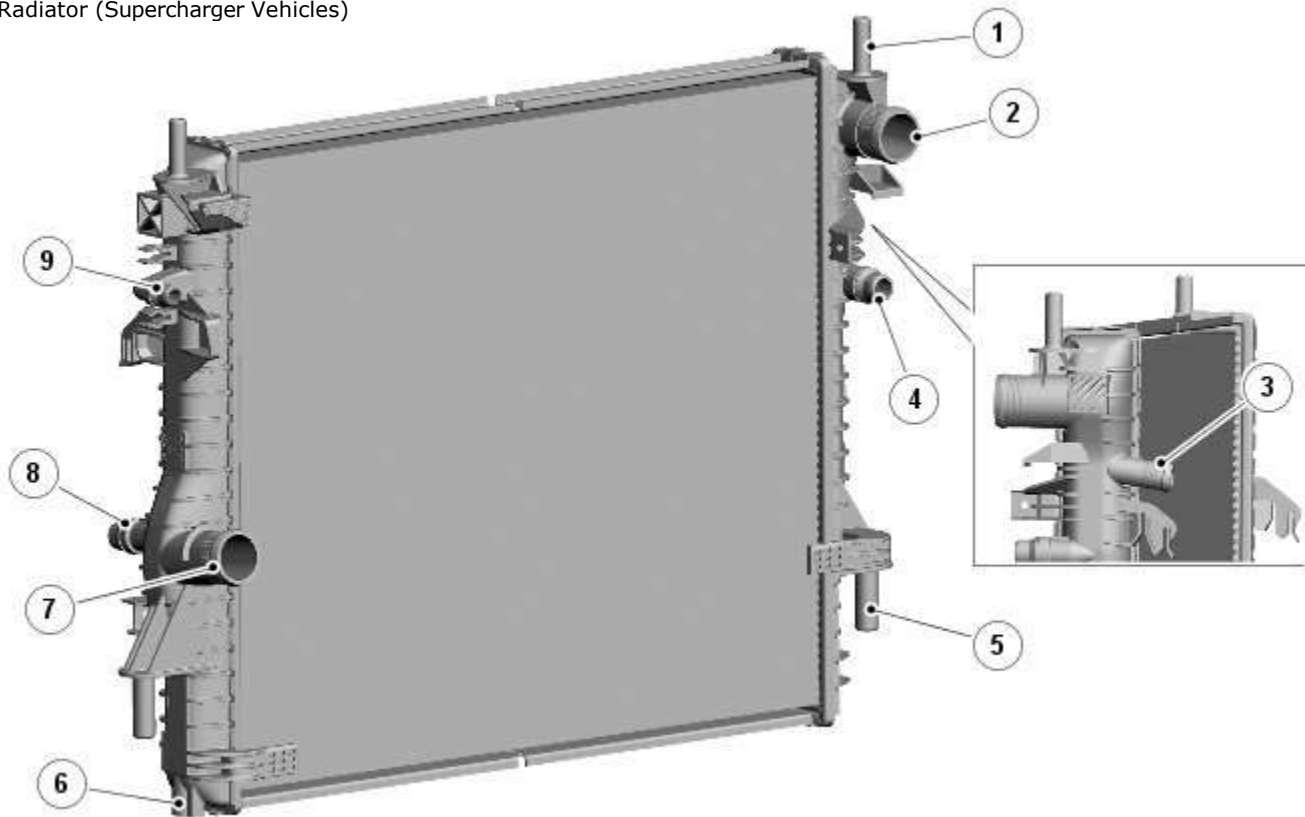
The thermostat is a multi-stage device located in the coolant pump inlet to provide fast response and control of the engine outlet temperature.

The thermostat allows rapid engine warm-up by preventing coolant flow through the radiator and by limiting coolant flow through the cylinder block when the engine is cold. During warm-up and at engine speeds above approximately 1800 rev/min, a by-pass valve opens to control the coolant flow and pressure, to protect the engine components. When the thermostat opening reaches 6 mm (0.24 in.), the by-pass flow is shut-off. When the thermostat opening exceeds 6 mm (0.24 in.), the radiator coolant flow is further controlled up to the point where the thermostat is fully open. At this point maximum radiator coolant flow is achieved to provide maximum cooling.

On both naturally aspirated and supercharger vehicles, the thermostat begins to open at 88 - 90 °C (190 - 194 °F) and is fully open at 102 °C (216 °F).

RADIATOR

Radiator (Supercharger Vehicles)



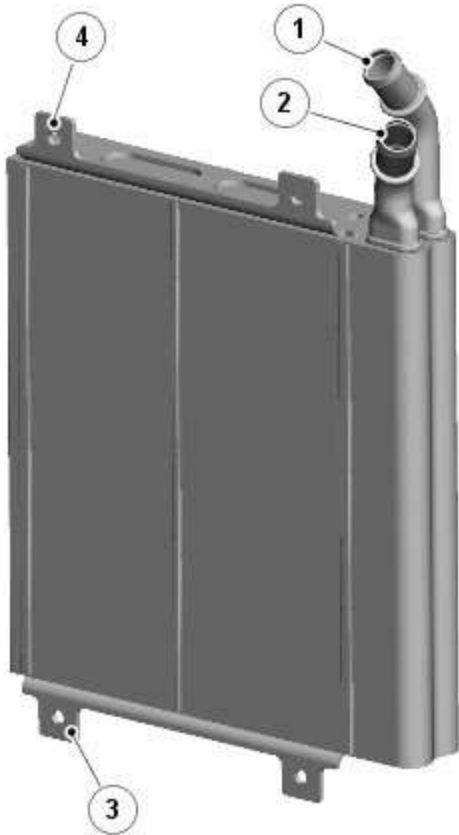
E115016

Item	Description
1	Locating spigot (2 off)
2	Upper hose connection
3	Supercharger cooling system connection
4	Auxiliary radiator inlet hose connection
5	Support (2 off)
6	Drain plug
7	Lower hose connection
8	Auxiliary radiator outlet hose connection
9	Transmission fluid cooler inlet hose connection

The radiator is a cross flow type with an aluminum core and plastic end tanks. The radiator is part of the cooling module and is attached to the vehicle by locating spigots and supports integrated into the end tanks. The supports are installed in rubber bushes located in mounting brackets on the front subframe. The locating spigots are installed in rubber bushes located in mounting brackets on the front crossmember.

The two end tanks incorporate connections for the upper and lower hoses, the coolant supply hose of the transmission fluid cooler and, on [SC](#) vehicles, the supply and return hoses of the auxiliary radiator. A drain plug is installed in the bottom of the [LH \(left-hand\)](#) end tank.

AUXILIARY RADIATOR (SUPERCHARGER VEHICLES ONLY)

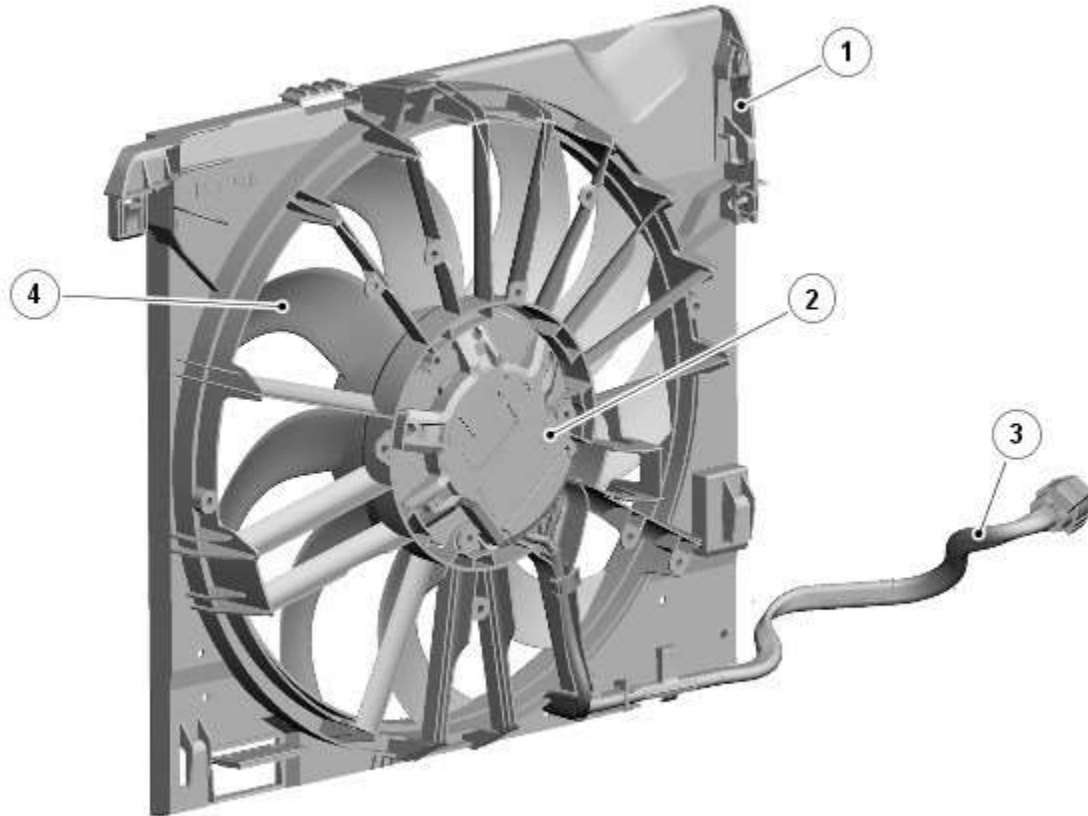


E117994

Item	Description
1	Return hose connection
2	Supply hose connection
3	Bottom bracket
4	Top bracket

The auxiliary radiator is connected in parallel with the (main) radiator to increase the engine cooling capacity on [SC](#) vehicles. The auxiliary radiator is installed in an air duct, to the right of the cooling module, which takes cooling air from the [RH \(right-hand\)](#) grille in the front bumper. Two spigots on the top of the auxiliary radiator provide the coolant supply and return connections with the main radiator.

COOLING FAN

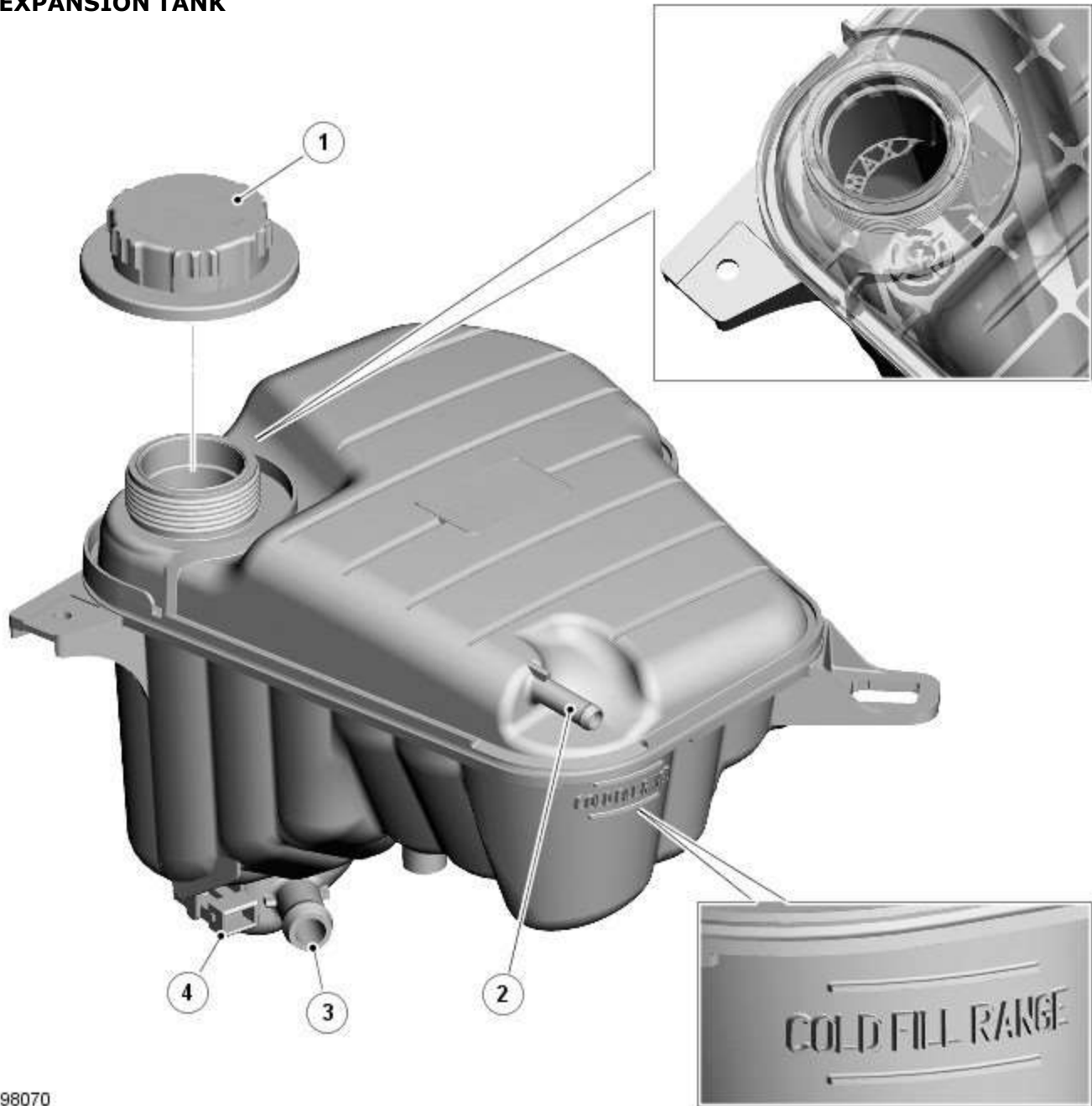


E115018

Item	Description
1	Shroud
2	Motor and fan control module
3	Harness
4	Fan

An electric, variable speed cooling fan is installed in a shroud attached to the rear of the radiator. The cooling fan is operated by a fan control module, integrated into the electric motor, under the control of the [ECM](#). An electrical connector at the [RH](#) side of the shroud provides the interface between the cooling fan harness and the vehicle wiring.

EXPANSION TANK



E98070

Item	Description
1	Filler cap
2	Vent hose connection
3	Expansion hose connection
4	Level sensor

The expansion tank is installed in the engine compartment, on the [LH](#) upper suspension housing.

A filler cap and level sensor are incorporated into the expansion tank. A MAX level marking is molded into the interior of the tank below the filler cap. Cold fill levels are molded onto the exterior of the tank.

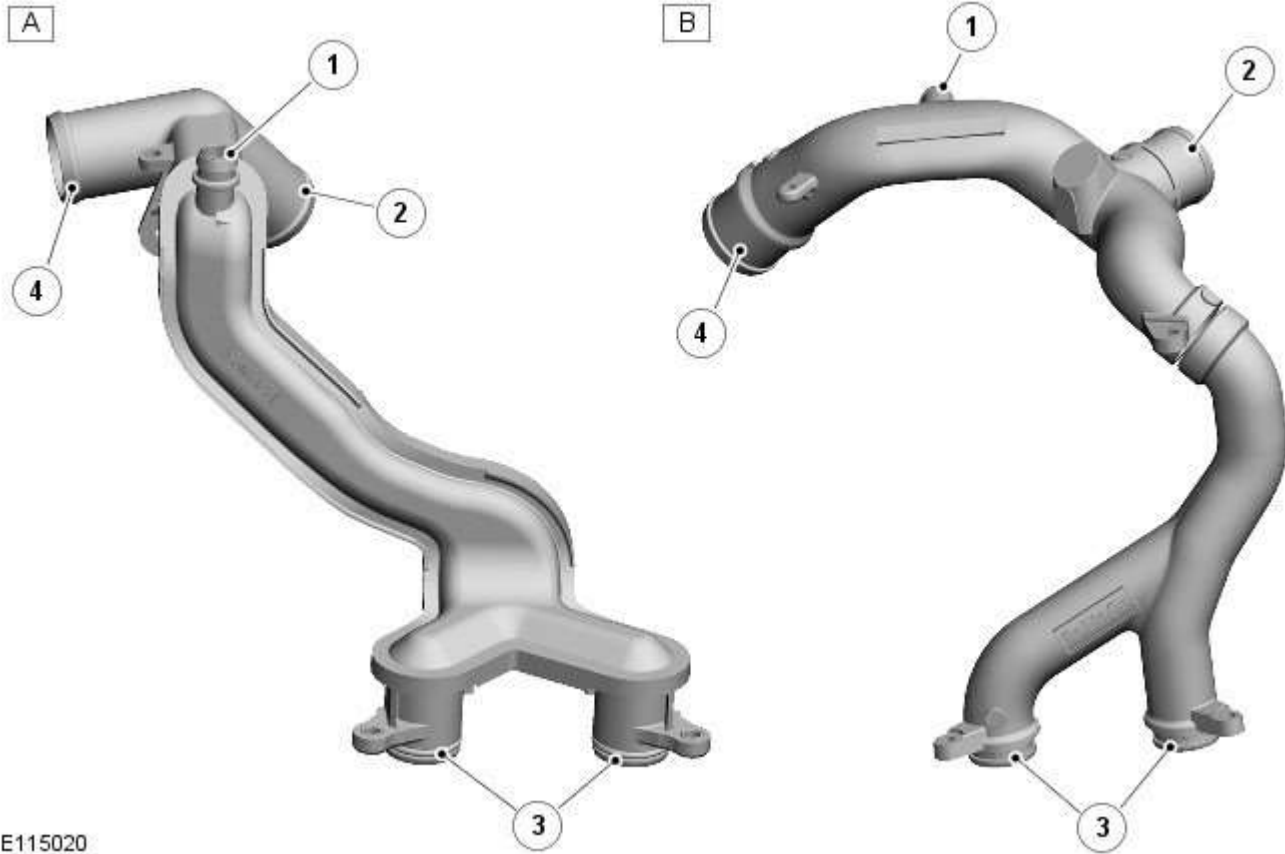
The expansion tank provides the following functions:

- Service fill.
- Coolant expansion during warm-up.
- Air separation during operation.
- System pressurization by the filler cap.

The expansion tank has an air space of approximately 0.5 liter (1.06 US pints), above the MAX level, to allow for coolant expansion.

OUTLET TUBE AND HEATER MANIFOLD

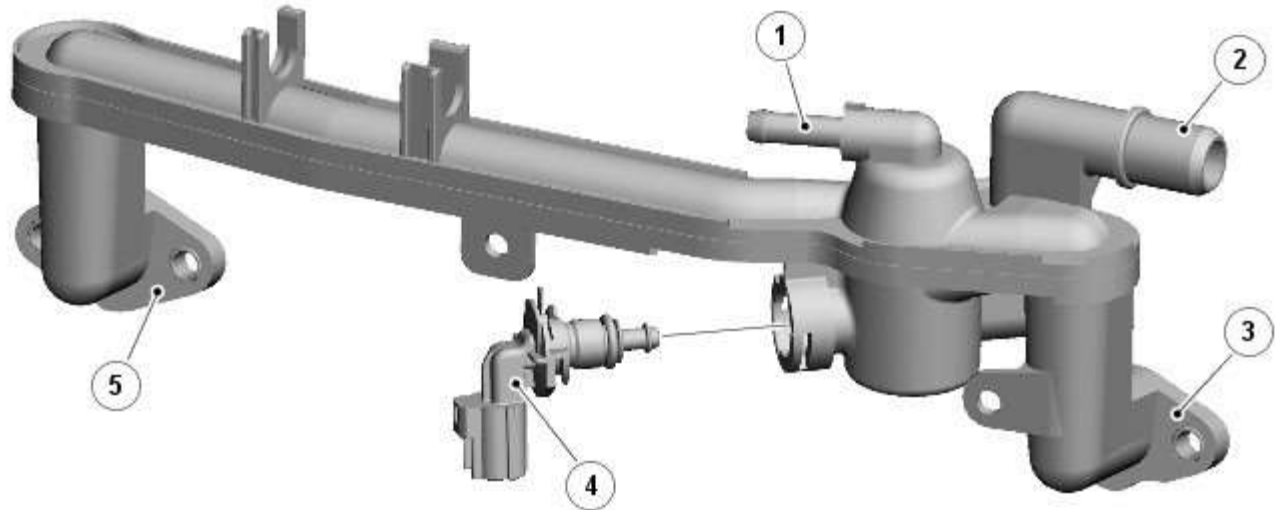
Outlet Tube



E115020

Item	Description
A	Outlet tube on naturally aspirated vehicles
B	Outlet tube on supercharger vehicles
1	Bleed hose connection
2	Radiator upper hose connection
3	Cylinder block connections
4	Thermostat hose connection

Heater Manifold



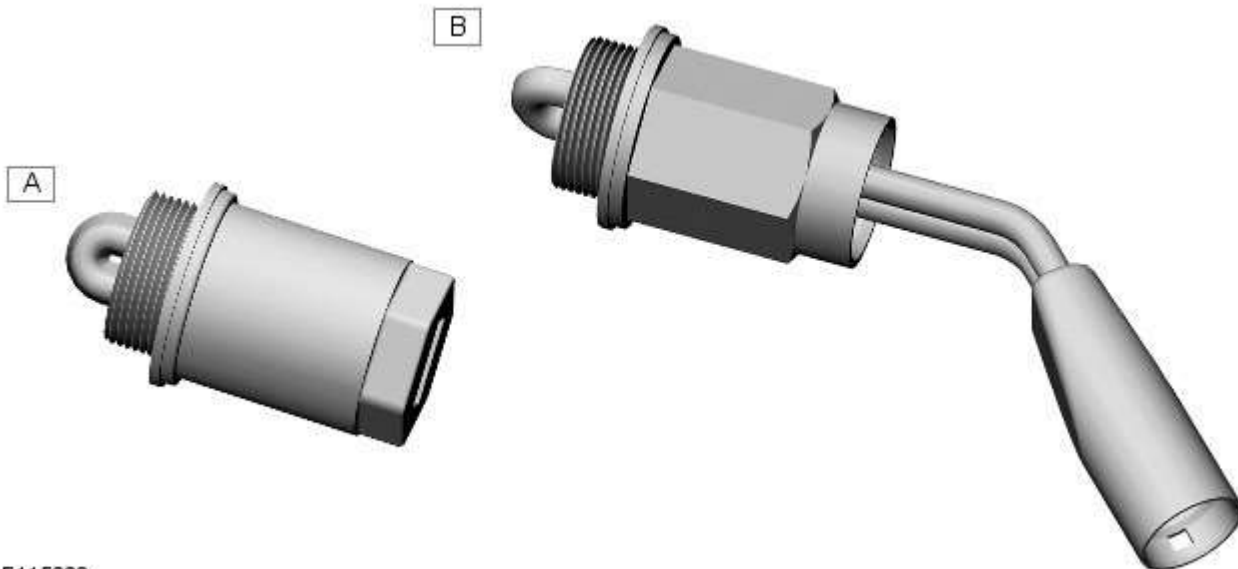
E115021

Item	Description
1	Throttle body heater hose connection
2	Heater core supply hose connection
3	RH cylinder head connection
4	Engine coolant temperature sensor
5	LH cylinder head connection

ENGINE COOLANT

The engine coolant is formulated to last for ten years or 240,000 km (150,000 miles). The coolant is silicate free and must not be mixed with conventional engine coolant.

ENGINE BLOCK HEATER



E115022

Item	Description
A	110 V ac version
B	240 V ac version

For vehicle markets subject to very cold climatic conditions, an engine block heater is installed in place of the cylinder block drain plug. The engine block heater is either a 110 V ac or 240 V ac electric heater element, depending on the market, which can be connected to a domestic power supply via a connector in the lower center grill of the front bumper.

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Cooling V8 5.0L Petrol/V8 S/C 5.0L Petrol

Diagnosis and Testing

Principle of Operation

For a detailed description of the engine cooling system and operation, refer to the relevant description and operation section of the workshop manual. **Engine Cooling, Section - 303-03**

Inspection and Verification



WARNING: Moving parts can cause severe injury, keep clear of moving parts, never place your hands or any part of your body near to moving parts



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle

NOTES:



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests

1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Coolant leaks • Coolant hoses • Coolant expansion tank • Radiator • Heater core • Accessory drive belt • Cooling fan 	<ul style="list-style-type: none"> • Fuses • Harnesses • Loose or corroded connector(s) • Engine coolant temperature sensor


3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the symptom chart, alternatively check for diagnostic trouble codes (DTCs) and refer to the DTC Index



Symptom Chart

Symptom	Possible Causes	Action
Coolant loss	<ul style="list-style-type: none"> • Hoses • Hose connections • Radiator • Water pump • Heater core • Gaskets • Engine casting cracks • Engine block core plugs 	Carry out a visual inspection. If there are no obvious leaks, carry out a cooling system pressure test. Rectify any leaks as necessary
Overheating	<ul style="list-style-type: none"> • Low/contaminated coolant • Thermostat • Cooling fan 	Check the coolant level and condition. Carry out a cooling system pressure test. Rectify any leaks as necessary. Check the thermostat and rectify as necessary. Check the cooling fan operation, make sure the cooling fan rotates freely. Check for obstructions to the air flow over the radiator. Rectify as necessary

Symptom	Possible Causes	Action
	<ul style="list-style-type: none"> Engine coolant temperature sensor Restricted air flow over the radiator 	
Engine not reaching normal temperature	<ul style="list-style-type: none"> Thermostat Cooling fan Thermostat Fan speed module 	Check the thermostat operation. Check the cooling fan operation, make sure the cooling fan is not seized. Rectify as necessary
Engine NOT running. Cooling fan is maximum speed	<ul style="list-style-type: none"> Circuit reference PWM <ul style="list-style-type: none"> Duty cycle is implausible Circuit reference PWM <ul style="list-style-type: none"> Frequency out of range Circuit reference PWM <ul style="list-style-type: none"> Circuit is open circuit Circuit reference PWM <ul style="list-style-type: none"> Circuit is short circuit to power Circuit reference PWM <ul style="list-style-type: none"> Circuit is short circuit to ground 	Refer to the electrical circuit diagrams and check the PWM circuit for short circuit to ground, short circuit to power, open circuit, high resistance
Engine IS running. Cooling fan is stationary	<ul style="list-style-type: none"> Circuit reference - IGN <ul style="list-style-type: none"> Circuit is open circuit Circuit reference - IGN <ul style="list-style-type: none"> Circuit is short circuit to ground EMS fuse failure EMS relay failure 	Refer to the electrical circuit diagrams and check the IGN circuit for short circuit to ground, open circuit, high resistance. Check and install a new EMS relay and fuse

PINPOINT TEST A :

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK FOR COOLING FAN RELATED DTCS	
	 <p>NOTE: For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to section 100-00. Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).</p>
1	Using the manufacturer approved diagnostic system check the engine control module for DTCs
2	P0480-00 & P0480 with any other different last 2 digits in the DTC
3	P0481-00 & P0481 with any other different last 2 digits in the DTC
4	P0483-00 & P0483 with any other different last 2 digits in the DTC
	Are any of the cooling fan related DTCS listed, logged in the engine control module?
Yes	Please refer to section 100-00 and refer to the relevant DTC index and carry out repair procedure Using the manufacturer approved diagnostic system clear all stored diagnostic trouble codes from the diagnosis menu tab Proceed to the test step A9 'Cooling fan validation procedure'
No	Proceed to the next step. A2 'Check for other DTCS'
A2: CHECK FOR OTHER DTCS	
1	Using the manufacturer approved diagnostic system check the engine control module for DTCs
	Are any other DTCS listed, logged in the engine control module?
Yes	Please refer to section 100-00 and refer to the relevant DTC index and carry out repair procedure Using the manufacturer approved diagnostic system clear all stored diagnostic trouble codes from the diagnosis menu tab
No	

	Proceed to the next step. A3 'Cooling fan is operating permanently'
A3: COOLING FAN IS OPERATING PERMANENTLY	
1	The cooling fan is operating permanently
	Is the customer reported symptom that the cooling fan is operating permanently at maximum speed? Yes The cooling fan is operating permanently Proceed to the test step A5 'Cooling fan is operating permanently' No The cooling fan is NOT operating permanently Proceed to the next step. A4 'Cooling fan is NOT operating'
A4: COOLING FAN IS NOT OPERATING	
1	The cooling fan is NOT operating
	Is the cooling fan NOT operating? Yes The cooling fan is NOT operating Proceed to the test step A6 'Cooling fan is NOT operating' No No fault found. Verify customer concern of cooling fan operation
A5: COOLING FAN IS OPERATING PERMANENTLY	
 WARNING: Moving parts can cause severe injury, keep clear of moving parts, never place your hands or any part of your body near to moving parts	
1	Using the manufacturer approved diagnostic system check datalogger signal – Electric Fan PWM Control - Commanded (OX03F9) -
2	Record the value of the datalogger signal – Electric Fan PWM Control - Commanded (OX03F9) -
	Is the value of the datalogger signal – Electric Fan PWM Control - Commanded (OX03F9) - between 5% & 16% whilst the cooling fan is operating? Yes The cooling fan should not be rotating in this PWM range Refer to the electrical circuit diagrams and check the following circuit's for short circuit to ground, short circuit to power, open circuit, high resistance Refer to the electrical circuit diagrams and check the following connectors for signs of water ingress, and pins for damage and/or corrosion Engine control module, connector and wiring Circuit reference - ECFC -Cooling fan motor control unit connector and wiring Circuit reference - VBATT -Circuit reference - IGN -Circuit reference - PWM -Circuit reference - GND -Battery junction box, connector and wiring Engine junction box, connector and wiring Check and install a new cooling fan No Proceed to the next step. A6 'Cooling fan is NOT operating'
A6: COOLING FAN IS NOT OPERATING	
 CAUTION: Ensure hood is closed and there are not any loose objects in front of the vehicle	
1	Using the manufacturer approved diagnostic system command datalogger signal – Electric Fan PWM Control - Commanded (OX03F9) - to 30%
	Did the cooling fan start rotating? Yes Proceed to the next step. A7 'Electric Fan PWM Control' No Proceed to the step. A8 'Wiring check'
A7: ELECTRIC FAN PWM CONTROL	
1	Using the manufacturer approved diagnostic system command datalogger signal – Electric Fan PWM Control - Commanded (OX03F9) - to 90%
	Did the cooling fan rotating speed increase? Yes Using the manufacturer approved diagnostic system disable output state control function for this signal and allow the cooling fan to stop rotating No fault found. Verify customer concern of cooling fan operation Proceed to the test step A9 'Cooling fan validation procedure' No Proceed to the step. A8 'Wiring check'
A8: WIRING CHECK	
1	Refer to the electrical circuit diagrams and check the following circuit's for short circuit to ground, short circuit to power, open circuit, high resistance
2	Refer to the electrical circuit diagrams and check the following connectors for signs of water ingress, and pins for damage and/or corrosion <ul style="list-style-type: none"> • Engine control module, connector and wiring <ul style="list-style-type: none"> - Circuit reference - ECFC - • Cooling fan motor control unit connector and wiring <ul style="list-style-type: none"> - Circuit reference - VBATT - - Circuit reference - IGN - - Circuit reference - PWM - - Circuit reference - GND - • Battery junction box, connector and wiring <ul style="list-style-type: none"> - Megafuses

	<ul style="list-style-type: none"> - Megafuse fixing nuts • Engine junction box <ul style="list-style-type: none"> - Megafuse - Megafuse fixing nuts - Fuses - Engine control module relay
	<p>Were any circuits or wiring short circuit to ground, short circuit to power, open circuit, high resistance or any connectors damaged from water ingress, pin damage and/or corrosion?</p> <p>Yes Rectify as required</p> <p>No Proceed to the next step. A9 'Cooling fan validation procedure'</p>
A9: COOLING FAN VALIDATION PROCEDURE	
	1 Ensure the hood is closed
	2 Allow vehicle to idle
	3 Switch ON air conditioning and set to lowest temperature and highest fan speed
	4 Allow vehicle to reach operating temperature (approximately 90 degrees C). Using the manufacturer approved diagnostic system monitor datalogger signals – Engine Coolant Temperature (OXF405) -and - Electric Fan PWM Control - Commanded (OX03F9) - as the engine coolant temperature reaches operating temperature the fan speed should also increase between the values of 9 and 90%
	<p>Did the cooling fan rotate at increasing speed as engine coolant temperature increased?</p> <p>Yes Return vehicle to customer</p> <p>No Contact dealer technical support</p>

DTC Index

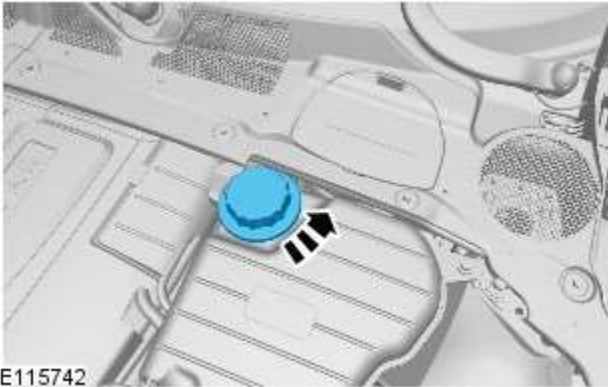
For a list of diagnostic trouble codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: [Electronic Engine Controls](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).


Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Cooling System Draining and Vacuum Filling

General Procedures


Draining

1. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).



2.  **WARNING:** Release the cooling system pressure by slowly turning the coolant expansion tank cap a quarter of a turn. Cover the expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

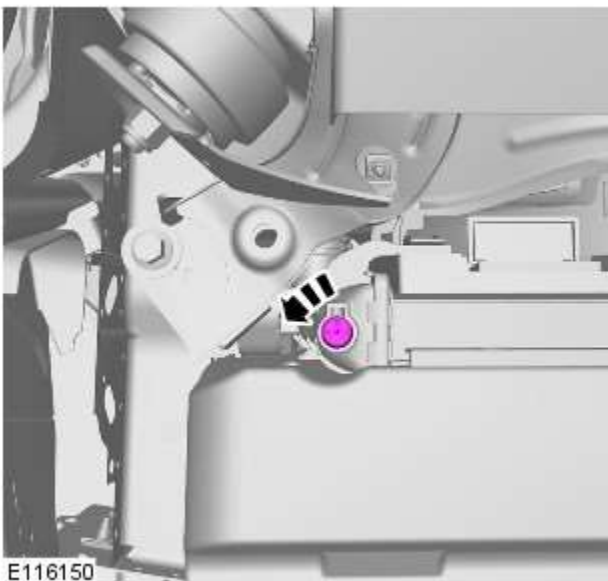
CAUTIONS:

 Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure

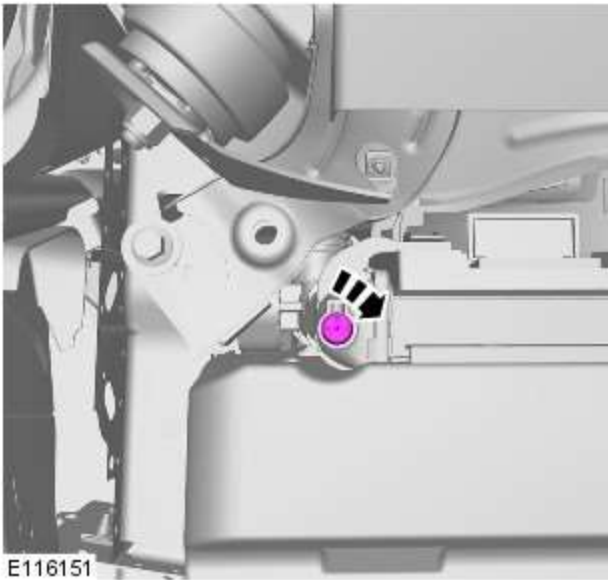
 Be prepared to collect escaping coolant.

3.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

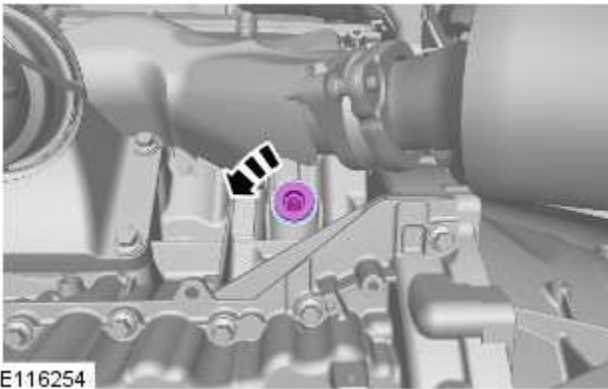
Raise and support the vehicle.




4.  **CAUTION:** Be prepared to collect escaping coolant.

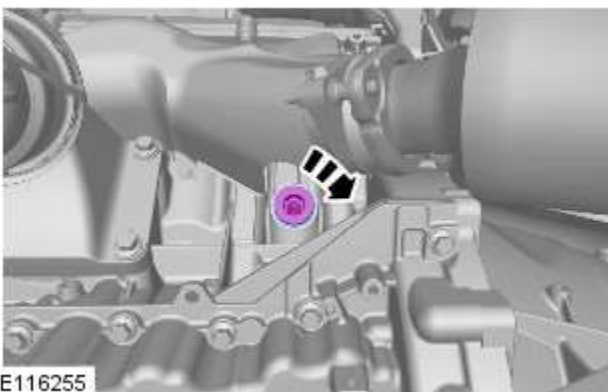



5. Torque: 2 Nm



6.  CAUTION: Be prepared to collect escaping coolant.

 NOTE: Only carry out the following step if the coolant is to be drained from the engine.




7.  NOTE: This step is only required if previously removed.

Torque: 50 Nm

Filling

1. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).
2. Lower the vehicle.

3.  CAUTION: Anti-freeze concentration must be maintained at 50%.
- Install the cooling system vacuum refill adaptor to the expansion tank.
 - Install the vacuum filler gauge to the cooling system vacuum refill adaptor.
 - Install the venturi tube assembly to the vacuum filler gauge.

4. NOTES:

 Make sure the coolant supply valve is in the closed position on the vacuum filler gauge assembly.

 The coolant vacuum fill tool needs an air pressure of 6 to 8 bar (87 to 116 psi) to operate correctly.

 Small diameter or long airlines may restrict airflow to the coolant vacuum fill tool.

- Connect a regulated compressed air supply to the venturi tube assembly.

5. Position the evacuated air hose into a container.

6. Open the air supply valve.

7. NOTE: Make sure the coolant supply hose is positioned into a container of fifty percent mixture of Jaguar Premium Cooling System Fluid or equivalent, meeting Jaguar specification WSS M97B44-D and fifty percent water. Make sure no air can enter the coolant supply hose.

Open the coolant supply valve for 2 seconds to prime the coolant supply hose.

8. Apply air pressure progressively until the arrow on the vacuum filler gauge reaches the green segment.

9. Disconnect the compressed air supply line.

10.  NOTE: Close the coolant supply valve when the coolant expansion tank MAX mark is reached or coolant movement has ceased.


Open the coolant supply valve and allow the coolant to be drawn into the system.

11. Remove the vacuum filler gauge and cooling system vacuum refill adaptor assembly.

12.




13. Set the heater controls to maximum.

14.  CAUTION: Observe the engine temperature gauge. If the engine starts to over-heat switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle

Start the engine and idle until hot air is emitted at the face registers.


15. Switch the heater off.

16. Raise the engine speed to 2000 RPM for eight minutes.


17.  CAUTION: Switch off the engine and allow the coolant temperature to go cold.

Switch the engine off.


18. Visually check the engine and cooling system for signs of coolant leakage.

19.  WARNING: When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.

CAUTIONS:

 Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure

 Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.


 NOTE: When the cooling system is warm, the coolant will be approximately 10mm above the upper level mark on the expansion tank with the cap removed.

Check and top-up the coolant if required.

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Cooling System Partial Draining, Filling and Bleeding V8 S/C 5.0L Petrol


General Procedures

Draining


1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).

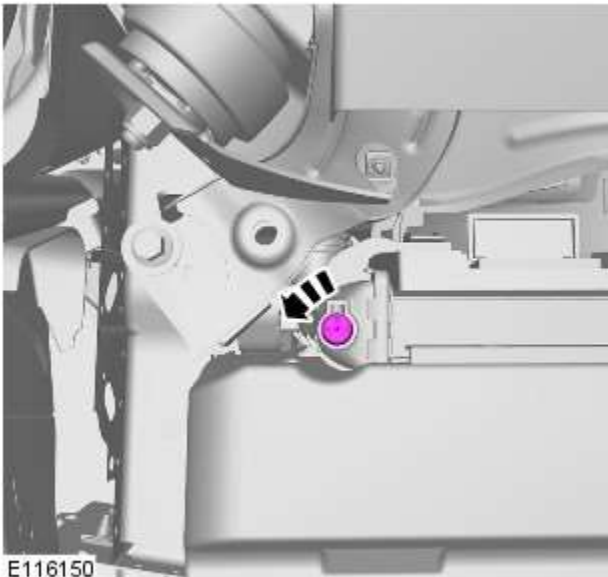


3. **WARNINGS:**

 Release the cooling system pressure by slowly turning the coolant expansion tank cap a quarter of a turn. Cover the expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

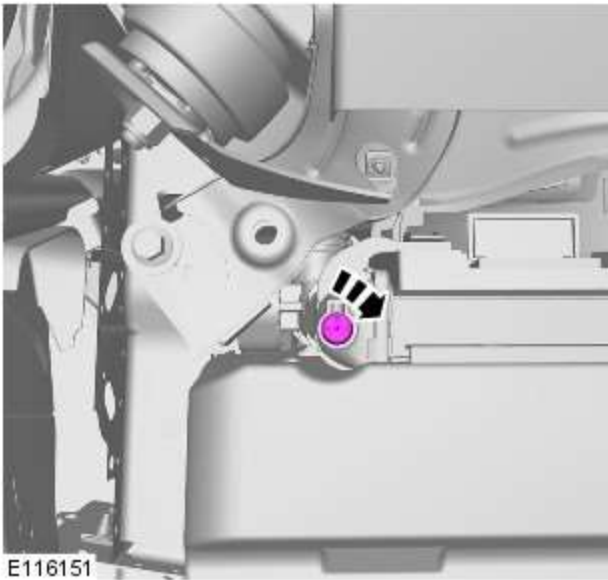
 Be prepared to collect escaping fluid.

 **CAUTION:** Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.



4.  **CAUTION:** Be prepared to collect escaping fluids.

5. Torque: 2 Nm



Filling

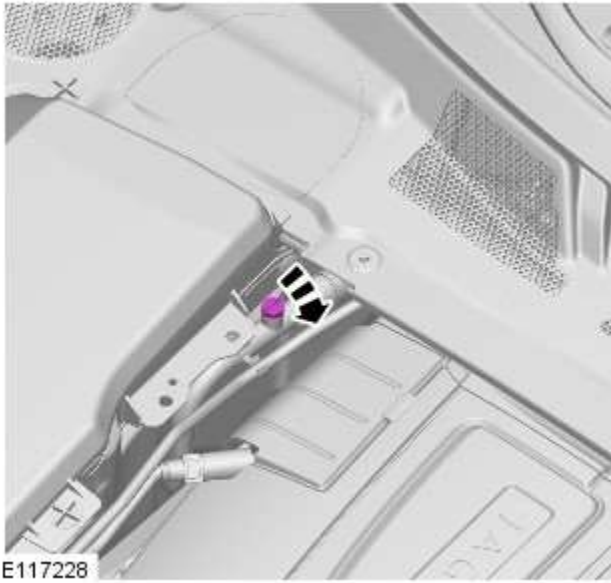
1. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).
2. Lower the vehicle.

3.



4.  **CAUTION:** Anti-freeze concentration must be maintained at 50%.

Fill the cooling system, keeping coolant to the upper level mark of the expansion tank until a steady stream of coolant is seen running from the coolant hose bleed point.



5.
 - Continue to fill the coolant until the maximum level is reached.


6. Set the heater controls to maximum.

7. Start engine and increase speed to 2000 rpm for 2 minutes.

8.
 - Continue to top-up with coolant with engine idling until hot air is emitted from face vents.
 - When hot air is emitted from the vents, switch the heater off. Go to Step 10.

9. If no hot air is emitted, turn the engine off for 10 seconds and then start the engine and return to Step 7.



10.  **CAUTION:** Correct installation of the Coolant expansion tank cap can be obtained by tightening the cap until an audible click is heard.


Continue to fill the coolant until the maximum level is reached.

11. Switch the heater off.

12. Raise the engine speed to 2000 rpm for eight minutes.

13. Switch the engine off and allow to cool.

14. Visually check the engine and cooling system for signs of coolant leakage.

15.  WARNING: When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.

CAUTIONS:



Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.



Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.




NOTE: When the cooling system is warm, the coolant will be approximately 10mm above the upper level mark on the expansion tank with the cap removed.

Check and top-up the coolant if required.

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Cooling System Draining, Filling and Bleeding V8 S/C 5.0L Petrol

General Procedures


Draining

1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Secondary Bulkhead Center Panel](#) (501-02 Front End Body Panels, Removal and Installation).
3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).




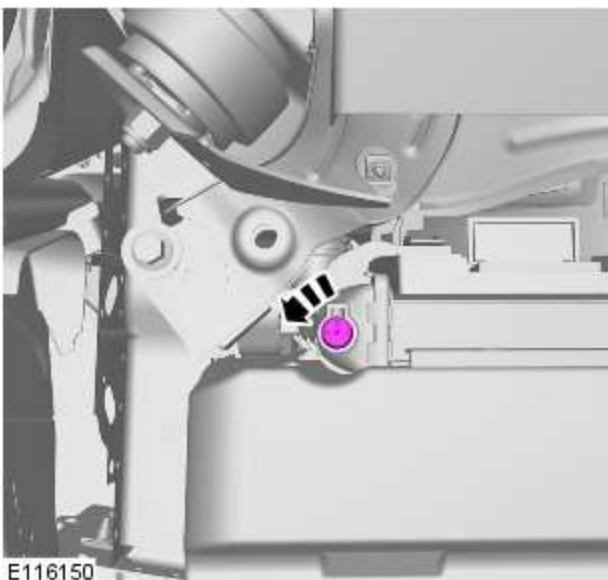
E115742

5. WARNINGS:

 Release the cooling system pressure by slowly turning the coolant expansion tank cap a quarter of a turn. Cover the expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

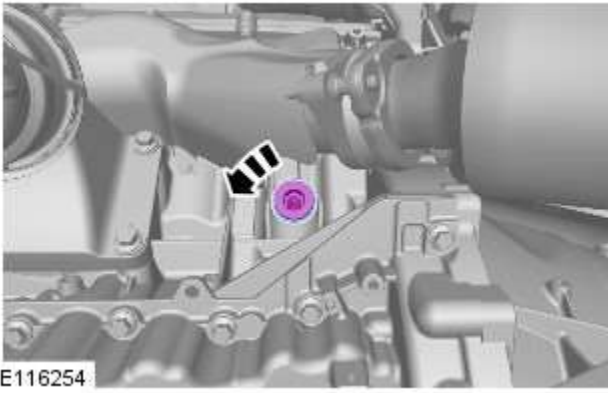
 Be prepared to collect escaping fluid.

 **CAUTION:** Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.

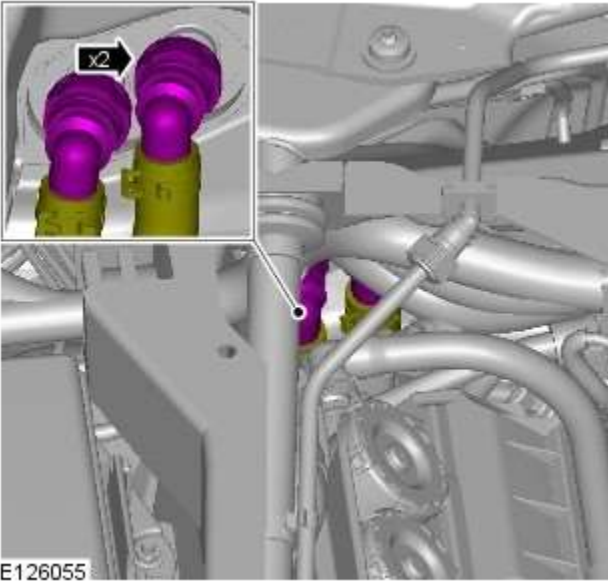


E116150

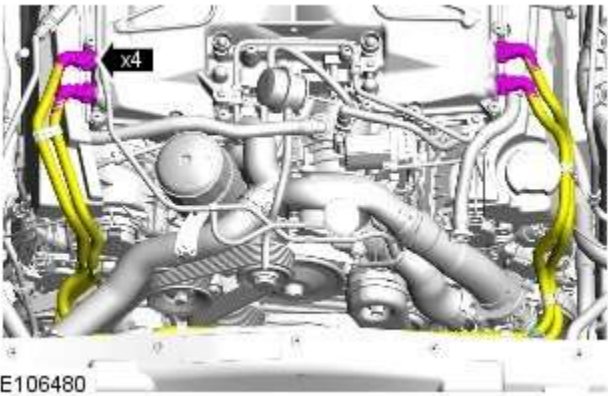
6.  **CAUTION:** Be prepared to collect escaping fluids.



7.  CAUTION: Be prepared to collect escaping fluids.

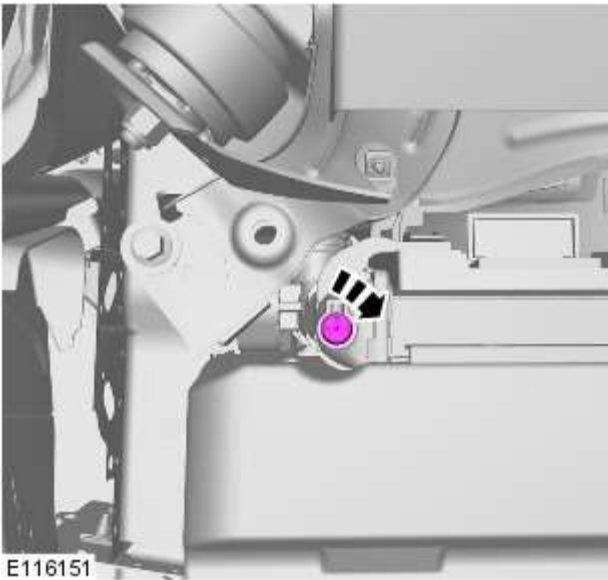


8.  CAUTION: Be prepared to collect escaping coolant.

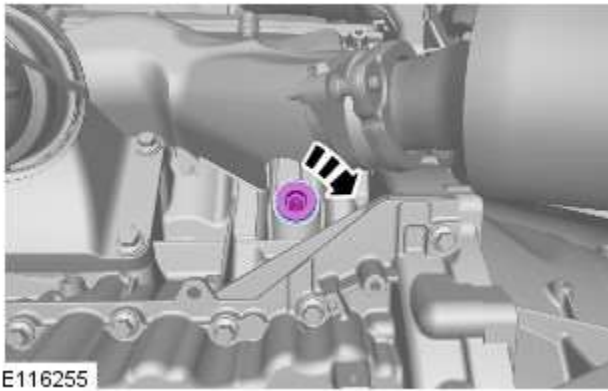


9.

10. Torque: 2 Nm



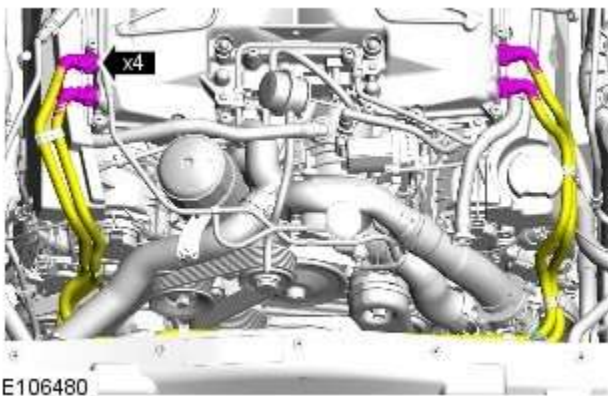
11. Torque: 50 Nm

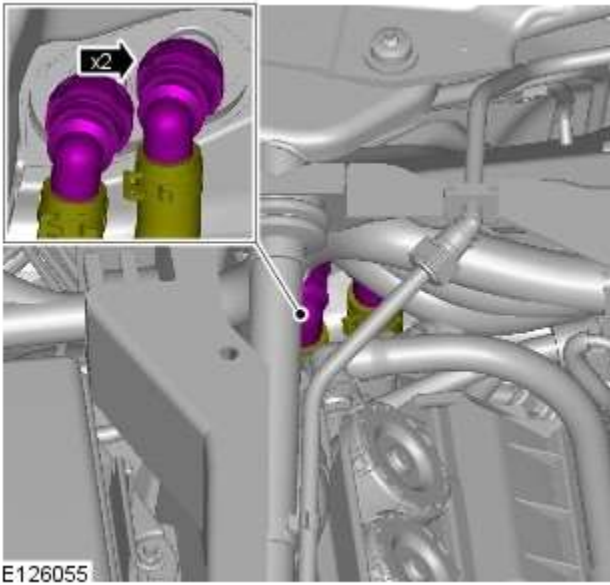


12. Carry out the procedure up to step 1 in the filling section three times, filling the cooling system with clean water at the first two drains. At the third refill, use a suitable measuring tool to make sure that the cooling system maintains a 50% mix.

Filling

1.

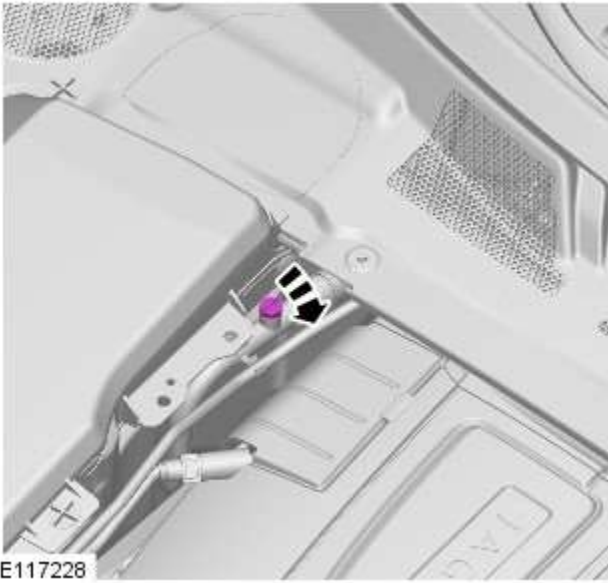




2.  CAUTION: Be prepared to collect escaping coolant.



3.



4.  **CAUTION:** Be prepared to collect escaping coolant.

Fill the cooling system, keeping coolant to the upper level mark of the expansion tank until a steady stream of coolant is seen running from the coolant hose bleed point.

5. Continue to fill the coolant until the maximum level is reached.

6. Set the heater controls to maximum.


7. Start engine and increase speed to 2000 rpm for 2 minutes.

8.

- Continue to top-up with coolant with engine idling until hot air is emitted from face vents.
- When hot air is emitted from the vents, switch the heater off. Go to Step 10.

9. If no hot air is emitted, turn the engine off for 10 seconds and then start the engine and return to Step 7.



10.  **CAUTION:** Correct installation of the Coolant expansion tank cap can be obtained by tightening the cap until an audible click is heard.


Continue to fill the coolant until the maximum level is reached.

11. Switch the heater off.

12. Raise the engine speed to 2000 rpm for eight minutes.

13. Switch the engine off and allow to cool.

14. Visually check the engine and cooling system for signs of coolant leakage.

15.  **WARNING:** When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.

CAUTIONS:



Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.



Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.



NOTE: When the cooling system is warm, the coolant will be approximately 10mm above the upper level mark on the expansion tank with the cap removed.

Check and top-up the coolant system as required when cool.

16. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

17. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).

18. Refer to: [Secondary Bulkhead Center Panel](#) (501-02 Front End Body Panels, Removal and Installation).

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Auxiliary Radiator

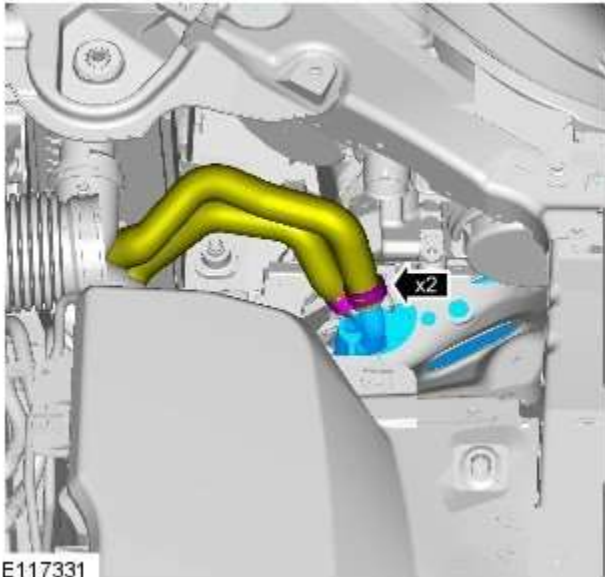
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

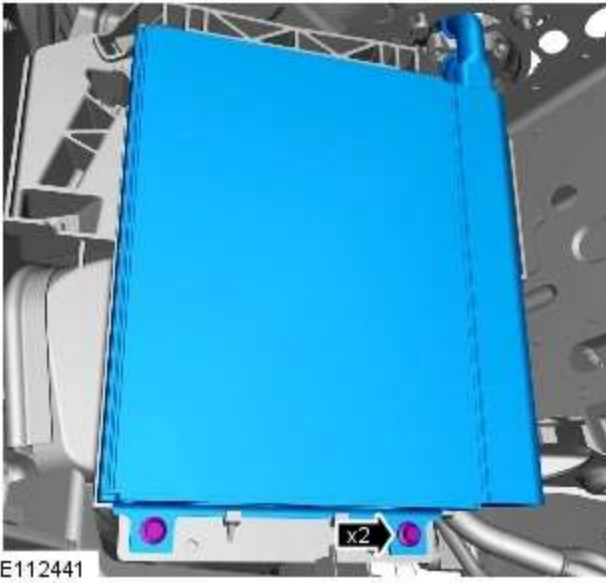
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Air Cleaner RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).



3.  CAUTION: Be prepared to collect escaping coolant.

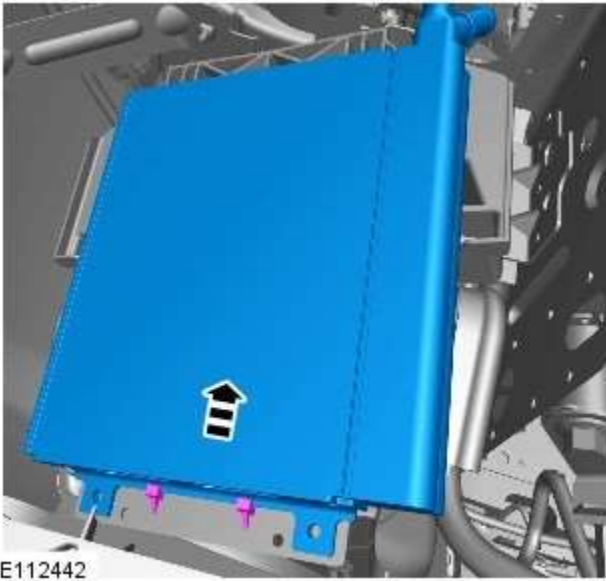



4. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
5. Refer to: [Cooling System Partial Draining, Filling and Bleeding - V8 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).
6. Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).

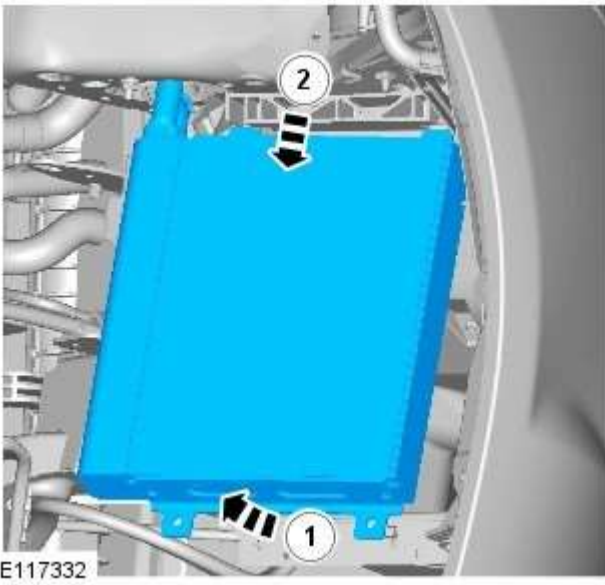


7. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 9 Nm



8.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



9.  CAUTION: Be prepared to collect escaping coolant.

Installation

1. To install, reverse the removal procedure.

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Coolant Expansion Tank

Removal and Installation

Removal



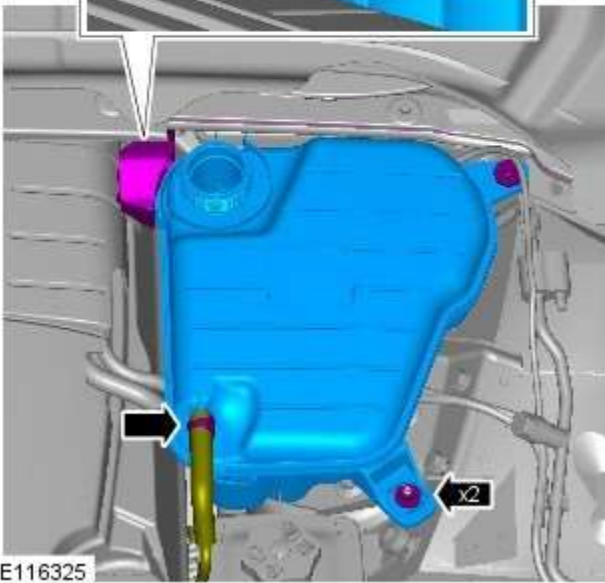
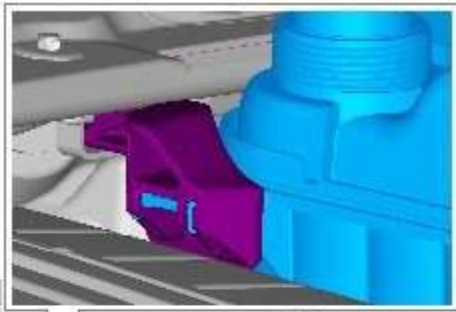
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Using a syringe, remove the cooling fluid from the expansion tank.

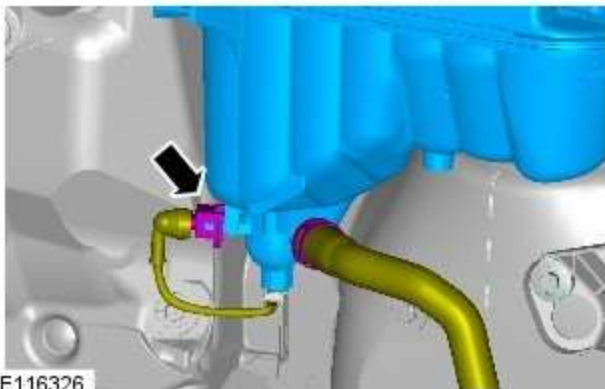


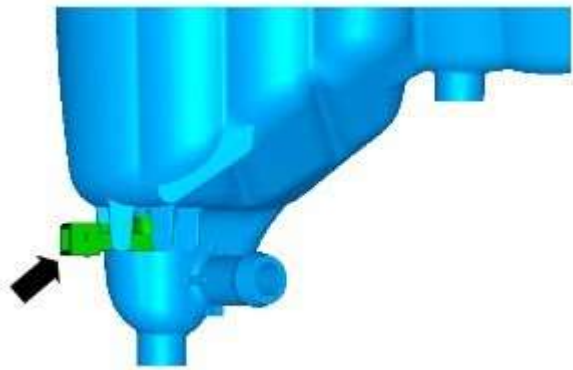
3. CAUTION: Take extra care not to damage the component.

Torque: 7 Nm



- 4.





E116327

5.  CAUTION: Note the fitted position of the component prior to removal.

NOTES:



Do not disassemble further if the component is removed for access only.



Make sure that the component is installed to the position noted on removal.

Installation

1. To install, reverse the removal procedure.
2. Fill the cooling system to the upper level mark of the coolant expansion tank.

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Cooling Fan Motor and Shroud Vehicles With: Supercharger

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

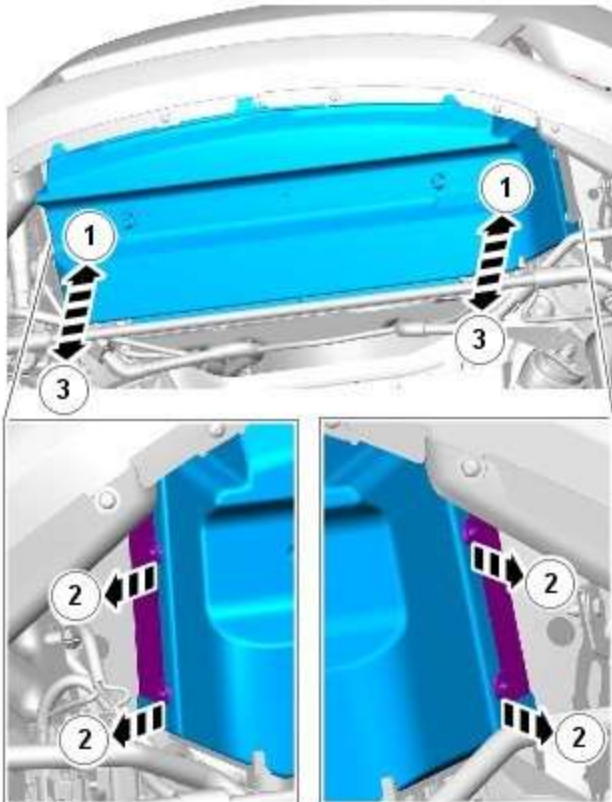


2. **WARNING:** Make sure to support the vehicle with axle stands.

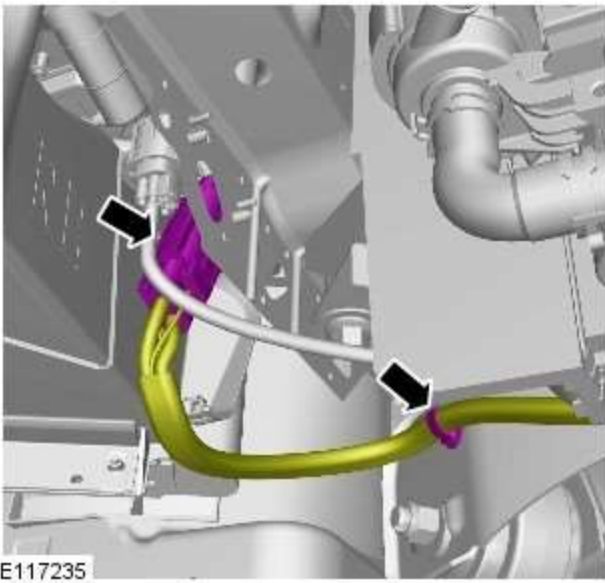
Raise and support the vehicle.

3. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).

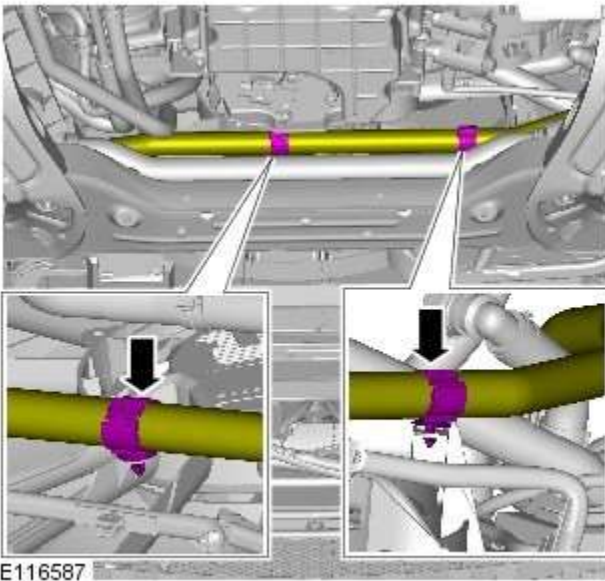
4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E97870



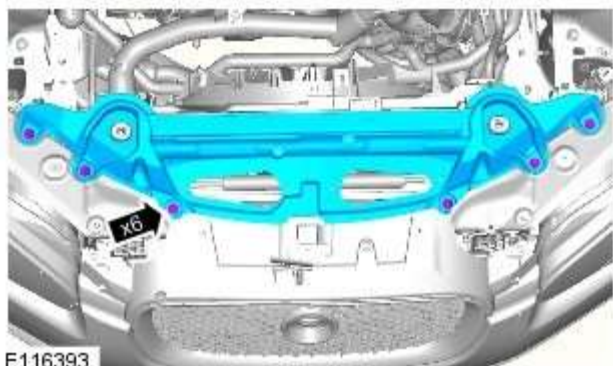
5. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



- 6.

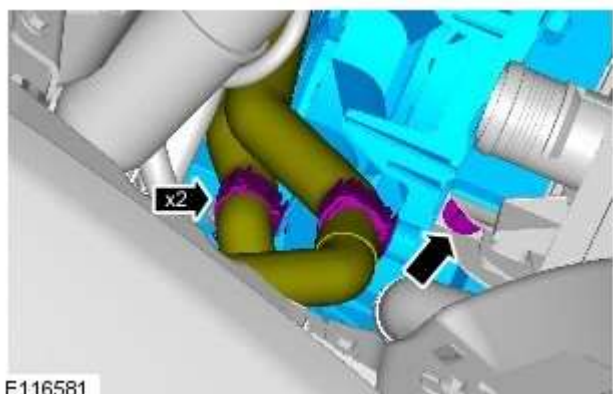
7. Lower the vehicle.
8. Refer to: [Air Cleaner Outlet Pipe LH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
9. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
10. Refer to: [Air Cleaner Outlet Pipe T-Connector](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
11. Refer to: [Air Cleaner RH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
12. Refer to: [Air Cleaner LH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

13. Torque: 9 Nm



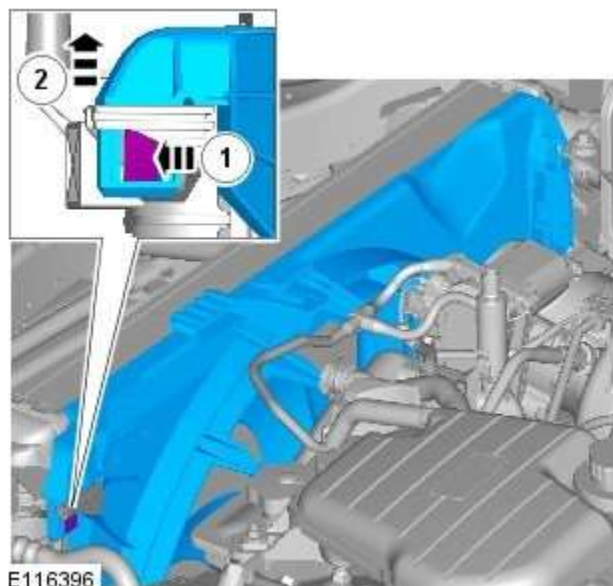
E116393

14. Torque: 7 Nm



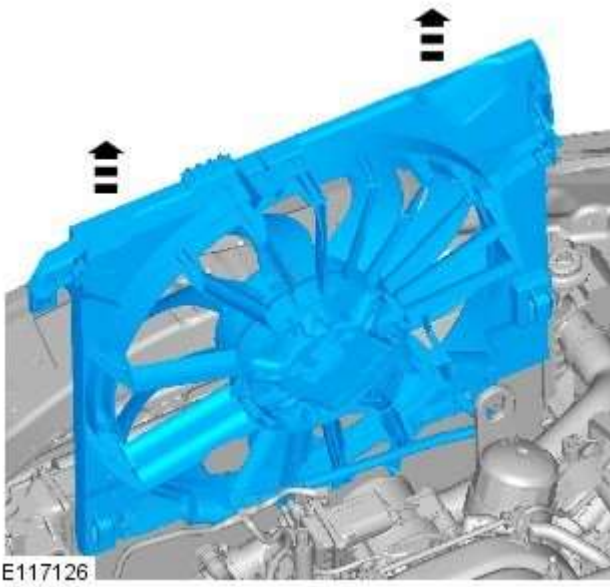
E116581

15.



E116396

16.



Installation

1. To install, reverse the removal procedure.

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Cooling Module Vehicles

With: Supercharger

Removal and Installation

Removal



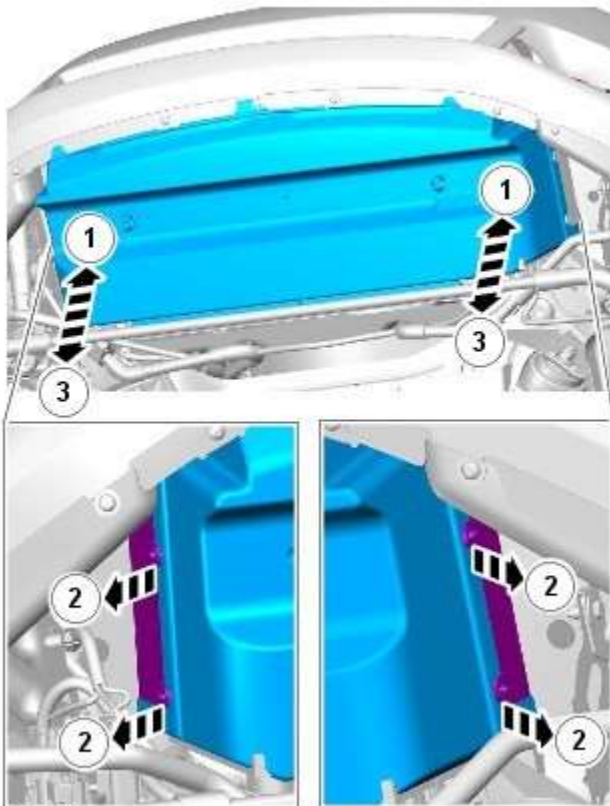
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).



3. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E97870

5. **WARNINGS:**



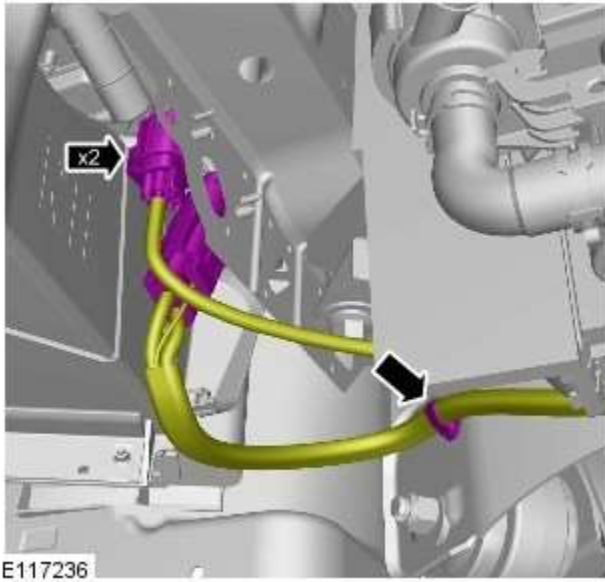
Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.



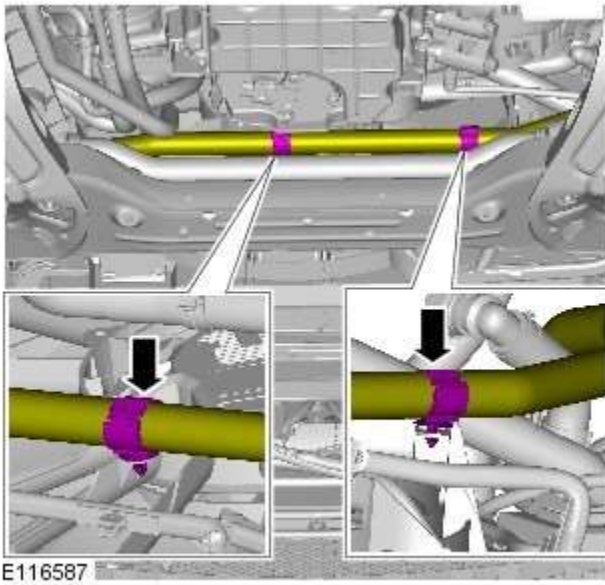
Be prepared to catch escaping fluid.

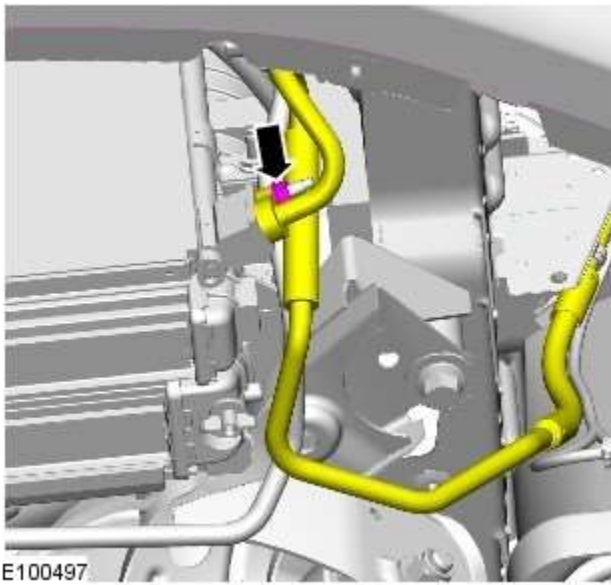
Refer to: [Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

6.



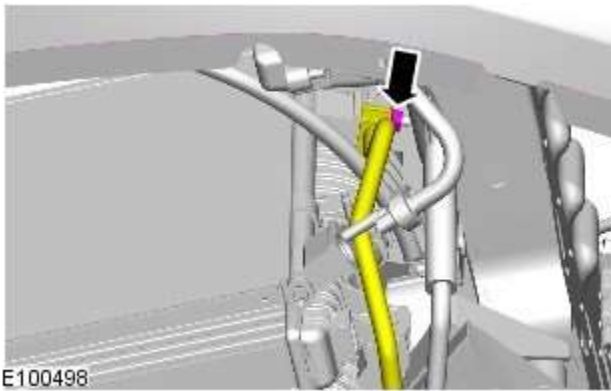
7.





8.  CAUTION: A new O-ring seal is to be installed.

Torque: 8 Nm



9.  CAUTION: A new O-ring seal is to be installed.

Torque: 8 Nm

10. Lower the vehicle.

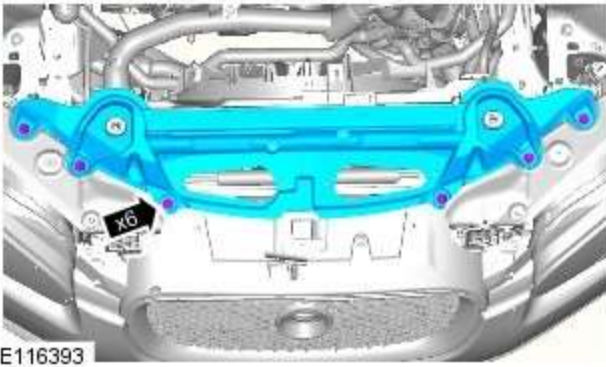
11. Refer to: [Air Cleaner Outlet Pipe LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

12. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).


13. Refer to: [Air Cleaner Outlet Pipe T-Connector](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

14. Refer to: [Air Cleaner RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

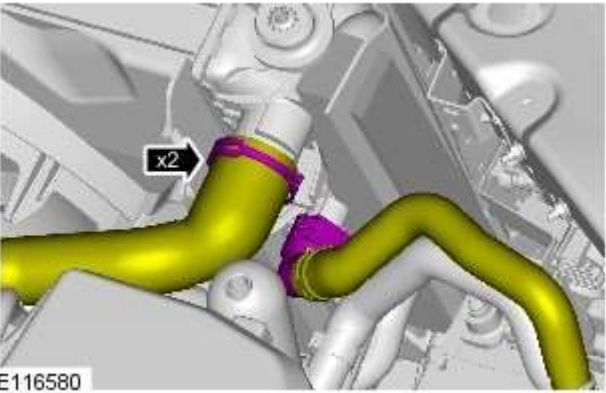
15. Refer to: [Air Cleaner LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).



E116393

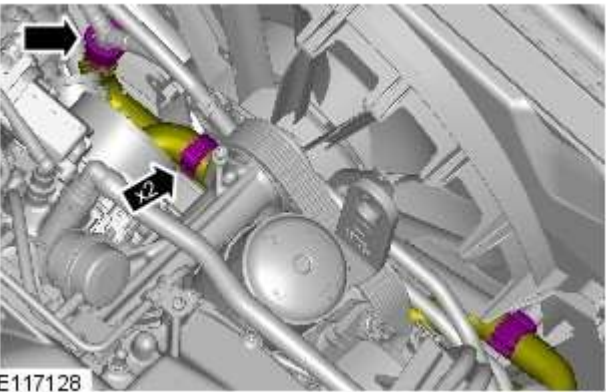
16.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 9 Nm



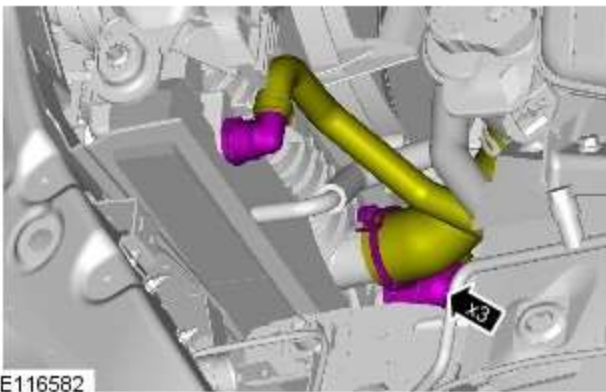
E116580

17.  CAUTION: Be prepared to collect escaping coolant.



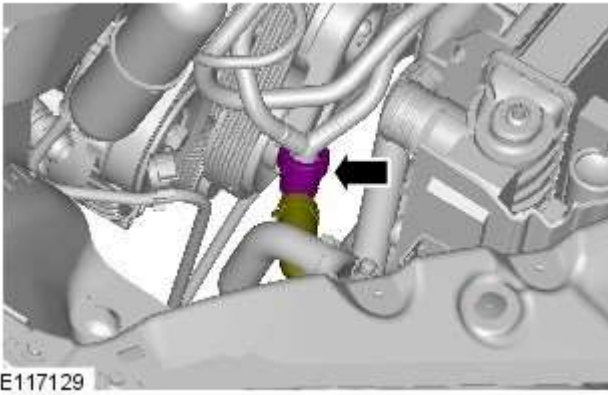
E117128

- 18.

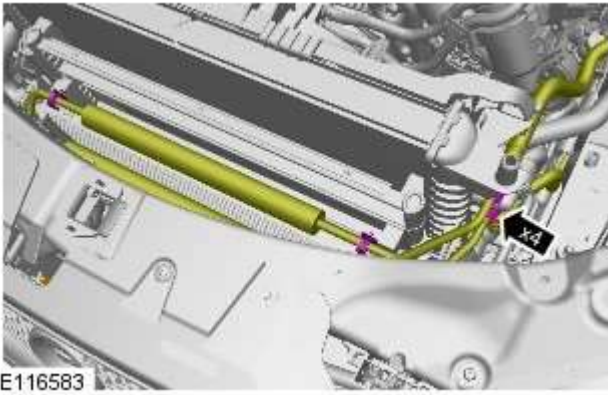


E116582

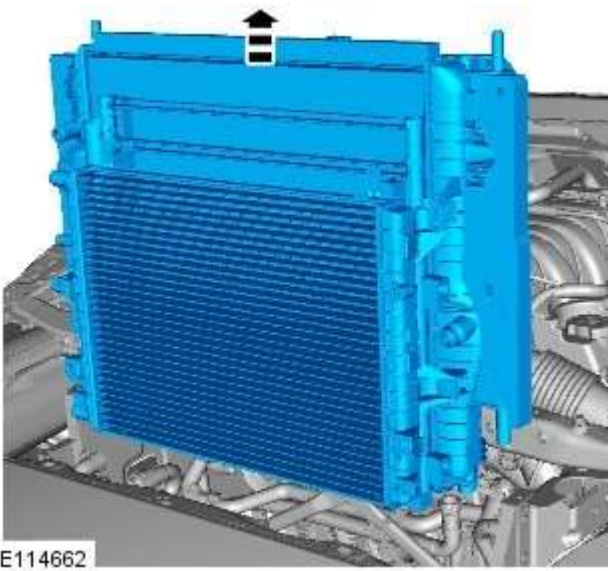
- 19.



20.



21.



22.  CAUTION: Be prepared to collect escaping coolant.

Installation

1. To install, reverse the removal procedure.

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Coolant Pump Vehicles

With: Supercharger

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

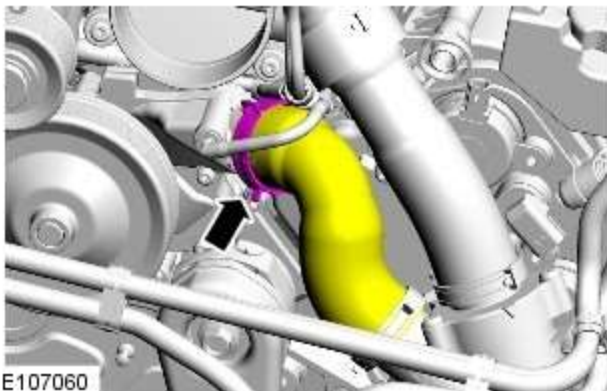


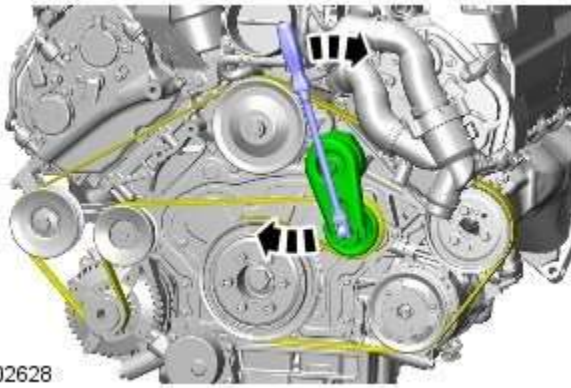
2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).
4. Refer to: [Air Cleaner Outlet Pipe T-Connector](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
5. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
6. Refer to: [Air Cleaner Outlet Pipe LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
7. Refer to: [Air Cleaner LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
8. Refer to: [Air Cleaner RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
9. Refer to: Supercharger Belt (303-05, Removal and Installation).

10.

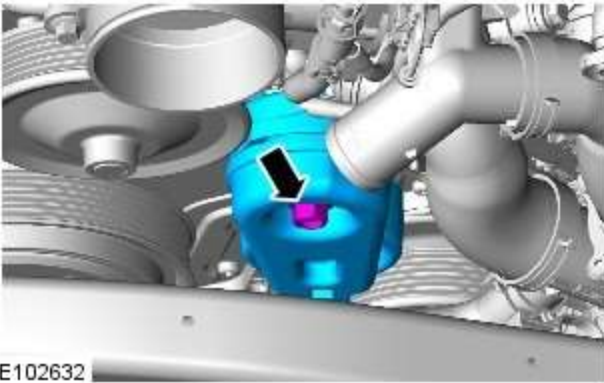




E102628

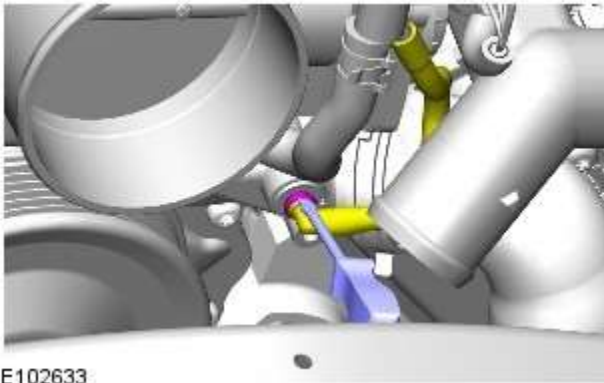
11.

Torque: 40 Nm




E102632

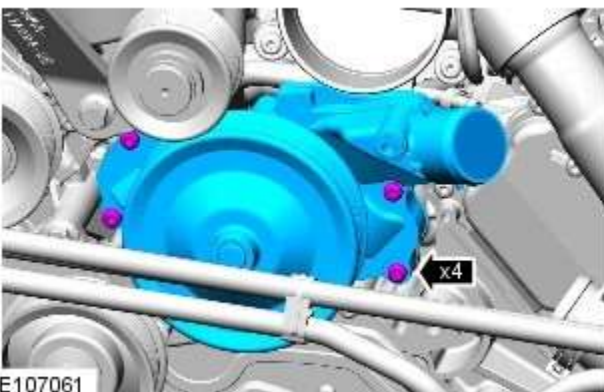
12.




E102633

13.

 **WARNING:** Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.



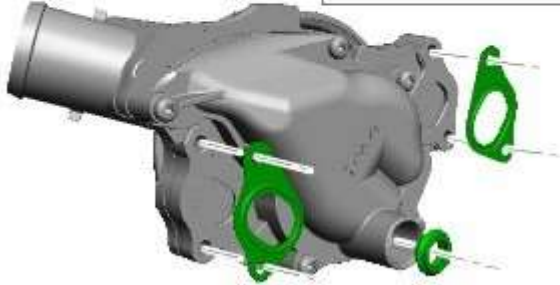
E107061

14.  **CAUTION:** Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Torque: 11 Nm



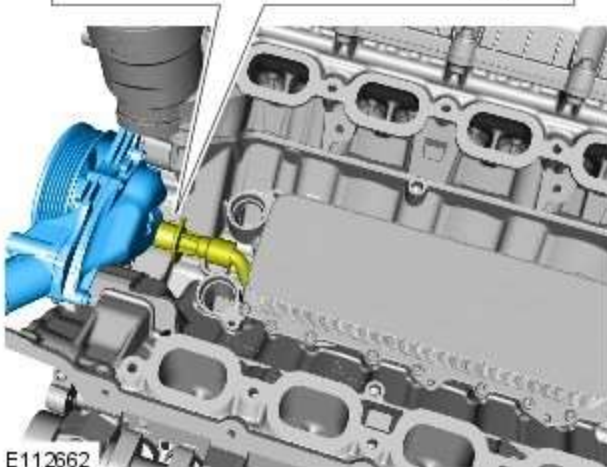
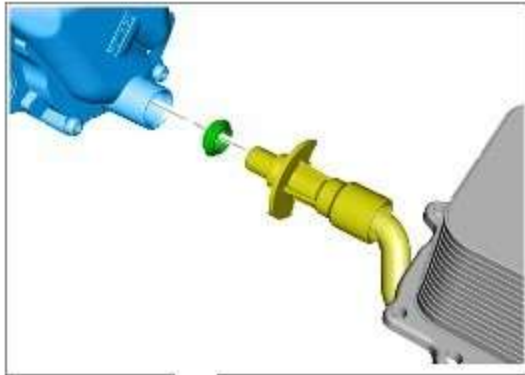
15.  **CAUTION:** Note the fitted position of the component prior to removal.



E102636

Installation

1. To install, reverse the removal procedure.



E112662

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Radiator Vehicles With: Supercharger

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

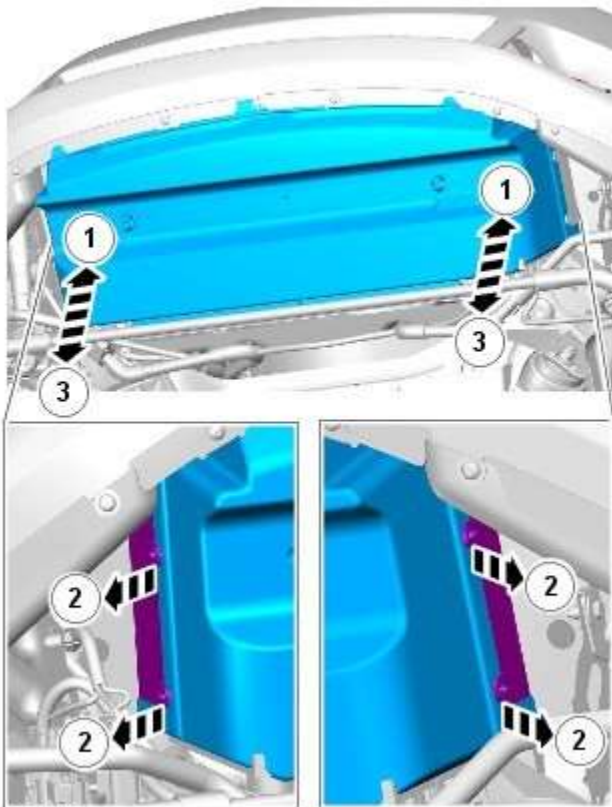
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.

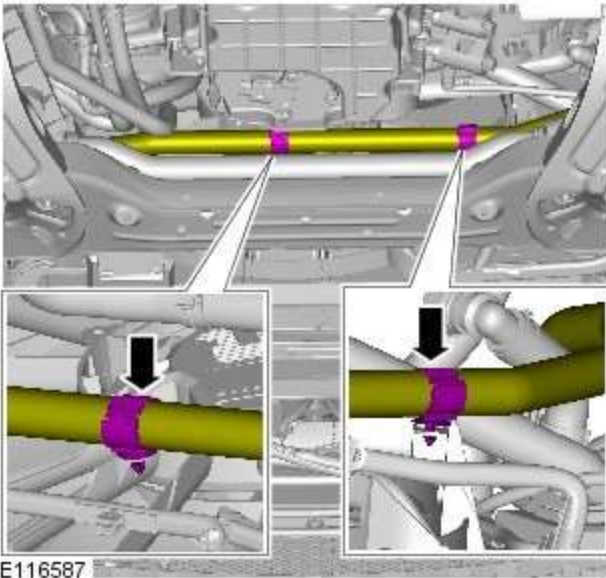
Raise and support the vehicle.

3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

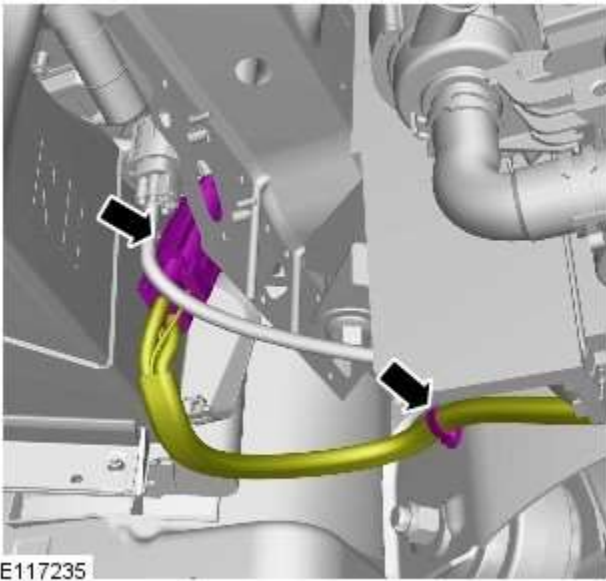


E97870

4.



5.



6. **WARNINGS:**



Since injury such as scalding could be caused by escaping steam or coolant, do not remove the filler cap from the coolant expansion tank while the system is hot.



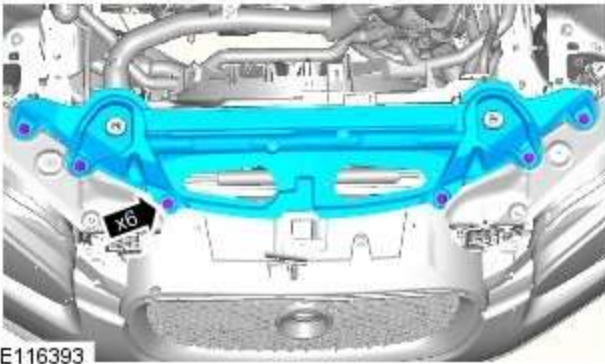
Be prepared to catch escaping fluid.


Refer to: [Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

7. Lower the vehicle.

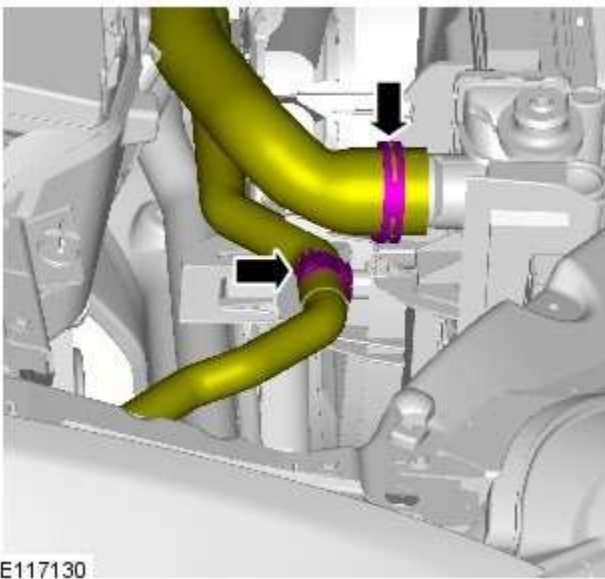
8. Refer to: [Air Cleaner Outlet Pipe LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

9. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
10. Refer to: [Air Cleaner Outlet Pipe T-Connector](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
11. Refer to: [Air Cleaner RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
12. Refer to: [Air Cleaner LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

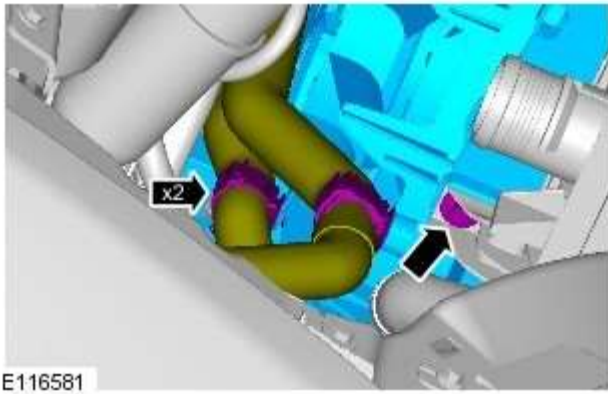


13.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

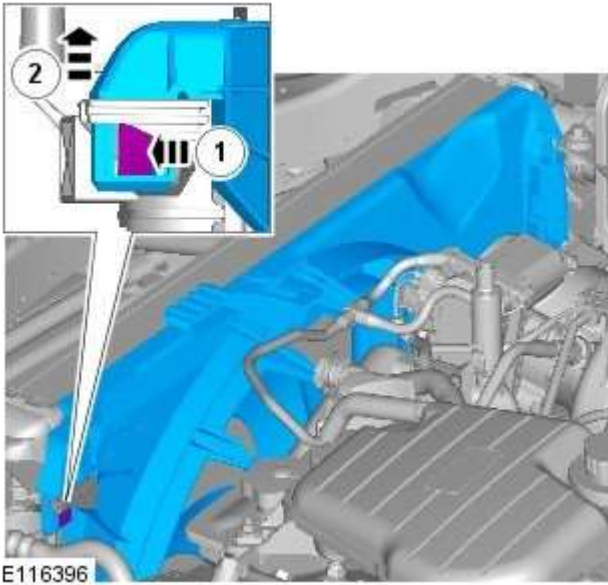
Torque: 9 Nm



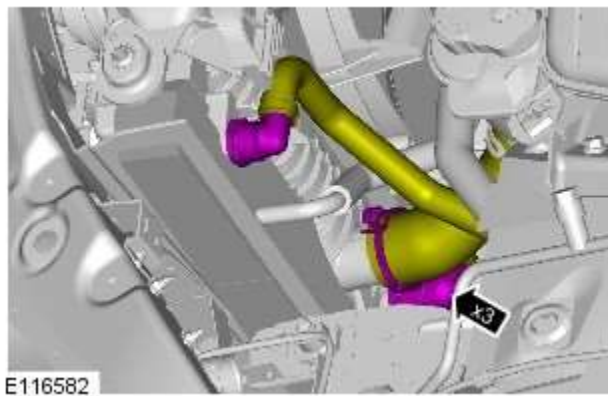
14.  CAUTION: Be prepared to collect escaping coolant.



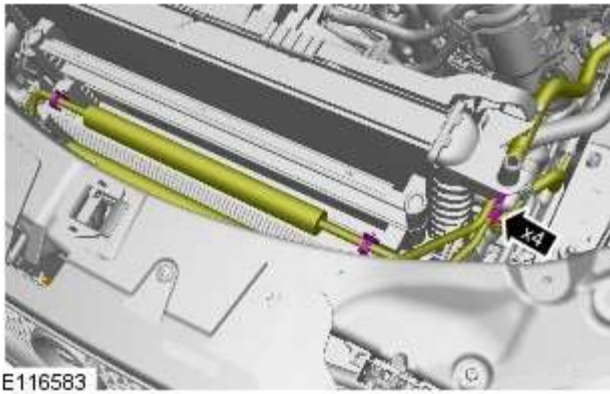
15. Torque: 7 Nm



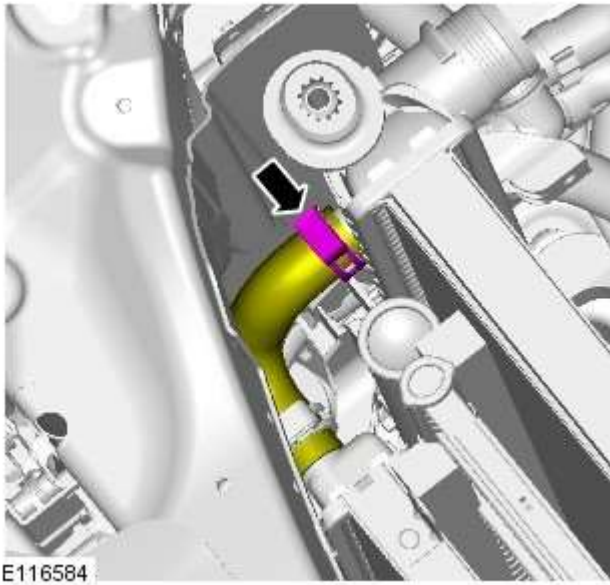
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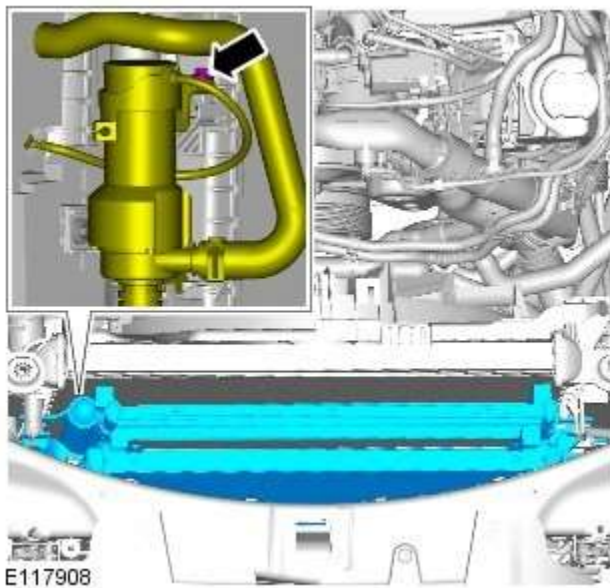
17.  CAUTION: Be prepared to collect escaping coolant.



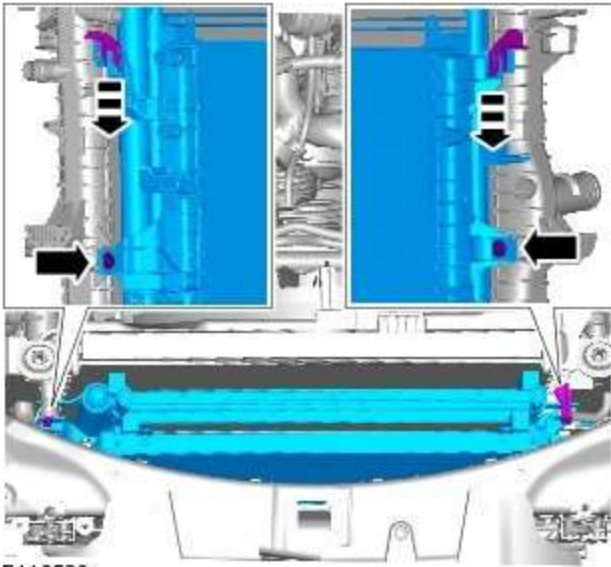
18.




19.  CAUTION: Be prepared to collect escaping coolant.

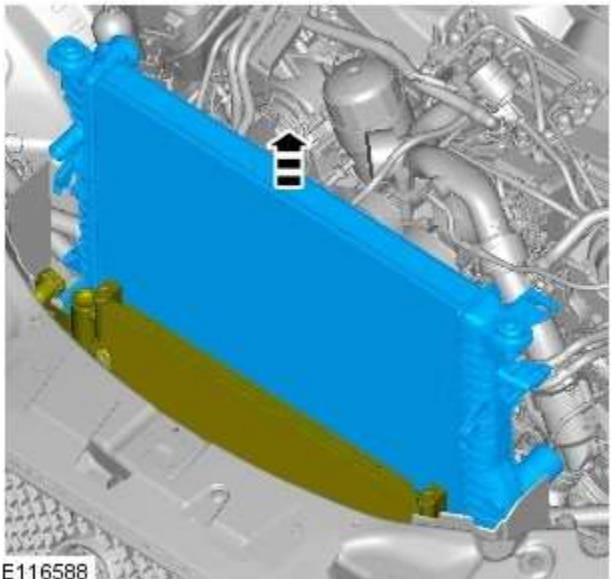


20. Torque: 7 Nm




E116586

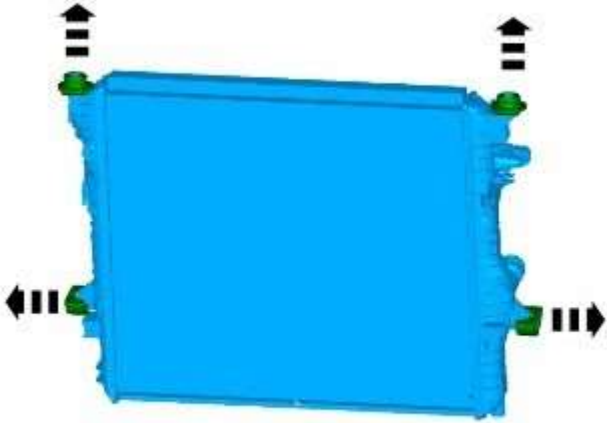
21.  NOTE: Support the air conditioning (A/C) condenser.
Torque: 7 Nm



E116588

22.  CAUTION: Be prepared to collect escaping coolant.

23.  NOTE: Do not disassemble further if the component is removed for access only.



E116403

- 24.



E114649

Installation

1. To install, reverse the removal procedure.

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Thermostat Housing Vehicles With: Supercharger

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

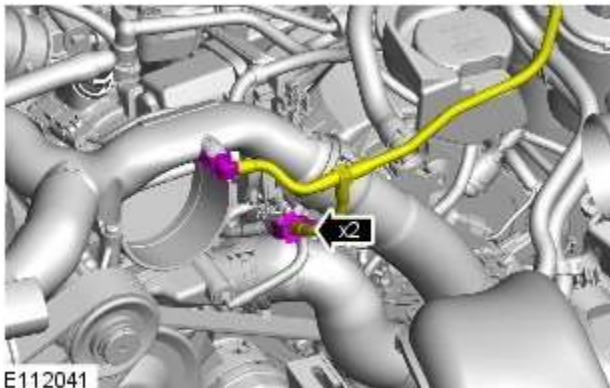
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.

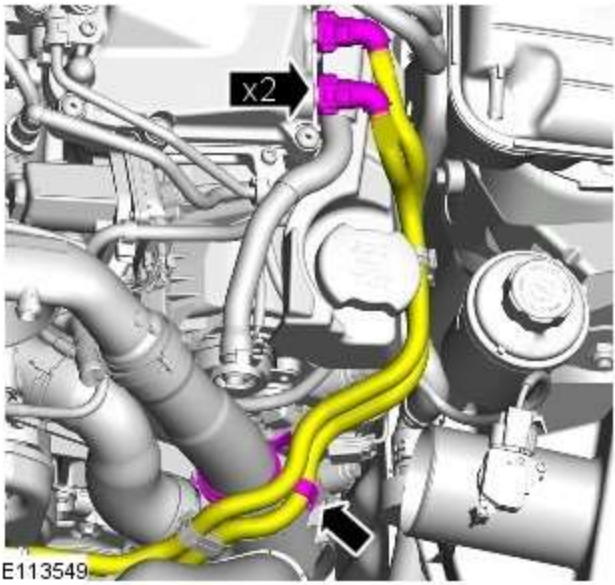
Raise and support the vehicle.


3. Refer to: [Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).
4. Refer to: [Air Cleaner Outlet Pipe T-Connector](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
5. Refer to: [Air Cleaner Outlet Pipe LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
6. Refer to: [Air Cleaner LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

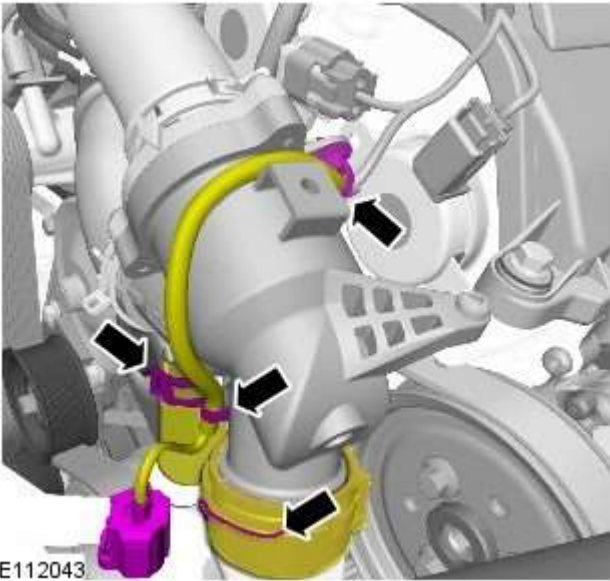



7. **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.

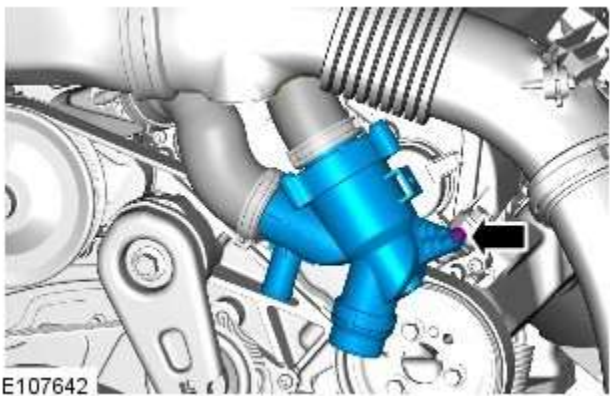
E112041




8.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

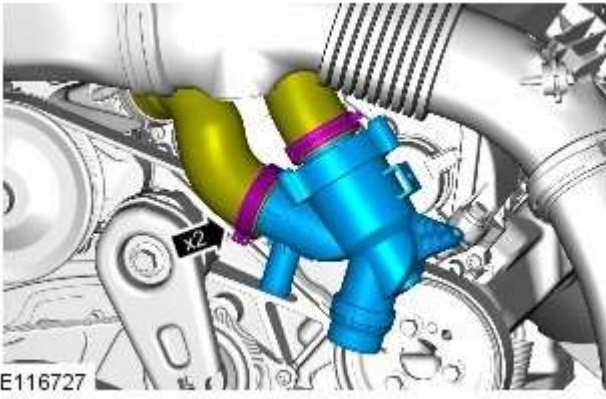



9.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



10.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 10 Nm



11.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

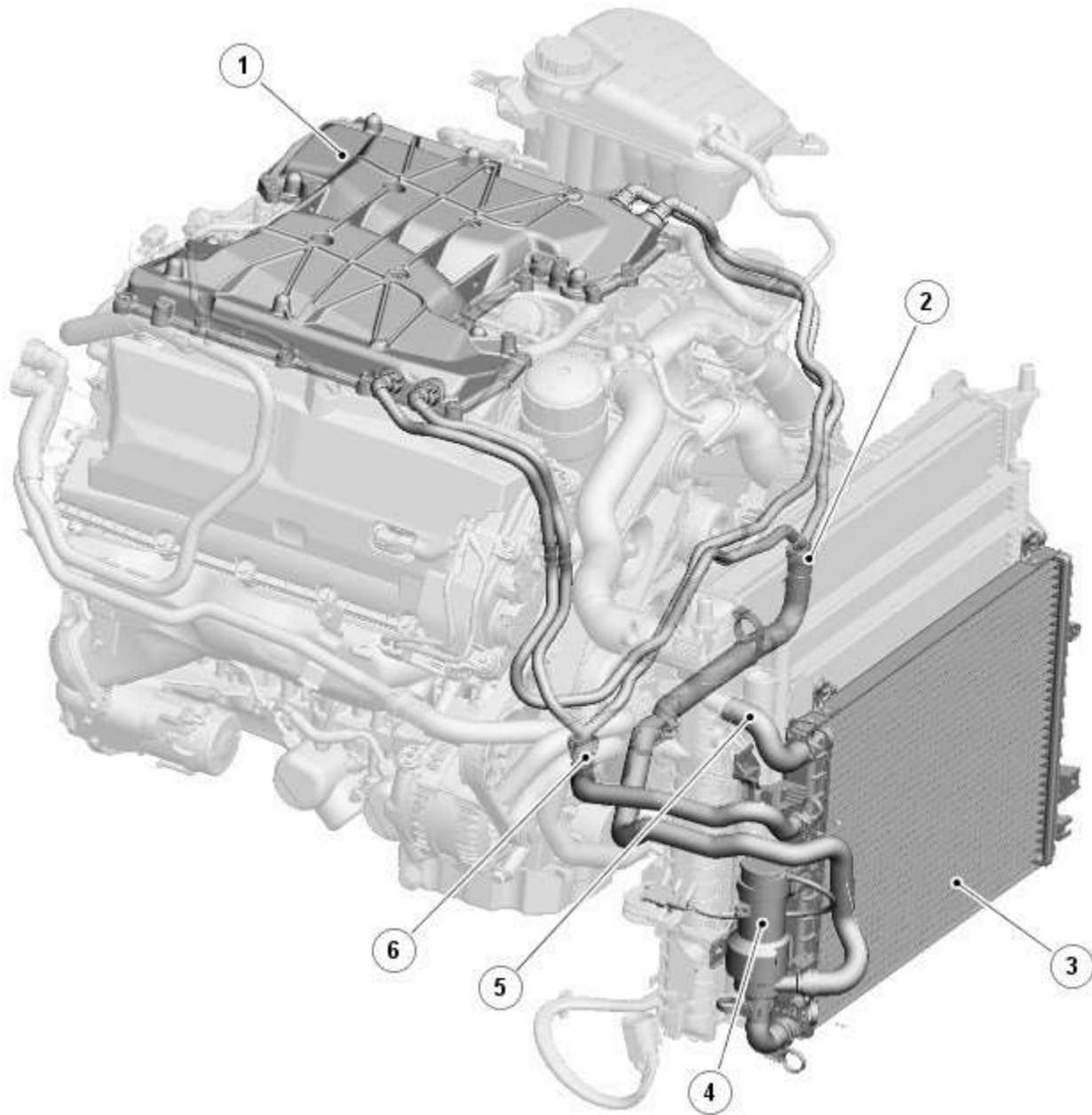
1. To install, reverse the removal procedure.

Supercharger Cooling - V8 S/C 5.0L Petrol - Supercharger Cooling -

Component Location

Description and Operation

COMPONENT LOCATION



E118001

Item	Description
1	Intake manifold assemblies
2	Supply hoses to charge air coolers
3	Charge air radiator
4	Charge air coolant pump
5	Engine cooling system connecting hose
6	Return hoses from charge air coolers

Supercharger Cooling - V8 S/C 5.0L Petrol - Supercharger Cooling -

Overview

Description and Operation

OVERVIEW

The supercharger cooling system cools the pressurized charge air from the supercharger. The supercharger cooling system consists of:

- A charge air coolant pump.
- A charge air radiator.
- Two charge air coolers.
- Connecting hoses and pipes.

The supercharger cooling system is operationally independent of the engine cooling system, but connected to it by a hose installed between the charge air radiator and the radiator of the engine cooling system. The connection with the engine cooling system accommodates thermal expansion and retraction of the coolant in the supercharger cooling system, and enables filling and draining of the supercharger cooling system.

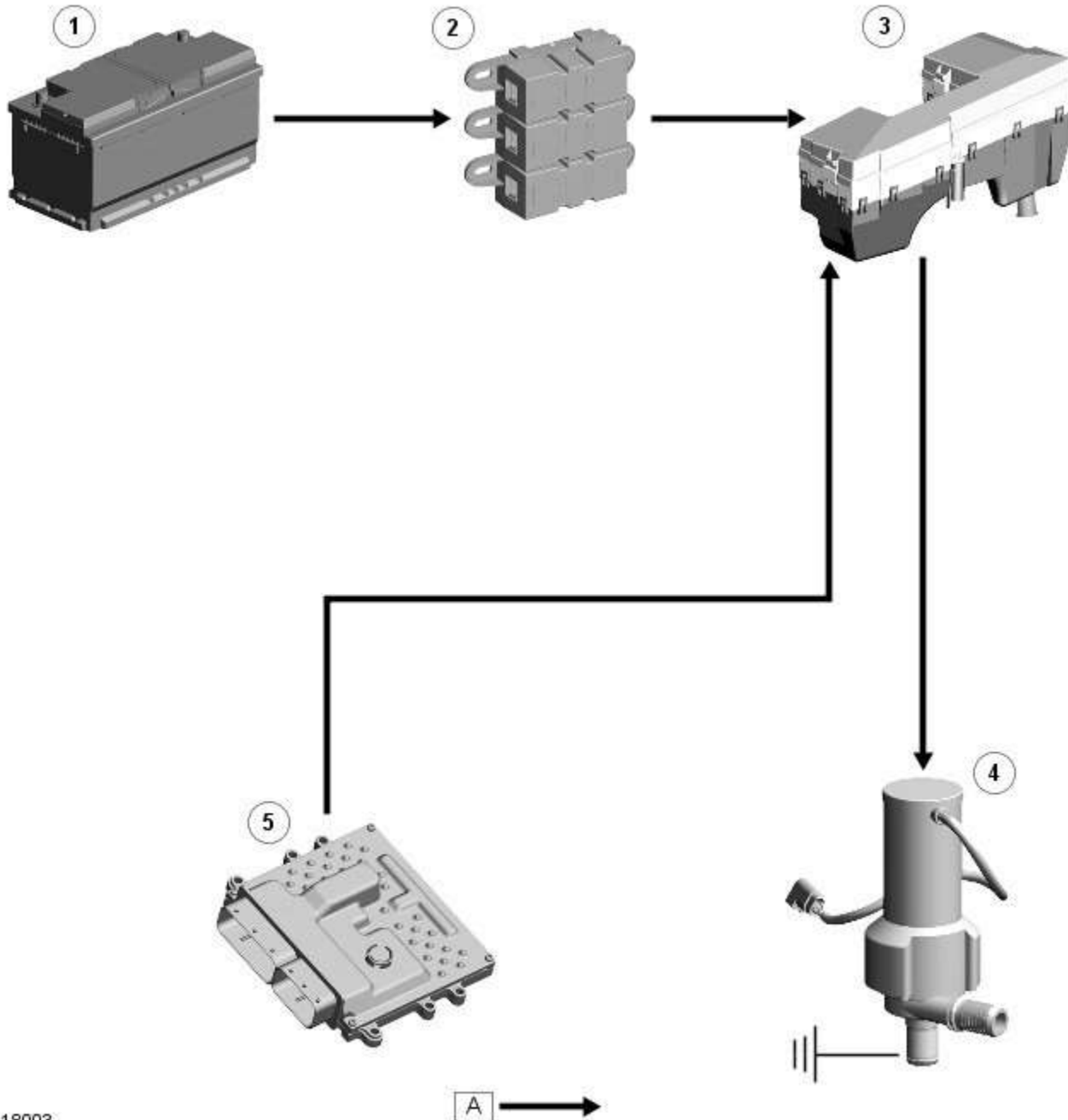
Supercharger Cooling - V8 S/C 5.0L Petrol - Supercharger Cooling - System Operation and Component Description

Description and Operation

Control Diagram



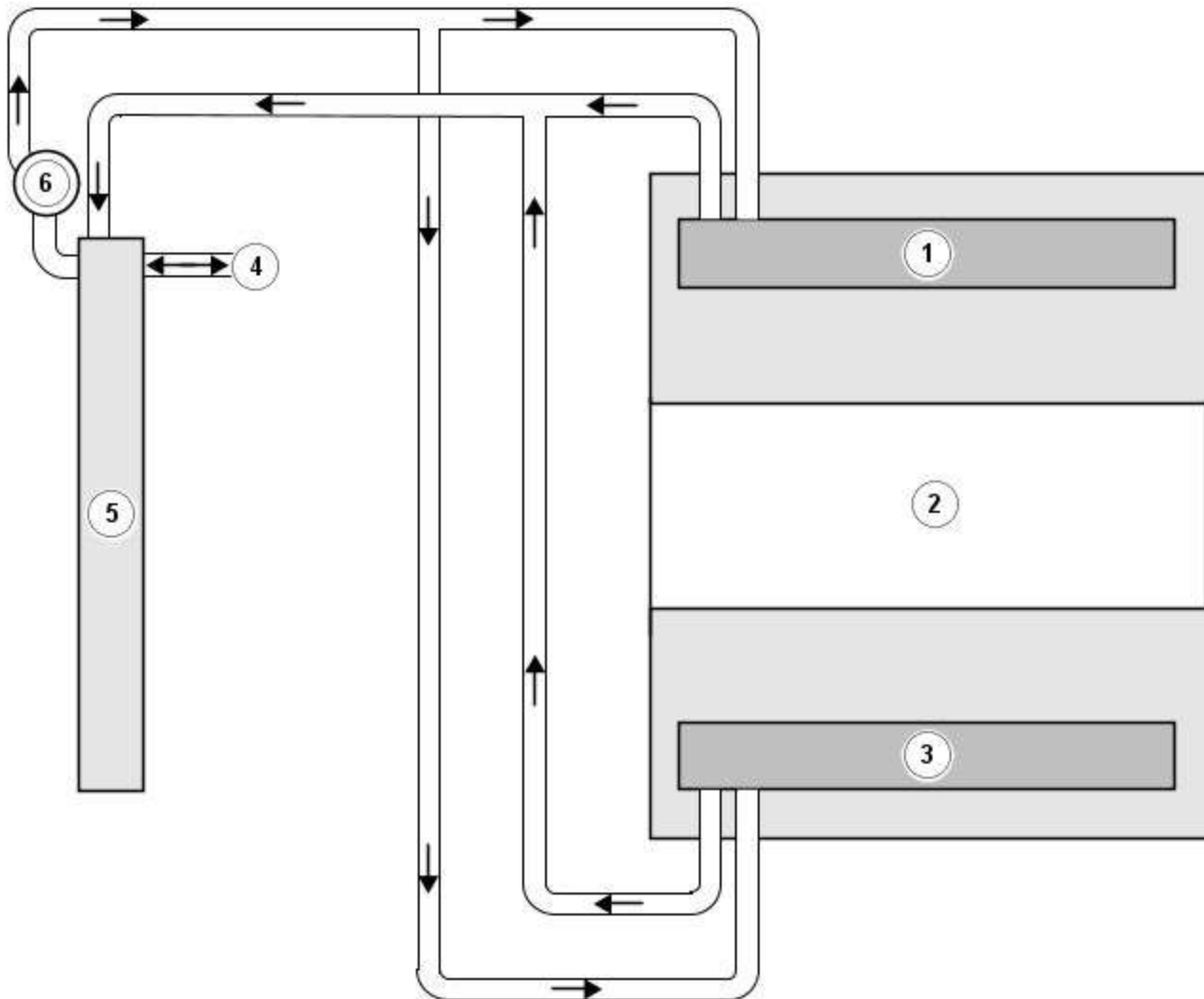
NOTE: A = Hardwired



E118003

Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse)
3	EJB (engine junction box)
4	Charge air coolant pump
5	ECM (engine control module)

Supercharger Cooling Flow Diagram



E115071

Item	Description
1	RH (right hand) charge air cooler
2	Engine
3	LH (left hand) charge air cooler
4	Expansion hose connection (with engine cooling system)
5	Charge air radiator
6	Charge air coolant pump

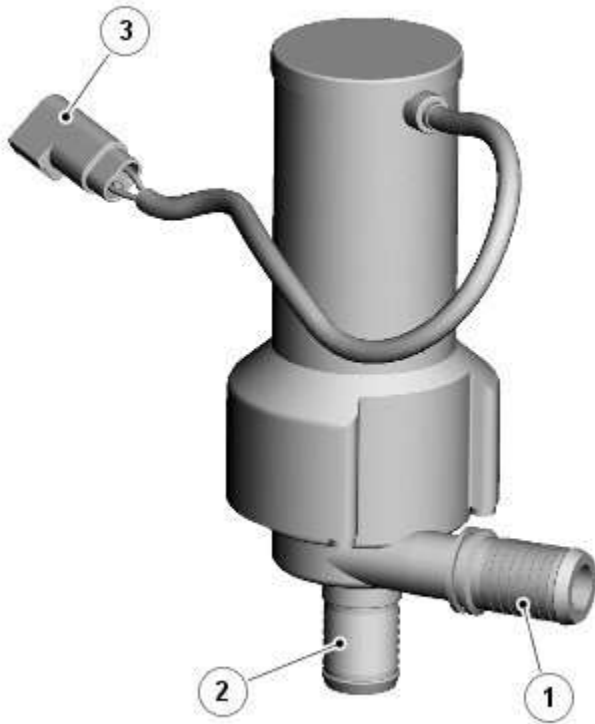
System Operation

Electrical power for the charge air coolant pump is supplied from the intercooler water pump relay in the power distribution box. When the intercooler water pump relay is energized, it connects power from the battery, via the [BJB \(battery junction box\)](#) and [CJB \(central junction box\)](#), to the charge air coolant pump. Operation of the intercooler water pump relay is controlled by the [ECM \(engine control module\)](#). The intercooler water pump relay is energized continuously while the ignition is in power mode 6.

When the charge air coolant pump is running, coolant flows from the pump outlet through the charge air coolers, the charge air radiator and back to the pump inlet.

Component Description

CHARGE AIR COOLANT PUMP

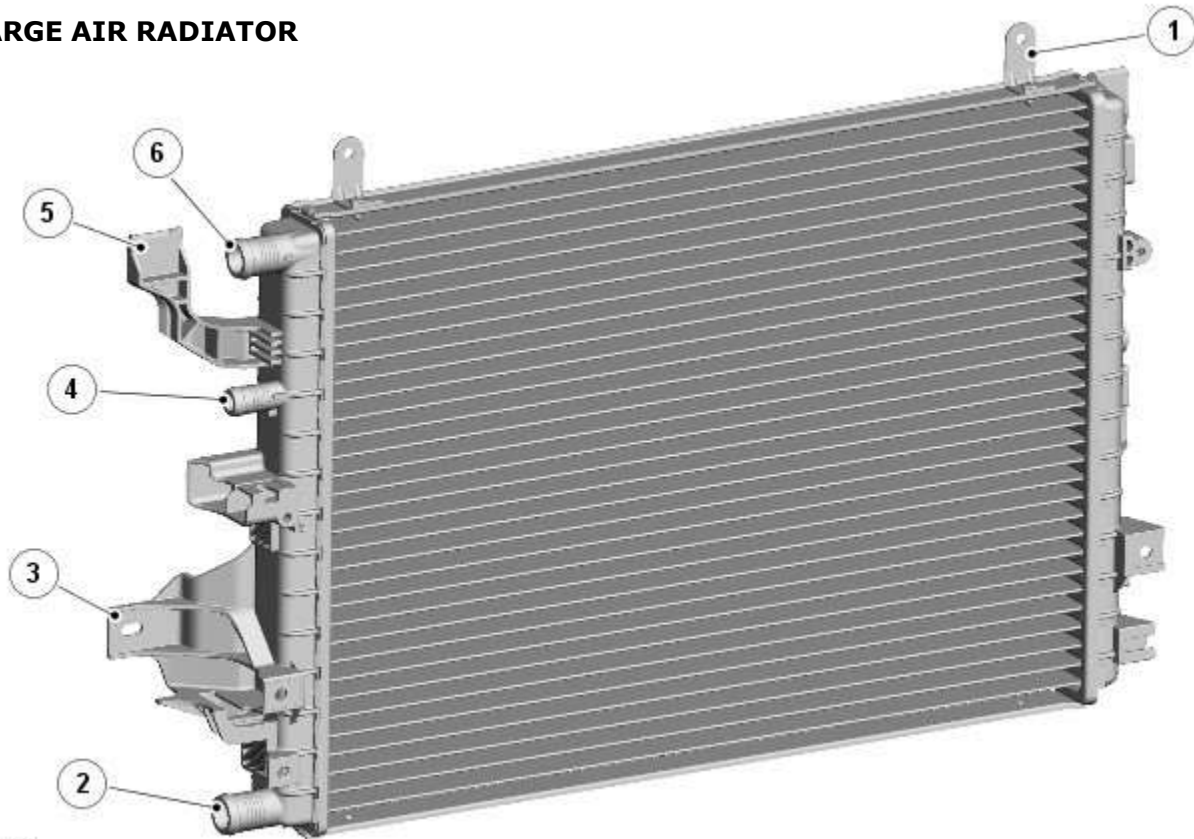


E98150

Item	Description
1	Coolant outlet connection
2	Coolant inlet connection
3	Electrical connector

The charge air coolant pump is an electric pump attached to the **RH (right-hand)** side of the charge air radiator. Hoses connect the inlet of the charge air coolant pump to the charge air radiator, and the outlet to the charge air coolers. An electrical connector provides the interface between the motor of the charge air coolant pump and the vehicle wiring.

CHARGE AIR RADIATOR



E115069

Item	Description
1	Pipe clip bracket (2 off)
2	Coolant outlet connection
3	Lower attachment bracket (2 off)
4	Coolant inlet connection
5	Upper attachment bracket (2 off)
6	Expansion hose connection (with engine cooling system)

The charge air radiator is a cross flow type with an aluminum core and plastic end tanks. The charge air radiator is installed in the cooling module, in front of the [A/C \(air conditioning\)](#) condenser. Brackets on the end tanks attach the charge air radiator to the front of the engine cooling system radiator.

The [RH](#) end tank incorporates the coolant inlet and outlet connections, and a connection for the hose to the engine cooling system. Hoses connect the inlet of the charge air radiator to the charge air coolers, and the outlet to the charge air coolant pump.

CHARGE AIR COOLERS

A charge air cooler is installed in each intake manifold.

Refer to: [Intake Air Distribution and Filtering](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Description and Operation).

Supercharger Cooling - V8 S/C 5.0L Petrol - Radiator

Removal and Installation

Removal



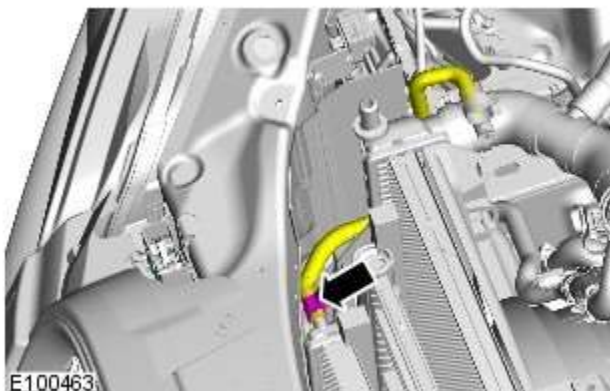
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Air Cleaner LH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).
3. Refer to: [Air Cleaner RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

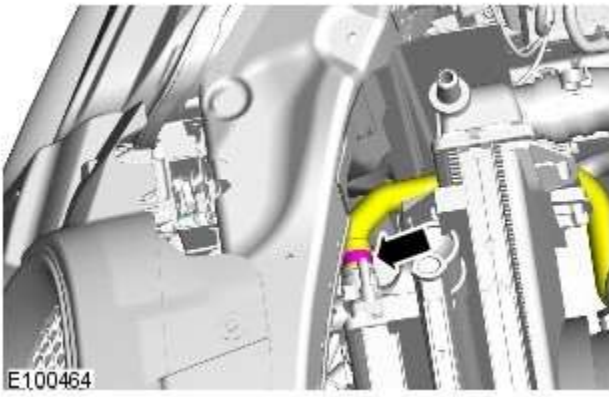


4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.


Torque: 9 Nm



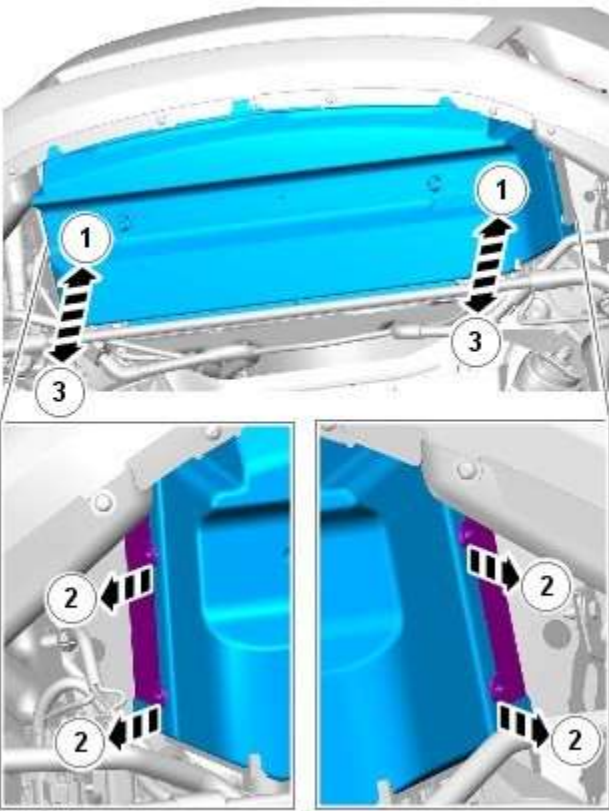
5.  CAUTION: Be prepared to collect escaping coolant.



6.

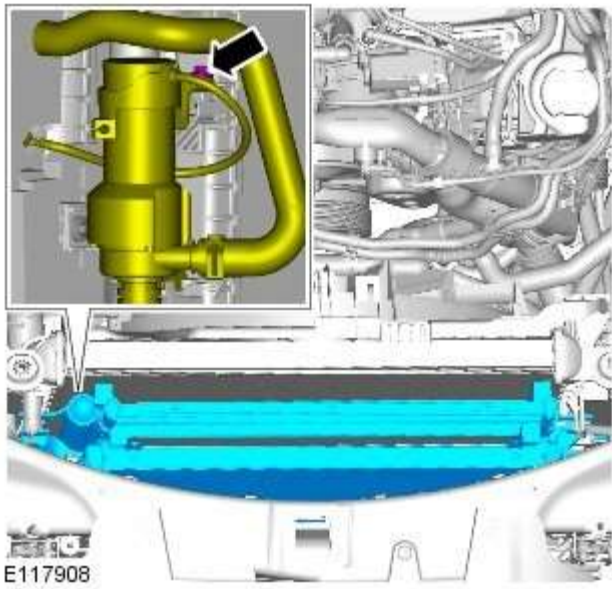
7.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

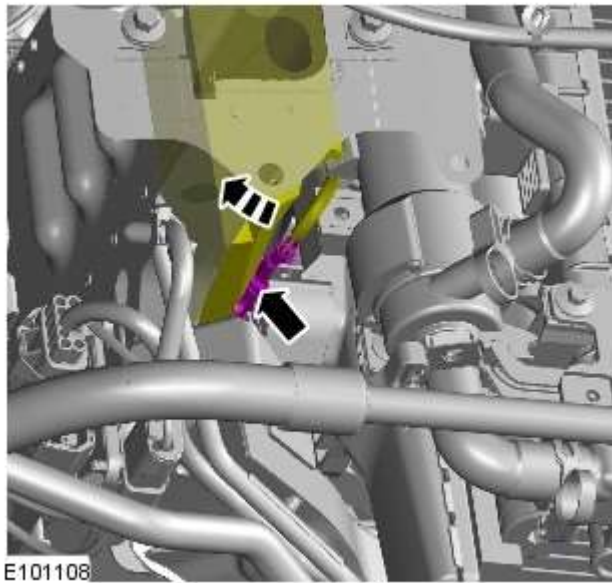


8. **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.

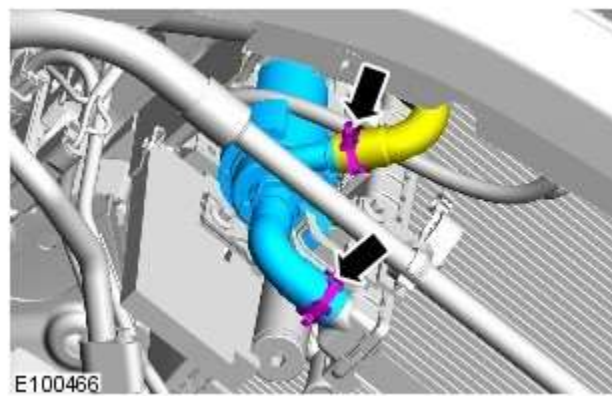
9. Refer to: [Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).



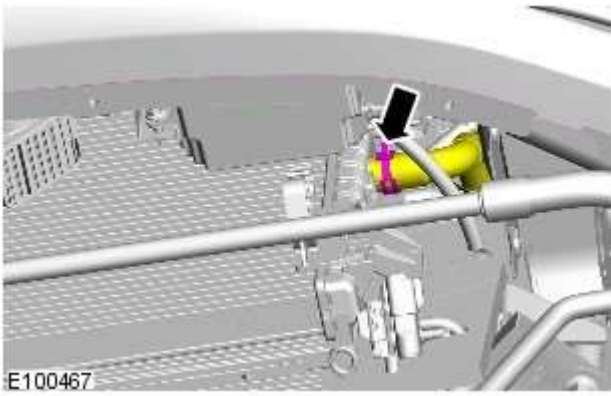
10. Torque: 7 Nm



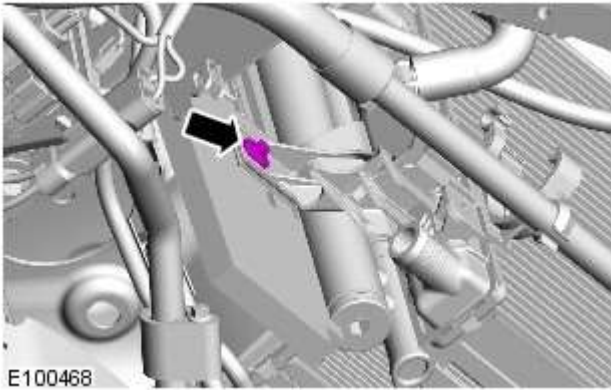
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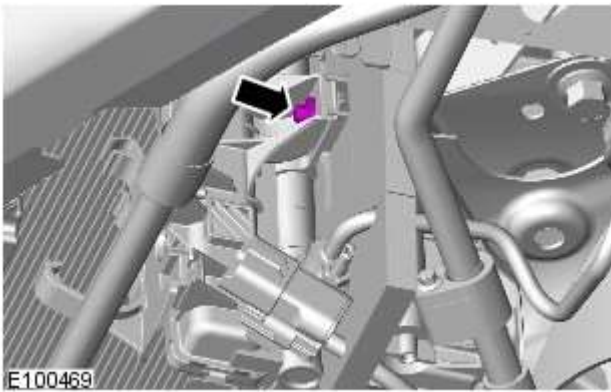
12.  CAUTION: Be prepared to collect escaping coolant.



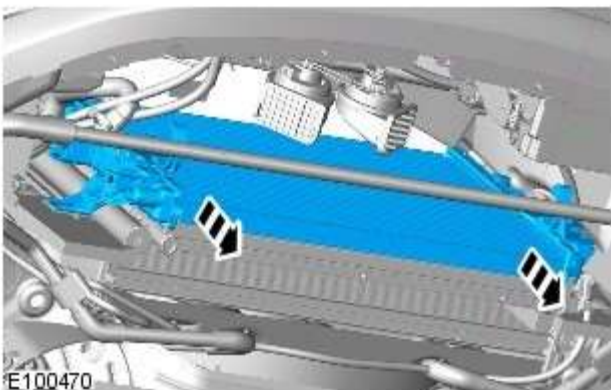
13.



14.  NOTE: Support the air conditioning (A/C) condenser.
Torque: 7 Nm



15. Torque: 7 Nm



16.  CAUTION: Be prepared to collect escaping coolant.

Installation

1. To install, reverse the removal procedure.
www.JagDocs.com

Fuel Charging and Controls - V8 S/C 5.0L Petrol -

WARNINGS:



Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.



Before any work is carried out on the fuel system, ground the vehicle to earth and maintain the ground connection until the work is complete.



CAUTION: Before disconnecting or removing components, make sure the area around the joint faces and connections are clean. Plug open connections to prevent contamination.



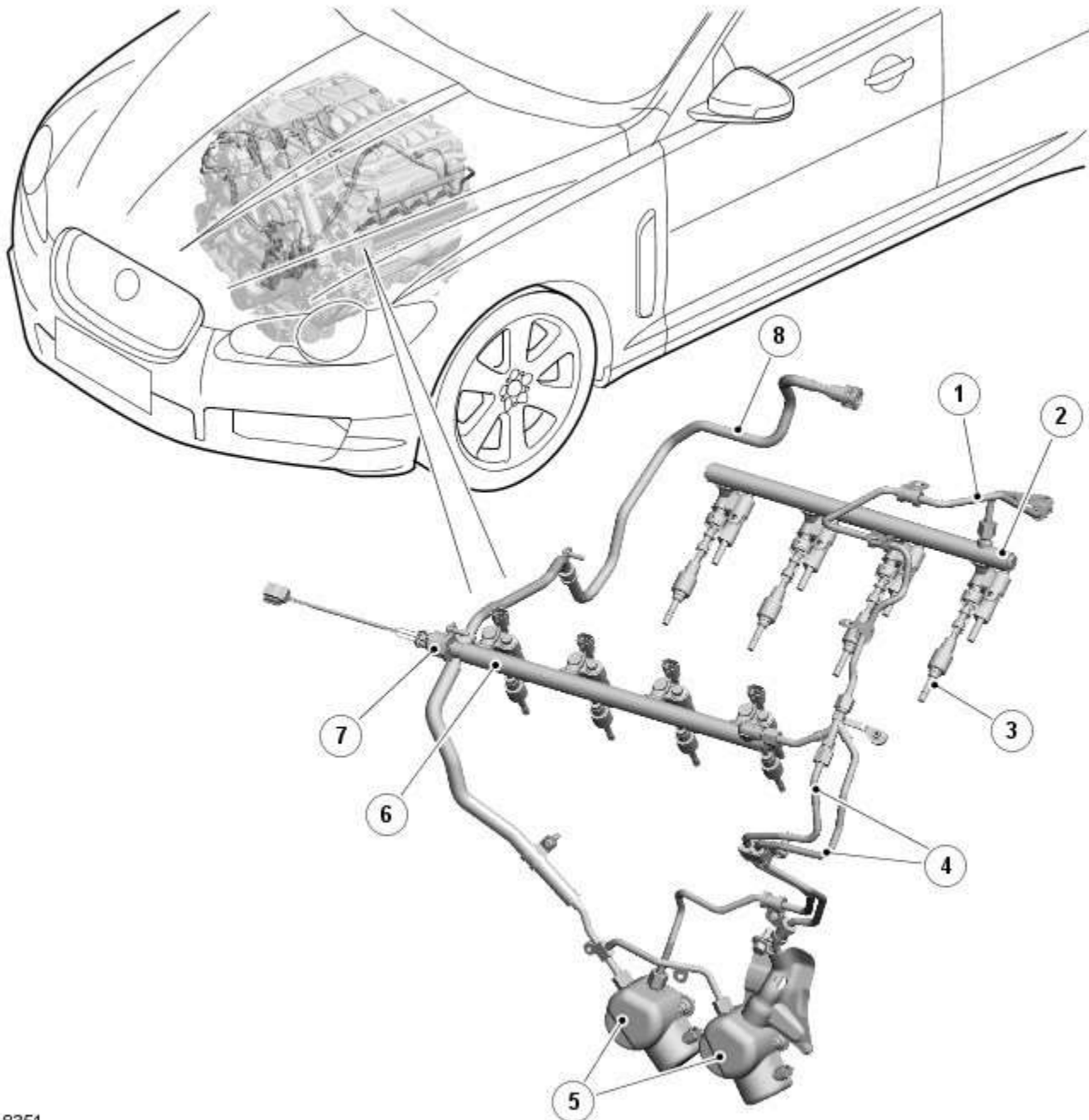
NOTE: Tighten the fuel rail high pressure fuel pump fuel line unions and fuel rail crossover pipe unions as it is instructed in service manual.

Description	Nm	lb-ft	lb-in
Ignition coil-on-plugs retaining bolts	7	-	62
Spark plugs	20	15	-
Fuel rail retaining bolt	Stage 1 - 20 Stage 2 - 30	Stage 1 - 15 Stage 2 - 22	-
Fuel rail crossover pipe unions	21	15	-
Fuel rail crossover pipe retaining bolts	12	9	-
Fuel pressure regulator	33	24	-
Fuel rail high pressure fuel pump fuel line unions	21	15	-
Fuel rail high pressure fuel pump fuel line M8 bolt	25	18	-
Fuel rail high pressure fuel pump fuel line M6 bolt	11	8	-
Fuel rail high pressure fuel pump fuel line M5 nut	6	-	53
Fuel rail high pressure fuel pump fuel line shield M10 bolt	29	21	-
Fuel rail high-pressure fuel pump fuel line shield M6 bolt	11	8	-
Fuel rail high pressure fuel pump torx bolts	12	9	-
Throttle body retaining bolts	10	7	-
Accessory drive belt idler pulley retaining bolts	25	18	-
Steering gear retaining bolts	100	74	-
Steering column lower universal joint assembly bolts	35	26	-
Coolant expansion tank retaining bolt	10	7	-
Engine compartment brace retaining bolts	45	33	-

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Fuel Charging and Controls - Component Location

Description and Operation

COMPONENT LOCATION



E118351

Item	Description
1	Crossover tube
2	LH (left hand) fuel rail
3	Fuel injector (8 off)
4	HP (high pressure) fuel lines
5	HP fuel pumps and covers
6	RH (right hand) fuel rail
7	FRP (fuel rail pressure) sensor
8	LP (low pressure) fuel lines

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Fuel Charging and Controls - Overview

Description and Operation

OVERVIEW

The fuel charging and controls system is a gasoline DI (direct injection) system controlled by the [ECM \(engine control module\)](#).

The fuel charging and controls system consists of:

- LP and HP fuel lines.
- Two HP fuel pumps.
- Two fuel rails and a crossover tube.
- A [FRP \(fuel rail pressure\)](#) sensor.
- Eight fuel injectors.

LP fuel from the pump in the fuel tank is pressurized by the HP fuel pumps and supplied to the fuel injectors via the fuel rails and crossover tube. The [ECM](#) controls the fuel injectors and HP fuel pumps to inject the required volume of fuel into the combustion chambers.

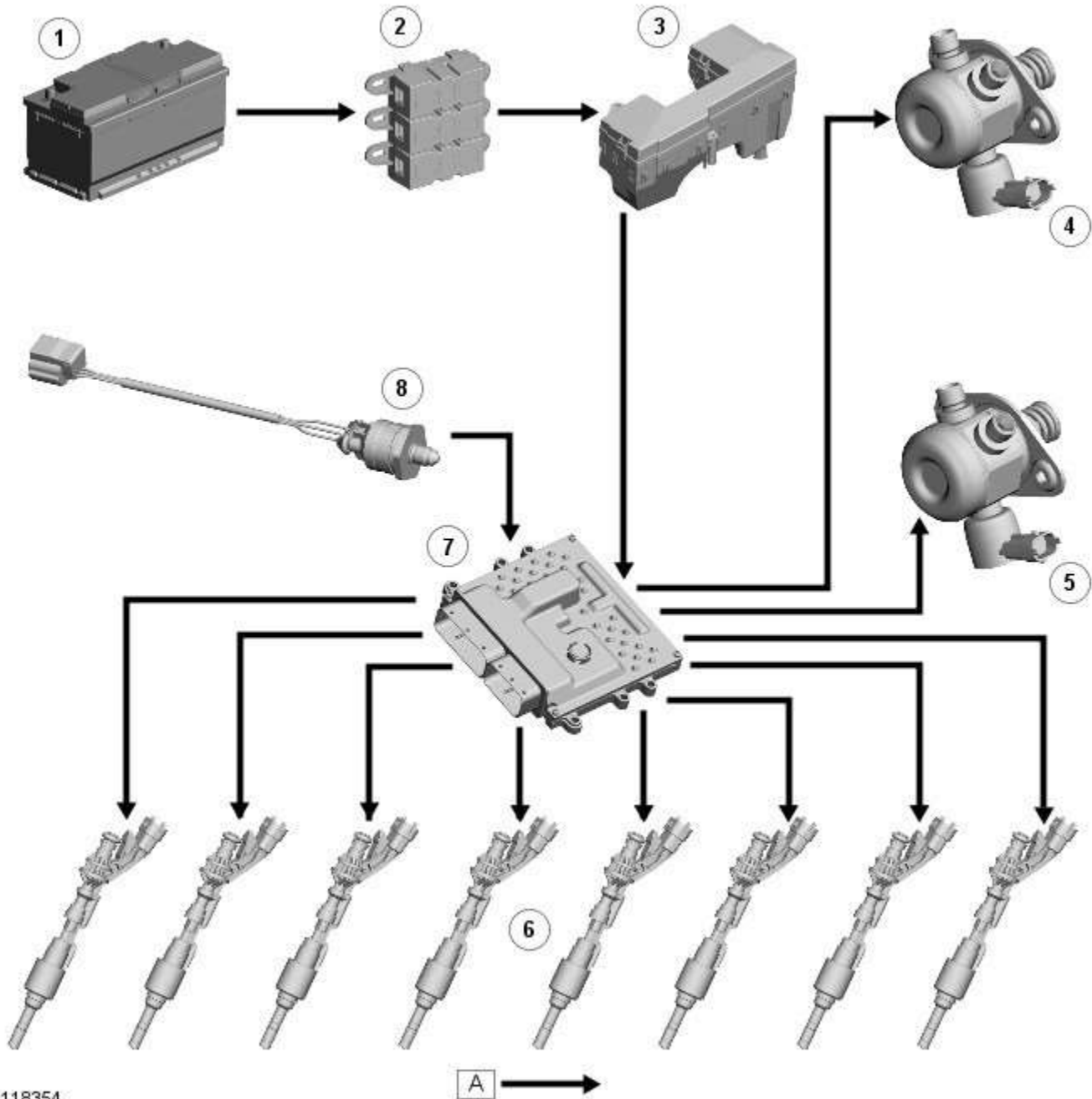
Fuel Charging and Controls - V8 S/C 5.0L Petrol - Fuel Charging and Controls - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired



E118354

Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse)
3	EJB (engine junction box)
4	No. 1 HP fuel pump
5	No. 2 HP fuel pump
6	Fuel injectors
7	ECM
8	FRP sensor

System Operation

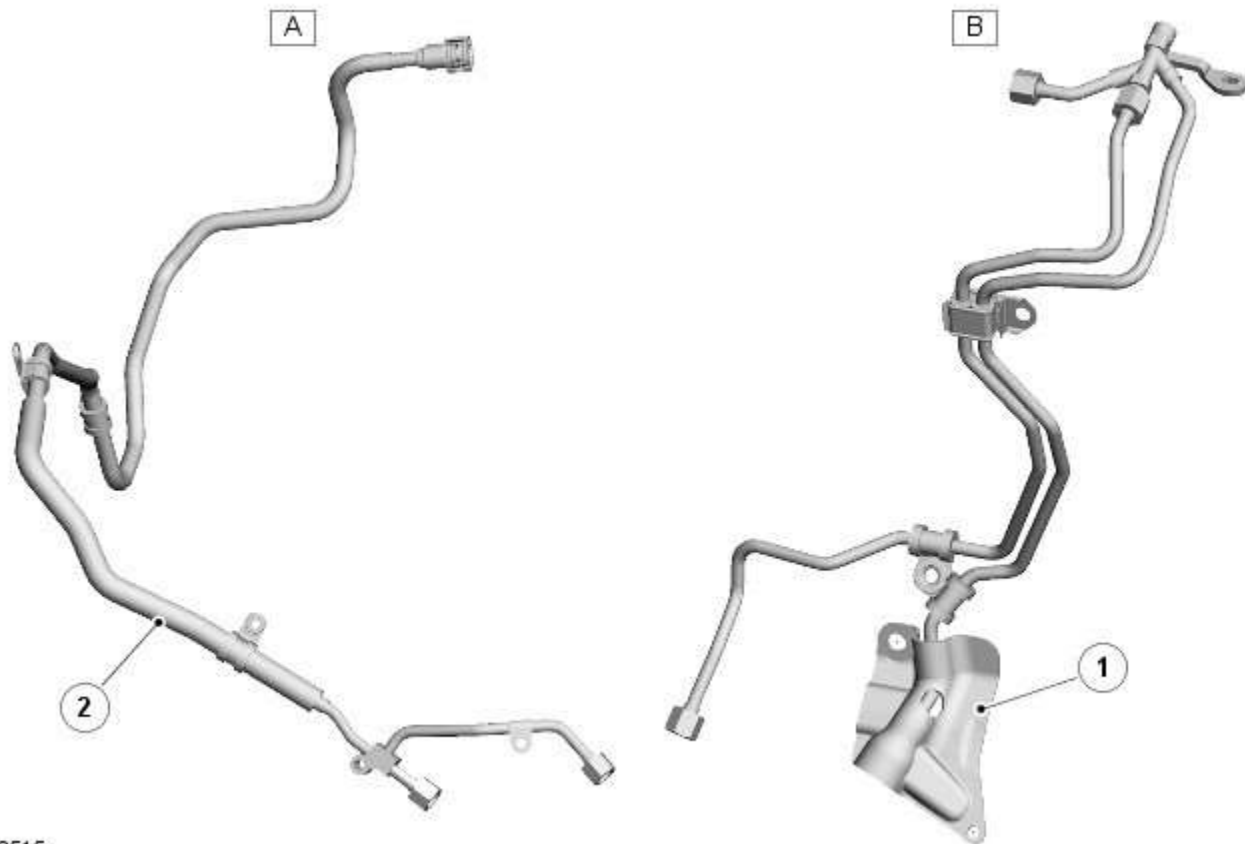
GENERAL

The **ECM (engine control module)** controls the output from the HP fuel pumps to deliver the required volume of fuel at pressures up to 150 bar (2175 lbf/in²).

The **ECM** uses the signal from the **FRP (fuel rail pressure)** sensor to calculate the time the fuel injectors need to be energized to deliver the correct mass of fuel to the combustion chambers.

Component Description

LOW AND HIGH PRESSURE FUEL LINES



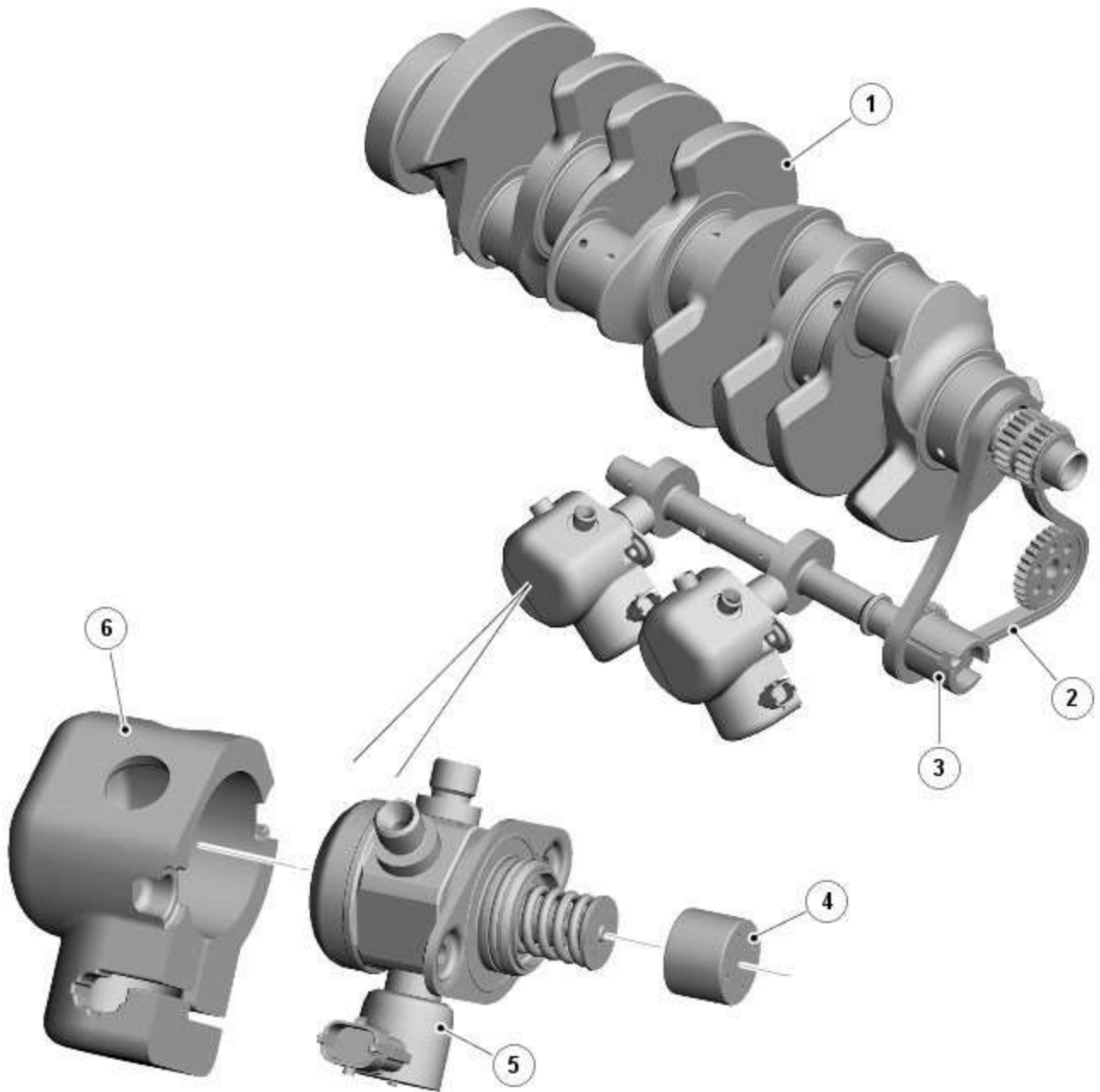
E113515

Item	Description
A	LP fuel lines
B	HP fuel lines
1	Acoustic cover
2	Heat reflective and insulation sleeves

The LP fuel line connects the HP fuel pumps to the fuel delivery line from the fuel tank and lines system. A quick release connector at the start of the LP fuel line is held in a clip integrated into the **LH (left-hand)** ignition coils cover. P-clips secure the LP fuel line to the rear of each cylinder head and to the **RH (right-hand)** side of the cylinder block. A heat reflective and insulation sleeves are installed on the LP fuel line where it runs behind the **RH** exhaust manifold.

The HP fuel lines connect the HP fuel pumps to the **RH** fuel rail and the crossover tube. Two P-clips and a pipe clamp attach the HP fuel lines to the cylinder block and the **RH** cylinder head respectively. An integral bracket on the front HP fuel line is attached to a stud on the front-upper **RH** timing cover. An acoustic cover is installed on the bottom of the front HP fuel line.

HIGH PRESSURE FUEL PUMPS



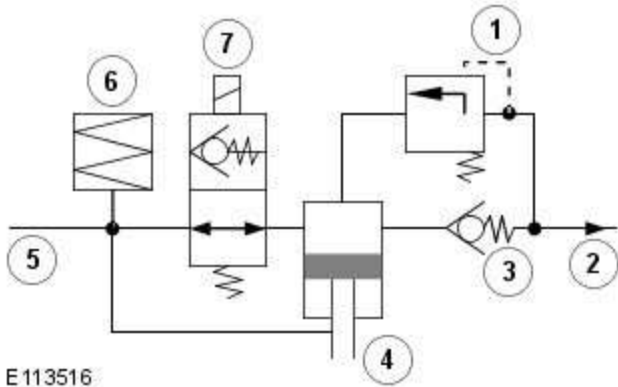
E114701

Item	Description
1	Crankshaft
2	Auxiliary drive chain
3	Auxiliary camshaft
4	Tappet
5	HP fuel pump
6	Acoustic cover

The two HP fuel pumps are identical mechanically-driven pumps installed on the **RH** side of the sump body, behind the generator. An O-ring seals each of the HP fuel pumps in the sump body. The rear HP fuel pump is identified as No. 1 pump; the front HP fuel pump is identified as No. 2 pump. An acoustic cover is installed on each of the HP fuel pumps.

The HP fuel pumps are single-plunger pumps. The plunger of each pump extends through the sump body and the carrier of the auxiliary camshaft. A tappet on the end of each plunger is operated by a two-lobe cam on the auxiliary camshaft. A spring installed on the outside of the plunger ensures the plunger and tappet remain in contact with the cam.

The auxiliary camshaft is driven by the crankshaft, via the auxiliary drive chain, at engine speed. The auxiliary camshaft is timed to match the pump delivery strokes with crankshaft position.



E113516

Item	Description
1	PRV (pressure relief valve)
2	To HP fuel lines
3	Check valve
4	Plunger
5	From LP fuel lines
6	Damper chamber
7	Fuel metering valve

In addition to the plunger, each HP fuel pump contains:

- A damper chamber.
- A fuel metering valve.
- A check valve.
- A PRV.

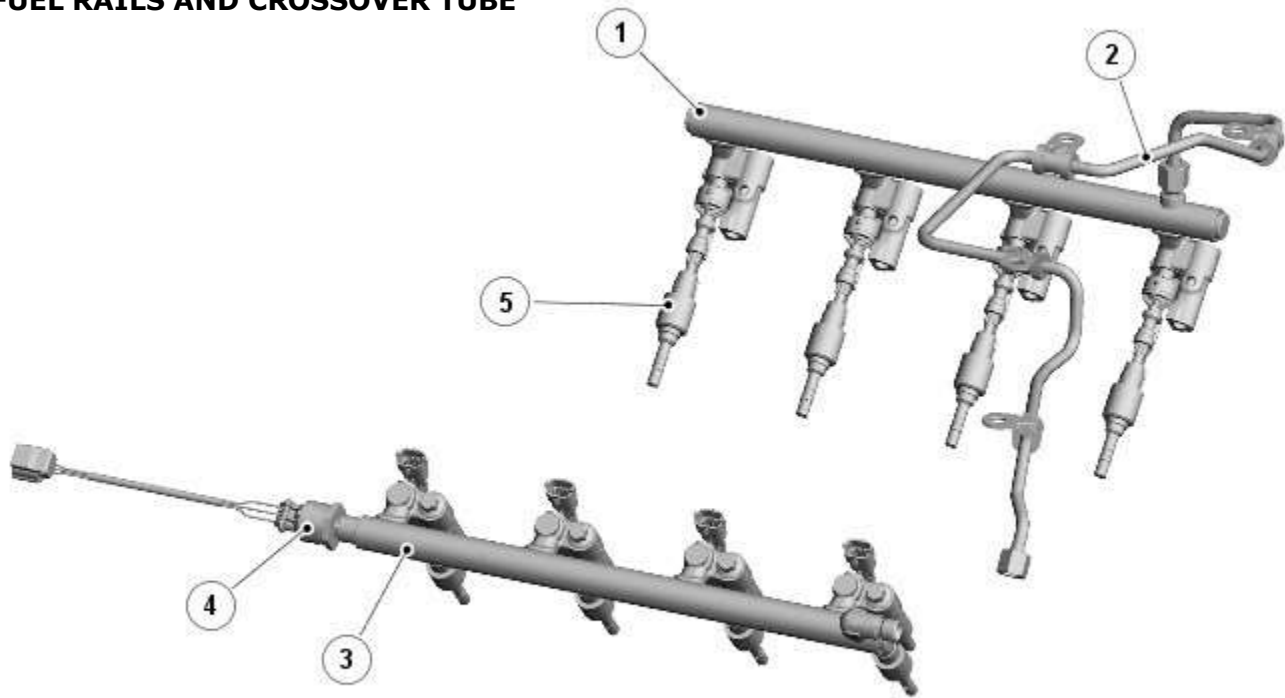
The damper absorbs pressure pulses from the plunger when the fuel metering valve is open at the start of the delivery stroke.

The fuel metering valve regulates the output pressure from the HP fuel pump. The fuel metering valve is a normally open solenoid valve controlled by the [ECM](#). During the inlet stroke of the plunger the fuel metering valve is de-energized, which allows LP fuel into the pumping chamber. The [ECM](#) energizes the fuel metering valve closed during the delivery stroke of the plunger, which forces the fuel in the pumping chamber through the check valve into the HP lines. By changing the closing point of the fuel metering valve, the [ECM](#) can determine the volume of fuel output during the delivery stroke, and thus the pressure in the HP side of the system.

The check valve prevents the return of HP fuel to the pumping chamber during the inlet stroke of the plunger.

The PRV protects the HP side of the system from excessive pressure if there is a failure of the fuel metering valve. If the pump delivery pressure increases to 195 - 204 bar (2828 - 2959 lbf/in²), the PRV opens and returns fuel to the inlet side of the plunger.

FUEL RAILS AND CROSSOVER TUBE



E113517

Item	Description
1	LH fuel rail
2	Crossover tube
3	RH fuel rail
4	FRP sensor
5	Fuel injector (8 off)

The fuel rails and crossover tube are made from stainless steel. Bolts attach each fuel rail to the related cylinder head. The crossover tube connects the front high pressure line to the [LH](#) fuel rail, which ensures there is equal pressure in the two fuel rails. Four P-clips attach the crossover tube to the intercooler-tank top.

The rear of the [RH](#) fuel rail incorporates a threaded boss for installation of the [FRP](#) sensor.

FUEL RAIL PRESSURE SENSOR

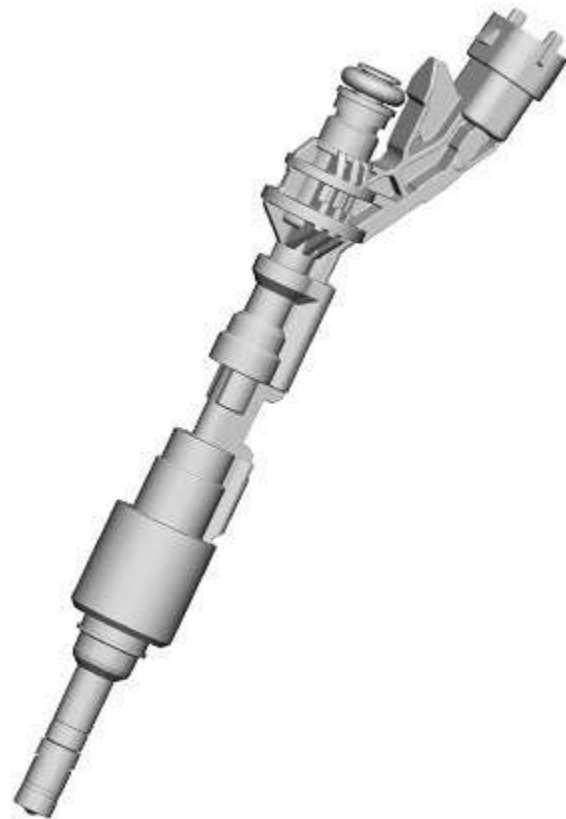


E113518

The [FRP](#) sensor provides the [ECM](#) with a continuous signal of fuel rail pressure. The [FRP](#) sensor is installed in the rear of the [RH](#) fuel rail. The [FRP](#) sensor is screwed into a threaded boss in the fuel rail. A flying lead and three pin connector provides the interface with the engine harness.

The [FRP](#) sensor contains a steel diaphragm fitted with strain gages, which are incorporated into a Wheatstone bridge. The output from the Wheatstone bridge is processed by the [ECM](#) to derive a pressure value.

FUEL INJECTORS



E113519

The fuel injectors spray fuel from the fuel rail directly into the combustion chambers. The fuel injectors are installed close to the center of the combustion chambers, between the inlet and exhaust valves and next to the spark plug.

The fuel injectors are a push fit in the fuel rails and the cylinder heads. On each fuel injector, a rubber O-ring seals the head of the fuel injector in the fuel rail. A teflon ring seals the nozzle of the fuel injector in the cylinder head. A clamp locks each fuel injector to the fuel rail.

Each fuel injector contains a solenoid-operated needle valve, which opens when the solenoid winding is energized. While the needle valve is open, fuel is sprayed into the combustion chamber. The solenoid winding is connected to a power feed and a ground from the [ECM](#), which operates the fuel injectors with a two stage power supply. Initially the [ECM](#) supplies the fuel injectors with 65 V, then once the boost current reaches 11 A the power supply is switched to battery voltage. The [ECM](#) meters the amount of fuel injected into the combustion chambers by adjusting the time that the solenoid winding is energized.

There are six holes around the tip of the nozzle through which the fuel is sprayed. Two of the holes direct fuel below the spark plug. The other four holes direct fuel evenly around the remainder of the combustion chamber.

If a fuel injector fails, the engine will suffer from unstable idle speed, poor [NVH \(noise, vibration and harshness\)](#) and poor emissions performance.

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Fuel Charging and Controls

Diagnosis and Testing

Principles of Operation

For a detailed description of the fuel charging and controls system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to:

[Fuel Charging and Controls](#) (303-04D Fuel Charging and Controls - V8 5.0L Petrol, Description and Operation),
[Fuel Charging and Controls](#) (303-04D Fuel Charging and Controls - V8 5.0L Petrol, Description and Operation),
[Fuel Charging and Controls](#) (303-04D Fuel Charging and Controls - V8 5.0L Petrol, Description and Operation),
[Fuel Charging and Controls](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Description and Operation),
[Fuel Charging and Controls](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Description and Operation),
[Fuel Charging and Controls](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.



NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Fuel level • Fuel leaks • Damaged fuel lines • Damaged push connect fittings • Fuel contamination/grade/quality • Throttle body • Damaged fuel tank filler pipe cap • Damaged fuel tank filler pipe 	<ul style="list-style-type: none"> • Fuses • Loose or corroded electrical connectors • Harnesses • Sensor(s) • Engine Control Module (ECM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Engine cranks, but does not fire	<ul style="list-style-type: none"> • Engine breather system disconnected/restricted • Ignition system • Fuel system • Electronic engine control 	Ensure the engine breather system is free from restriction and is correctly installed. Check for ignition system, fuel system and electronic engine control DTCs and refer to the relevant DTC Index
Engine cranks and fires, but will not start	<ul style="list-style-type: none"> • Evaporative emissions purge valve • Fuel pump • Spark plugs • HT short to ground (tracking) check rubber boots for cracks/damage • Ignition system 	Check for evaporative emissions, fuel system and ignition system related DTCs and refer to the relevant DTC Index
Difficult cold start	<ul style="list-style-type: none"> • Engine coolant level/anti-freeze content • Battery • Electronic engine controls • Exhaust Gas Recirculation (EGR) valve stuck open • Fuel pump 	Check the engine coolant level and condition. Ensure the battery is in a fully charged and serviceable condition. Check for electronic engine controls, engine emissions, fuel system and evaporative emissions system related DTCs and refer to the relevant DTC Index

Symptom	Possible Causes	Action
	<ul style="list-style-type: none"> Purge valve 	
Difficult hot start	<ul style="list-style-type: none"> Injector leak Electronic engine control Purge valve Fuel pump Ignition system EGR valve stuck open 	Check for injector leak, install new injector as required. Check for electronic engine controls, evaporative emissions, fuel system, ignition system and engine emission system related DTCs and refer to the relevant DTC Index
Difficult to start after hot soak (vehicle standing, engine off, after engine has reached operating temperature)	<ul style="list-style-type: none"> Injector leak Electronic engine control Purge valve Fuel pump Ignition system EGR valve stuck open 	Check for injector leak, install new injector as required. Check for electronic engine controls, evaporative emissions, fuel system, ignition system and engine emission system related DTCs and refer to the relevant DTC Index
Engine stalls soon after start	<ul style="list-style-type: none"> Breather system disconnected/restricted ECM relay Electronic engine control Ignition system Air intake system restricted Air leakage Fuel lines 	Ensure the engine breather system is free from restriction and is correctly installed. Check for electronic engine control, ignition system and fuel system related DTCs and refer to the relevant DTC Index. Check for blockage in air filter element and air intake system. Check for air leakage in air intake system
Engine hesitates/poor acceleration	<ul style="list-style-type: none"> Fuel pressure, fuel pump, fuel lines Injector leak Air leakage Electronic engine control Throttle motor Restricted accelerator pedal travel (carpet, etc) Ignition system EGR valve stuck open Transmission malfunction 	Check for fuel system related DTCs and refer to the relevant DTC Index. Check for injector leak, install new injector as required. Check for air leakage in air intake system. Ensure accelerator pedal is free from restriction. Check for electronic engine controls, ignition, engine emission system and transmission related DTCs and refer to the relevant DTC Index
Engine backfires	<ul style="list-style-type: none"> Fuel pump/lines Air leakage Electronic engine controls Ignition system Sticking variable camshaft timing (VCT) hub 	Check for fuel system failures. Check for air leakage in intake air system. Check for electronic engine controls, ignition system and VCT system related DTCs and refer to the relevant DTC Index
Engine surges	<ul style="list-style-type: none"> Fuel pump/lines Electronic engine controls Throttle motor Ignition system 	Check for fuel system failures. Check for electronic engine controls, throttle system and ignition system related DTCs and refer to the relevant DTC Index
Engine detonates/knocks	<ul style="list-style-type: none"> Fuel pump/lines Air leakage Electronic engine controls Sticking VCT hub 	Check for fuel system failures. Check for air leakage in intake air system. Check for electronic engine controls and VCT system related DTCs and refer to the relevant DTC Index
No throttle response	<ul style="list-style-type: none"> Electronic engine controls Throttle motor 	Check for electronic engine controls and throttle system related DTCs and refer to the relevant DTC Index
Poor throttle response	<ul style="list-style-type: none"> Breather system disconnected/restricted Electronic engine control Transmission malfunction Traction control event Air leakage 	Ensure the engine breather system is free from restriction and is correctly installed. Check for electronic engine controls, transmission and traction control related DTCs and refer to the related DTC Index. Check for air leakage in intake air system

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged in the Engine Control Module (ECM), please refer to Section 303-14.

REFER to: [Electronic Engine Controls](#) (303-14C Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing) /

[Electronic Engine Controls](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Fuel Injection Component Cleaning

General Procedures

General Equipment

Pneumatic vacuum gun

Cleaning

WARNINGS:



Do not carry out any repairs to the fuel system with the engine running. Failure to follow this instruction may result in personal injury.



Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.



If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek immediate medical attention.



Place the vehicle in a well ventilated, quarantined area and arrange 'No Smoking/Petrol Fumes' signs about the vehicle.



Wash hands thoroughly after fuel handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.



Do not carry or operate cellular phones when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

CAUTIONS:



Before using the cleaning fluid, protect all electrical components and connectors with lint-free non-flocking material.



Make sure that all parts removed from the vehicle are placed on the lint-free non-flocking material.



Make sure that any protective clothing worn is clean and made from lint-free non-flocking material.



Make sure that clean non-plated tools are used. Clean tools using a new brush that will not lose its bristles, prior to starting work on the vehicle.



Use a steel topped workbench and cover it with clean, lint-free non-flocking material.



Make sure the workshop area in which the vehicle is being worked on is as clean and as dust free as possible. Foreign matter from work on clutches, brakes or from machining or welding operations can contaminate the fuel system and may result in later malfunction.

1. Using a new brush that will not lose its bristles, brush the components being removed and the surrounding area.
2. Using a pneumatic vacuum gun, remove all traces of foreign material.

General Equipment: [Pneumatic vacuum gun](#)

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Fuel Injectors

Removal and Installation

Removal

1. Refer to: [Fuel Rail RH](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Removal and Installation).




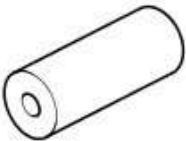
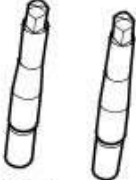
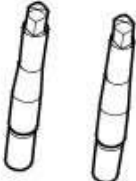
Installation

1. Refer to: [Fuel Rail RH](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Removal and Installation).

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Fuel Rail LH

Removal and Installation

Special Tool(s)

 <p>E115268</p>	<p>303-1450 Spark Plug Remover/Installer</p>
 <p>E114526</p>	<p>310-197 Remover, Fuel Injector</p>
 <p>E107680</p>	<p>310-198 Installer, Teflon Seal</p>
 <p>E107681</p>	<p>310-199 Re-shape Tool, Teflon Seal</p>
 <p>E 107682</p>	<p>310-200-01 Fuel Rail Installation Guide Pins - Threaded</p>
 <p>E 107682</p>	<p>310-200-02 Fuel Rail Installation Guide Pins - Unthreaded</p>


Removal



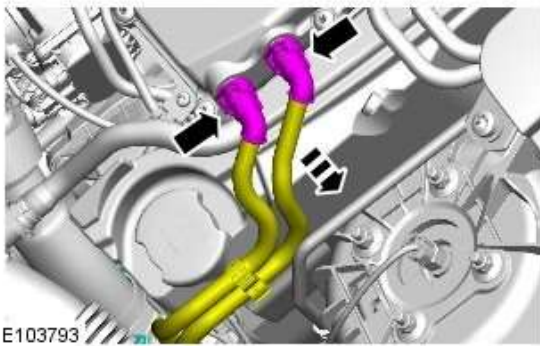
CAUTION: Make sure that tools and equipment are clean, free of foreign material and lubricant.

NOTES:

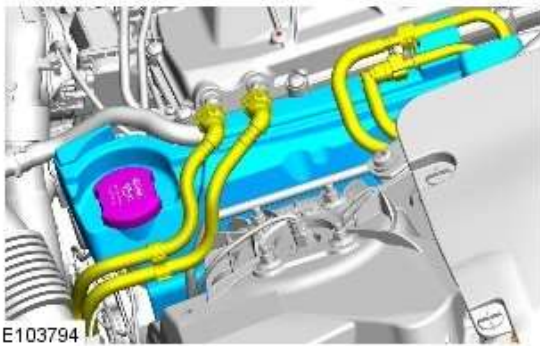
 Removal steps in this procedure may contain installation details.

 Some variation in the illustrations may occur, but the essential information is always correct.

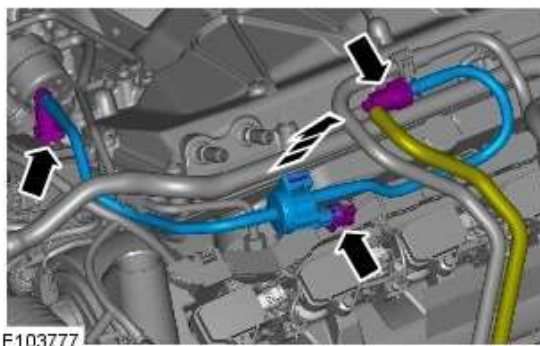
1. Refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: [Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (310-00 Fuel System - General Information, General Procedures).
4. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
5. Refer to: [Fuel Injection Component Cleaning](#) (303-04D Fuel Charging and Controls - V8 5.0L Petrol, General Procedures).



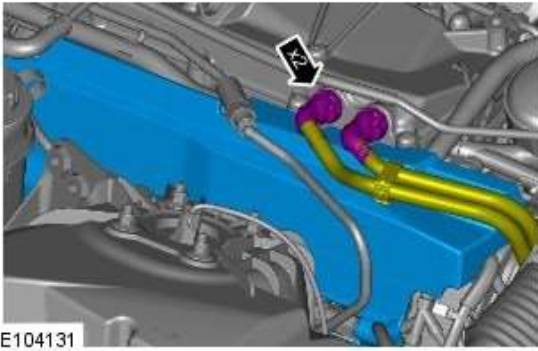
6.  CAUTION: Be prepared to collect escaping fluids.



- 7.

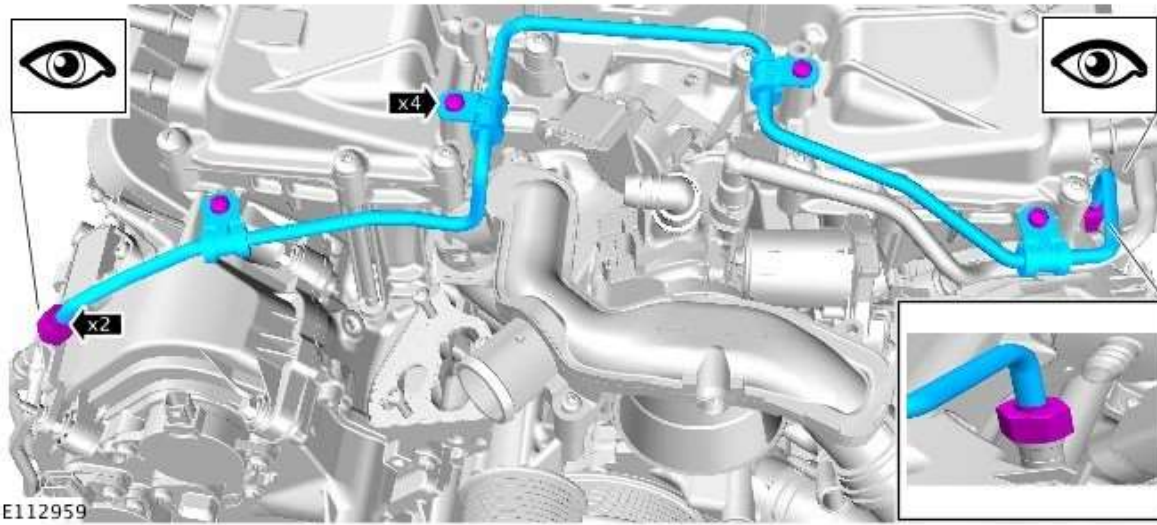


8.  CAUTION: Be prepared to collect escaping fluids.




9.  CAUTION: Be prepared to collect escaping fluids.

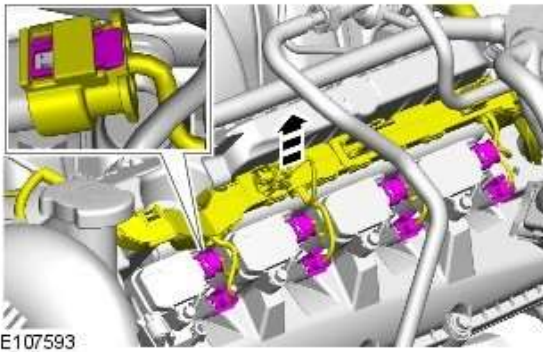
10. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).



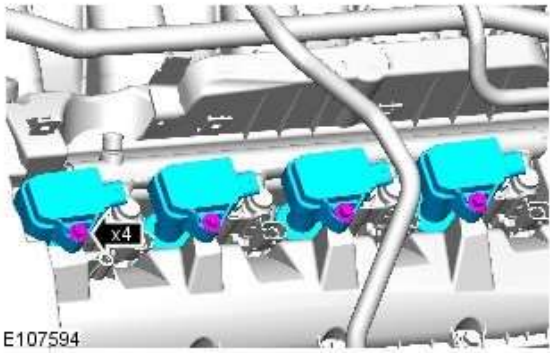
11. CAUTIONS:

 Be prepared to collect escaping fluids.

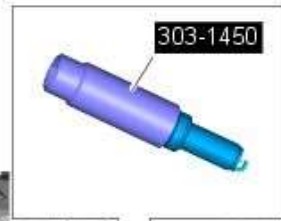
 Make sure that all openings are sealed. Use new blanking caps.




12.

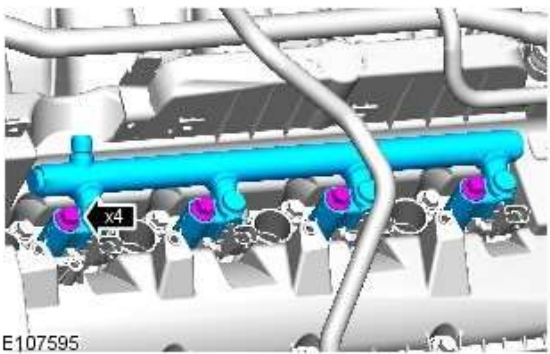
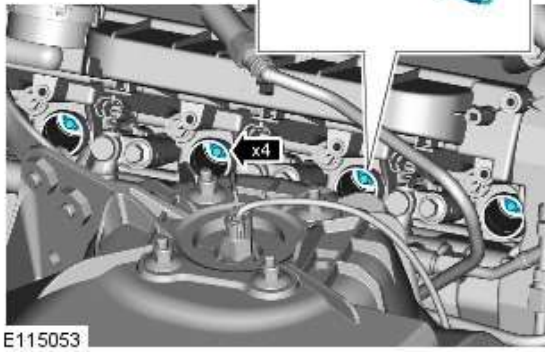



13.

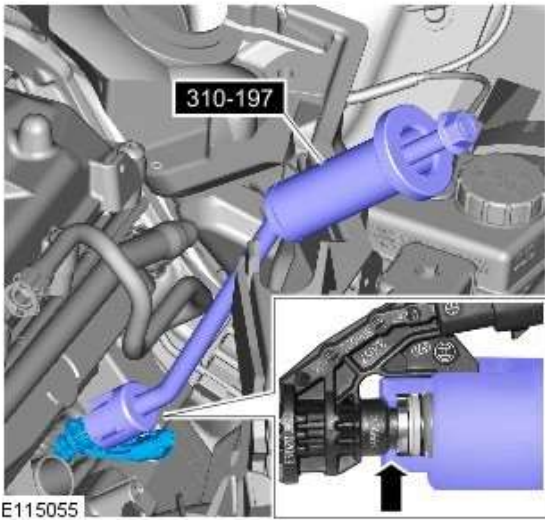


14.  NOTE: RH shown LH similar.

Special Tool(s): [303-1450](#)



15.  CAUTION: Make a note of the fuel injector clamp alignment to the fuel rail prior to removal.



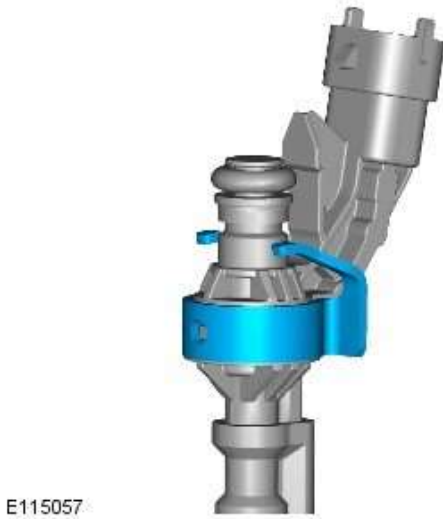
16. CAUTIONS:


 Make sure that the special tool is located correctly to the fuel injector prior to removing the fuel injector.

 Make sure that the special tool is held square to the fuel injector during removal.

 Make sure that all open ports are covered to prevent any foreign material ingress.


Special Tool(s): [310-197](#)




17.  CAUTION: If the fuel injector is being removed without a new component being installed, the fuel injector clamp must remain with the fuel injector it is removed with.

18. CAUTIONS:

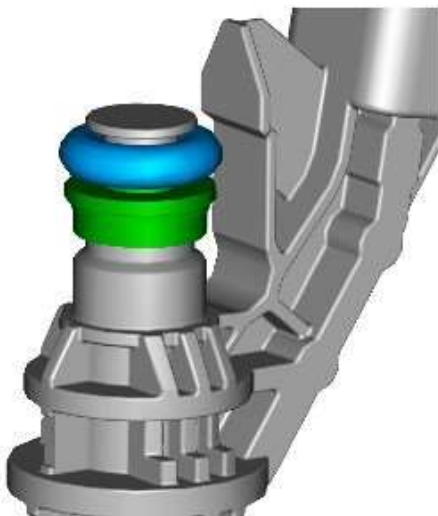
 Do not use a knife to remove the Teflon seal as damage could occur to the fuel injector.

 Do not cut the Teflon seal too deep as damage could occur to the fuel injector.

 Pinch the Teflon seal to allow the tool to cut the Teflon seal without damaging the fuel injector.



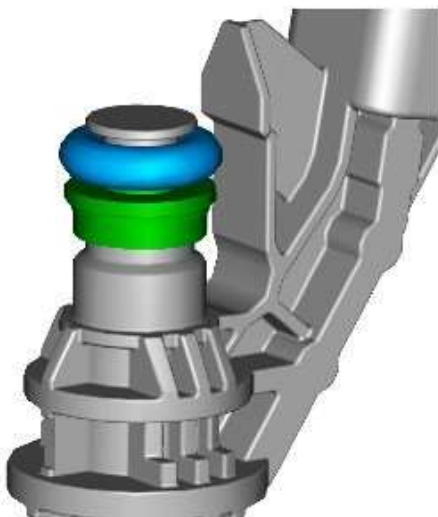
E115058



E115059

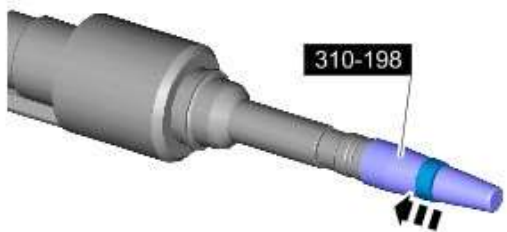
19.  CAUTION: Do not use any sharp tools to remove the O-ring seal as damage could occur to the fuel injector.

Installation



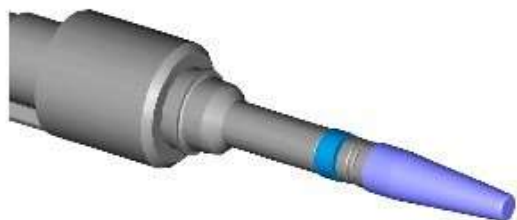
E115059

1. Install new O-ring seals.

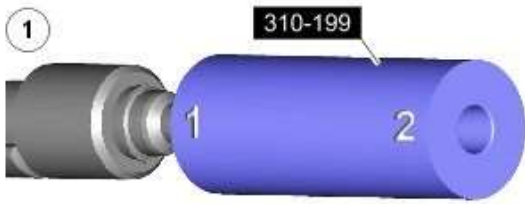


2. Install new Teflon seals.

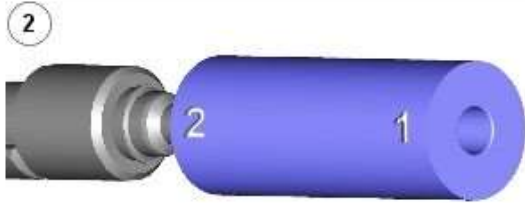
Special Tool(s): [310-198](#)



E115060




3. *Special Tool(s):* [310-199](#)

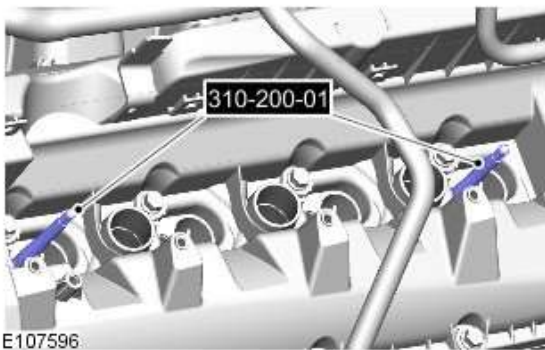



E115062



4.  CAUTION: If the original fuel injector is being installed, the original fuel injector clamp must be installed with the fuel injector it was removed with.

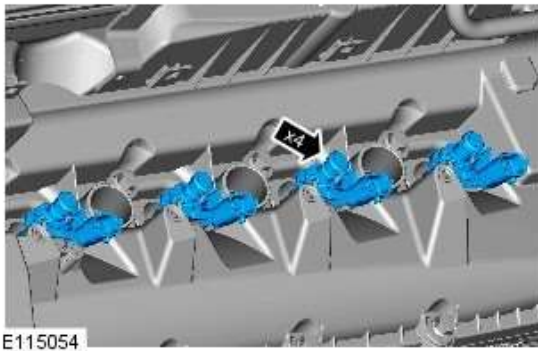
E115057



5.  CAUTION: If a new cylinder head has been installed then the special tool 310-200-02 without the thread must be used to install the fuel rail.


Special Tool(s): [310-200-01](#), [310-200-02](#)


E107596

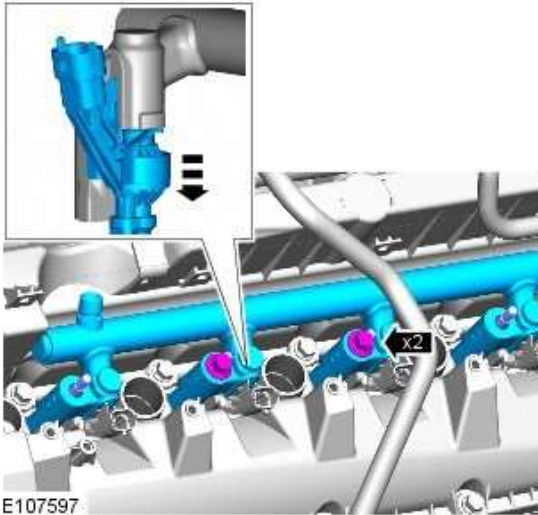


E115054

6. CAUTIONS:

 Make sure that the area around the open fuel injector ports are clean and free of foreign material and lubricant prior to installing the fuel injector.


 When Installing the fuel injector(s), make sure that the Teflon seal is clean and free of foreign material and lubricant.



E107597

7. CAUTIONS:

 If new fuel injectors are installed, a new injector clamp must be installed

 Make sure that the fuel injector is aligned and installed into the fuel rail correctly, as noted in the removal step.

 Tighten the fuel rail retaining bolts a turn at a time until the correct torque is achieved.

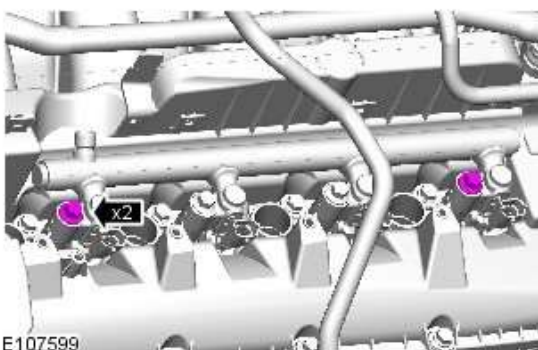
 NOTE: Lubricate the fuel injector O-ring seals with clean engine oil.

Torque: 20 Nm



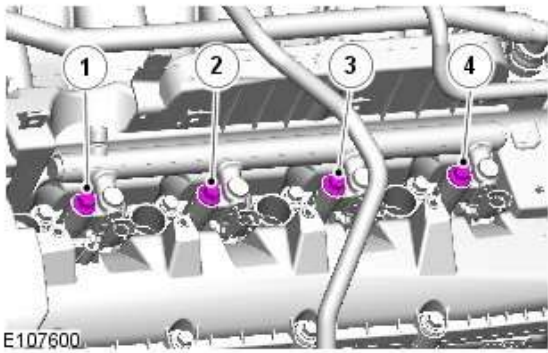
E107598

8. Special Tool(s): [310-200-01](#), [310-200-02](#)



E107599


9. Torque: 20 Nm



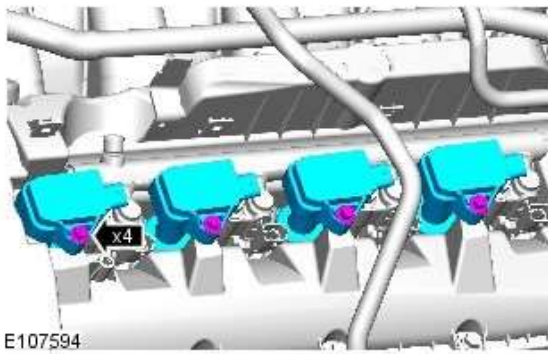
10.  NOTE: Tighten in the sequence indicated.

Torque:
Bolt 2 30 Nm
Bolt 3 30 Nm
Bolt 1 30 Nm
Bolt 4 30 Nm

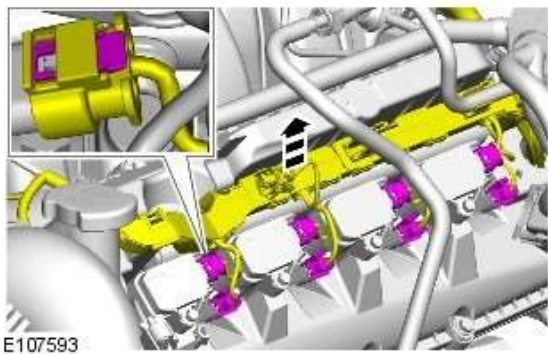


11.  NOTE: RH shown LH similar.

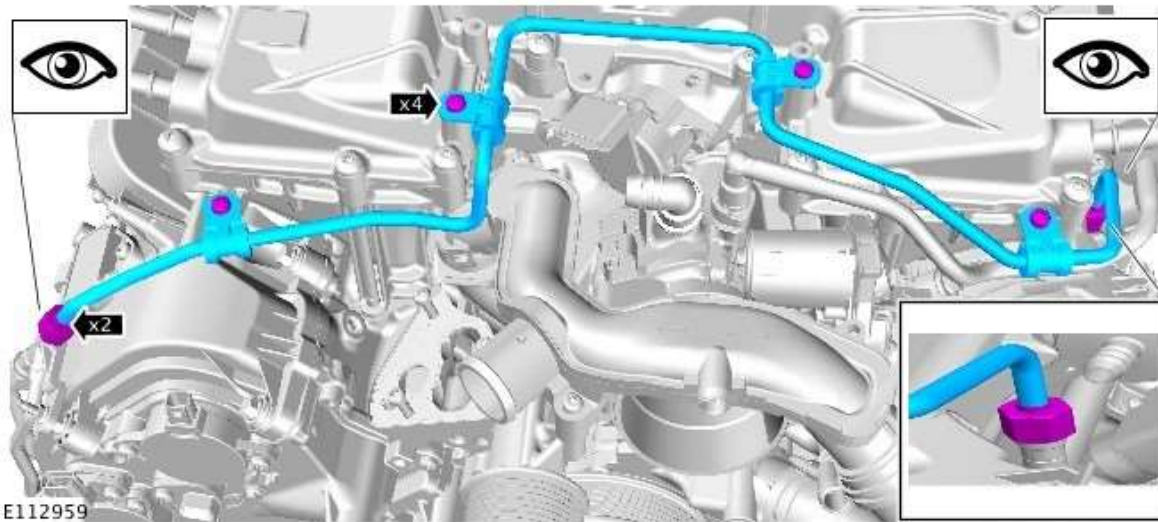
Special Tool(s): 303-1450
Torque: 20 Nm



12. Torque: 7 Nm



- 13.



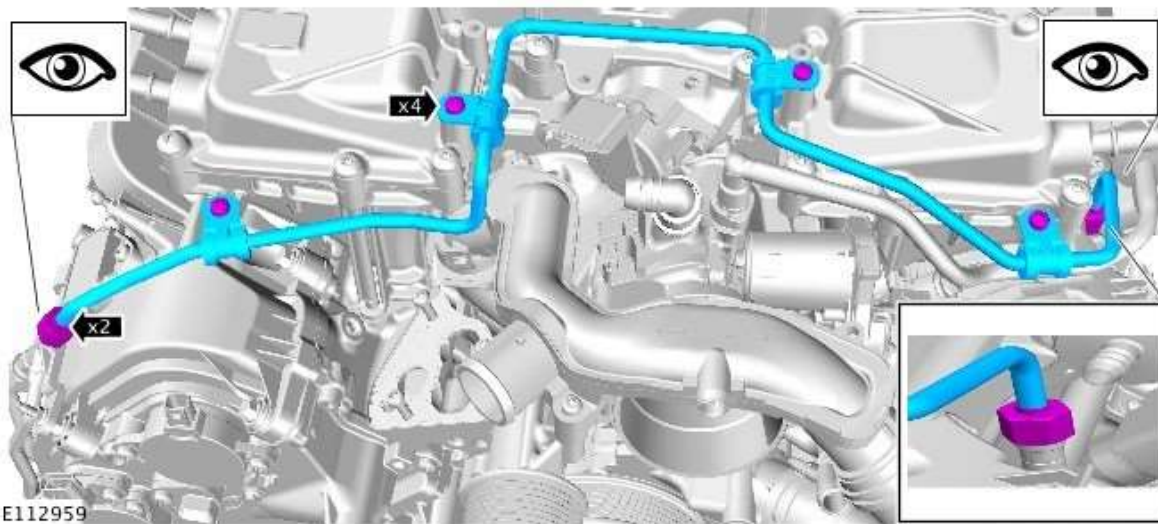
14. NOTES:

 Lubricate the union threads with clean engine oil.

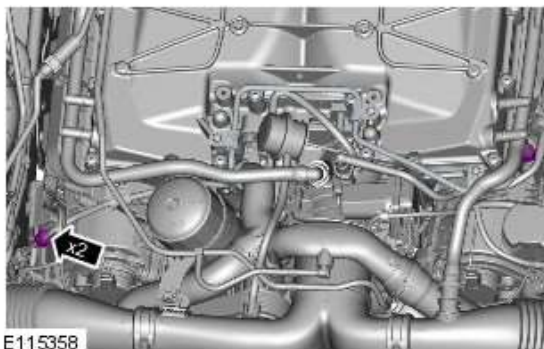
 Do not tighten at this stage.

 Remove and discard the blanking caps.

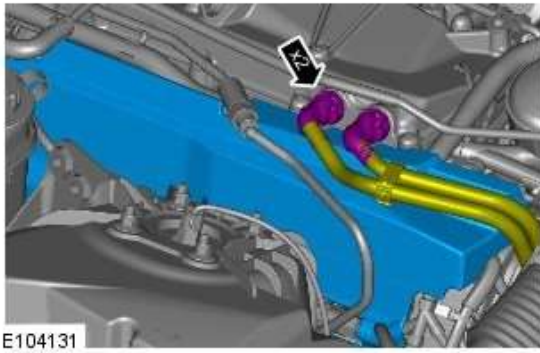
15. Torque: union 21 Nm
bolts 8 Nm



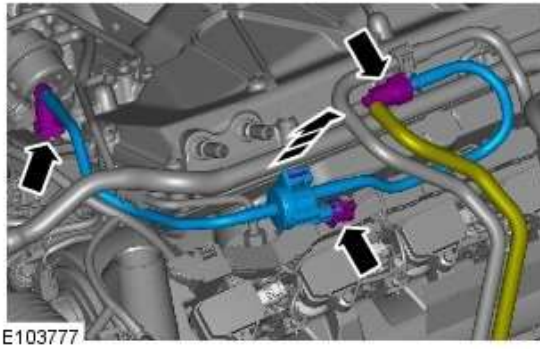
16. Torque: 21 Nm



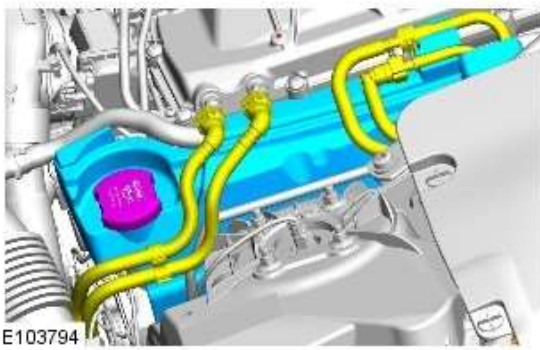
17. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).



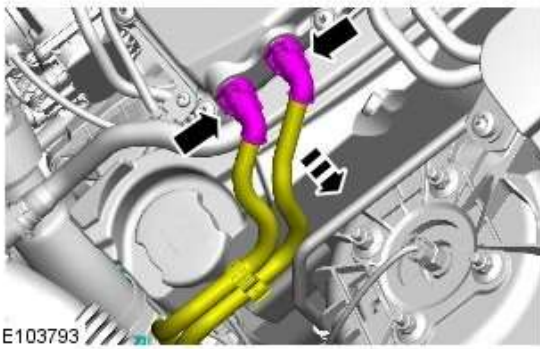
18.



19.



20.



21.




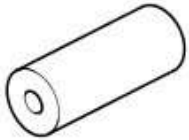
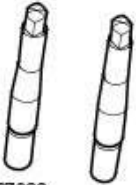
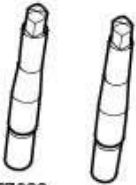
22. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).

23. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Fuel Rail RH

Removal and Installation

Special Tool(s)

 <p>E115268</p>	<p>303-1450 Spark Plug Remover/Installer</p>
 <p>E114526</p>	<p>310-197 Remover, Fuel Injector</p>
 <p>E107680</p>	<p>310-198 Installer, Teflon Seal</p>
 <p>E107681</p>	<p>310-199 Re-shape Tool, Teflon Seal</p>
 <p>E 107682</p>	<p>310-200-01 Fuel Rail Installation Guide Pins - Threaded</p>
 <p>E 107682</p>	<p>310-200-02 Fuel Rail Installation Guide Pins - Unthreaded</p>


Removal



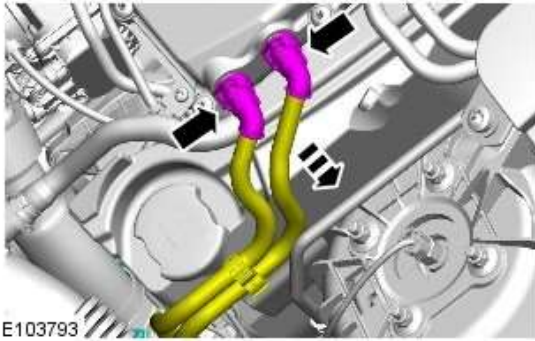
CAUTION: Make sure that tools and equipment are clean, free of foreign material and lubricant.

NOTES:

 Removal steps in this procedure may contain installation details.

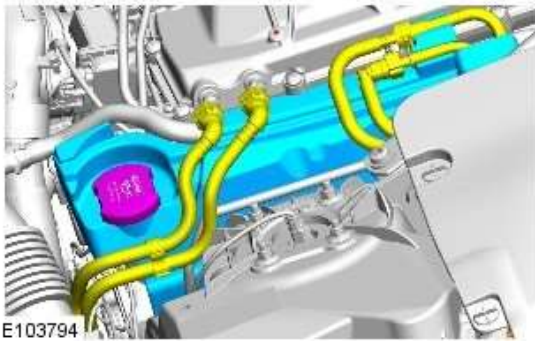
 Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: [Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (310-00 Fuel System - General Information, General Procedures).
4. Refer to: [Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
5. Refer to: [Fuel Injection Component Cleaning](#) (303-04D Fuel Charging and Controls - V8 5.0L Petrol, General Procedures).



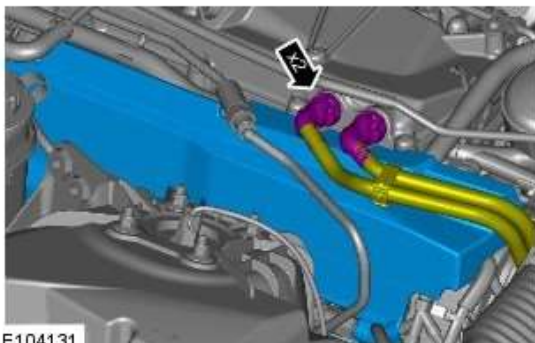
E103793

6.  CAUTION: Be prepared to collect escaping fluids.



E103794

- 7.



E104131

8.  CAUTION: Be prepared to collect escaping fluids.

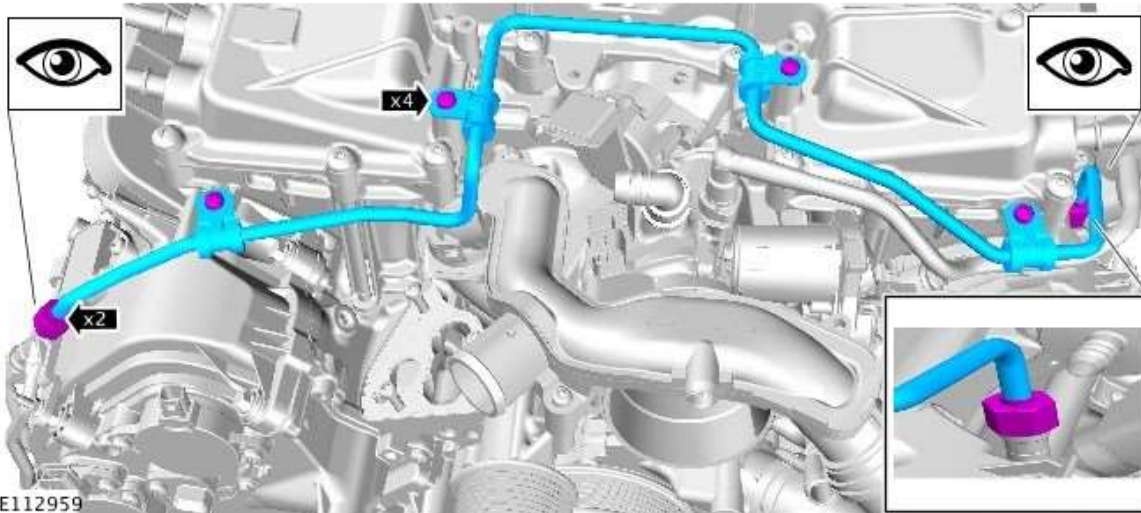
9. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12C Intake Air Distribution and Filtering - V8

5.0L Petrol, Removal and Installation).

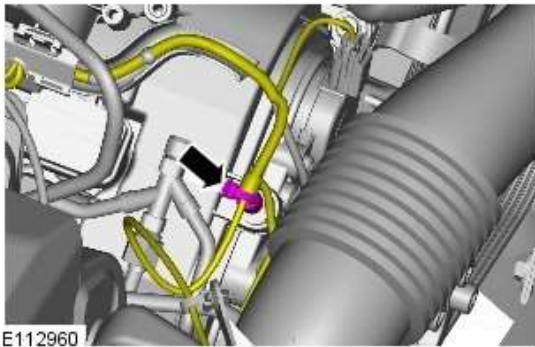
10. CAUTIONS:

 Be prepared to collect escaping fluids.

 Make sure that all openings are sealed. Use new blanking caps.



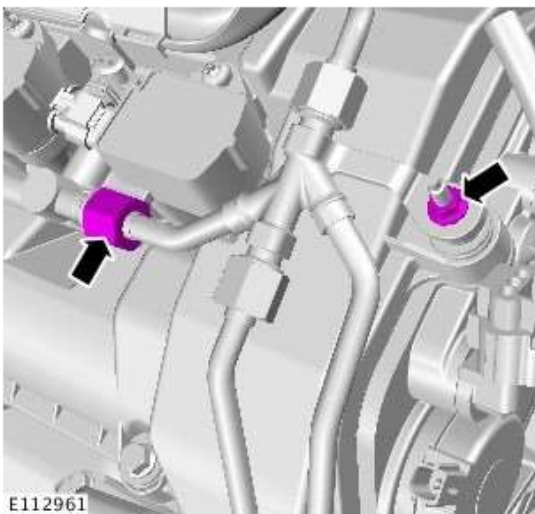
11.



12. CAUTIONS:

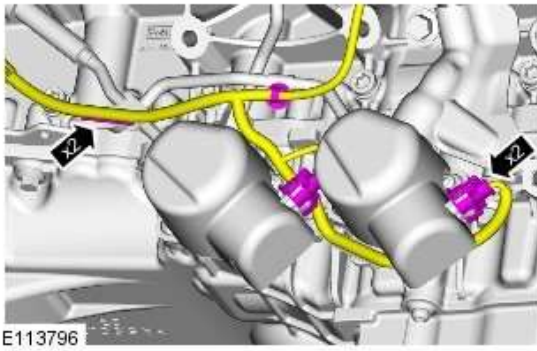
 Be prepared to collect escaping fluids.

 Make sure that all openings are sealed. Use new blanking caps.

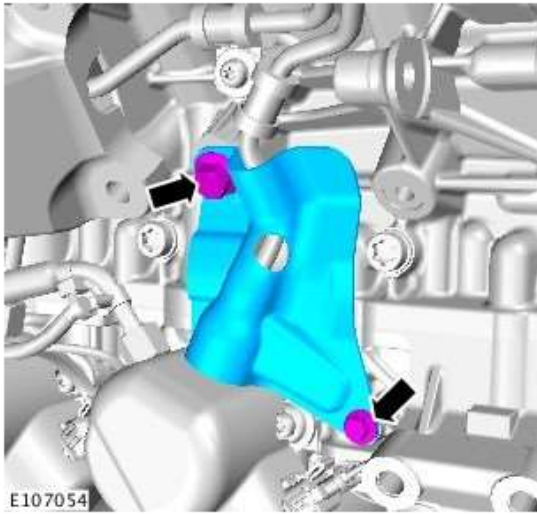



13.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

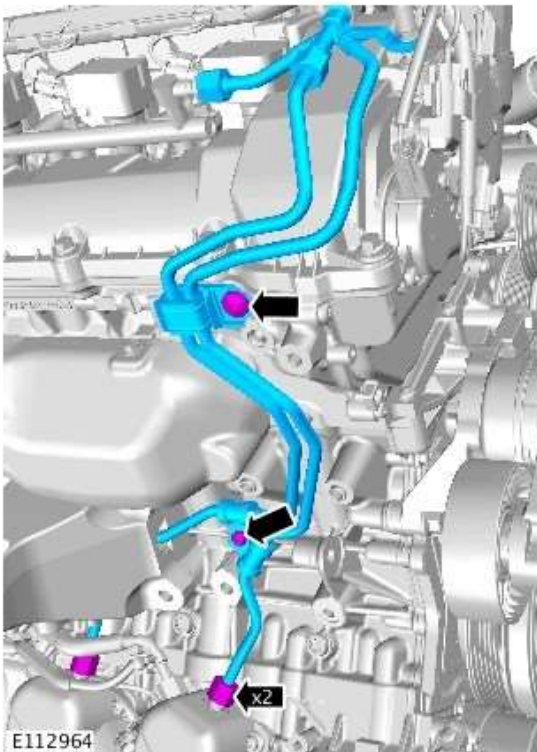
Raise and support the vehicle.



14.  NOTE: Engine shown removed for clarity.




15.  NOTE: Engine shown removed for clarity.



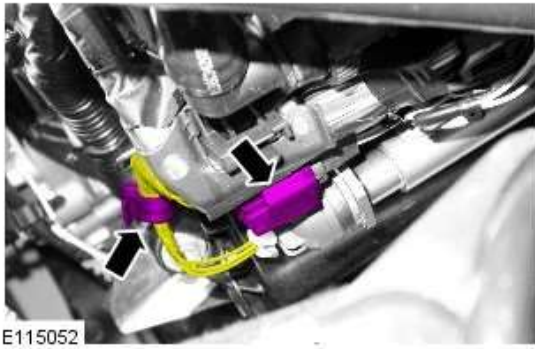
16. CAUTIONS:

 Be prepared to collect escaping fluids.

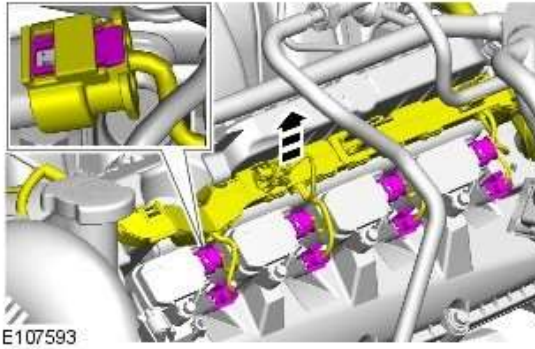
 Make sure that all openings are sealed. Use new blanking caps.

 NOTE: Engine shown removed for clarity.

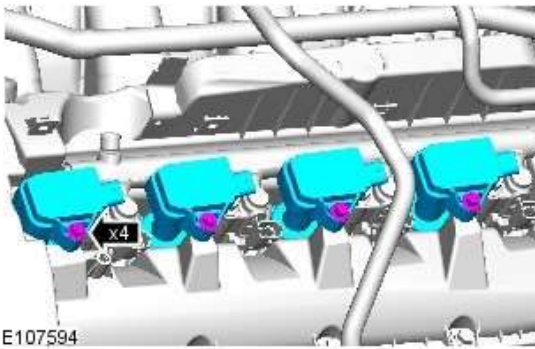
17. Lower the vehicle.




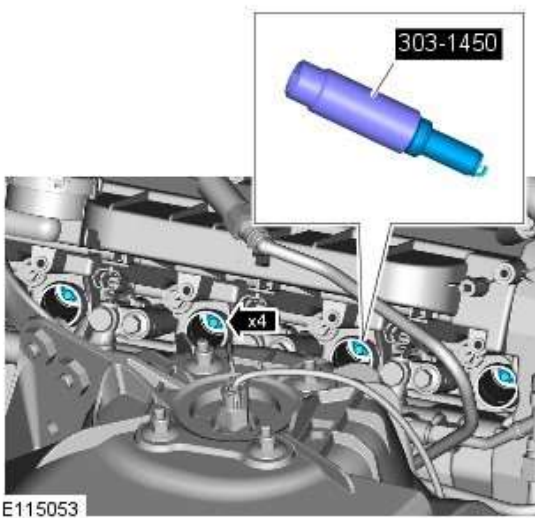
18.



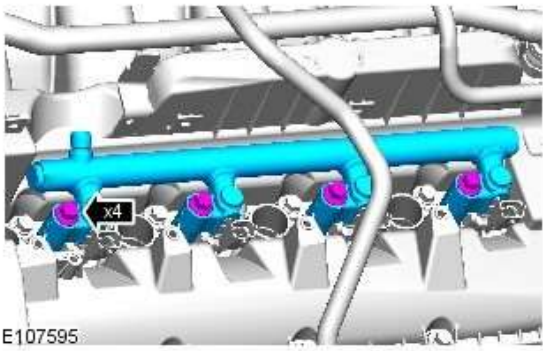
19.  NOTE: LH shown RH similar.




20.  NOTE: LH shown RH similar.

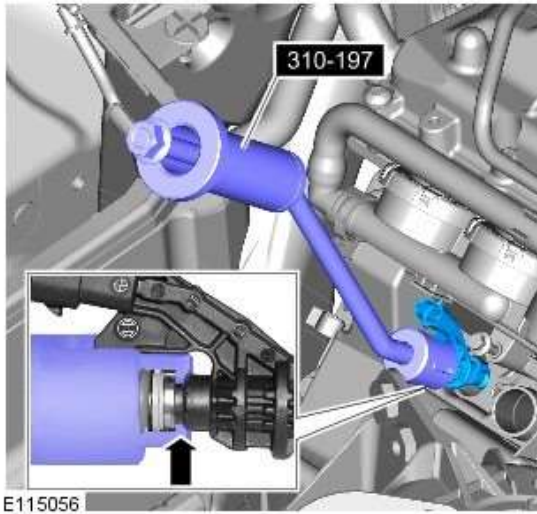


21. *Special Tool(s):* [303-1450](#)



22.  CAUTION: Make a note of the fuel injector alignment to the fuel rail prior to removal.

 NOTE: LH shown RH similar.



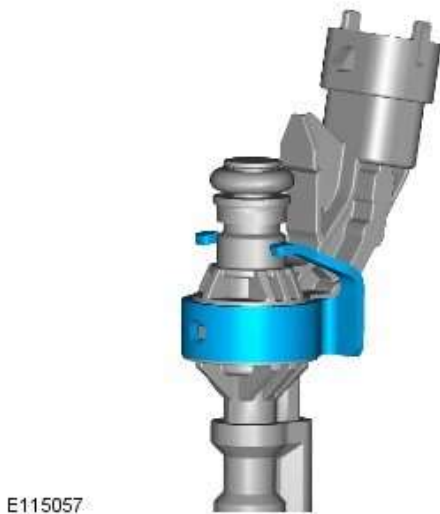
23. CAUTIONS:


 Make sure that the special tool is located correctly to the fuel injector prior to removing the fuel injector.

 Make sure that the special tool is held square to the fuel injector during removal.

 Make sure that all open ports are covered to prevent any foreign material ingress.

Special Tool(s): [310-197](#)



24.  CAUTION: If the fuel injector is being removed without a new component being installed, the fuel injector clamp must remain with the fuel injector it is removed with.



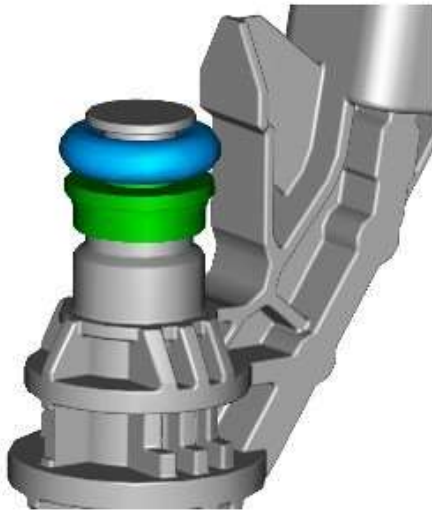
25. CAUTIONS:


 Do not use a knife to remove the Teflon seal as damage could occur to the fuel injector.

 Do not cut the Teflon seal too deep as damage could occur to the fuel injector.

 Pinch the Teflon seal to allow the tool to cut the Teflon seal without damaging the fuel injector.

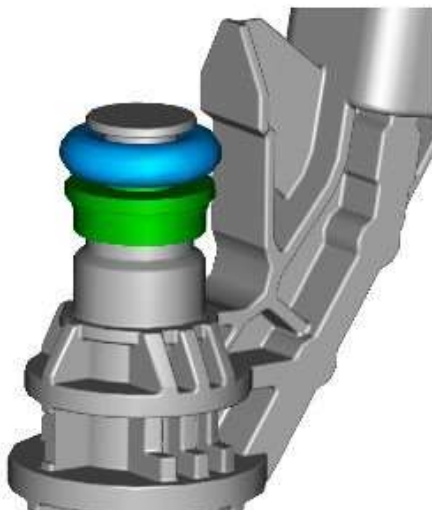
E115058



26.  CAUTION: Do not use any sharp tools to remove the O-ring seal as damage could occur to the fuel injector.

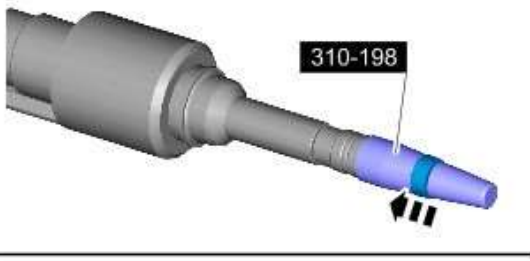
E115059

Installation



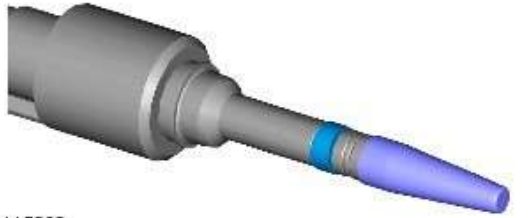
1. Install new O-ring seals.

E115059

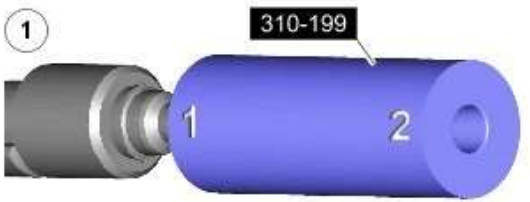


2. Install new Teflon seals.

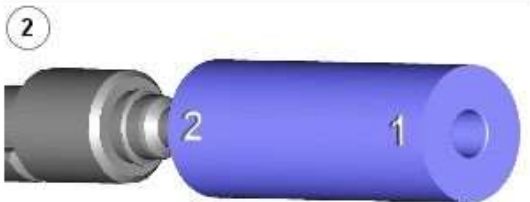
Special Tool(s): [310-198](#)



E115060




3. *Special Tool(s):* [310-199](#)

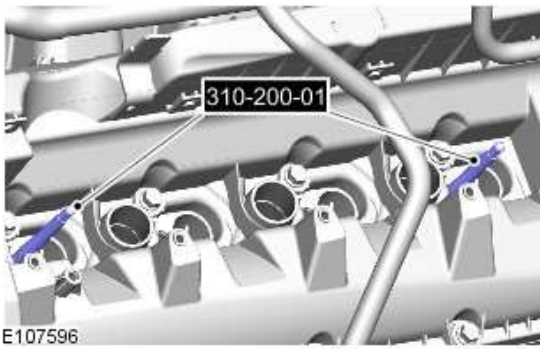



E115062



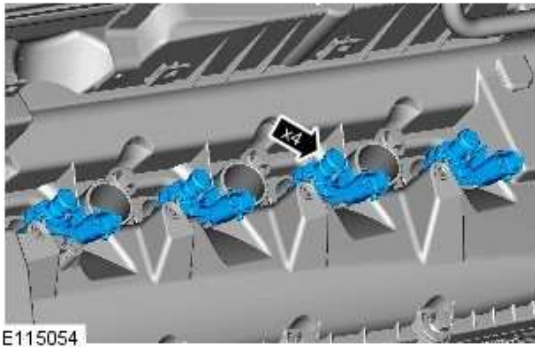
E115057

4.  CAUTION: If the original fuel injector is being installed, the original fuel injector clamp must be installed with the fuel injector it was removed with.





5.  CAUTION: If a new cylinder head has been installed then the special tool 310-200-02 without the thread must be used to install the fuel rail.

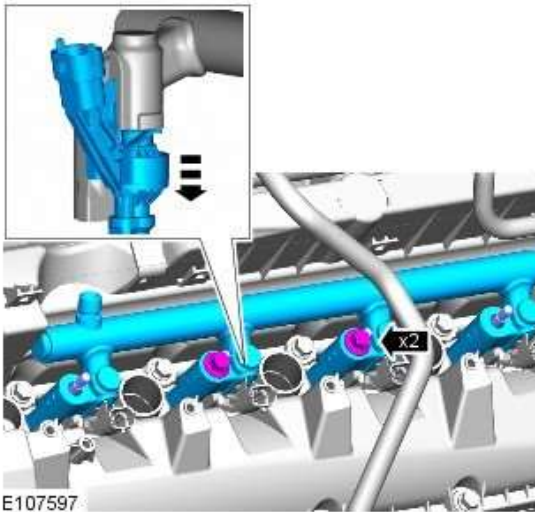
Special Tool(s): [310-200-01](#), [310-200-02](#)



6. CAUTIONS:


 Make sure that the area around the open fuel injector ports are clean and free of foreign material and lubricant prior to installing the fuel injector.

 When Installing the fuel injector(s), make sure that the Teflon seal is clean and free of foreign material and lubricant.



7. CAUTIONS:

 If new fuel injectors are installed, a new injector clamp must be installed

 Make sure that the fuel injector is aligned and installed into the fuel rail correctly, as noted in the removal step.

 Tighten the fuel rail retaining bolts a turn at a time until the correct torque is achieved.

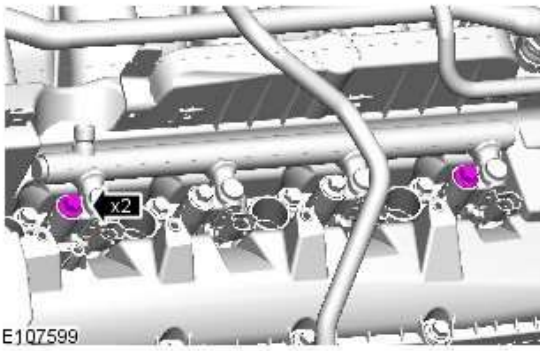
 NOTE: Lubricate the fuel injector O-ring seals with clean engine oil.


Torque: 20 Nm

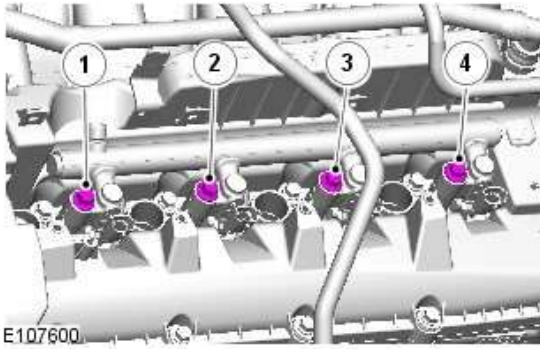




8.  NOTE: LH shown RH similar.

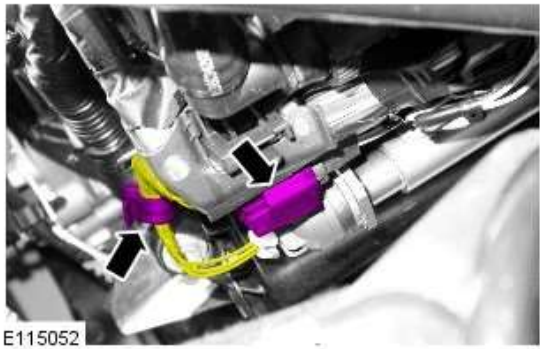
Special Tool(s): [310-200-01](#), [310-200-02](#)



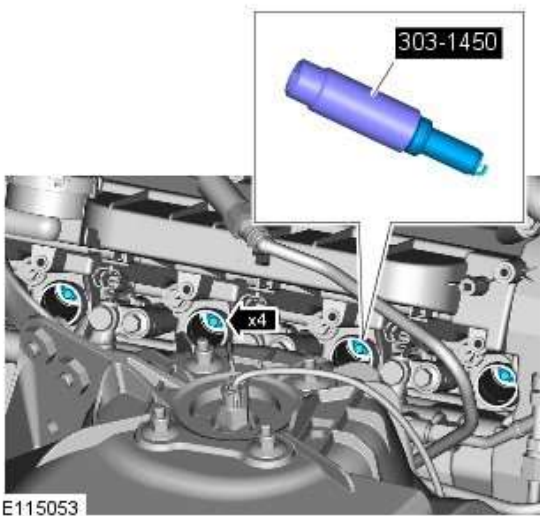
9.  NOTE: LH shown RH similar.
Torque: 20 Nm



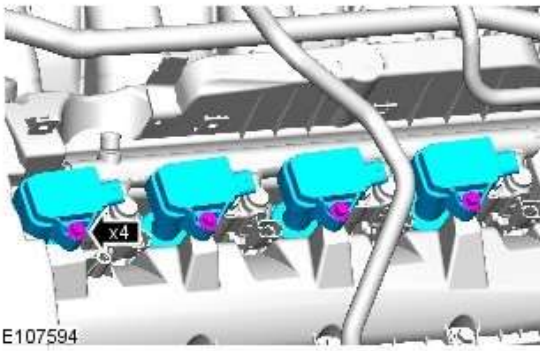
10. NOTES:
 LH shown RH similar.
 Tighten in the sequence indicated.
Torque:
Bolt 2 30 Nm
Bolt 3 30 Nm
Bolt 1 30 Nm
Bolt 4 30 Nm




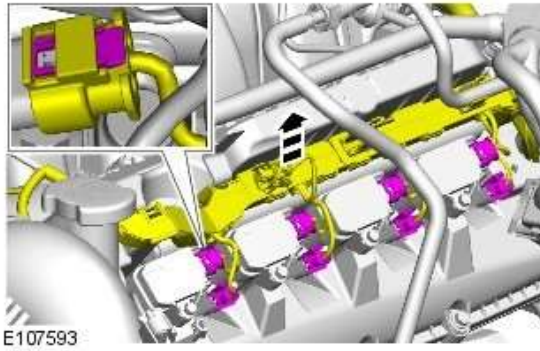
- 11.




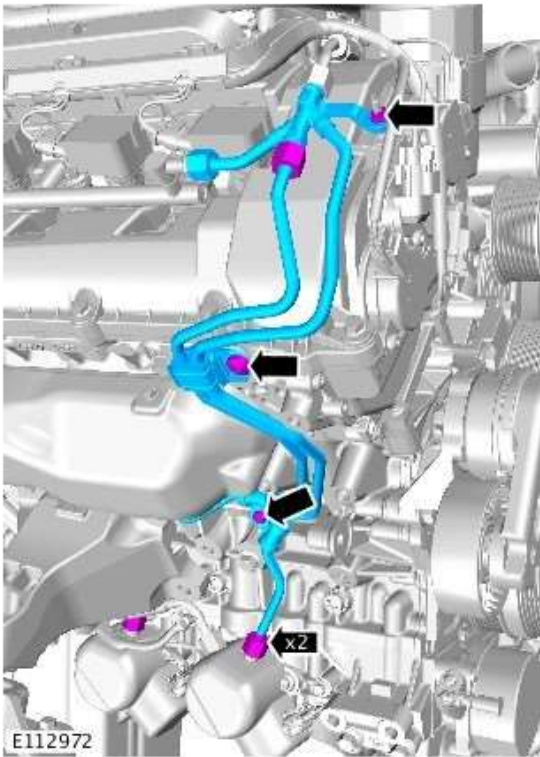
12. Special Tool(s): 303-1450
Torque: 20 Nm




13.  NOTE: LH shown RH similar.
Torque: 7 Nm



14.  NOTE: LH shown RH similar.



15.  CAUTION: Lubricate **only** the union threads with clean engine oil.

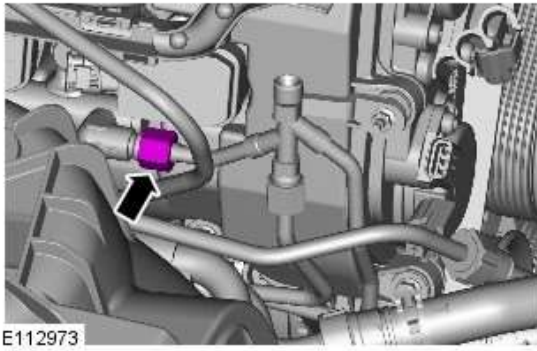
NOTES:

 Engine shown removed for clarity.

 Install the bolt and unions finger tight before final tightening.

 Remove and discard the blanking caps.


16. Lower the vehicle.



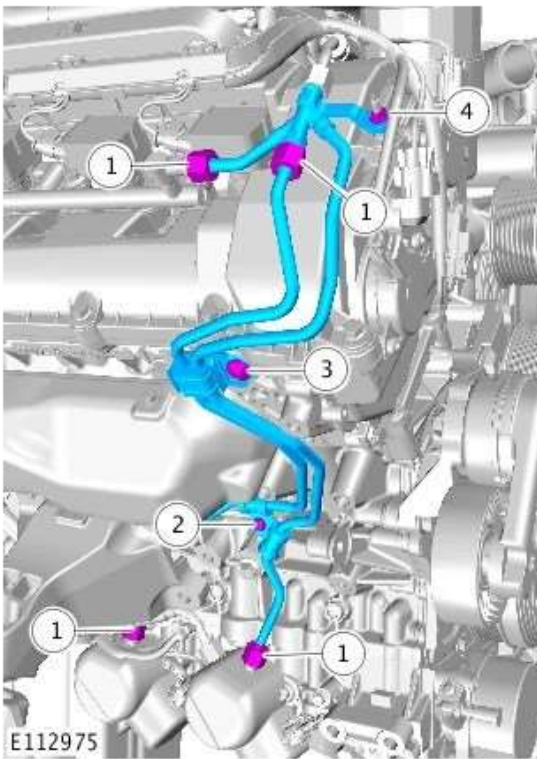
17. NOTES:

 Do not tighten at this stage.

 Remove and discard the blanking caps.

18.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



19.  NOTE: Engine shown removed for clarity.

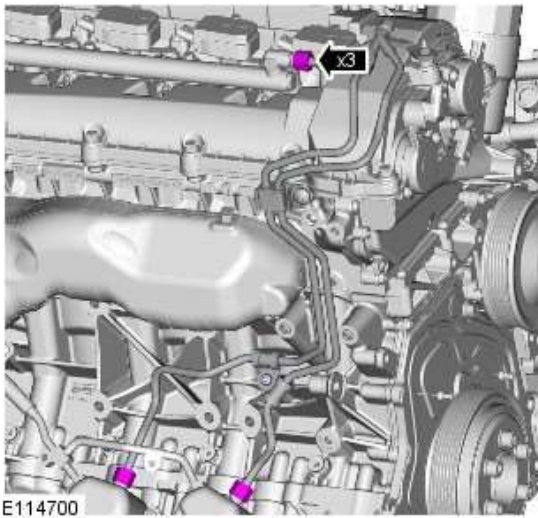
Torque:

Unions (1) 21 Nm

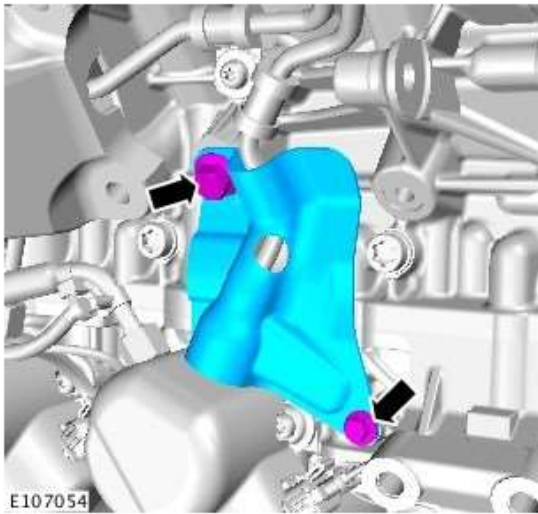
M6 (2) 11 Nm


M8 (3) 25 Nm

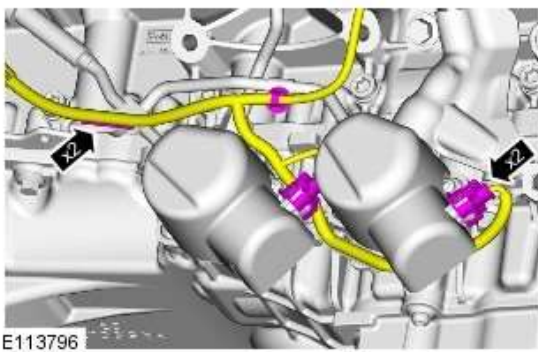
M5 nut (4) 6 Nm



20.  NOTE: Engine shown removed for clarity.
Torque: 21 Nm



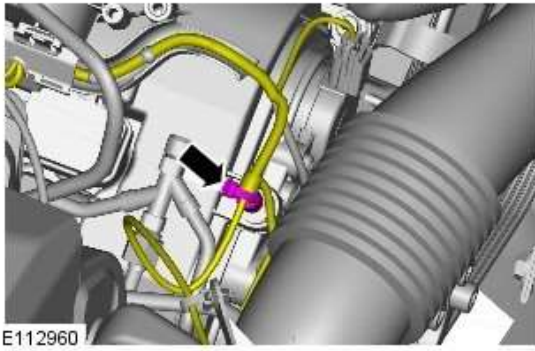
21.  NOTE: Engine shown removed for clarity.
Torque:
M10 29 Nm
M6 11 Nm



22.  NOTE: Engine shown removed for clarity.

23. Lower the vehicle.

24.



E112960

25. NOTES:



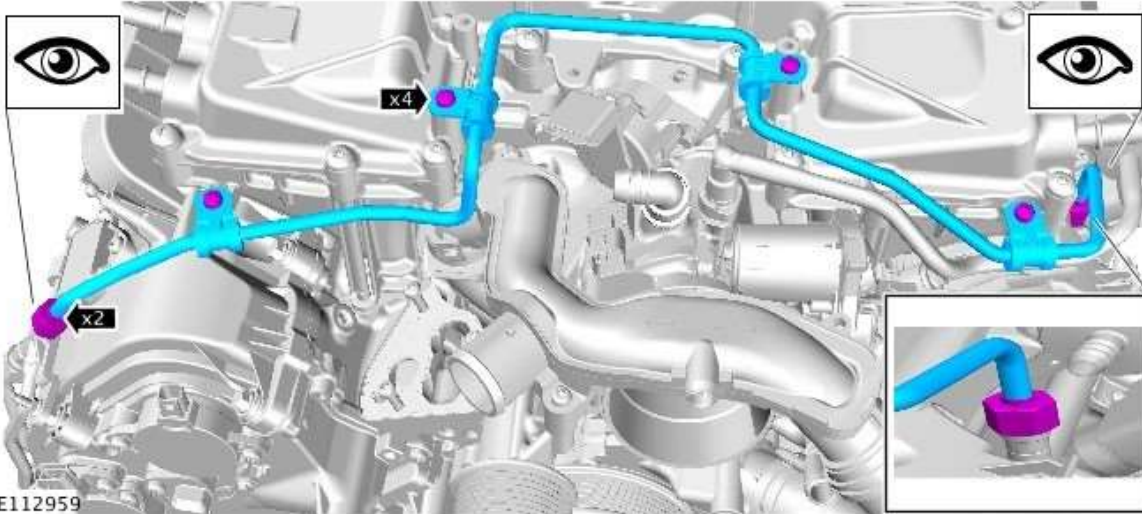
Lubricate the union threads with clean engine oil.



Do not tighten at this stage.

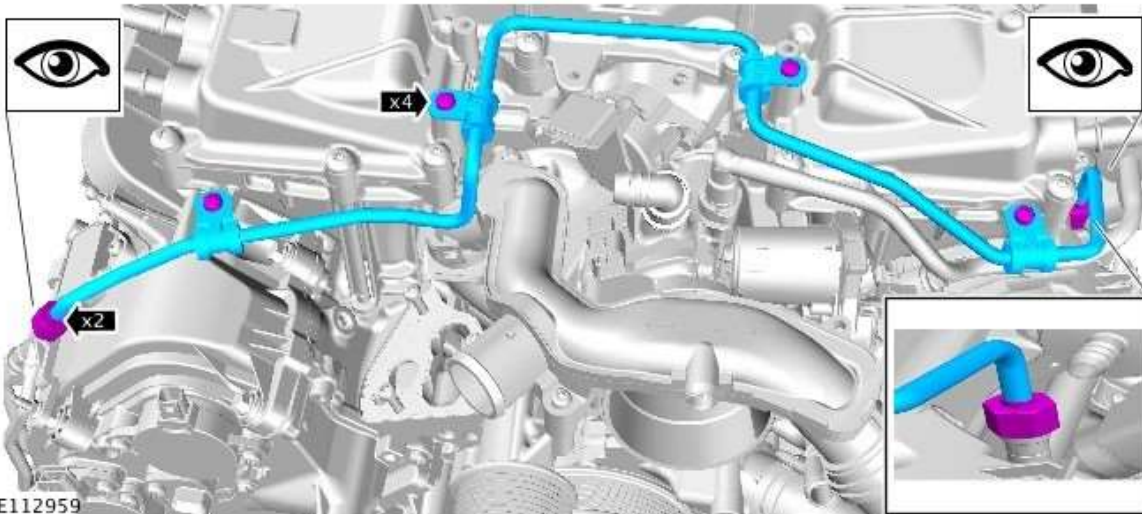


Remove and discard the blanking caps.



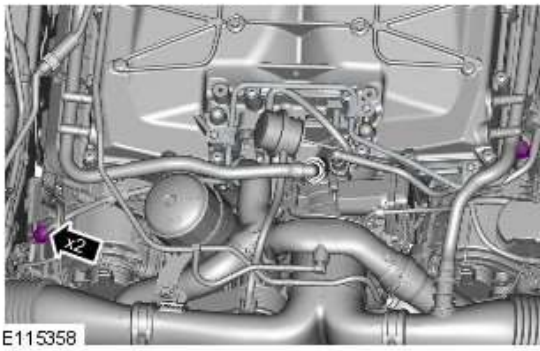
E112959

26. Torque:
Unions 21
Nm
Bolts 8
Nm



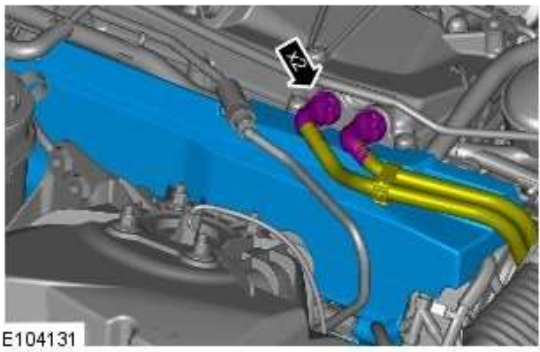
E112959

27. Torque: 21 Nm

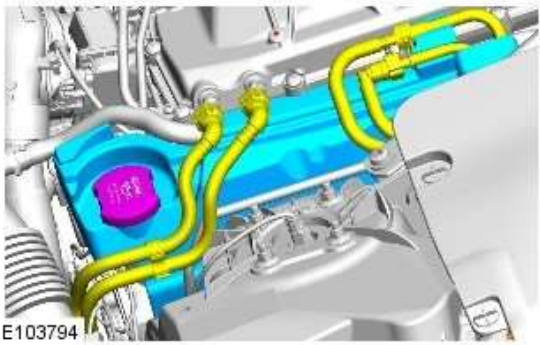


28. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

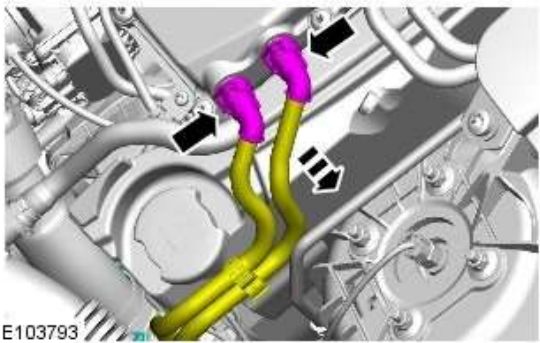
29.



30.



31.



32. Refer to: [Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).

33. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Left-Hand Fuel Rail High-Pressure Fuel Pump

Removal and Installation

Removal



CAUTION: Make sure that tools and equipment are clean, free of foreign material and lubricant.

NOTES:

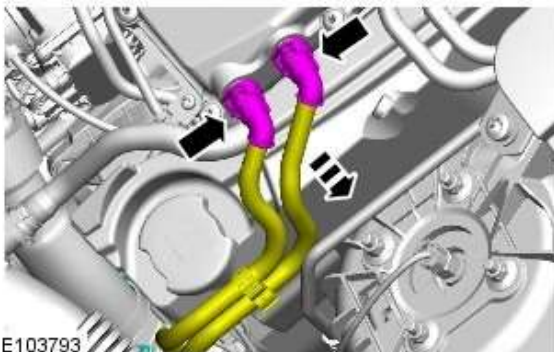


Removal steps in this procedure may contain installation details.



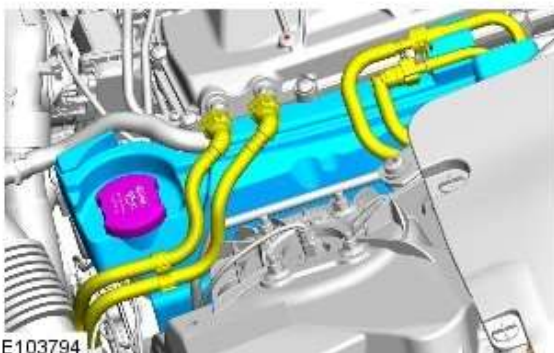
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
2. Refer to: [Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (310-00 Fuel System - General Information, General Procedures).
3. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
5. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
6. Refer to: [Fuel Injection Component Cleaning](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, General Procedures).



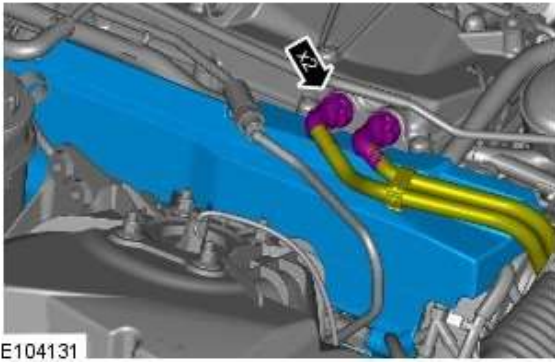
E103793

7. CAUTION: Be prepared to collect escaping fluids.



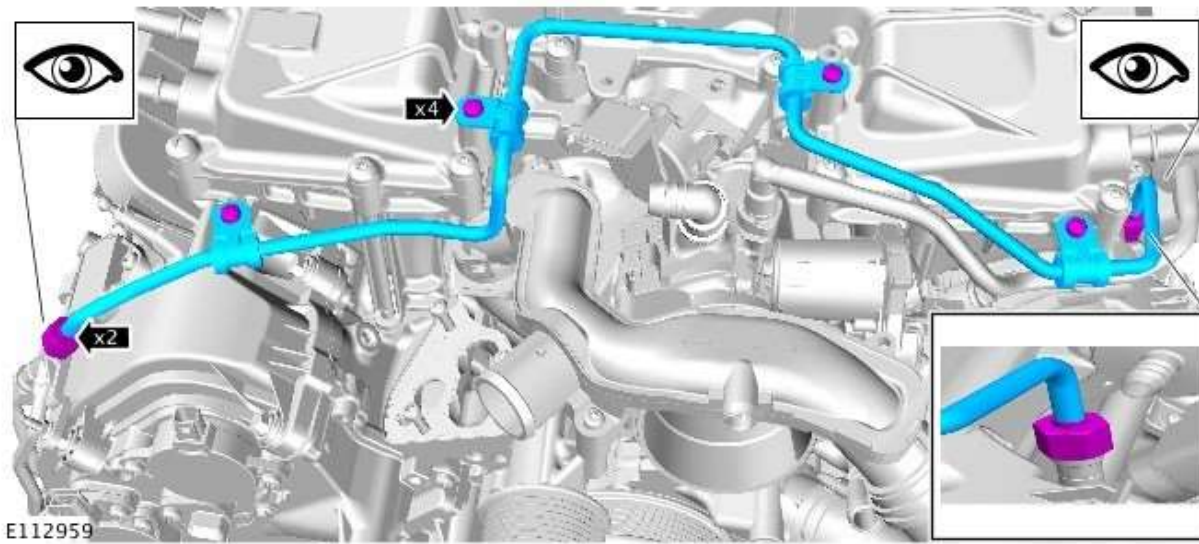
E103794

- 8.





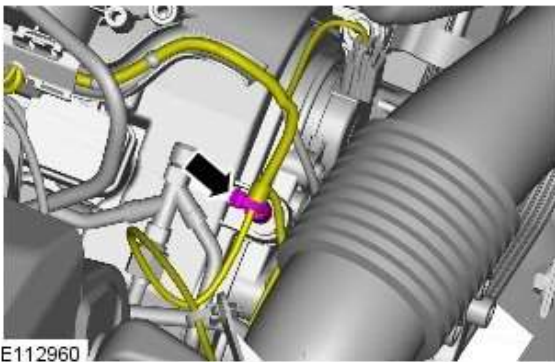
9.  CAUTION: Be prepared to collect escaping fluids.

10. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

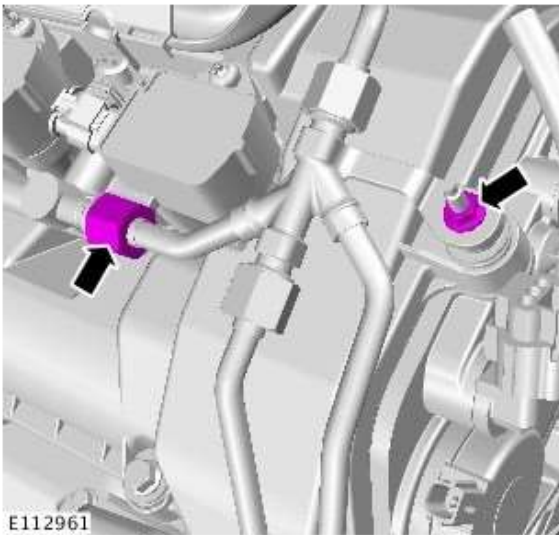


11. CAUTIONS:

-  Be prepared to collect escaping fluids.
-  Make sure that all openings are sealed. Use new blanking caps.



- 12.



13. CAUTIONS:



Be prepared to collect escaping fluids.



Make sure that all openings are sealed. Use new blanking caps.

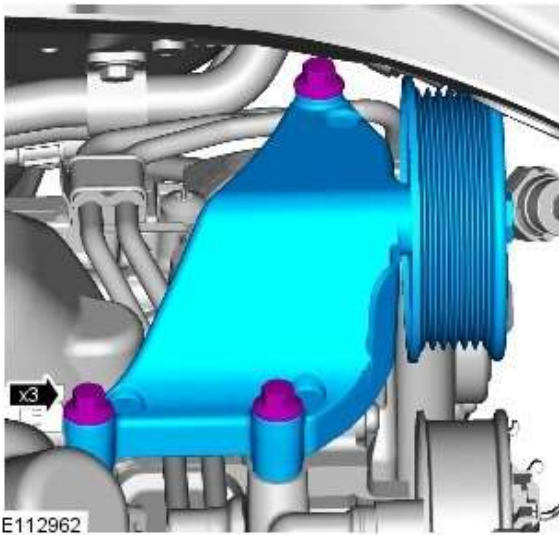
14.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

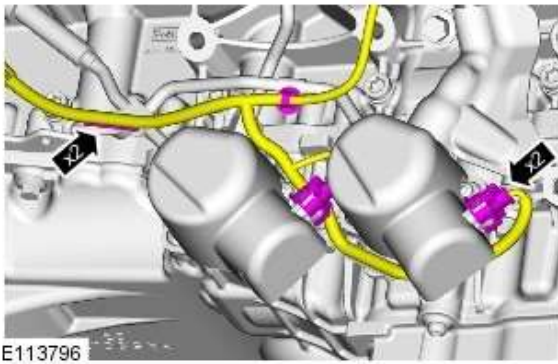
Raise and support the vehicle.

15. Refer to: [Engine Mount RH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

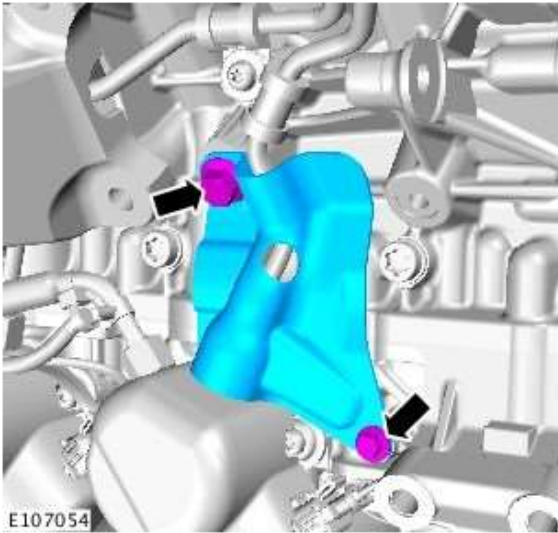
16. Refer to: [Generator - V8 5.0L Petrol](#) (414-02C Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).


17.

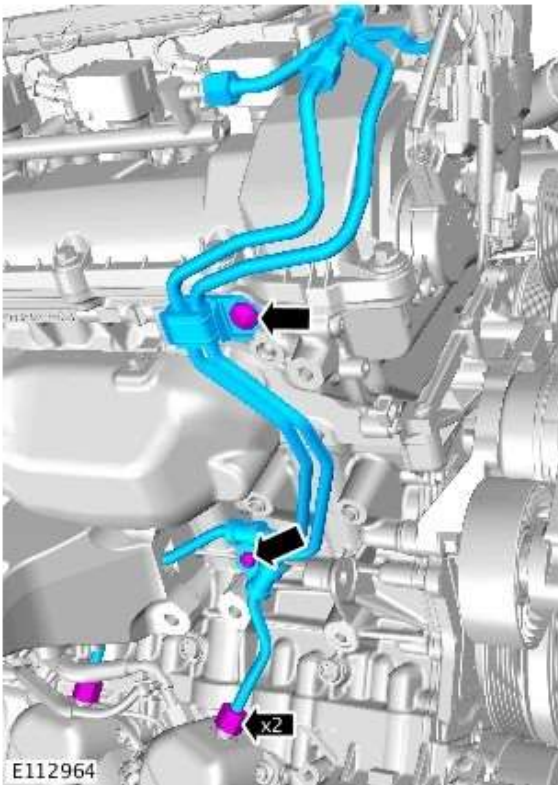




18.  NOTE: Engine shown removed for clarity.



19.  NOTE: Engine shown removed for clarity.



20. CAUTIONS:



Remove and discard the high-pressure fuel supply lines.



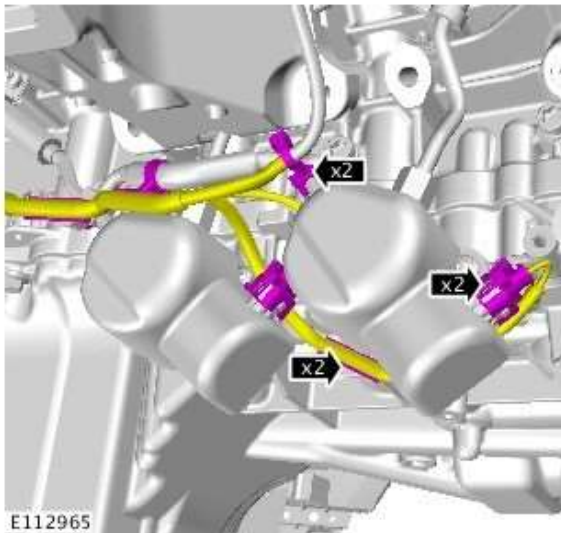
Be prepared to collect escaping fluids.



Make sure that all openings are sealed. Use new blanking caps.



NOTE: Engine shown removed for clarity.



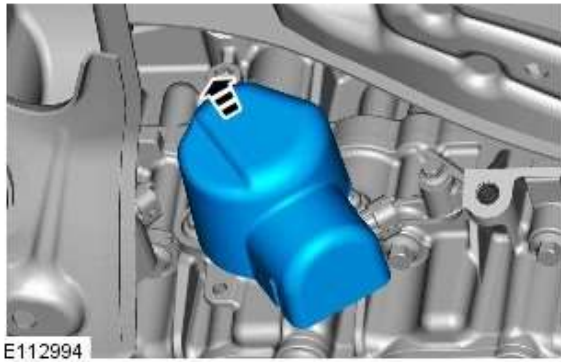
21. CAUTIONS:



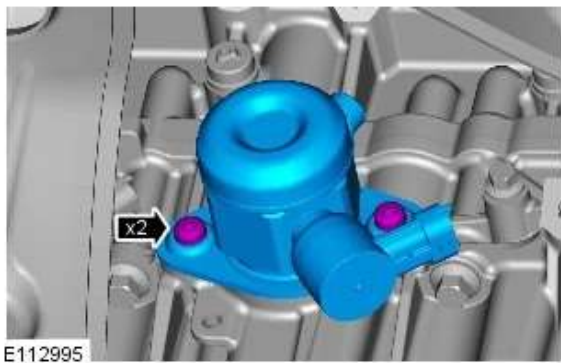
Be prepared to collect escaping fluids.



Make sure that all openings are sealed. Use new blanking caps.



22.



23.  CAUTION: Be prepared to collect escaping fluids.

Loosen the Torx screws a turn each at a time.

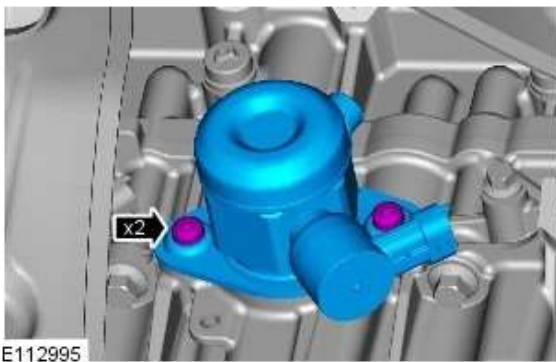


24.  CAUTION: Be prepared to collect escaping fluids.

Installation



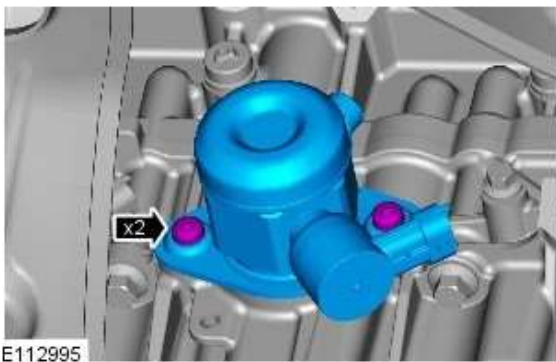
1.  NOTE: Lubricate the fuel rail high-pressure fuel pump bucket with clean engine oil.



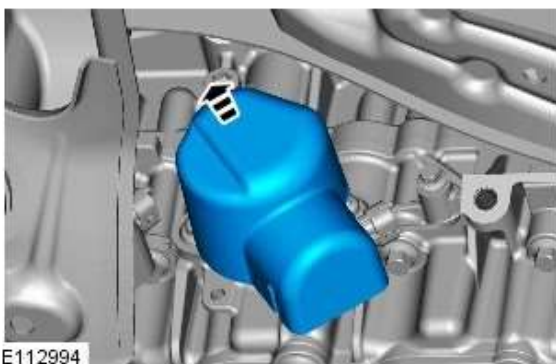
2.  CAUTION: Tighten the Torx screws a turn at a time until the correct torque is achieved.

 NOTE: Lubricate the fuel rail high-pressure fuel pump O-ring seal with clean engine oil.

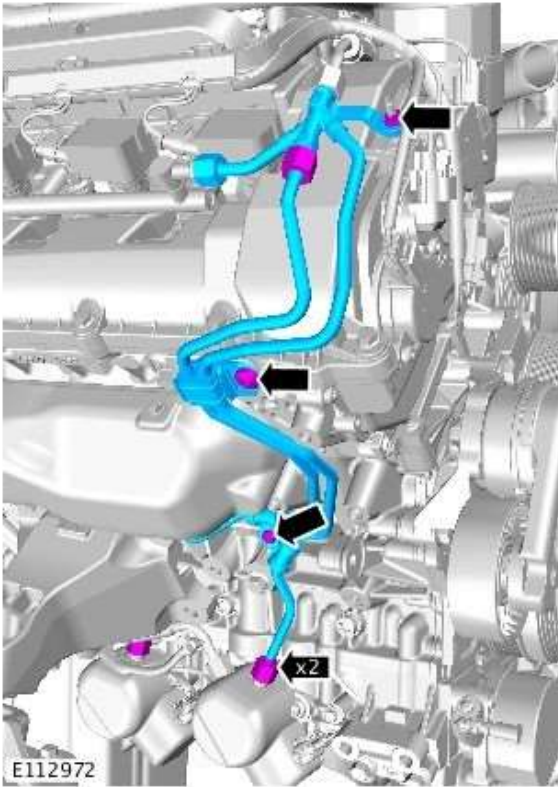
Torque: 12 Nm



3. Loosen the Torx screws half a turn each.



- 4.



5.  CAUTION: Install new high-pressure fuel supply lines.

NOTES:



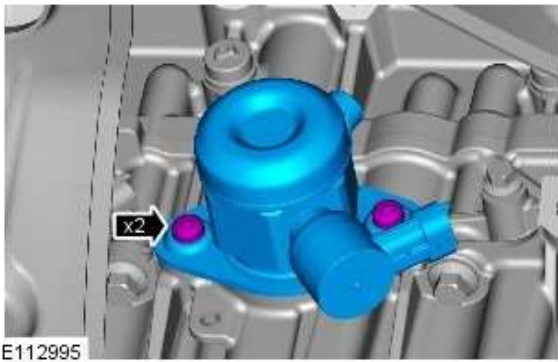
Engine shown removed for clarity.




Remove and discard the blanking caps.



Install the bolt and unions fully finger tight before final tightening.



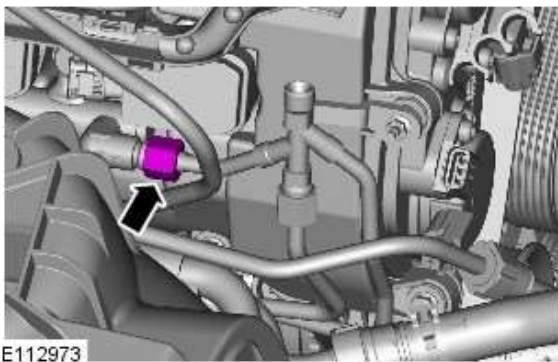
6.  CAUTION: Care must be taken when positioning the fuel rail high-pressure fuel pump cover to one side.



NOTE: Fuel rail high-pressure fuel pump cover shown removed for clarity.

Torque: 12 Nm

7. Lower the vehicle.



8. NOTES:



Do not tighten at this stage.

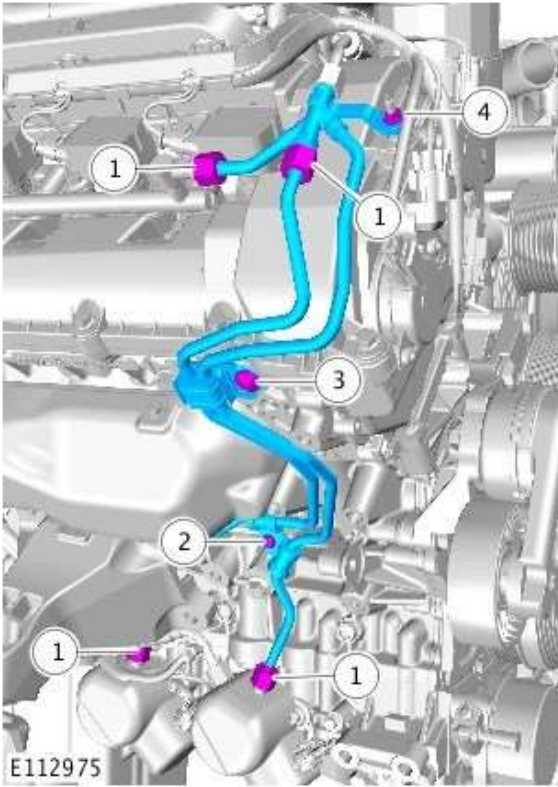



Remove and discard the blanking caps.

9.  WARNING: Do not work on or under a vehicle supported only by a jack. Always

support the vehicle on safety stands.

Raise and support the vehicle.



10.  CAUTION: Lubricate **only** the union threads with clean engine oil.

 NOTE: Engine shown removed for clarity.

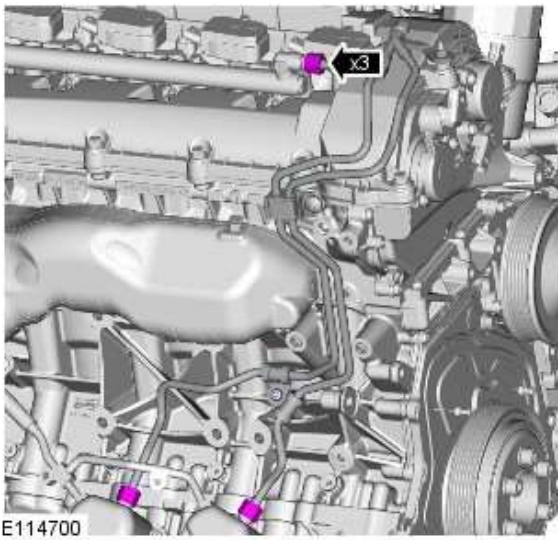
Torque:


Unions (1) 21 Nm

M6 (2) 11 Nm

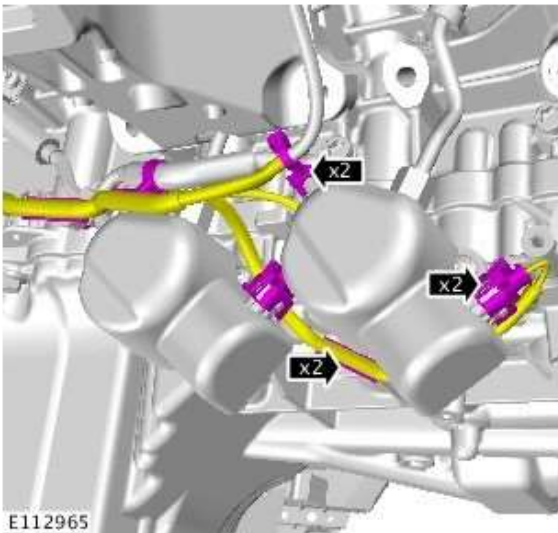
M8 (3) 25 Nm

M5 nut (4) 6 Nm




11.  NOTE: Engine shown removed for clarity.

Torque: 21 Nm



12. NOTES:

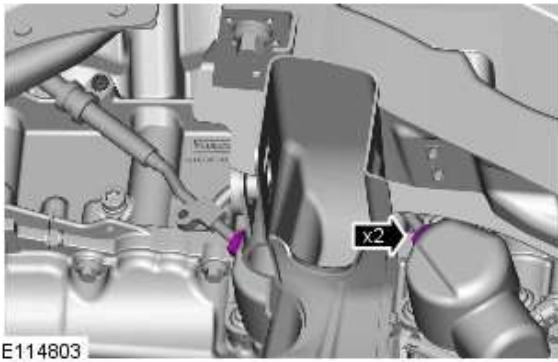
 Install the bolt and unions finger tight before final tightening.

 Remove and discard the blanking caps.

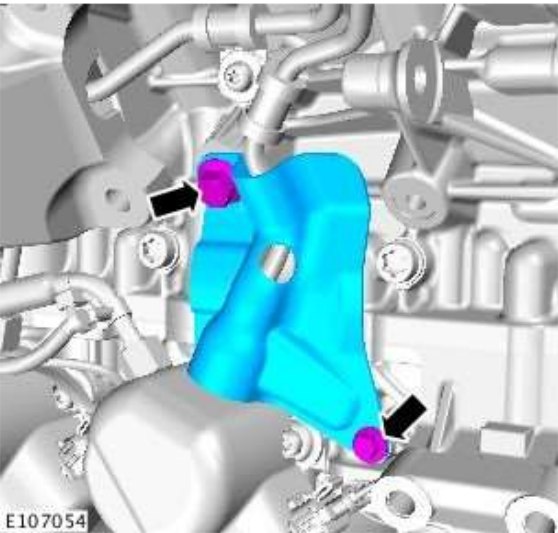
Torque:


Unions 21 Nm

M6 11 Nm



13. Torque: 21 Nm

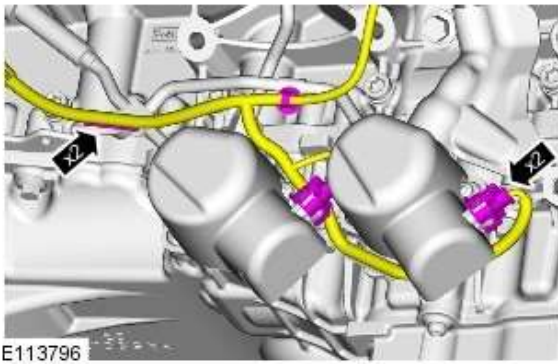


14.  NOTE: Engine shown removed for clarity.

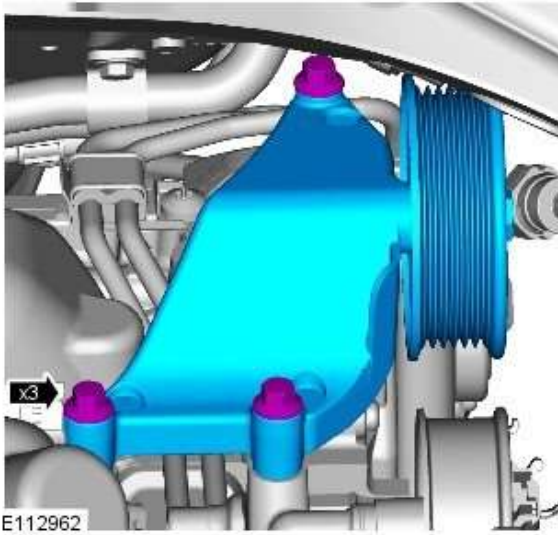
Torque:

M10 29 Nm

M6 11 Nm



15.  NOTE: Engine shown removed for clarity.

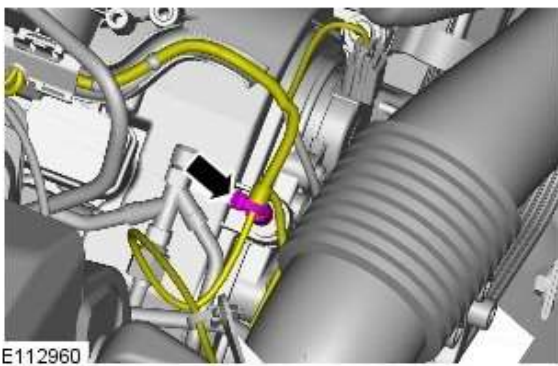


16. Torque: 25 Nm

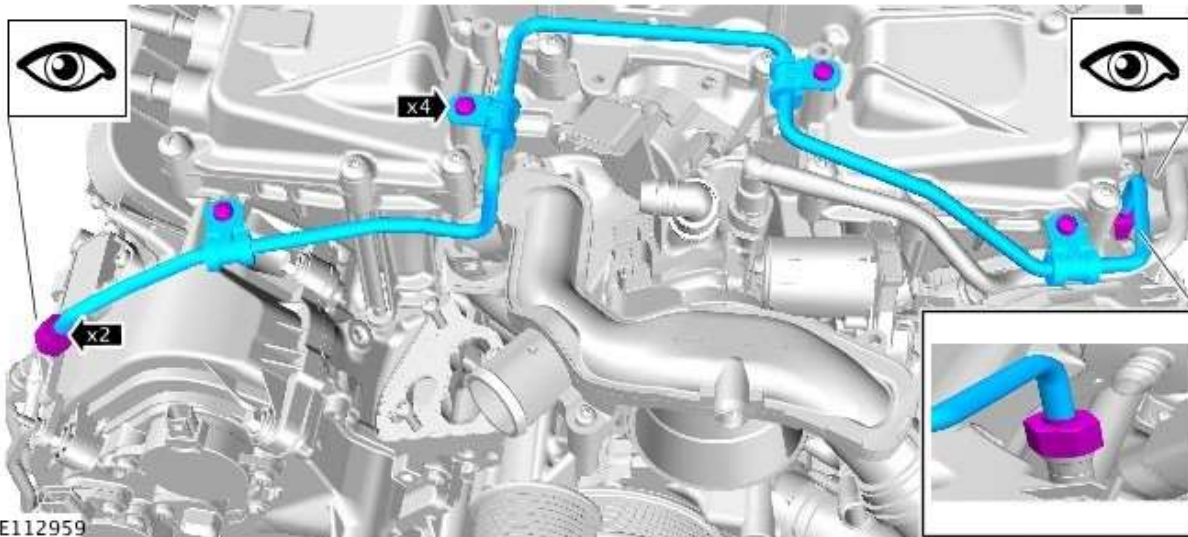
17. Refer to: [Generator - V8 5.0L Petrol](#) (414-02C Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

18. Refer to: Engine Mount RH (303-01D, In-vehicle Repair).

19. Lower the vehicle.




- 20.




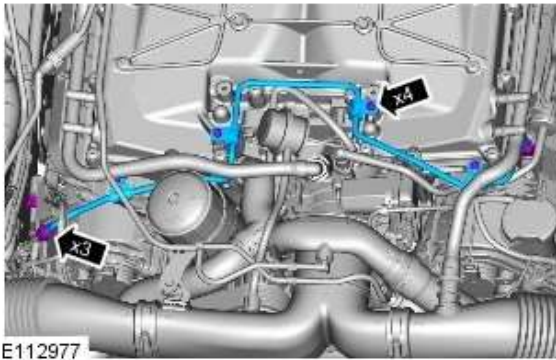
E112959

21. NOTES:

 Lubricate the union threads with clean engine oil.

 Do not tighten at this stage.

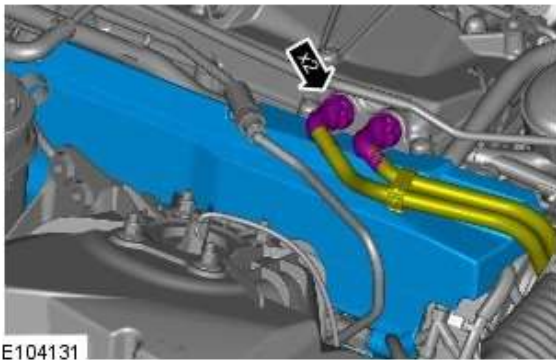
 Remove and discard the blanking caps.



E112977

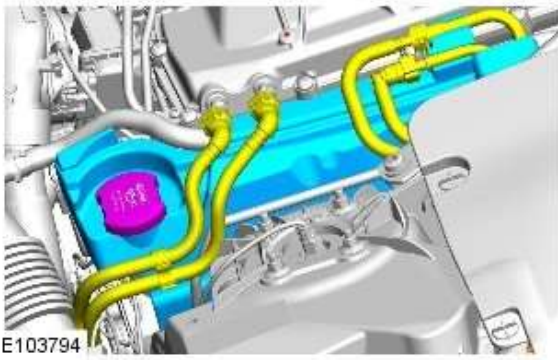
22. Torque:
Unions 21 Nm
Bolts 8 Nm

23. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

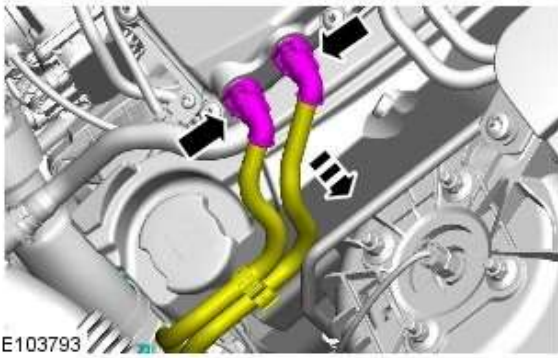


E104131

24.



25.



26.

27. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
28. Refer to: [Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
29. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
30. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Right-Hand Fuel Rail High-Pressure Fuel Pump

Removal and Installation

Removal



CAUTION: Make sure that tools and equipment are clean, free of foreign material and lubricant.

NOTES:



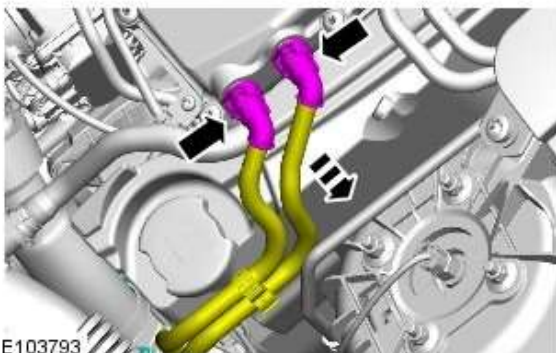
Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

All vehicles

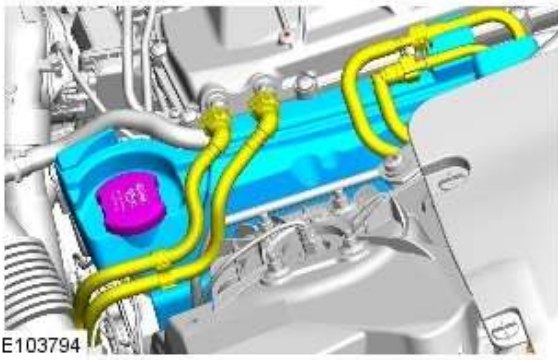
1. Refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
2. Refer to: [Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (310-00 Fuel System - General Information, General Procedures).
3. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
5. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
6. Refer to: [Fuel Injection Component Cleaning](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, General Procedures).



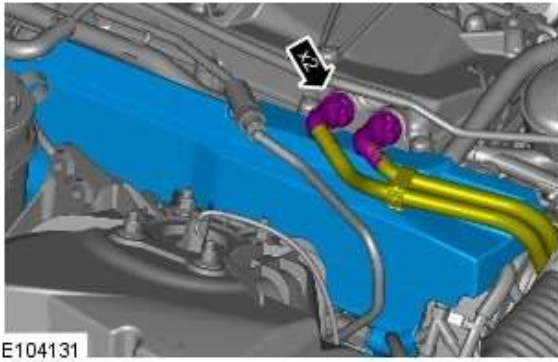
E103793



7. CAUTION: Be prepared to collect escaping fluids.

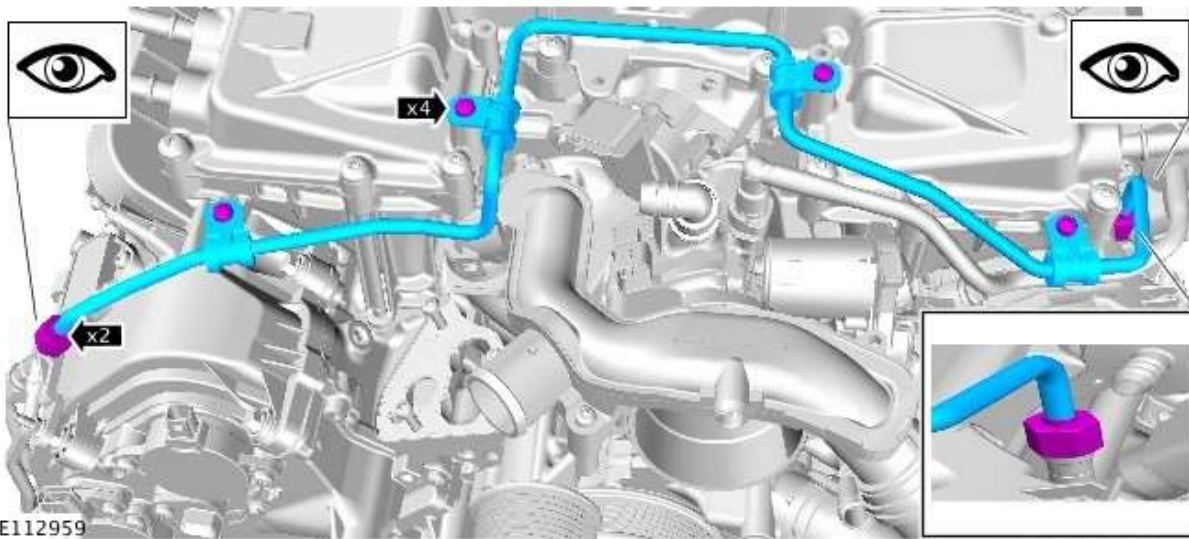


8.




9.  CAUTION: Be prepared to collect escaping fluids.

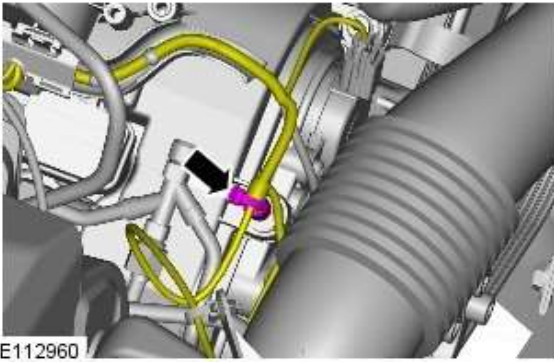
10. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).



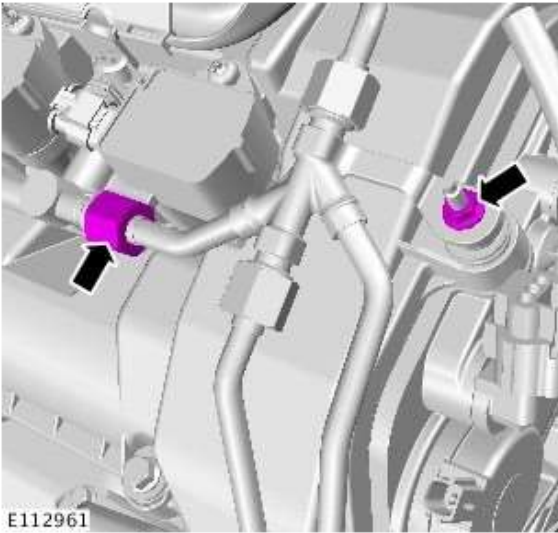
11. CAUTIONS:

 Be prepared to collect escaping fluids.

 Make sure that all openings are sealed. Use new blanking caps.



12.



13. CAUTIONS:



Be prepared to collect escaping fluids.



Make sure that all openings are sealed. Use new blanking caps.

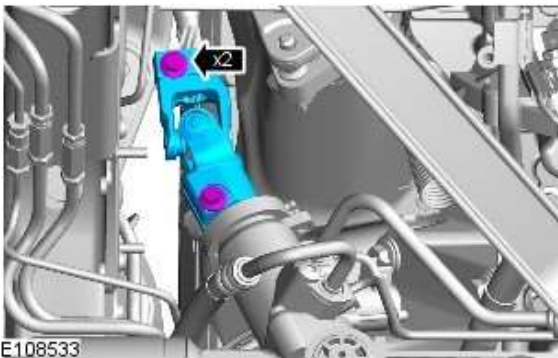
14.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

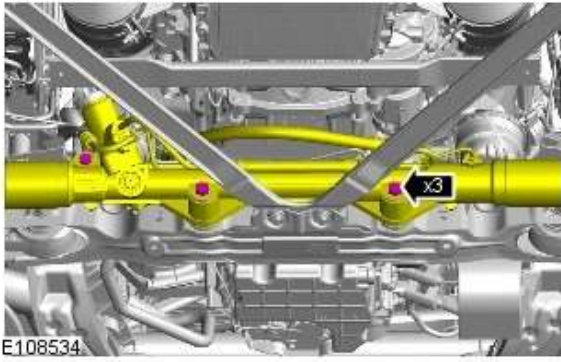
15. Refer to: [Engine Mount RH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

16. Refer to: [Generator - V8 5.0L Petrol](#) (414-02C Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

Left-hand drive vehicles

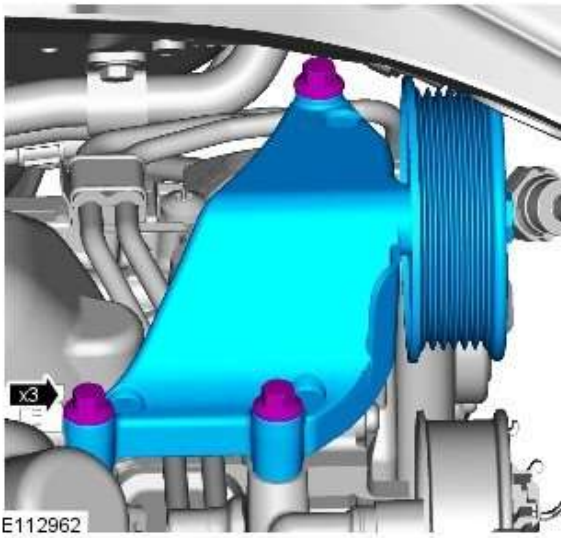


17.

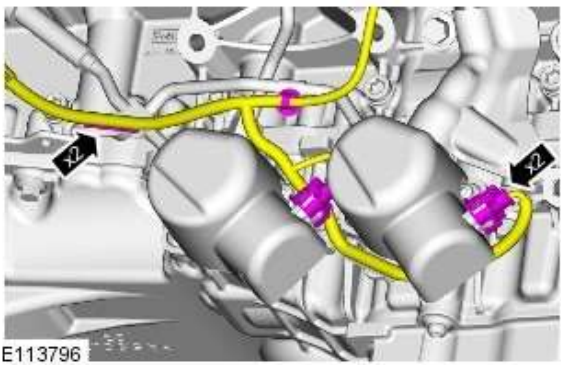



18.

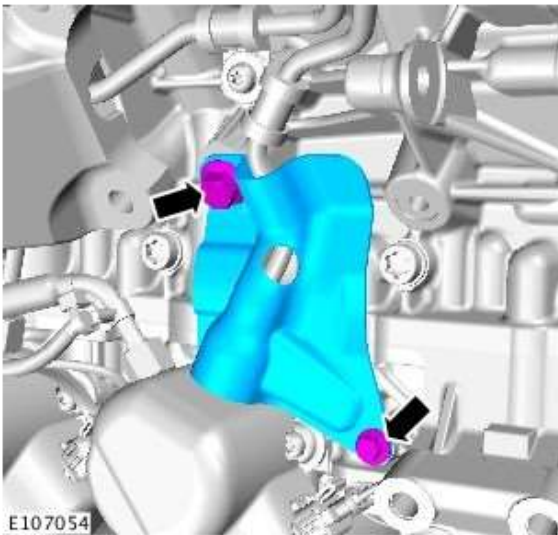
All vehicles



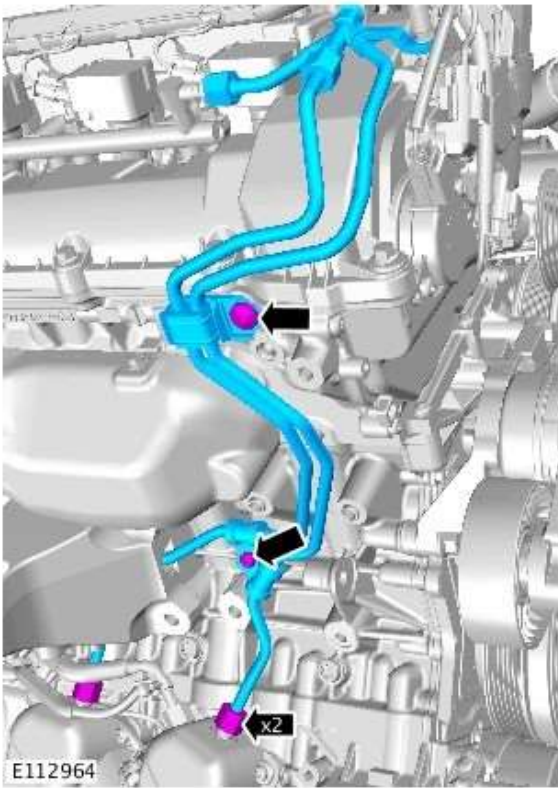
19.






20.  NOTE: Engine shown removed for clarity.



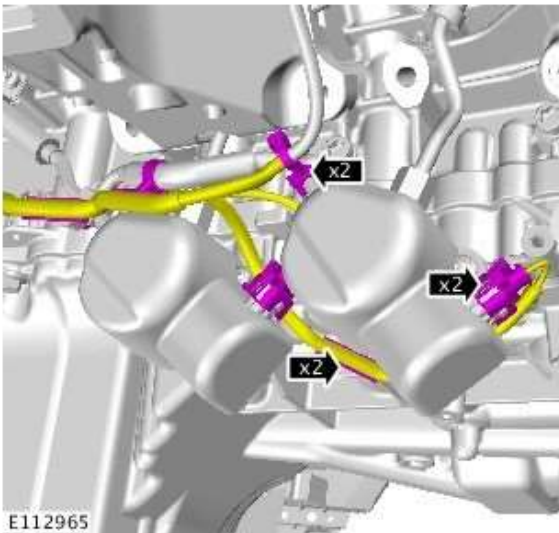
21.  NOTE: Engine shown removed for clarity.



22. CAUTIONS:

-  Remove and discard the high-pressure fuel supply lines.
-  Be prepared to collect escaping fluids.
-  Make sure that all openings are sealed. Use new blanking caps.

 NOTE: Engine shown removed for clarity.



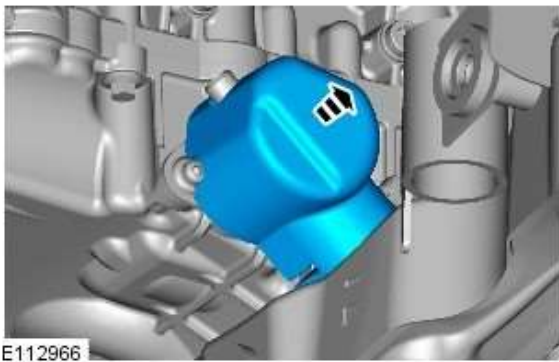
23. CAUTIONS:



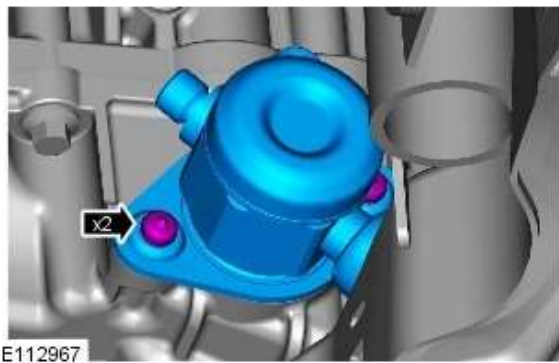
Be prepared to collect escaping fluids.



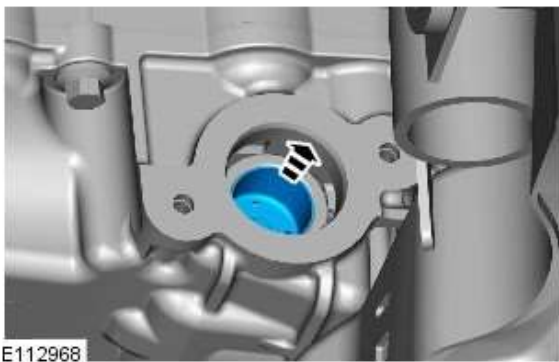
Make sure that all openings are sealed. Use new blanking caps.



24.



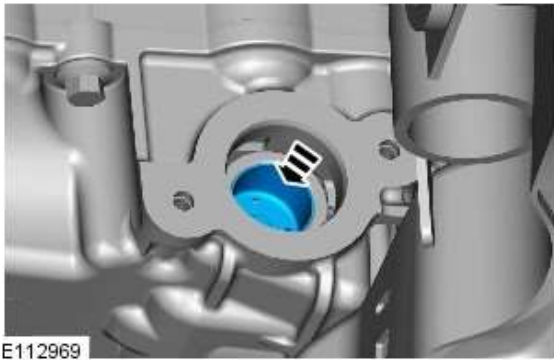
25.  CAUTION: Be prepared to collect escaping fluids.



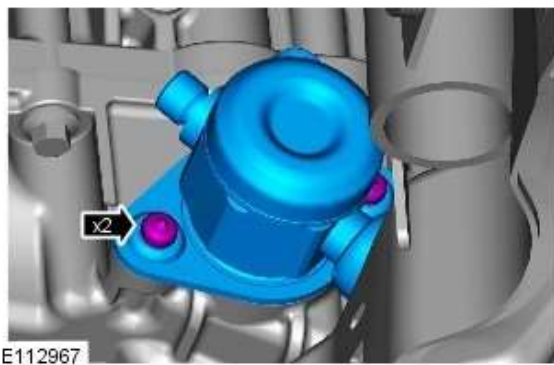
26.  CAUTION: Be prepared to collect escaping fluids.

Installation

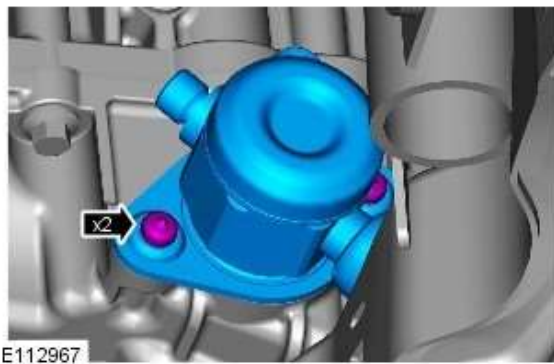
All vehicles



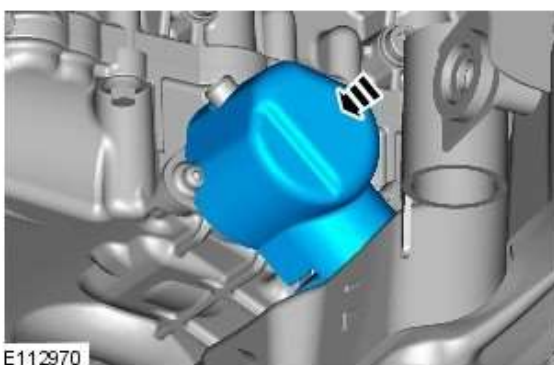
1.  NOTE: Lubricate the fuel rail high-pressure fuel pump bucket with clean engine oil.



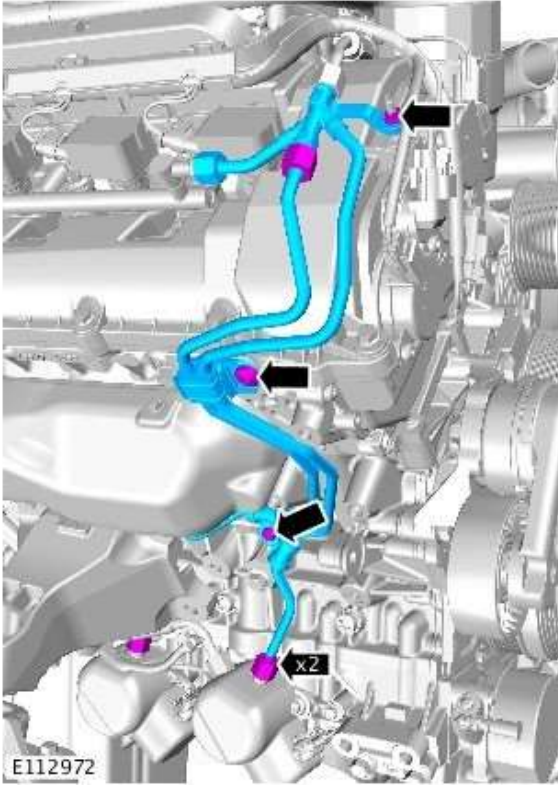
2.  CAUTION: Tighten on both sides simultaneously.
Torque: 12 Nm



3. Loosen the Torx screws half a turn each.



- 4.



5.  CAUTION: Install new high-pressure fuel supply lines.

NOTES:



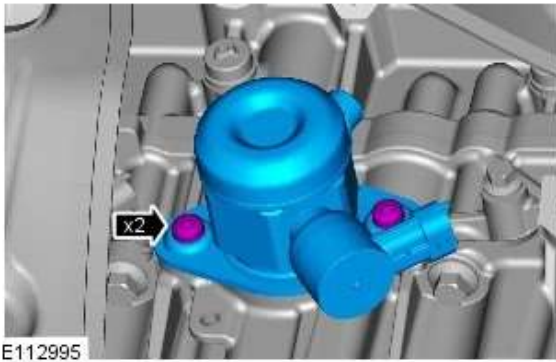
Engine shown removed for clarity.




Remove and discard the blanking caps.



Install the bolt and unions fully finger tight before final tightening.



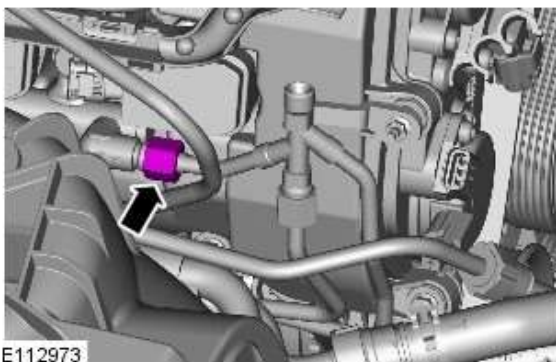
6.  CAUTION: Care must be taken when positioning the fuel rail high-pressure fuel pump cover to one side.



NOTE: Fuel rail high-pressure fuel pump cover shown removed for clarity.

Torque: 12 Nm

7. Lower the vehicle.



8. NOTES:



Do not tighten at this stage.

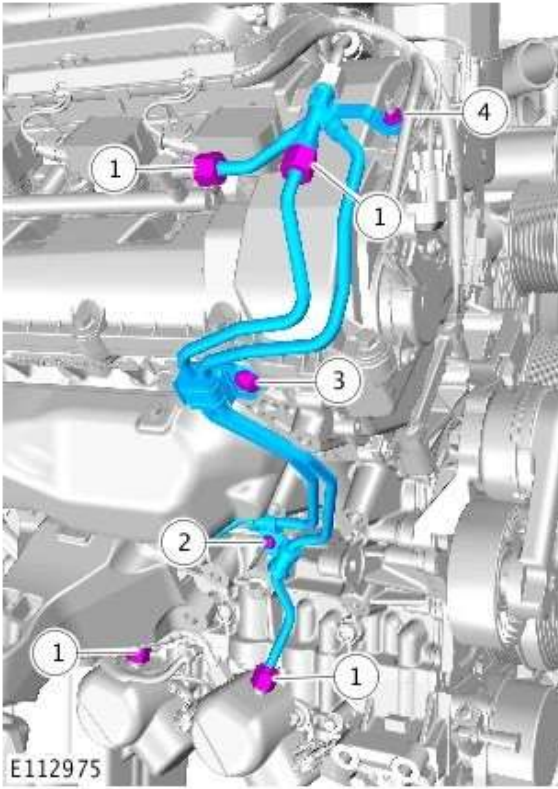



Remove and discard the blanking caps.



9. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

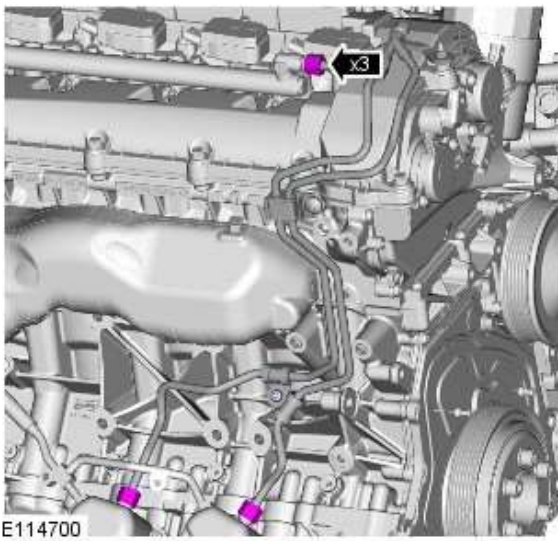



10.  CAUTION: Lubricate **only** the union threads with clean engine oil.

 NOTE: Engine shown removed for clarity.

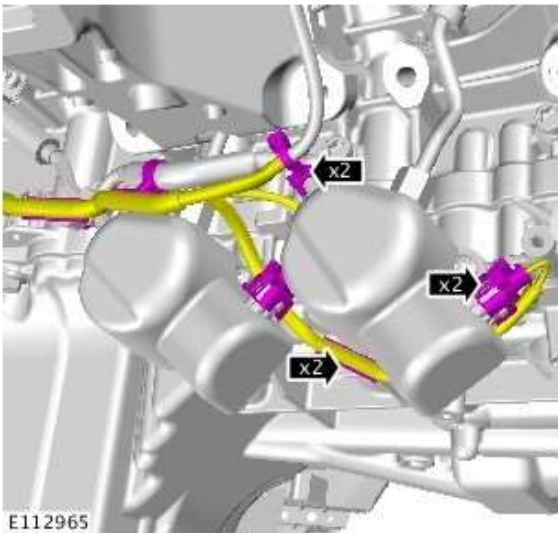
Torque:

Unions (1) 21 Nm
M6 (2) 11 Nm
M8 (3) 25 Nm
M5 nut (4) 6 Nm




11.  NOTE: Engine shown removed for clarity.

Torque: 21 Nm



12. NOTES:

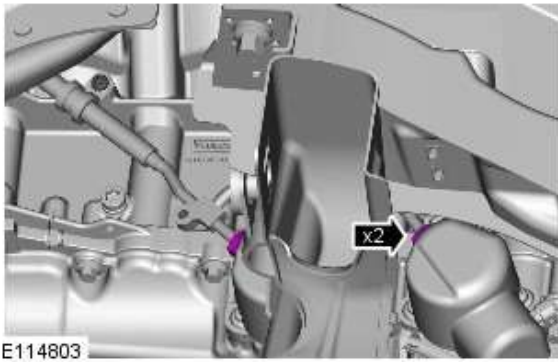
 Install the bolt and unions finger tight before final tightening.

 Remove and discard the blanking caps.

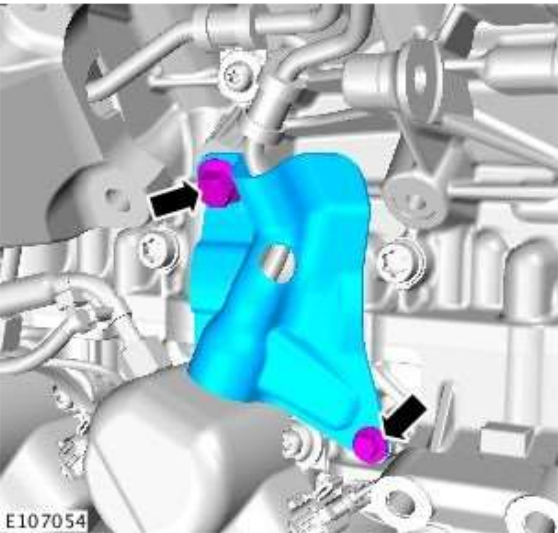
Torque:

Unions 21 Nm

M6 11 Nm



13. Torque: 21 Nm

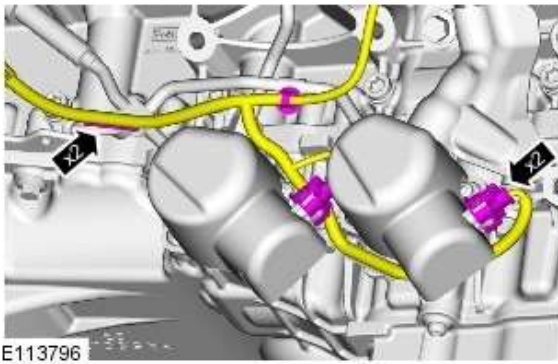



14.  NOTE: Engine shown removed for clarity.

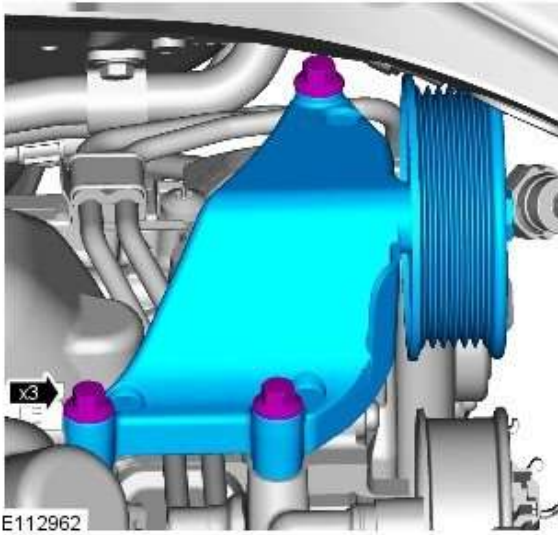
Torque:

M10 29 Nm

M6 11 Nm

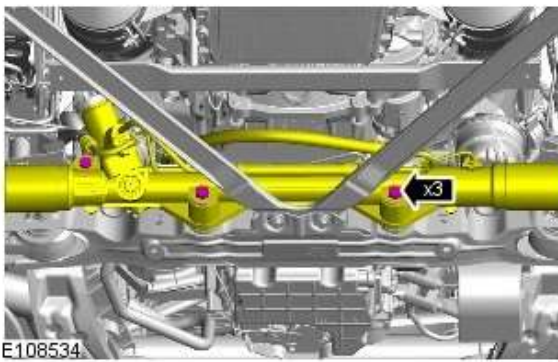


15.  NOTE: Engine shown removed for clarity.



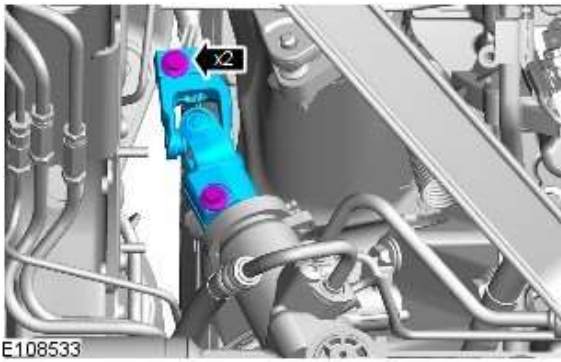
16. Torque: 25 Nm

Left-hand drive vehicles



17. Torque: 100 Nm

18. Torque: 35 Nm



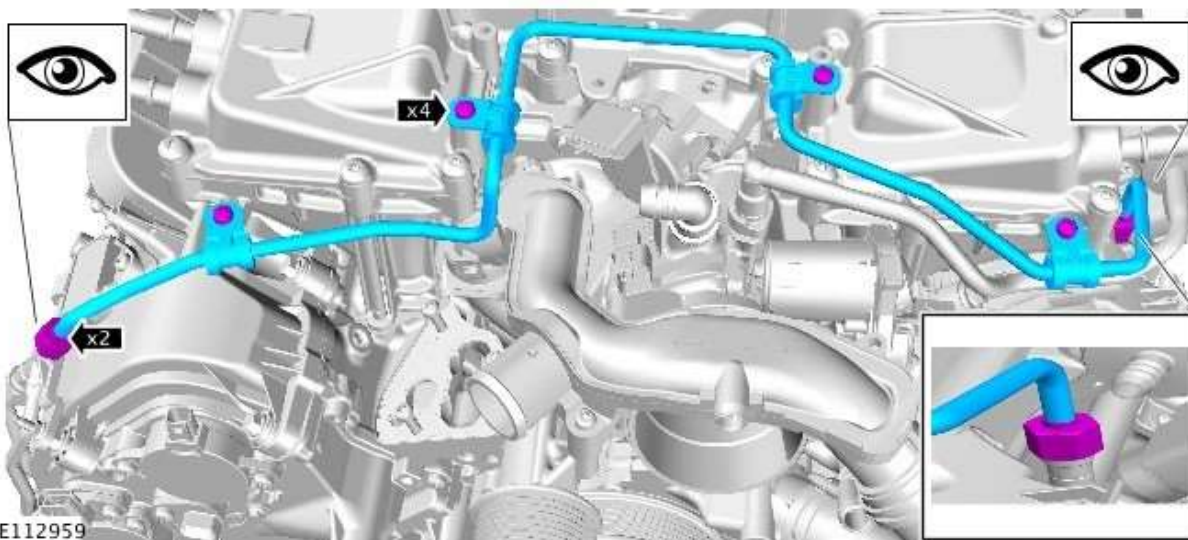
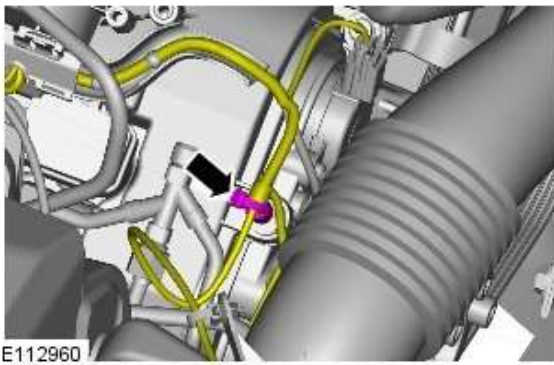
All vehicles

19. Refer to: [Generator - V8 5.0L Petrol](#) (414-02C Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).


20. Refer to: [Engine Mount RH](#) (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

21. Lower the vehicle.


22.

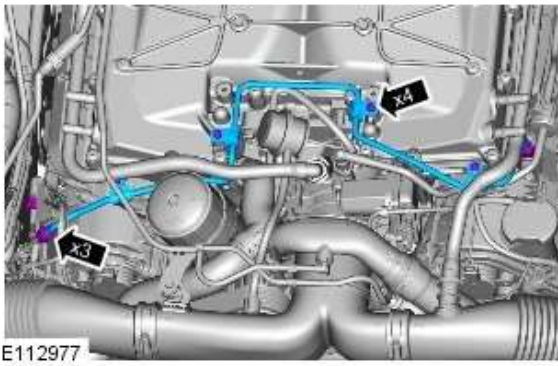


23. NOTES:

 Lubricate the union threads with clean engine oil.

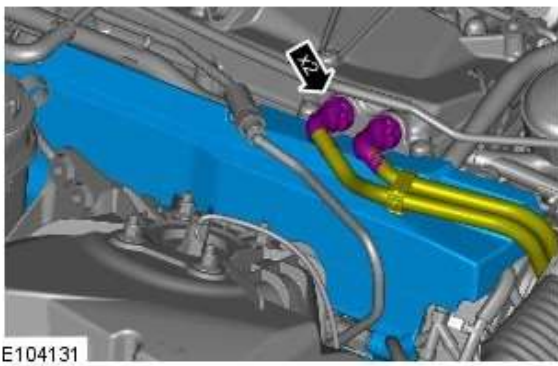
 Do not tighten at this stage.

 Remove and discard the blanking caps.

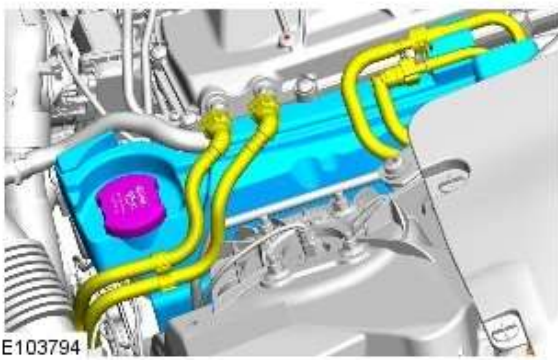


24. *Torque:*
Unions 21 Nm
Bolts 8 Nm

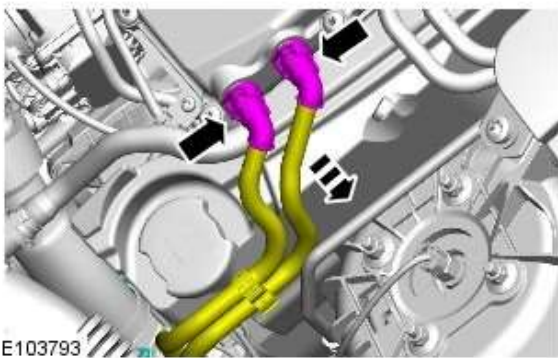
25. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).



- 26.



- 27.



- 28.

29. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and

Ornamentation, Removal and Installation).

30. Refer to: [Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
31. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).
32. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Throttle Body

Removal and Installation

Removal

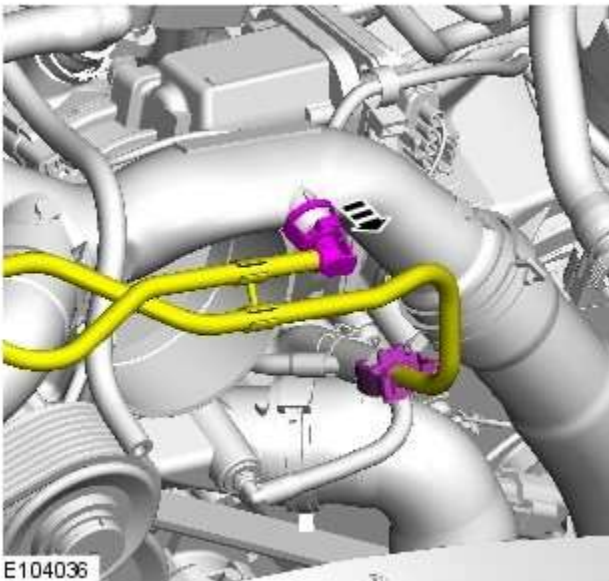


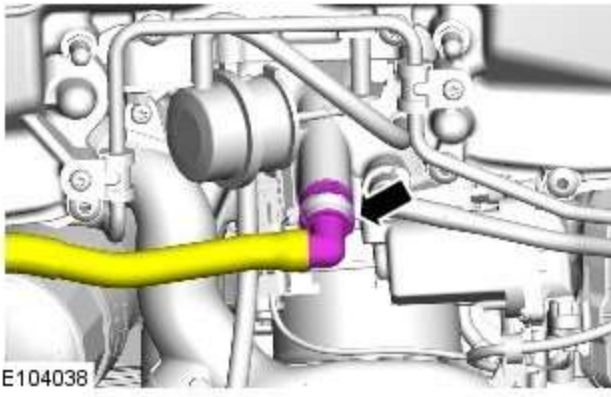
NOTE: Removal steps in this procedure may contain installation details.



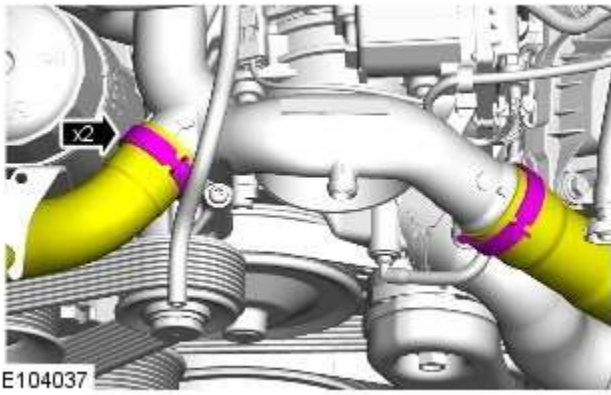
1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
Raise and support the vehicle.
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03E, General Procedures).
4. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
5. Refer to: Air Cleaner Outlet Pipe (303-12E, Removal and Installation).

6.

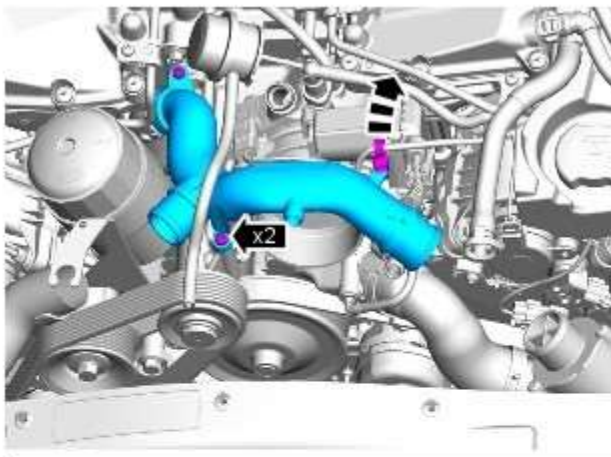




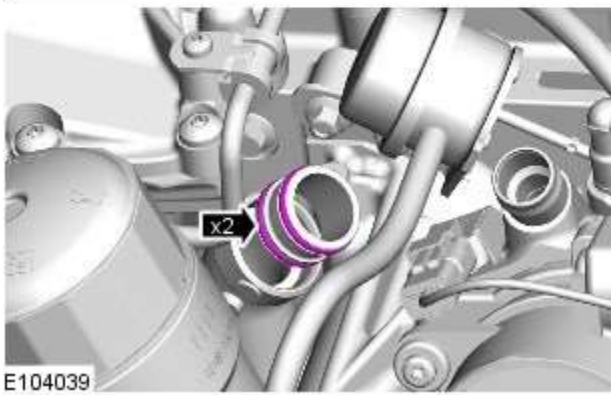
7.

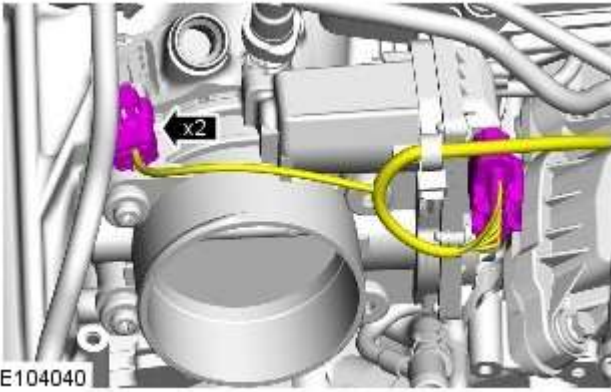


8.

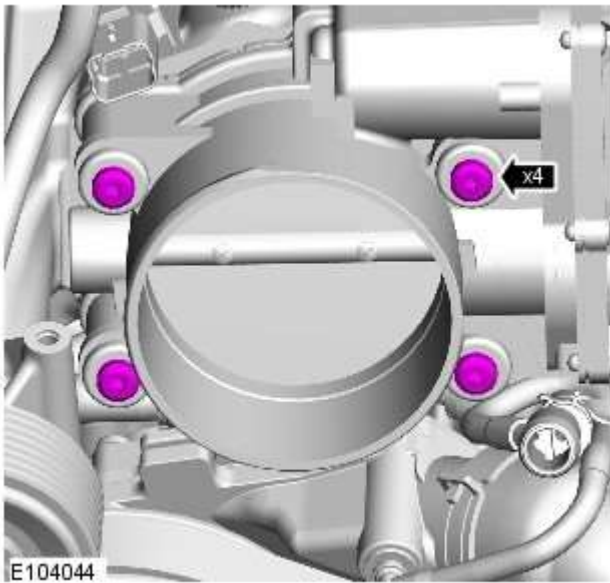


9. Torque: 10 Nm

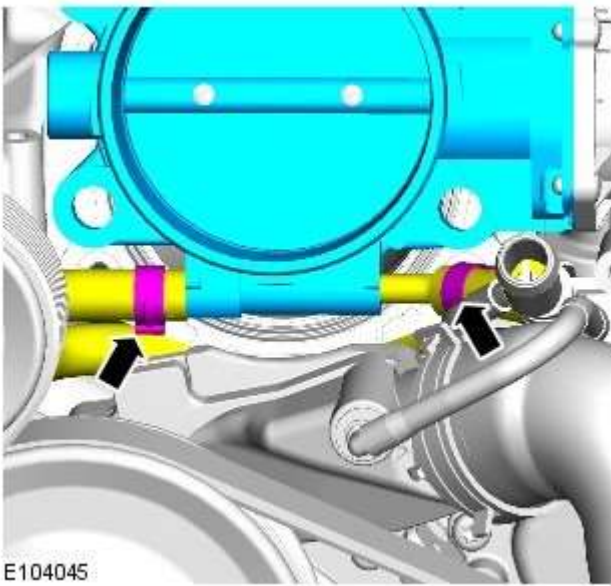





10.




11. Torque: 10 Nm



12. CAUTIONS:

 Take extra care when removing the throttle body, failure to follow this instruction may result in damage to the manifold absolute pressure and temperature (MAPT) sensor.

 Do not attempt to clean the throttle body bore, build up of deposits reduces air leakage past the throttle plate at the fully closed position.

- Remove and discard the gasket.

Installation

1. To install, reverse the removal procedure.

Accessory Drive - V8 S/C 5.0L Petrol -

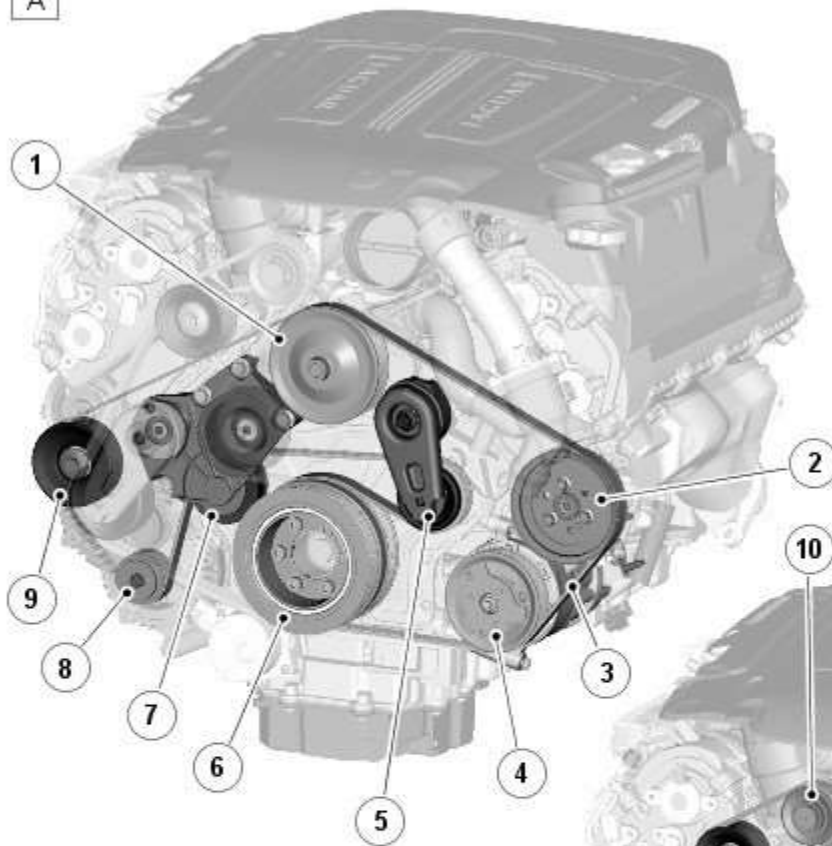
Description	Nm	lb-ft	lb-in
Accessory drive belt tensioner retaining bolt	40	30	-
Accessory drive belt idler pulley retaining bolt - all vehicles	40	30	-
Accessory drive belt center idler pulley retaining bolt - vehicles without supercharger	25	19	-
Accessory drive belt idler pulley retaining bolt to tensioner bracket - vehicles with supercharger	40	30	-
Supercharger belt tensioner bracket retaining bolt	25	19	-
Supercharger belt tensioner retaining bolt	40	30	-
Supercharger belt 76mm idler pulley retaining bolt	40	30	-
Supercharger belt 90mm idler pulley retaining bolt	56	41	-

Accessory Drive - V8 S/C 5.0L Petrol - Accessory Drive - Component Location

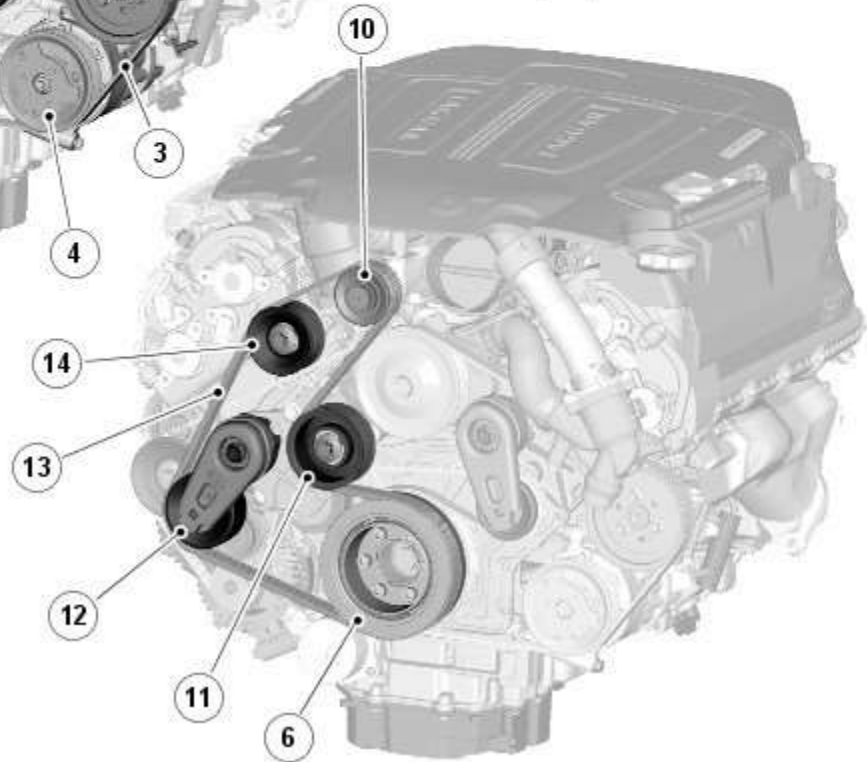
Description and Operation

COMPONENT LOCATION

A



B



E107359

Item	Description
A	Primary accessory drive
B	Secondary accessory drive
1	Coolant pump
2	Power steering pump
3	Primary drive belt
4	A/C (air conditioning) compressor
5	Belt tensioner
6	Crankshaft pulley/torsional vibration damper
7	Idler pulley

8	Generator
9	Idler pulley
10	Supercharger
11	Idler pulley
12	Belt tensioner
13	Secondary drive belt
14	Idler pulley

Accessory Drive - V8 S/C 5.0L Petrol - Accessory Drive - Overview

Description and Operation

OVERVIEW

The accessory drive is a belt system powered by a pulley attached to the front of the crankshaft. The crankshaft pulley, which incorporates a torsional vibration damper, drives two drive belts. An automatic belt tensioner in each belt run maintains the drive belt at the correct tension. Together with idler pulleys, the belt tensioners also guide the drive belts clear of obstructions and set the correct 'wrap-around' of the accessory component drive pulleys to ensure a slip-free drive.

PRIMARY DRIVE BELT

The primary drive belt is a six-ribbed poly-V belt that drives the:

- Coolant pump
- Power steering pump
- [A/C \(air conditioning\)](#) compressor
- Generator.

SECONDARY DRIVE BELT

The secondary drive belt is an eight-ribbed poly-V belt that drives the [SC \(supercharger\)](#).

BELT TENSIONERS

Each belt tensioner consists of an idler pulley on the end of a spring loaded pivot arm. The pivot arms can be turned manually for removal and installation of the drive belts.

Each belt tensioners is calibrated to automatically maintain the correct tension in the related drive belt.


Accessory Drive - V8 S/C 5.0L Petrol - Accessory Drive Belt

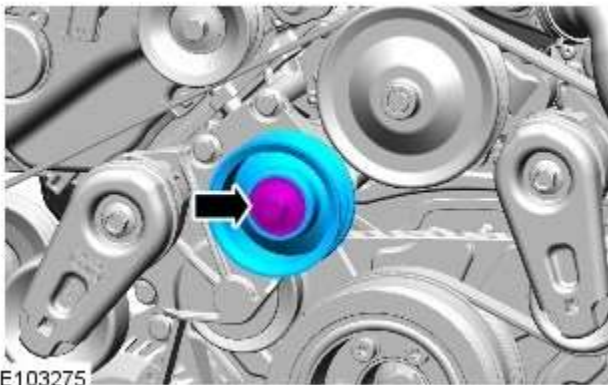
Removal and Installation

Removal

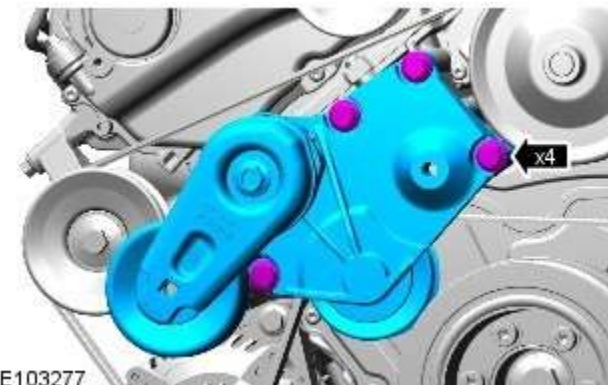


NOTE: Removal steps in this procedure may contain installation details.

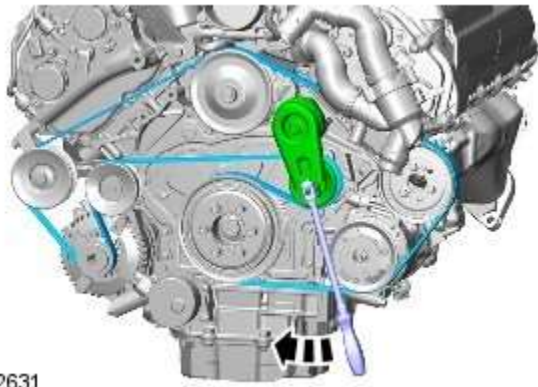
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Supercharger Belt (303-05, Removal and Installation).
3.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
4. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).



5. Torque: 55 Nm



6. Torque: 25 Nm



E102631

7. CAUTIONS:

 Make sure that the accessory drive belt is correctly aligned to the pulleys. Failure to follow this instruction may result in damage to the vehicle.

 Clean and inspect the accessory drive belt pulleys for damage.

NOTES:

 Some variation in the illustrations may occur, but the essential information is always correct.

 Engine shown removed for clarity.

 Note the fitted position.

Installation

1. To install, reverse the removal procedure.

Accessory Drive - V8 S/C 5.0L Petrol - Accessory Drive Belt Idler Pulley

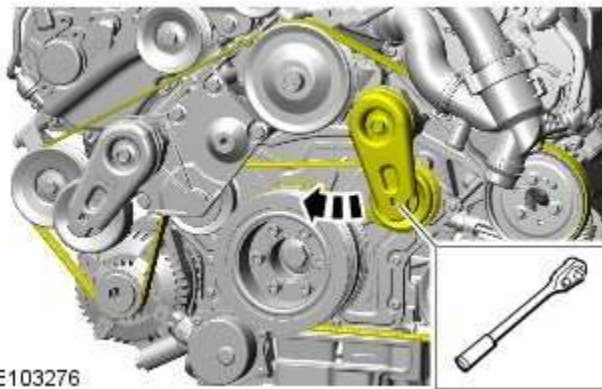
Removal and Installation

Removal




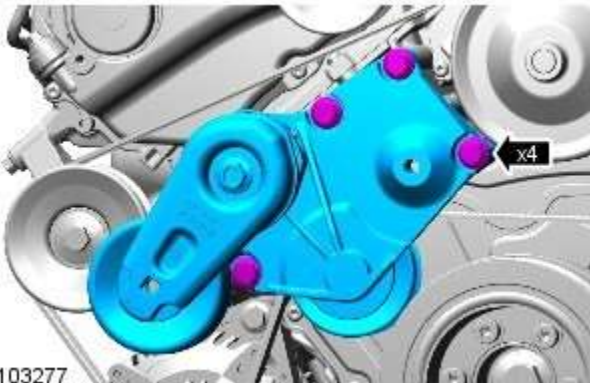
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Supercharger Belt (303-05, Removal and Installation).
3. Refer to: [Air Cleaner Outlet Pipe LH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).



E103276

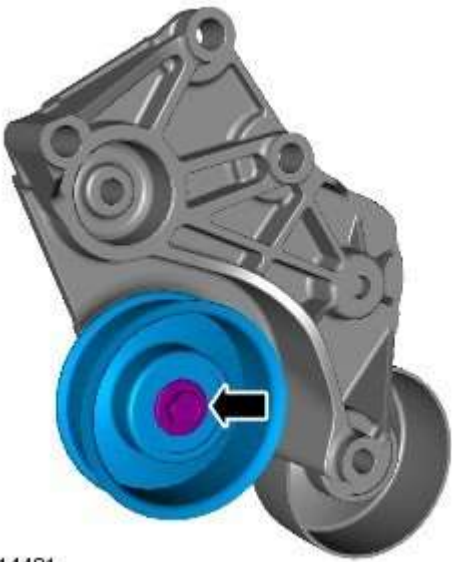
4.  NOTE: Note the fitted position.



E103277

5. Torque: 25 Nm

6. Torque: 40 Nm



E114481

Installation

1. CAUTIONS:



Make sure the accessory belt is correctly aligned to the pulleys. Failure to follow this instruction may result in damage to the vehicle.



Clean and inspect the accessory drive belt pulleys for damage.

To install, reverse the removal procedure.

Accessory Drive - V8 S/C 5.0L Petrol - Accessory Drive Belt Tensioner

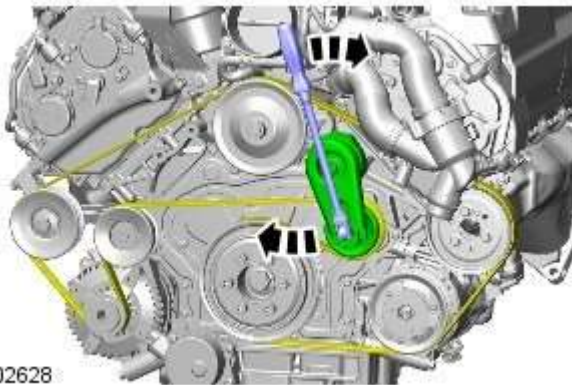
Removal and Installation

Removal



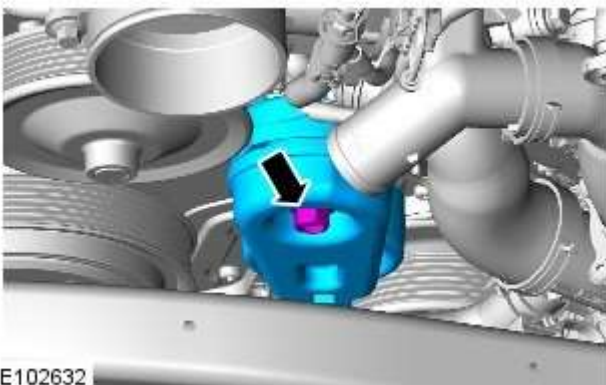
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Air Cleaner Outlet Pipe T-Connector](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
3. Refer to: [Air Cleaner Outlet Pipe LH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).



4.  NOTE: Note the fitted position.

5. Torque: 40 Nm



Installation

1. CAUTIONS:



Make sure the accessory belt is correctly aligned to the pulleys. Failure to follow this instruction may result in damage to the vehicle.



Clean and inspect the accessory drive belt pulleys for damage.

To install, reverse the removal procedure.

Accessory Drive - V8 S/C 5.0L Petrol - Supercharger Belt Idler Pulley

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
3. Refer to: [Air Cleaner Outlet Pipe T-Connector](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

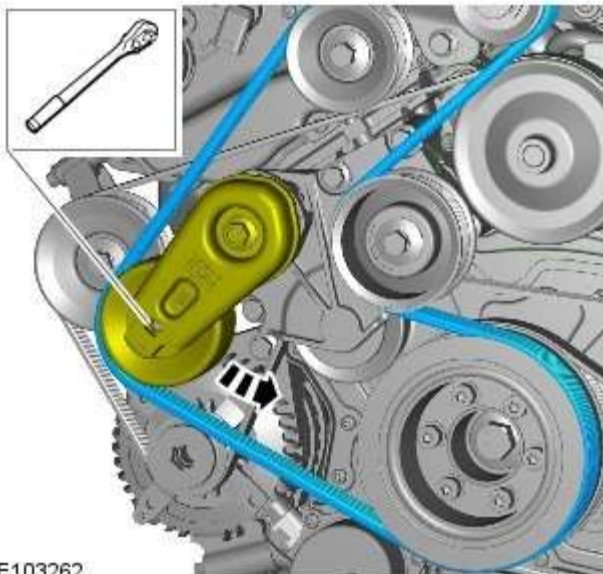
4. NOTES:



Note the fitted position.

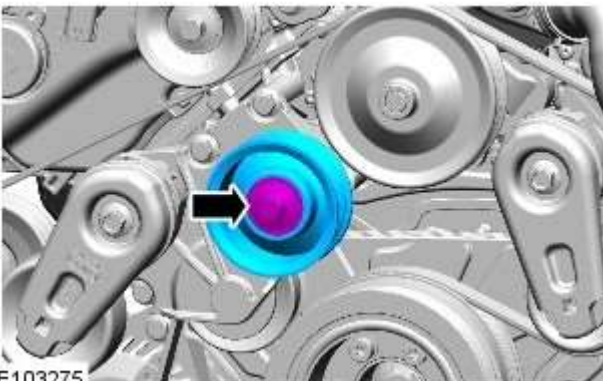


Engine shown removed for clarity.



E103262

5. Torque: 40 Nm



E103275

Installation



1. CAUTION: Make sure the supercharger belt is correctly aligned to the pulleys. Failure to follow this instruction may result in damage to the vehicle.

To install, reverse the removal procedure.

Accessory Drive - V8 S/C 5.0L Petrol - Supercharger Belt Tensioner

Removal and Installation

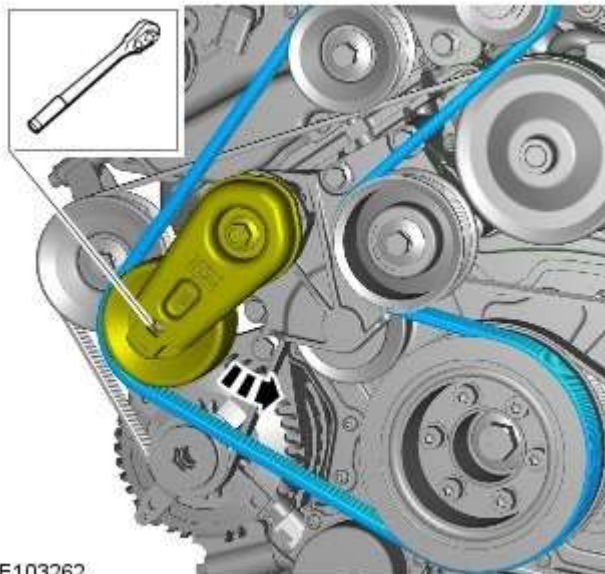
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Air Cleaner Outlet Pipe RH](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
3. Refer to: [Air Cleaner Outlet Pipe T-Connector](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

4.



5. Torque: 40 Nm



Installation

1. CAUTIONS:



Make sure the supercharger belt is correctly aligned to the pulleys. Failure to follow this instruction may result in damage to the vehicle.



Clean and inspect the accessory drive belt pulleys for damage.

To install, reverse the removal procedure.

Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol -

Description	Nm	lb-ft	lb-in
Starter motor retaining bolts	47	35	-
Battery positive terminal connector retaining nut	10	7	-
Solenoid terminal connector retaining nut	7	-	62

Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Starting System -

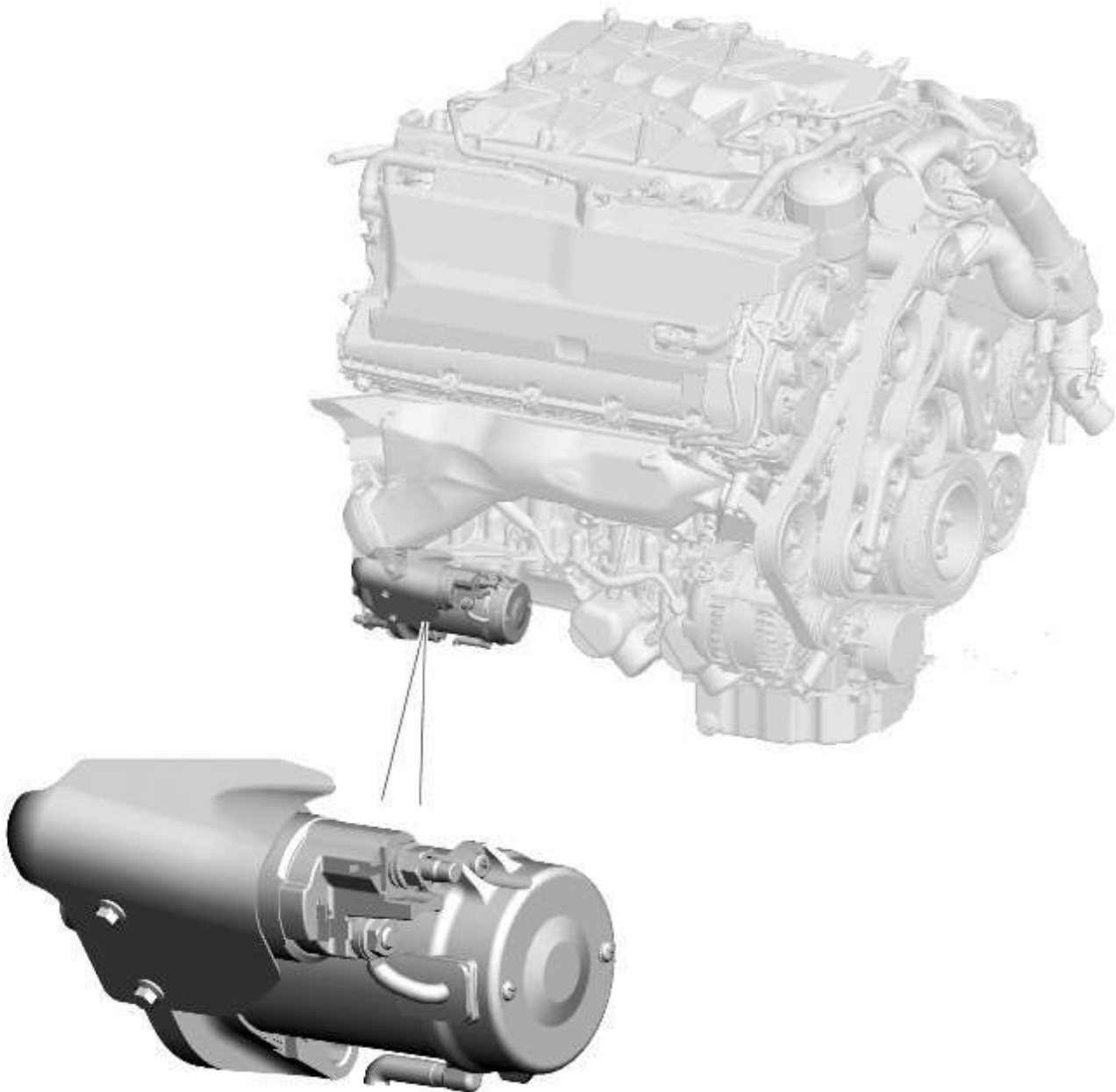
Component Location

Description and Operation



NOTE: Installation on supercharged engine shown, installation on naturally aspirated engine similar.

COMPONENT LOCATION



E118325

Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Starting System -

Overview

Description and Operation

OVERVIEW

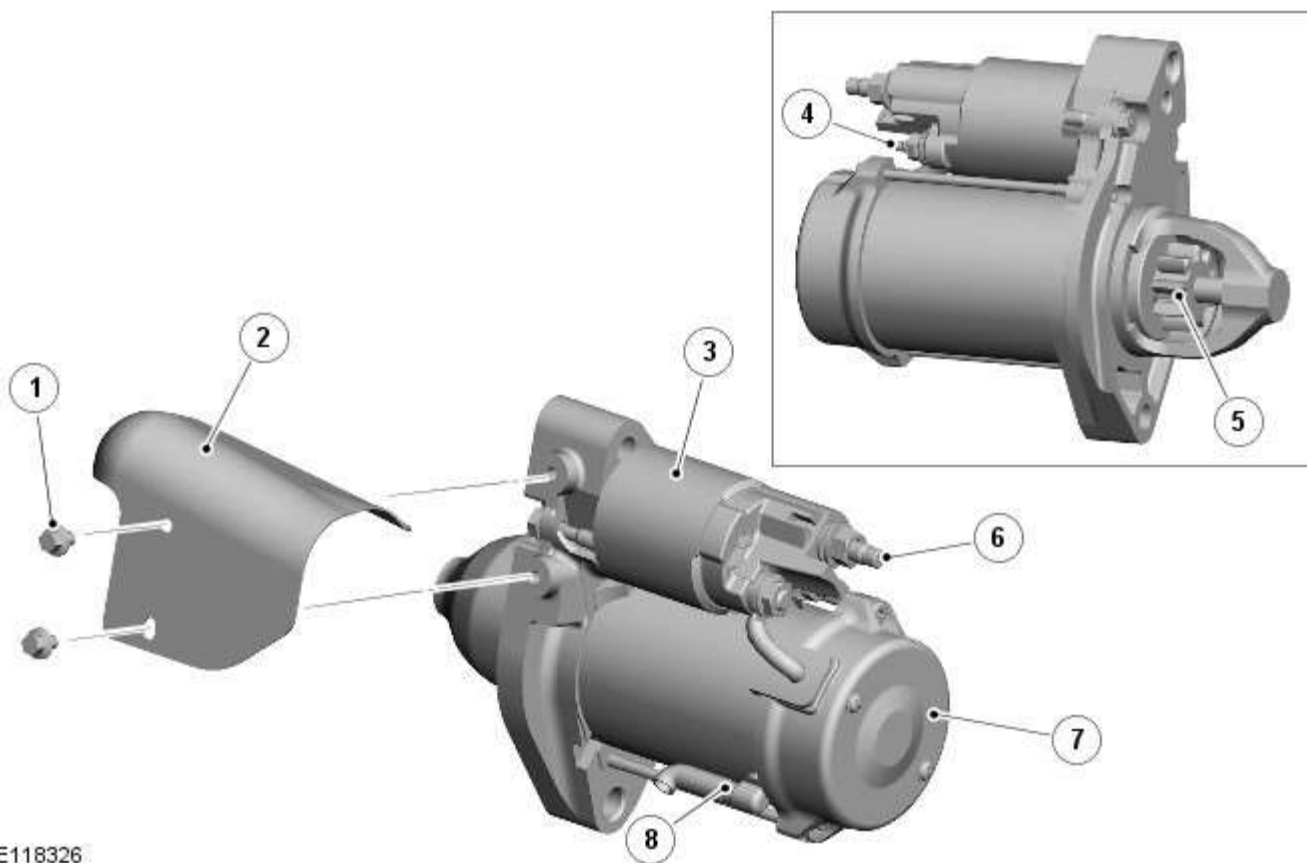
The starter motor is manufactured by Denso and is rated at 1.8 kW. The motor is geared directly to the pinion. The motor is a series wound motor with an overrunning clutch. The interior of the motor is ventilated through a breather tube attached to the underside of the motor housing.

The starter motor is located on the rear right side of the engine sump body. The motor is installed in an aperture in the sump body and the pinion is engaged with the ring gear of the crankshaft drive plate. A ground cable for the starter motor is connected to one of the starter motor securing points.

A heat shield is attached to the starter motor, at the point closest to the exhaust manifold and catalytic converter.

A heavy duty cable, which supplies the electrical power to turn the starter motor, is connected to the battery positive terminal via the [BJB \(battery junction box\)](#). At the starter motor, the cable is connected to a terminal stud on the solenoid. The power feed from the starter relay, to energize the solenoid, is connected to a second terminal stud on the solenoid.

Starter Motor Assembly



E118326

Item	Description
1	Bolt (2 off)
2	Heat shield
3	Starter solenoid
4	Solenoid power terminal
5	Pinion gear
6	Starter power terminal
7	Electric motor
8	Breather tube

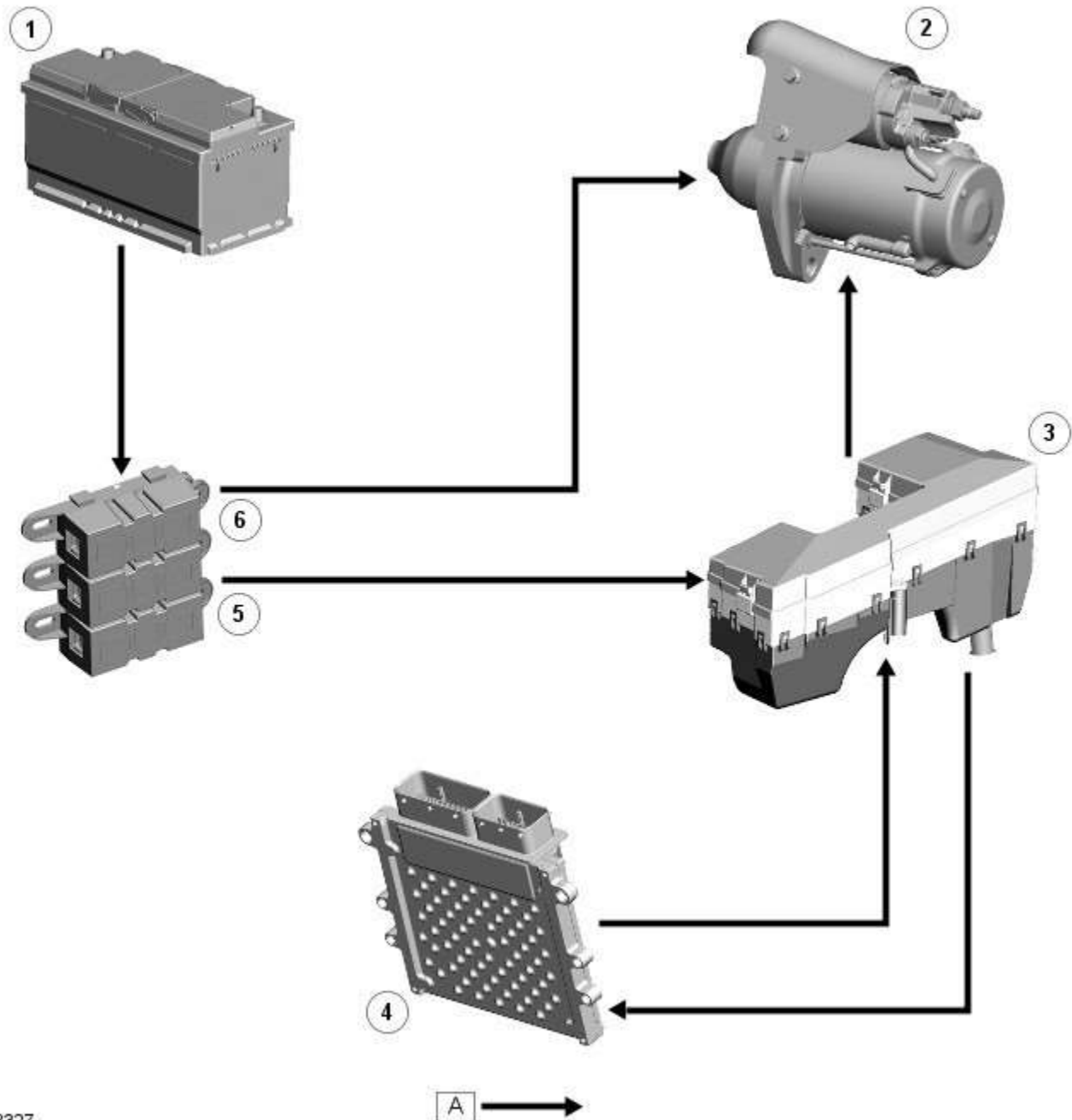
Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Starting System - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired



E118327

Item	Description
1	Battery
2	Starter motor
3	EJB (starter relay)
4	ECM
5	BJB (250 A megafuse)
6	BJB (400 A megafuse)

System Operation

GENERAL

Engine crank requests are monitored by the passive anti-theft system and, if valid, passed on to the [ECM \(engine control module\)](#).

Refer to: [Anti-Theft - Passive](#) (419-01B Anti-Theft - Passive, Description and Operation).

When the [ECM](#) receives a crank request, it energizes the starter relay in the [EJB \(engine junction box\)](#). The energized starter relay supplies 12 V power (fed via the 250 A megafuse in the [BJB \(battery junction box\)](#)) to energize the pull-in coil of the starter solenoid. Once activated, the pull-in coil engages the solenoid plunger, which engages the pinion with the ring gear. The plunger then closes the solenoid circuit, feeding power from the 400 A megafuse in the [BJB](#) to the starter motor.

Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Starting System

Diagnosis and Testing

Principles of Operation

For a detailed description of the starting system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (303-06C Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol)

[Starting System](#) (Description and Operation),
[Starting System](#) (Description and Operation),
[Starting System](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.



NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Gear selector lever cable adjustment (vehicles with automatic transmission) • Starter motor • Engine (turns freely) 	<ul style="list-style-type: none"> • Battery • Fuses • Starter relay • Wiring harness(es) • Damaged, loose or corroded connectors • Ignition switch • Generator • Transmission Control Module (TCM) • Engine Control Module (ECM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
The engine does not crank (starter motor does not turn)	<ul style="list-style-type: none"> • Gear selector not in P or N position (vehicles with automatic transmission) • Battery • Starter relay • Invalid key code received by Central Junction Box (CJB) • Harness/Connectors • Starter motor • Ignition switch • Generator • Transmission Control Module (TCM) • Engine Control Module (ECM) • Engine seized 	Make sure the gear selector is in the P or N position and correctly adjusted. Check the battery condition and state of charge. Check for DTCs indicating an immobilizer fault. Check the starter motor relay, ignition switch and generator circuits. Refer to the electrical guides. Check for TCM and ECM DTCs. Check that the engine turns freely.
The engine does not crank (starter motor does turn)	<ul style="list-style-type: none"> • Starter motor installation • Starter motor • Flywheel/Drive plate ring gear 	Check the starter motor installation (fasteners tight, starter motor square to engine, etc). Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.

Symptom	Possible Causes	Action
Engine cranks too slowly	<ul style="list-style-type: none"> • Battery • Harness/Connectors • Starter motor • Oil grade 	Check the battery condition and state of charge. Check the starter motor circuits. Refer to the electrical guides. Check the engine oil grade and condition.
Engine cranks too fast	<ul style="list-style-type: none"> • Low engine compression 	Check the engine compressions.
Excessive starter motor noise	<ul style="list-style-type: none"> • Starter motor • Flywheel/Drive plate ring gear • Starter motor installation/casing 	Check the starter motor installation (fasteners tight, motor square to engine, etc). Check the starter motor casing condition. Check the flywheel/drive plate ring gear teeth for damage, foreign objects, etc.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged in the Engine Control Module (ECM), please refer to Section 303-14. REFER to:

[Electronic Engine Controls](#) (303-14C Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing),
[Electronic Engine Controls](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).

Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Starting System Vehicles With: Smart Key

Diagnosis and Testing

Principles of Operation

For a detailed description of the starting system, refer to the relevant Description and Operation section in the workshop manual.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Steering column • Brake pedal • Smart key • Steering Wheel 	<ul style="list-style-type: none"> • Fuses • Harnesses and connectors • Warning lamp operation • Smart key operation • Engine start operation

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTC's) and refer to the DTC Index.
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSM's which may be valid for the specific customer complaint and carry out the recommendations as needed.

CAUTIONS:



Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle



When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests





Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Symptom Chart

Symptom - Message Displayed	Symptom - Possible Cause	Action
Smart key not found - Refer to handbook	Ignition mode fails to switch on	GO to Pinpoint Test A .



Symptom - Message Displayed	Symptom - Possible Cause	Action
 NOTE: Back up start - 10MY onwards Smart key not found - Refer to handbook Press start and brake Steering column locked	Ignition mode fails to switch on	GO to Pinpoint Test B.
	Engine fails to crank	GO to Pinpoint Test C.
	Ignition switches off after 3 seconds	GO to Pinpoint Test D.
 NOTE: For diesel engines Engine still not cranking	Ambient temperatures below zero	GO to Pinpoint Test E.

Pin Point Test


PINPOINT TEST A : SMART KEY NOT FOUND - REFER TO HANDBOOK

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: IGNITION MODE FAILS TO SWITCH ON	
NOTES:	
 In normal operation, pressing the start button for one second will cause the vehicle to enter the ignition mode. If the procedures below are followed the engine should crank	
 For automatic transmission vehicles, ensure the brake pedal is depressed and the park or neutral selected	
	1 Ensure the smart Key is within the cabin area. Check the smart key is not close to any electrical devices e.g. Smart phones, laptops, laptop cases, games consoles and game console bags, briefcases, metal objects etc. All can affect the system performance and may block its communication with the vehicle. If the smart key battery low warning message has been displayed it is likely that the smart key battery has insufficient charge. Refer to section 'Back Up Start' for 10MY onwards
	Has the vehicle started? Yes No further action required No Check and install a new battery as required. Clear the DTC and retest. If the problem persists, contact dealer technical support






PINPOINT TEST B : BACK UP START - 10MY ONWARDS - SMART KEY NOT FOUND - REFER TO HANDBOOK

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: IGNITION MODE FAILS TO SWITCH ON	
NOTES:	
 In normal operation, pressing the start button for one second will cause the vehicle to enter the ignition mode. If the procedures below are followed the engine should crank	
 For automatic transmission vehicles, ensure the brake pedal is depressed and the park or neutral selected	
	1 On pressing the start button, smart key not found . When this warning is displayed the smart key should be brought into close proximity with the immobilize antenna unit. Hold the key in the location and press the start button again. If this process fails the first time, try repositioning the key around the immobilize antenna unit location, repeat the sequence again
	Has the vehicle started? Yes No further action required No Contact dealer technical support

PINPOINT TEST C : PRESS START AND BRAKE - (MESSAGE DISPLAYED)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: ENGINE FAILS TO CRANK	
NOTES:	
 Conditions for starting in addition to pressing the start button are	

PINPOINT TEST D : STEERING COLUMN LOCKED - (MESSAGE DISPLAYED)

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: IGNITION SWITCHES OFF AFTER 3 SECONDS	
NOTES:	
	Conditions for starting in addition to pressing the start button are
	For automatic transmission vehicles, ensure the brake pedal is depressed and the park or neutral selected
	If the engine can be heard to crank there is no fault with the smart key
	If the locking pin is still engaged, turn the steering wheel to overcome the side load
	Start authorisation defined as Ignition functions, Steering column lock engagement, Engine immobilize and smart key authorisation
	1 Unlock the vehicle using the key fob, within 3 minutes of unlocking ensure the steering wheel can rotate freely. Perform a further lock and unlock check and attempt to start vehicle. If the steering 'column locked' message is still displayed, Lock the vehicle with the key fob and ensure the column is locked (If installed) by turning the steering wheel. Then unlock the vehicle ensuring the column Steering wheel can turn freely. Now perform another start attempt
	Did the engine start? Yes No further action required No Contact dealer technical support

PINPOINT TEST E : ENGINE STILL NOT CRANKING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: AMBIENT TEMPERATURES BELOW ZERO	
	1 Hold the start button down for at least 4 seconds while starting the vehicle
	2 Switch the ignition on, the passive anti theft system (PATS) LED should now be illuminated. Start the engine, the PATS LED should switch off after 3 seconds
	Did the engine start? Yes No further action required No Contact dealer technical support

Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Starter Motor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

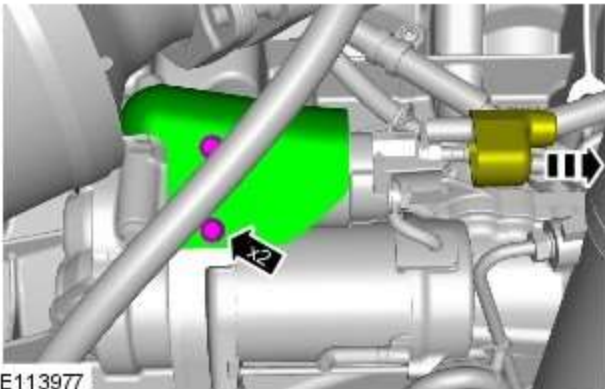
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



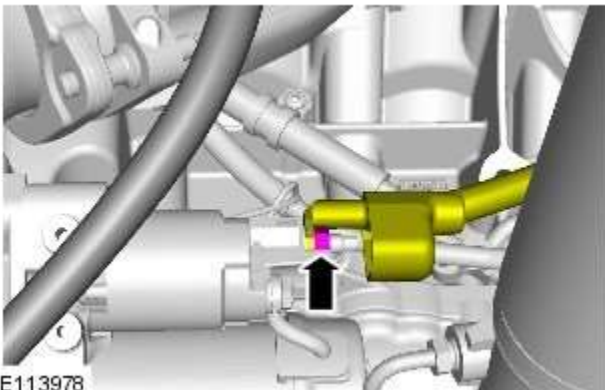
2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).


4. Torque: 6 Nm



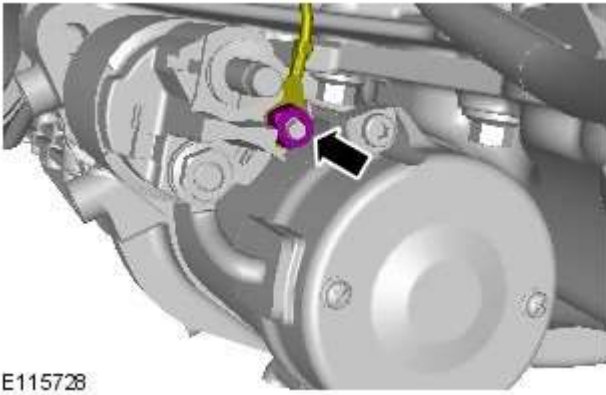
E113977



E113978

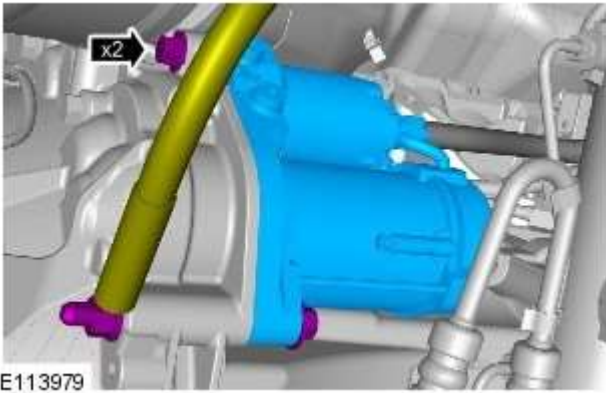
5.  **CAUTION:** Make sure that the protective cover is correctly installed over the electrical connector.

Torque: 12 Nm



E115728

6. Torque: 7 Nm



E113979

7. Torque: 48 Nm

Installation

1. To install, reverse the removal procedure.

Engine Ignition - V8 5.0L Petrol/V8 S/C 5.0L Petrol -

Item	Specification
Firing order	1:2:7:3:4:5:6:8
Spark plug type - Vehicles with supercharger	ILKAR6C-10
Spark plug type - Vehicles without supercharger	ILKAR6C-10

Description	Nm	lb-ft	lb-in
Spark plugs	20	15	-
Ignition coil-on-plug retaining bolts	7	5	-

Engine Ignition - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Ignition -

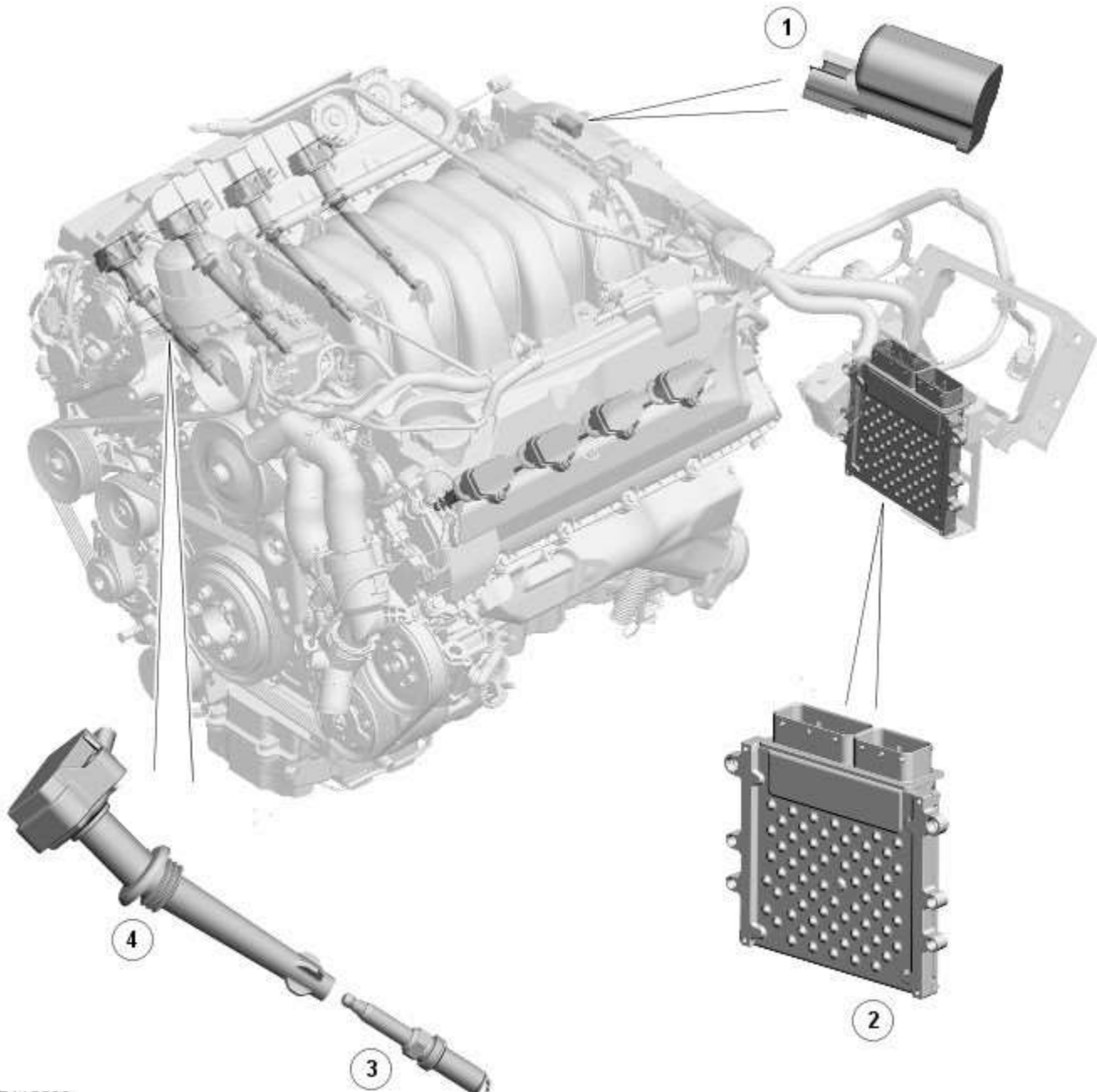
Component Location

Description and Operation



NOTE: RHD (right-hand drive) naturally aspirated installation shown; other installations similar.

COMPONENT LOCATION



E118296

Item	Description
1	RFI (radio frequency interference) suppressor
2	ECM (engine control module)
3	Spark plug (8 off)
4	Ignition coil (8 off)

Engine Ignition - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Ignition -

Overview

Description and Operation

OVERVIEW

The engine ignition system is a coil-on-plug, single spark system controlled by the [ECM \(engine control module\)](#). An iridium tipped spark plug is installed in each combustion chamber, between the inlet and exhaust valves, and an ignition coil is installed on each spark plug. A RFI (radio frequency interference) suppressor is connected to the power feed to the ignition coils.

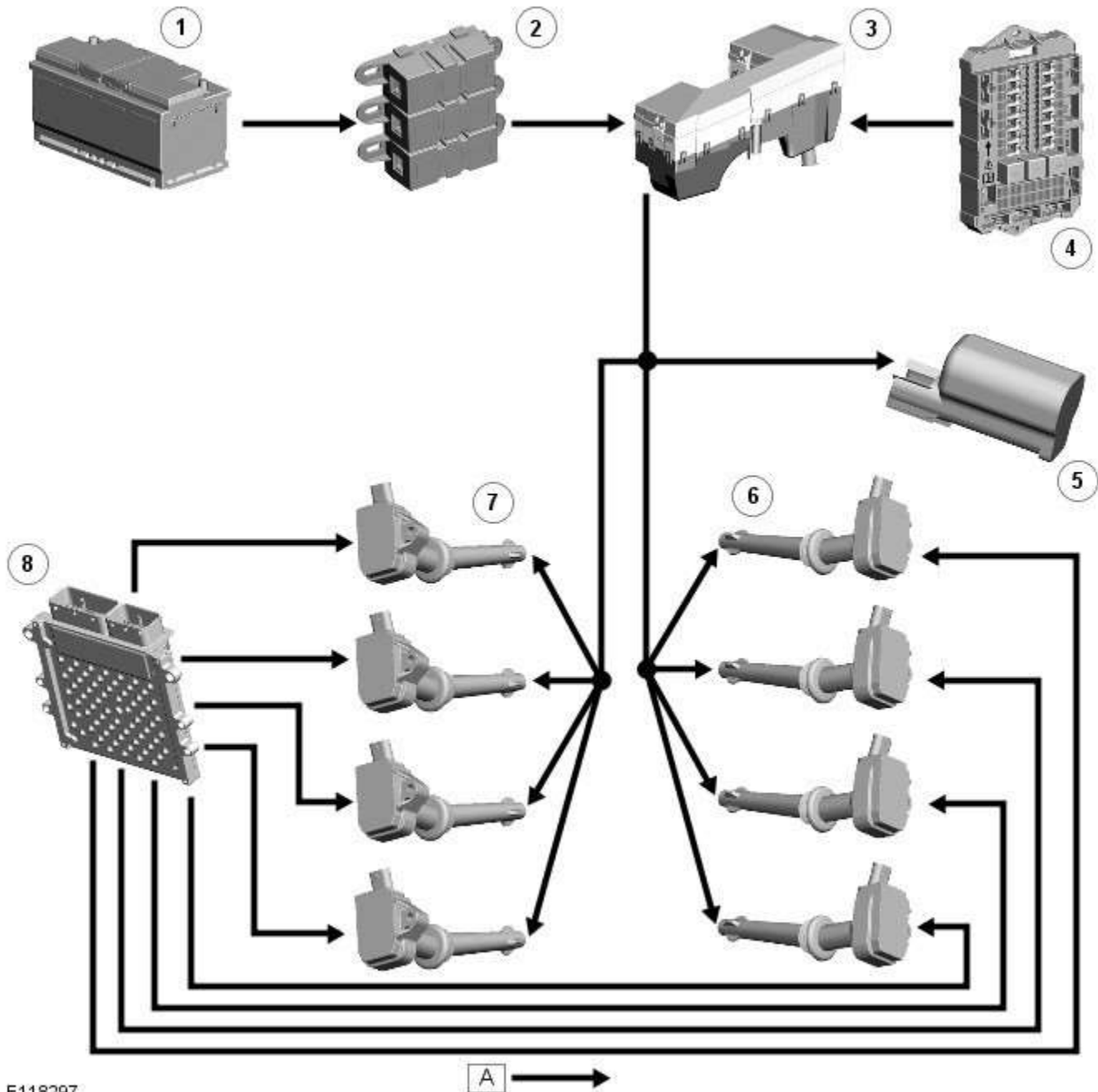
Engine Ignition - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Ignition - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired



E118297

Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse)
3	EJB (engine junction box (ignition relay))
4	CJB (central junction box)
5	RFI suppressor
6	LH (left hand) cylinder bank ignition coil (4 off)
7	RH (right hand) cylinder bank ignition coil (4 off)
8	ECM

System Operation

GENERAL

The ignition coils are supplied with electrical power from the battery via a 250 A megafuse in the [BJB \(battery junction box\)](#) and the ignition relay in the [EJB \(engine junction box\)](#). The control signal for the ignition relay is supplied by the [CJB \(central junction box\)](#).

The [ECM \(engine control module\)](#) sends a separate signal to each ignition coil to trigger the power stage switching. The [ECM](#) calculates the dwell time from the battery voltage and engine speed, to ensure a constant energy level is produced in the secondary coil each time the power stage is switched. This ensures sufficient spark energy is available without excessive primary current flow, which avoids overheating and damage to the ignition coils.

The [ECM](#) calculates the ignition timing for individual cylinders from:

- Engine speed
- Camshaft position
- Engine load
- Engine temperature
- The knock control function
- The shift control function
- The idle speed control function.

Component Description

IGNITION COILS



E116147

The ignition coils are installed in the cylinder head covers, under the [NVH \(noise, vibration and harshness\)](#) covers. Each ignition coil locates on a spark plug and is secured to the related cylinder head cover with a single screw. Each ignition coil incorporates a three pin electrical connector for connection to the engine harness.

Each ignition coil contains a primary and a secondary winding. The primary winding receives electrical power from the ignition relay in the power distribution box. A power stage in the primary winding allows the [ECM](#) to interrupt the power supply, to induce a voltage in the secondary winding and thus the spark plug. A diode in the ground side of the secondary winding reduces any undesirable switch-on voltage, to prevent misfiring into the intake manifold. The power stage limits the maximum voltage and current in the primary winding, to protect the power stage and limit the voltage in the secondary winding.

RFI SUPPRESSOR



E108416

The RFI suppressor is installed on the engine harness carrier at the rear of the engine.

Engine Ignition - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Ignition

Diagnosis and Testing

Principles of Operation

For a detailed description of the engine ignition system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (303-07B Engine Ignition - V8 5.0L Petrol/V8 S/C 5.0L Petrol)

[Engine Ignition](#) (Description and Operation),

[Engine Ignition](#) (Description and Operation),

[Engine Ignition](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.



NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical and electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Engine oil level • Cooling system coolant level • Fuel level • Fuel contamination/grade/quality • Exhaust gas recirculation (EGR) valves 	<ul style="list-style-type: none"> • Fuses • Wiring harness • Loose or corroded electrical connectors • Ignition coils • Sensor(s) • Engine Control Module (ECM) • Transmission Control Module (TCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Engine cranks, but does not fire	<ul style="list-style-type: none"> • Engine breather system disconnected/restricted • Ignition system • Fuel system • Electronic engine control 	Ensure the engine breather system is free from restriction and is correctly installed. Check for ignition system, fuel system and electronic engine control DTCs and refer to the relevant DTC Index
Engine cranks and fires, but will not start	<ul style="list-style-type: none"> • Evaporative emissions purge valve • Fuel pump • Spark plugs • HT short to ground (tracking) check rubber boots for cracks/damage • Ignition system 	Check for evaporative emissions, fuel system and ignition system related DTCs and refer to the relevant DTC Index
Difficult cold start	<ul style="list-style-type: none"> • Engine coolant level/anti-freeze content • Battery • Electronic engine controls • Exhaust Gas Recirculation (EGR) valve stuck open • Fuel pump • Purge valve 	Check the engine coolant level and condition. Ensure the battery is in a fully charged and serviceable condition. Check for electronic engine controls, engine emissions, fuel system and evaporative emissions system related DTCs and refer to the relevant DTC Index

Symptom	Possible Causes	Action
Difficult hot start	<ul style="list-style-type: none"> • Injector leak • Electronic engine control • Purge valve • Fuel pump • Ignition system • EGR valve stuck open 	Check for injector leak, install new injector as required. Check for electronic engine controls, evaporative emissions, fuel system, ignition system and engine emission system related DTCs and refer to the relevant DTC Index
Difficult to start after hot soak (vehicle standing, engine off, after engine has reached operating temperature)	<ul style="list-style-type: none"> • Injector leak • Electronic engine control • Purge valve • Fuel pump • Ignition system • EGR valve stuck open 	Check for injector leak, install new injector as required. Check for electronic engine controls, evaporative emissions, fuel system, ignition system and engine emission system related DTCs and refer to the relevant DTC Index
Engine stalls soon after start	<ul style="list-style-type: none"> • Breather system disconnected/restricted • ECM relay • Electronic engine control • Ignition system • Air intake system restricted • Air leakage • Fuel lines 	Ensure the engine breather system is free from restriction and is correctly installed. Check for electronic engine control, ignition system and fuel system related DTCs and refer to the relevant DTC Index. Check for blockage in air filter element and air intake system. Check for air leakage in air intake system
Engine hesitates/poor acceleration	<ul style="list-style-type: none"> • Fuel pressure, fuel pump, fuel lines • Injector leak • Air leakage • Electronic engine control • Throttle motor • Restricted accelerator pedal travel (carpet, etc) • Ignition system • EGR valve stuck open • Transmission malfunction 	Check for fuel system related DTCs and refer to the relevant DTC Index. Check for injector leak, install new injector as required. Check for air leakage in air intake system. Ensure accelerator pedal is free from restriction. Check for electronic engine controls, ignition, engine emission system and transmission related DTCs and refer to the relevant DTC Index
Engine backfires	<ul style="list-style-type: none"> • Fuel pump/lines • Air leakage • Electronic engine controls • Ignition system • Sticking variable camshaft timing (VCT) hub 	Check for fuel system failures. Check for air leakage in intake air system. Check for electronic engine controls, ignition system and VCT system related DTCs and refer to the relevant DTC Index
Engine surges	<ul style="list-style-type: none"> • Fuel pump/lines • Electronic engine controls • Throttle motor • Ignition system 	Check for fuel system failures. Check for electronic engine controls, throttle system and ignition system related DTCs and refer to the relevant DTC Index
Engine detonates/knocks	<ul style="list-style-type: none"> • Fuel pump/lines • Air leakage • Electronic engine controls • Sticking VCT hub 	Check for fuel system failures. Check for air leakage in intake air system. Check for electronic engine controls and VCT system related DTCs and refer to the relevant DTC Index
No throttle response	<ul style="list-style-type: none"> • Electronic engine controls • Throttle motor 	Check for electronic engine controls and throttle system related DTCs and refer to the relevant DTC Index
Poor throttle response	<ul style="list-style-type: none"> • Breather system disconnected/restricted • Electronic engine control • Transmission malfunction • Traction control event Air leakage 	Ensure the engine breather system is free from restriction and is correctly installed. Check for electronic engine controls, transmission and traction control related DTCs and refer to the related DTC Index. Check for air leakage in intake air system

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged in the Engine Control Module (ECM), please refer to Section 303-14. REFER to:

[Electronic Engine Controls](#) (303-14C Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing),

[Electronic Engine Controls](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).

Engine Ignition - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Ignition Coil-On-Plug V8 S/C 5.0L Petrol

Removal and Installation

Removal

NOTES:

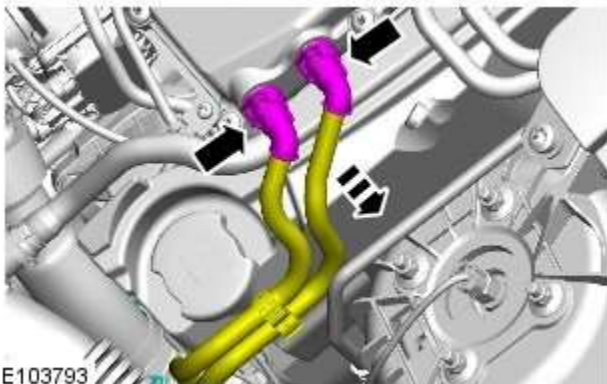


Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01, General Procedures).
2. Refer to: Engine Cover - 5.0L, Vehicles With: Supercharger (501-05, Removal and Installation).
3. Refer to: Secondary Bulkhead Panel RH - 5.0L/3.0L Diesel (501-02, Removal and Installation).



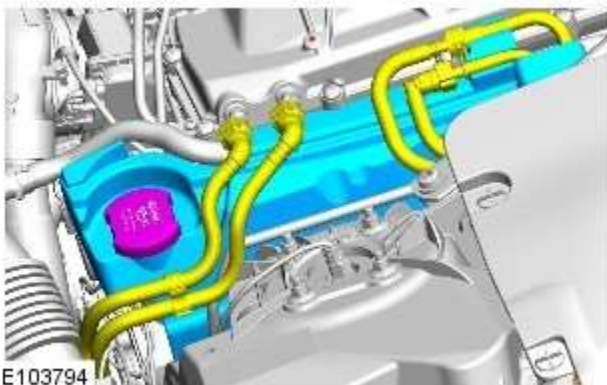
4. CAUTIONS:



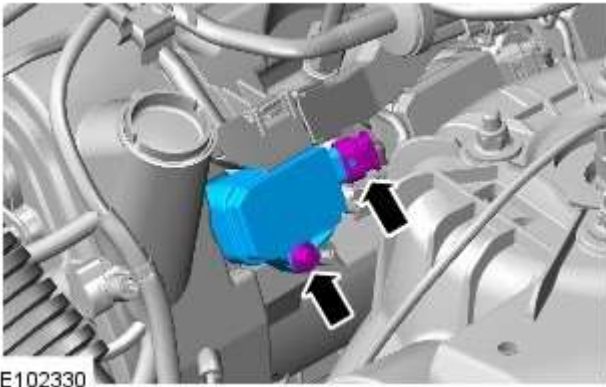
Be prepared to collect escaping coolant.



Make sure that all openings are sealed. Use new blanking caps.



5.



6. Torque: 7 Nm

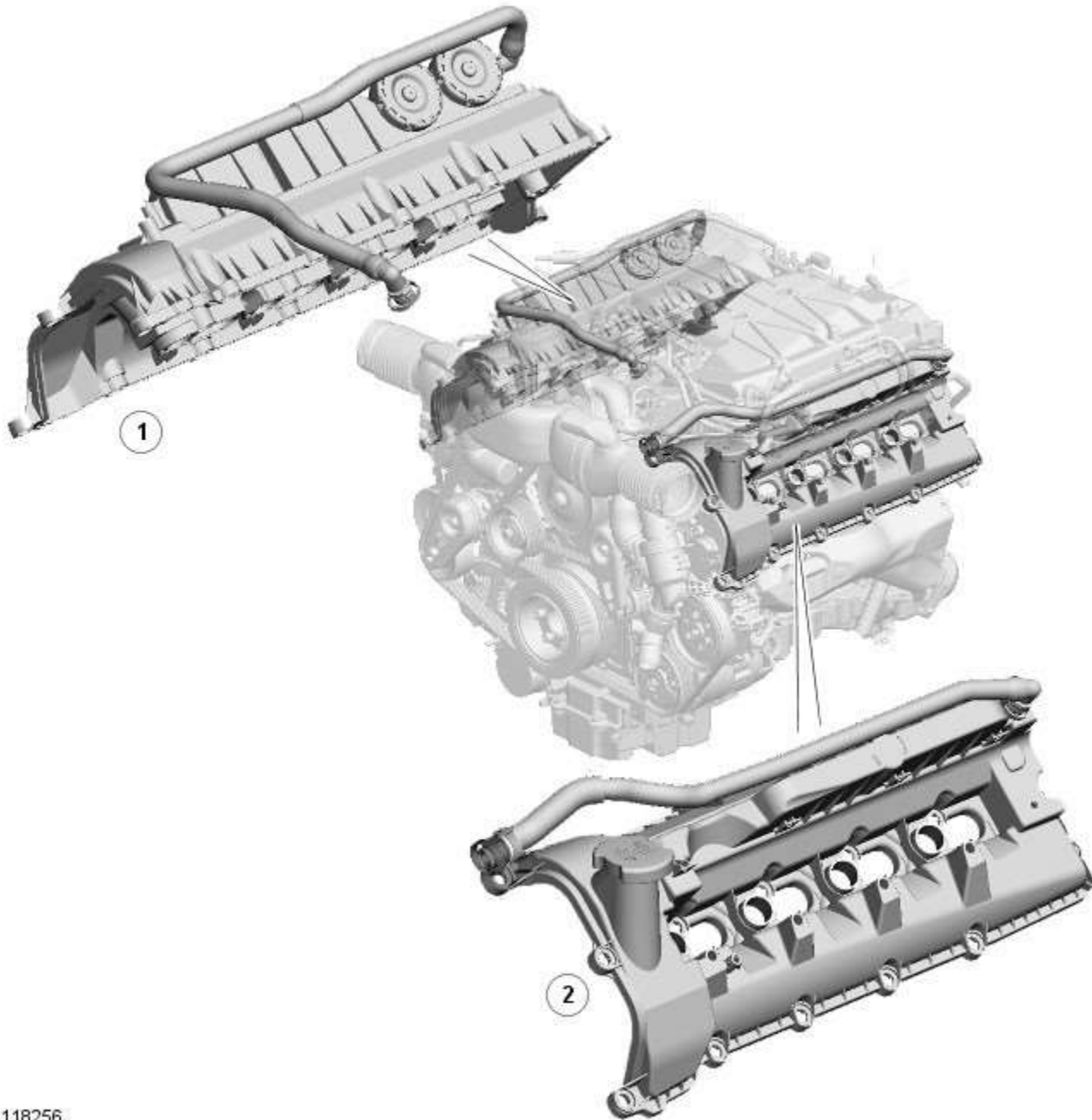
Installation

1. To install, reverse the removal procedure.

Engine Emission Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Emission Control - Component Location

Description and Operation

COMPONENT LOCATION - SUPERCHARGER VEHICLES



E 118256

Item	Description
1	Part load breather
2	Full load breather

Engine Emission Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Emission Control - Overview

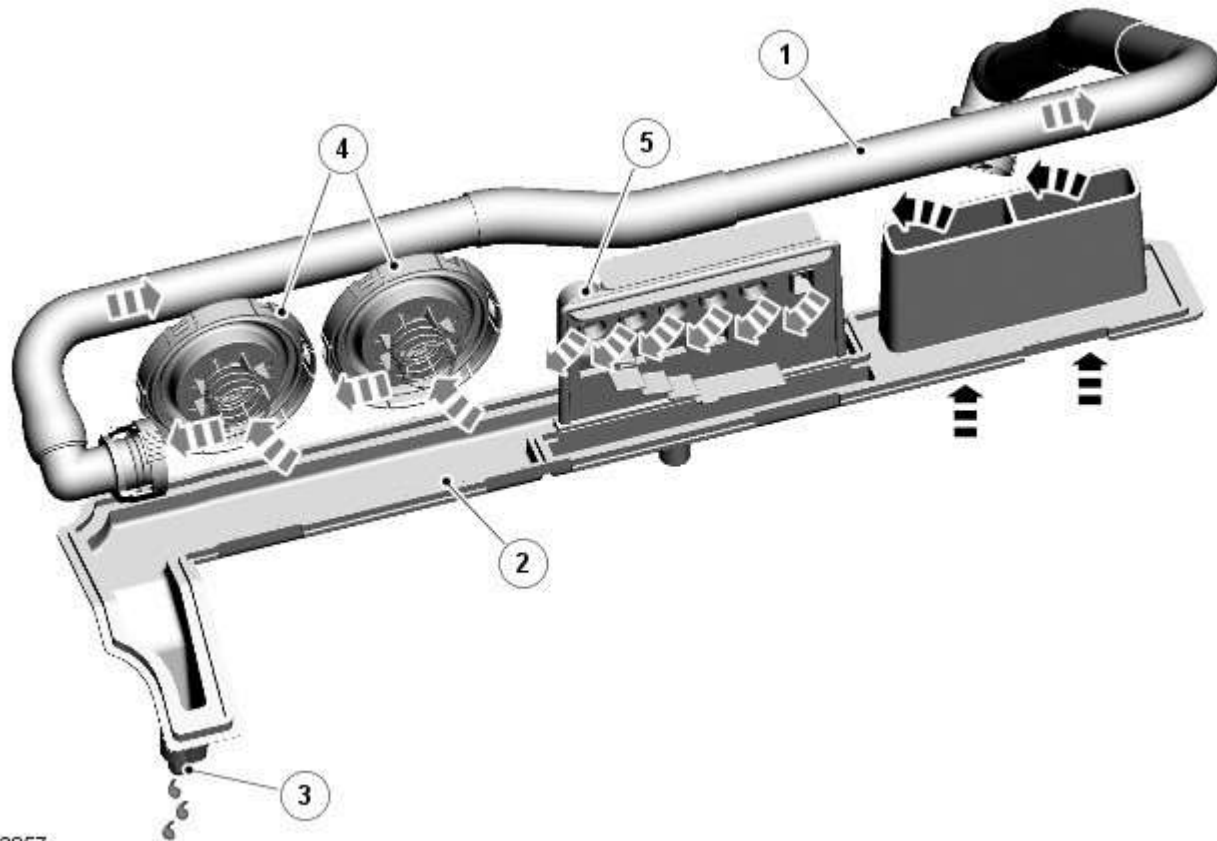
Description and Operation

OVERVIEW

The engine emission control system reduces the level of hydrocarbon emissions released to atmosphere from the engine. The engine emission control system consists of a **PCV (positive crankcase ventilation)** system with part and full load breathers. Piston blow-by gases are drawn through the breathers into the engine air intake and added to the air charge. The resultant depression in the engine sump, front covers and cylinder head covers reduces the load on the joint seals in those areas.

Component Description

PART LOAD BREATHER



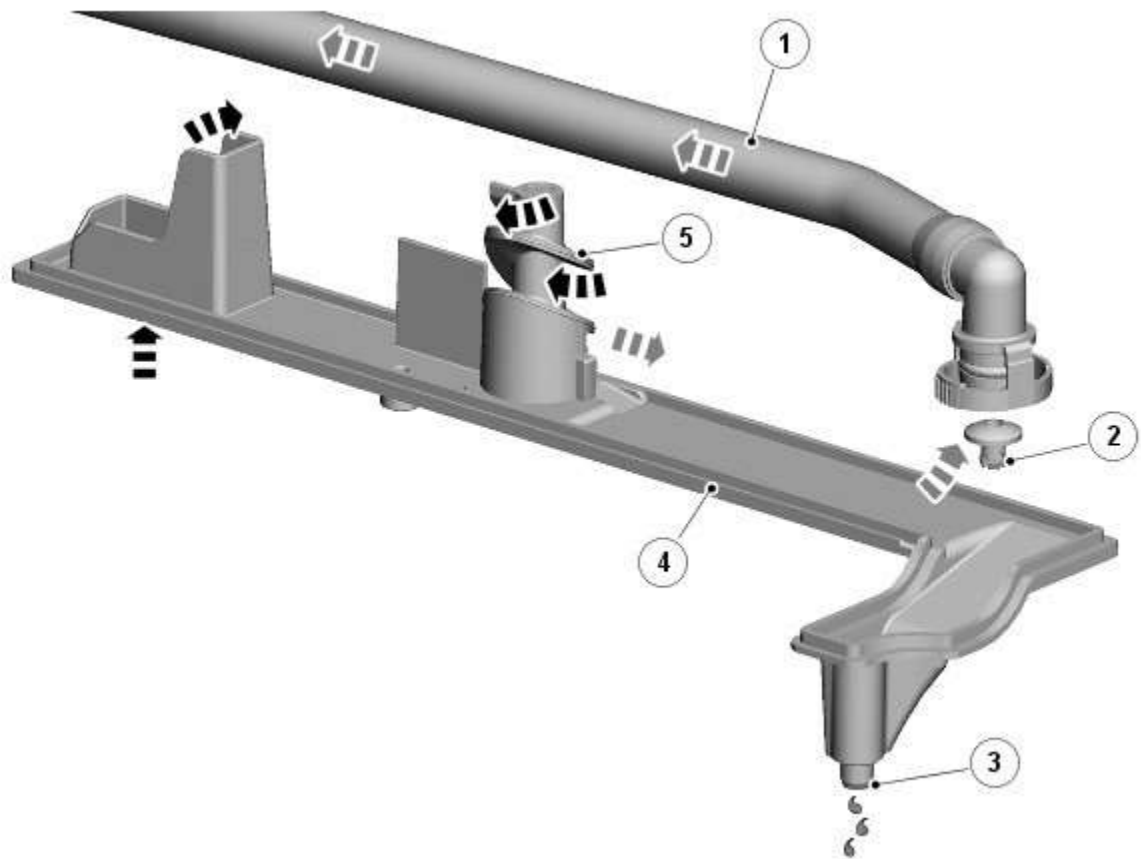
E113857

Item	Description
1	Flexible hose
2	Baffle plate
3	Oil drain
4	PCV (positive crankcase ventilation) valves
5	Oil separator

The part load breather comprises an oil separator, two **PCV (positive crankcase ventilation)** valves and a flexible hose. The oil separator and the **PCV** valves are installed in the top of the **RH (right-hand)** cylinder head cover. The flexible hose connects the **RH** cylinder head cover to the inlet of the **SC (supercharger)**.

The oil separator is installed in a channel in the top of the cylinder head cover. A baffle plate, which incorporates a gas inlet and an oil drain, is installed over the channel. The two **PCV** valves are installed on the outside of the cylinder head cover and connected in parallel in the gas outlet from the channel to the flexible hose. The **PCV** valves prevent reverse flow into the cylinder head cover when there is minimal depression in the inlet of the **SC**.

FULL LOAD BREATHER



E113867

Item	Description
1	Flexible hose
2	Two-way valve
3	Oil drain
4	Baffle plate
5	Oil separator

The full load breather consists of an oil separator, a two-way valve and a flexible hose. The oil separator and the two-way valve are installed in the top of the **LH (left-hand)** cylinder head cover. The flexible hose connects the **LH** cylinder head cover to the **LH** air duct of the intake air distribution and filtering system.

The oil separator is installed in a channel in the top of the cylinder head cover. A baffle plate, which incorporates a gas inlet and an oil drain, is installed over the channel. The two-way valve is installed in the gas outlet from the channel. The two-way valve prevents reverse flow into the cylinder head cover when there is minimal depression in the air duct.

Engine Emission Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Emission Control

Diagnosis and Testing

Principles of Operation

For a detailed description of the engine emission control system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (303-08C Engine Emission Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol)

[Engine Emission Control](#) (Description and Operation),
[Engine Emission Control](#) (Description and Operation),
[Engine Emission Control](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.



NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Exhaust gas recirculation system • Breather hoses • Positive crankcase ventilation valve • Fuel level • Fuel contamination/grade/quality • Throttle body 	<ul style="list-style-type: none"> • Fuses • Loose or corroded electrical connectors • Exhaust Gas Recirculation (EGR) valve • Engine Control Module (ECM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Difficult to start cold	<ul style="list-style-type: none"> • Battery • Crankshaft Position (CKP) sensor • Exhaust Gas Recirculation (EGR) valve stuck open • Fuel system • Evaporative emissions purge valve 	For battery information, CKP sensor, fuel system and purge valve tests, refer to relevant workshop manual section. Check the EGR valve.
Engine stalls soon after start	<ul style="list-style-type: none"> • Breather system disconnected/restricted • Engine Control Module (ECM) relay • MAF sensor • Ignition system • Air filter restricted • Air leakage • Fuel lines 	Check the engine breather hoses, PCV, etc. Check the Engine Control Module (ECM) relay operation. For MAF sensor, ignition system tests, air intake and fuel line information, refer to relevant workshop manual section.
Poor throttle response	<ul style="list-style-type: none"> • APP sensor malfunction • TP sensors • ECT sensor • MAF sensor • Transmission malfunction • Traction control event Air leakage 	For APP, TP, ECT, MAF sensor tests, intake system checks and transmission information, refer to relevant workshop manual section. Check the breather system hoses, PCV, etc.

Symptom	Possible Causes	Action
	<ul style="list-style-type: none"><li>• Breather system disconnected/restricted	

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged in the Engine Control Module (ECM), please refer to Section 303-14. REFER to:

[Electronic Engine Controls](#) (303-14C Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing),
[Electronic Engine Controls](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).

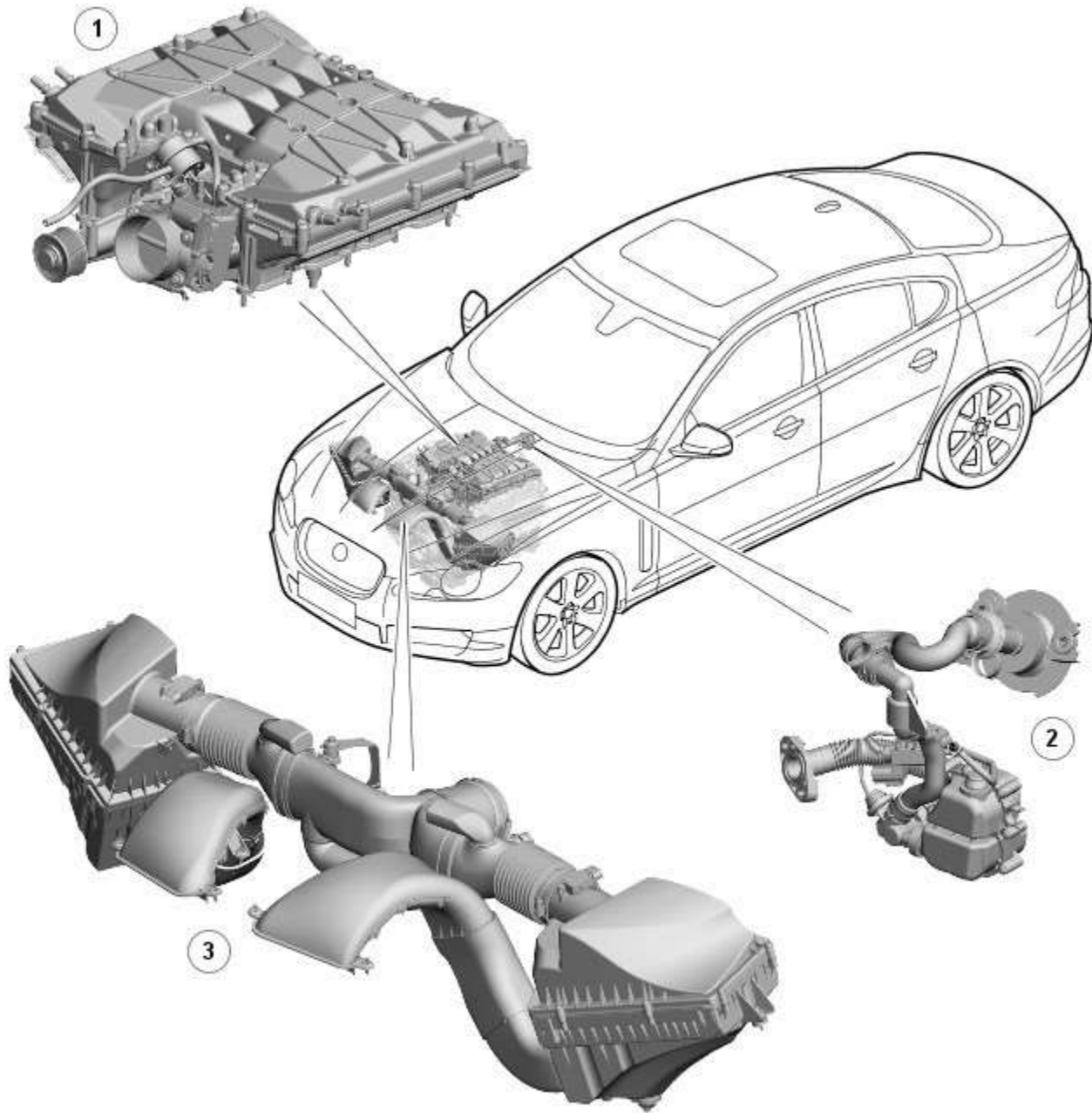
Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol -

Description	Nm	lb-ft	lb-in
Air cleaner retaining bolts	8	-	71
Supercharger retaining bolts	25	18	-
Charge air cooler lower assembly retaining bolts	20	15	-
Throttle body retaining studs	10	7	-
Charge air cooler top assembly retaining bolts	25	18	-
Manifold absolute pressure and temperature (MAPT) sensor	5	-	44
Coolant outlet pipe	11	8	-

Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Intake Air Distribution and Filtering - Component Location

Description and Operation

COMPONENT LOCATION



E118127

Item	Description
1	Supercharger and intake manifold
2	Noise feedback system
3	Air intakes, air cleaners and air ducts

Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Intake Air Distribution and Filtering - Overview

Description and Operation

OVERVIEW

The intake air distribution and filtering system comprises:

- Dual air intakes, air cleaners and air ducts.
- A [SC \(supercharger\)](#) and intake manifolds.
- A noise feedback system.

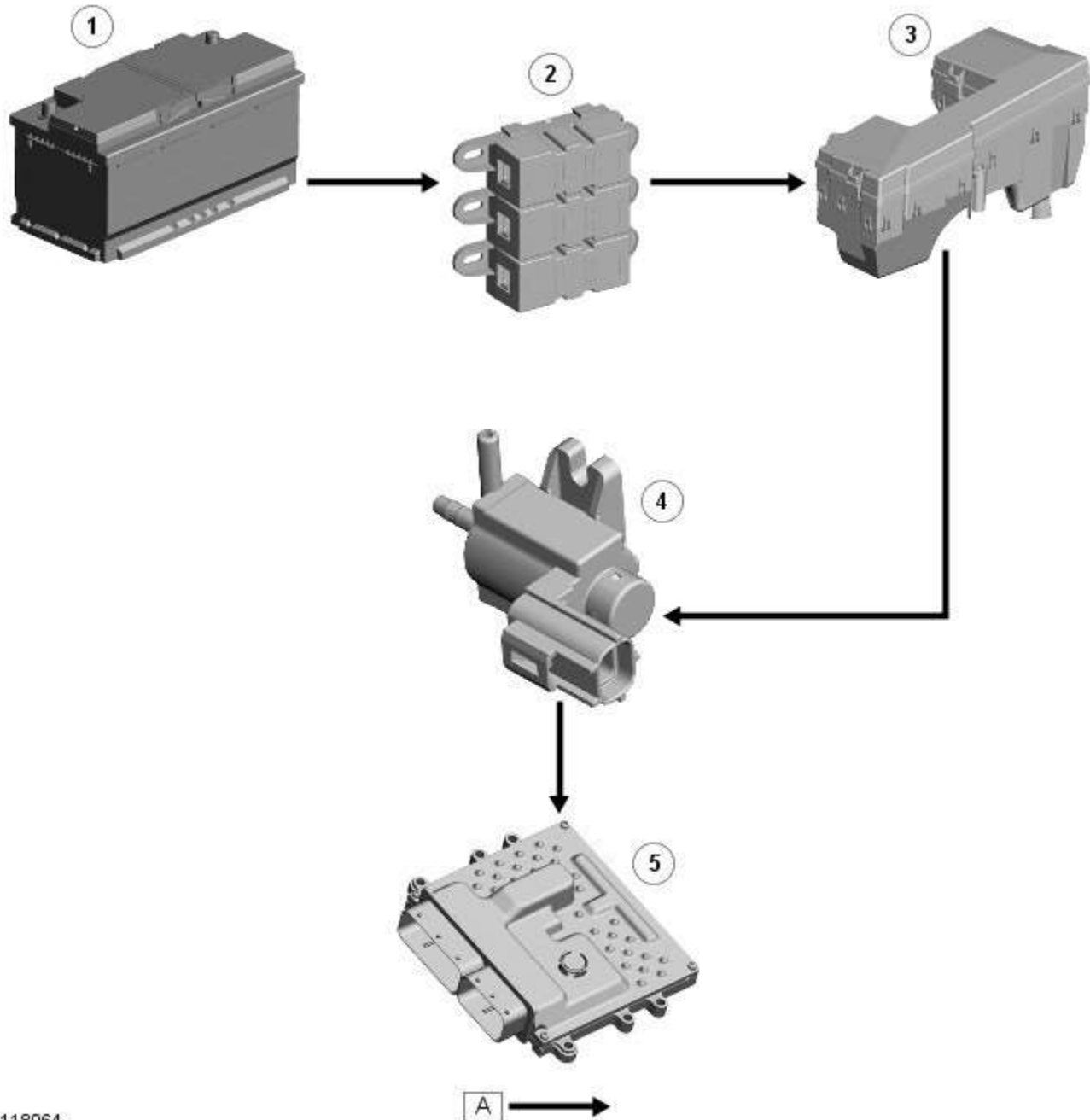
Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Intake Air Distribution and Filtering - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired



E118064

Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse)
3	EJB (engine junction box) (EMS high current relay)
4	Tuning valve
5	ECM (engine control module)

System Operation

SUPERCHARGER

At closed or partially open throttle positions, the bypass valve is fully open, allowing a flow of air from the **SC (supercharger)** outlet back to the inlet side. This results in little or no pressure increase across the **SC**. Progressive opening of the throttle reduces the depression downstream of the electric throttle. This is sensed by the pneumatic actuator, which moves to close the bypass valve. As the bypass valve closes there is a corresponding increase in the outlet pressure from the **SC**, which increases engine power output.

NOISE FEEDBACK SYSTEM

Sound waves from the **RH (right-hand)** intake manifold are filtered by the calibrated orifice in the inlet pipe connection on the symposer. The sound waves make the paddle oscillate and generate pulsations in the outlet chambers. When the pneumatic valve is open, the pulsations are transmitted through the outlet pipe and feedback tube to the resonator in the passenger compartment.

The tuning valve of the noise feedback system receives a power feed from the power distribution box and is connected to ground through the **ECM (engine control module)**. At lower engine loads and speeds the **ECM** keeps the ground open circuit and the tuning valve is de-energized closed. Atmospheric pressure is sensed at the pneumatic valve through the vent cap on the tuning valve, which keeps the pneumatic valve closed and prevents sound from the symposer entering the feedback system.

At higher engine loads and speeds the **ECM** connects the tuning valve to ground. The tuning valve energizes, blanks off the atmospheric vent and opens the vacuum line between the brake vacuum system and the pneumatic valve. The depression in the brake vacuum system is sensed at the pneumatic valve, which opens and allows sound from the symposer into the feedback system.

The status of the pneumatic valve at various engine loads and speeds is given below:

Pneumatic Valve Status

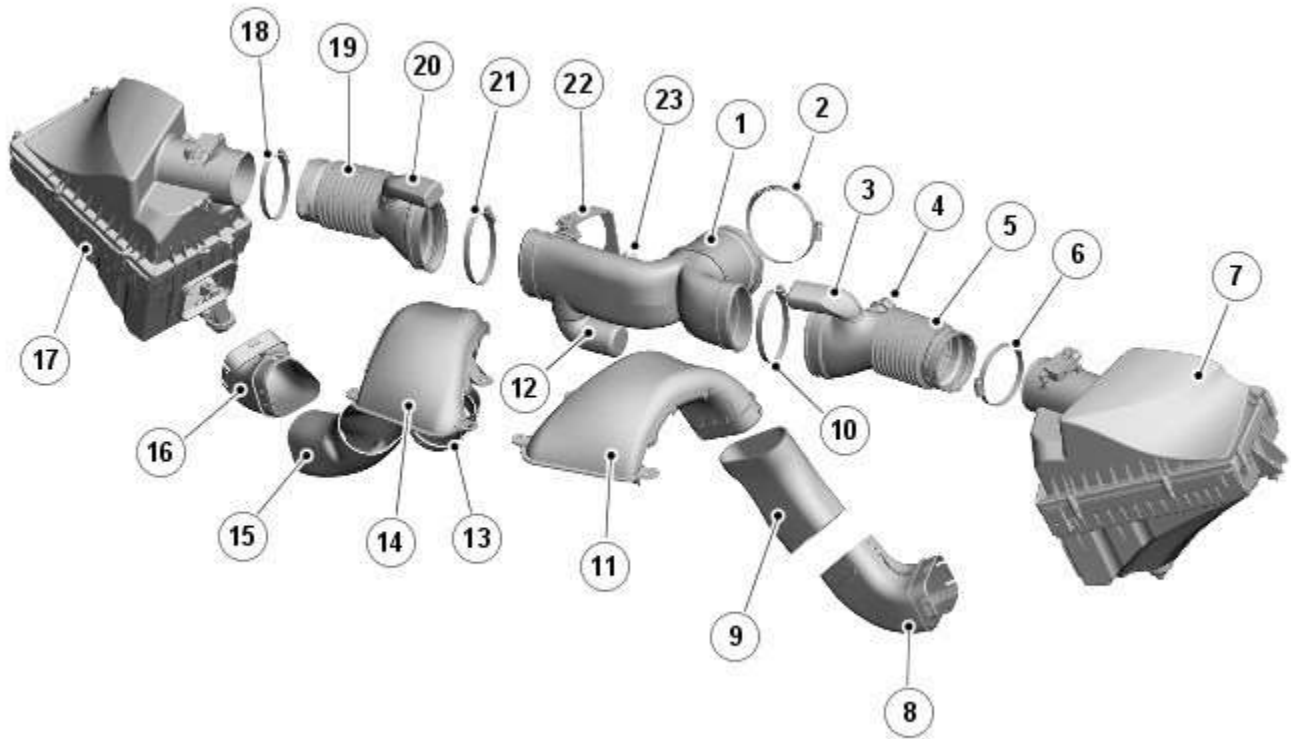


NOTE: Values are for valve opening with increasing engine load and speed. Deduct 0.05 g/rev and 50 rev/min for valve closing with decreasing engine load and speed.

Engine Load: g/rev	Engine Speed: rev/min							
	0	500	1000	2500	3000	4000	5800	6500
1.30	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
1.35	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Closed
1.40	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open
1.60	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open
1.80	Closed	Closed	Closed	Closed	Closed	Closed	Closed	Open
2.50	Closed	Closed	Closed	Closed	Closed	Open	Open	Open
3.00	Closed	Closed	Closed	Closed	Closed	Open	Open	Open
3.50	Closed	Closed	Closed	Open	Open	Open	Open	Open

Component Description

AIR INTAKES, AIR CLEANERS AND AIR DUCTS



E118128

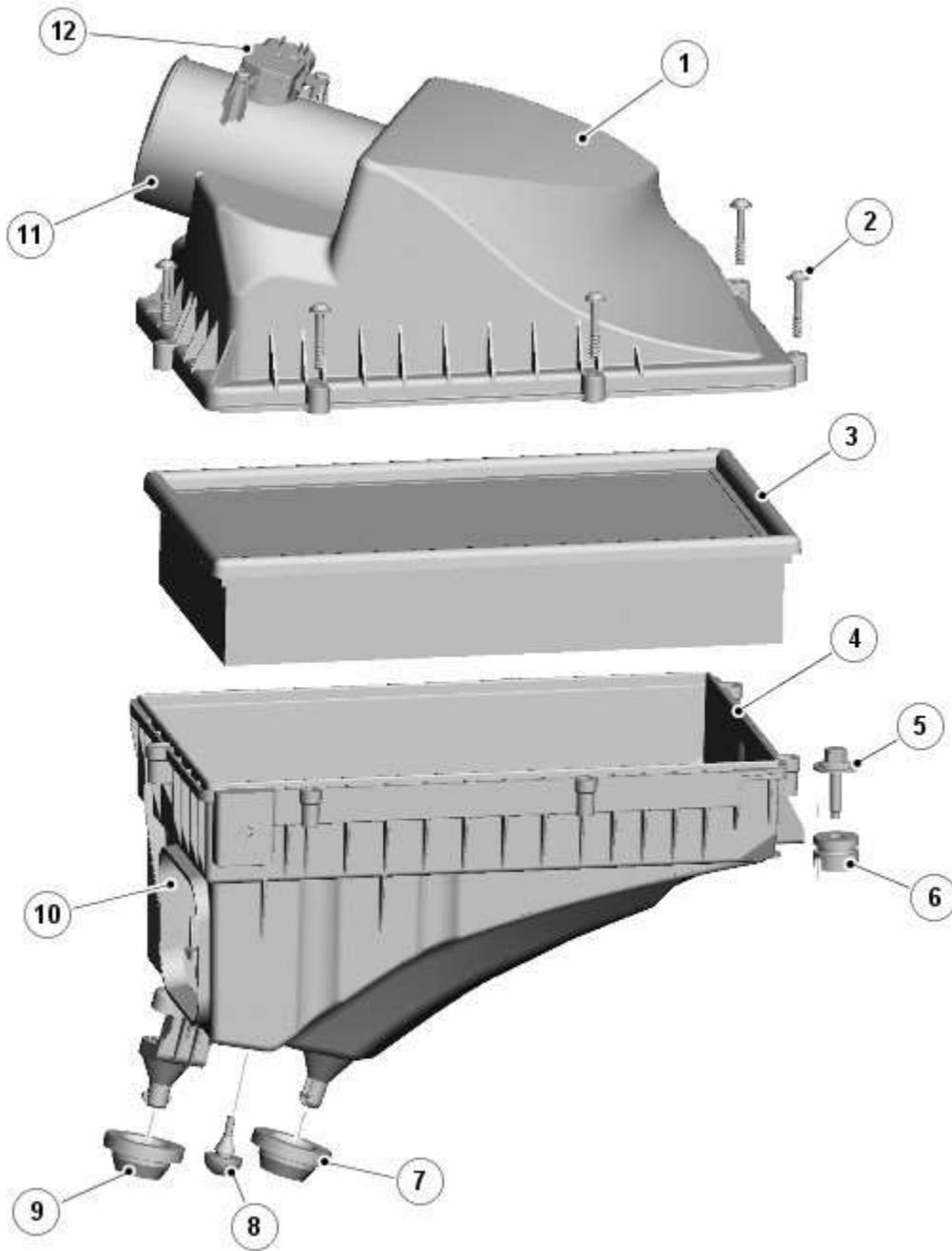
Item	Description
1	Throttle T-piece duct
2	Hose clamp
3	Quarter wave resonator
4	Full load breather connector stub
5	LH (left hand) air cleaner outlet tube
6	Hose clamp
7	LH air cleaner
8	LH air cleaner lower intake duct
9	LH air cleaner center intake duct
10	Hose clamp
11	LH air cleaner intake scoop
12	Quarter wave resonator
13	RH air cleaner support intake duct
14	RH (right hand) air cleaner intake scoop
15	RH air cleaner center intake duct
16	RH air cleaner lower intake duct
17	RH air cleaner
18	Hose clamp
19	RH air cleaner outlet tube
20	Quarter wave resonator
21	Hose clamp
22	Mounting grommet and bracket
23	Bypass valve actuator connector stub

Air intake scoops and ducts supply air from behind the front crossmember to the air cleaners. The air intake scoops, ducts and air cleaner are locked together by latches and matching recesses molded into the mating joint faces.

The air cleaners are located in the forward corners of the engine compartment, on the fender front aprons. Each air cleaner is located on the related fender front apron and front side member by two supports, and secured to a bracket at the top of the fender front apron by a bolt and grommet.

Each air cleaner consists of an air cleaner element installed in a tray and enclosed with a cover secured by seven screws. Air inlet and outlet connections are incorporated into the tray and cover respectively. The bottom of the tray incorporates a drain hole to prevent the accumulation of water in the air cleaner. The air outlet connection incorporates a [MAFT \(mass air flow and temperature\)](#) sensor.

Air Cleaner



E118066

Item	Description
1	Cover
2	Screw (7 off)
3	Air cleaner element
4	Tray
5	Bolt
6	Grommet
7	Support

8	Bump stop
9	Support
10	Inlet connection
11	Outlet connection
12	MAFT sensor

The outlet tubes and T-piece duct direct the air from the air cleaners to the electric throttle. Hose clamps connect the outlet tubes and T-piece duct together, and to the air cleaners and the electric throttle. A grommet and bracket attached the T-piece duct to a bracket on the [RH](#) cylinder head.

The two outlet tubes and the T-piece duct each incorporate a quarter wave resonator to reduce air induction noise.

The [LH \(left-hand\)](#) outlet tube incorporates a connector stub for the engine full load breather pipe.

The T-piece duct incorporates a connector stub for the vacuum tube of the bypass valve actuator on the supercharger.

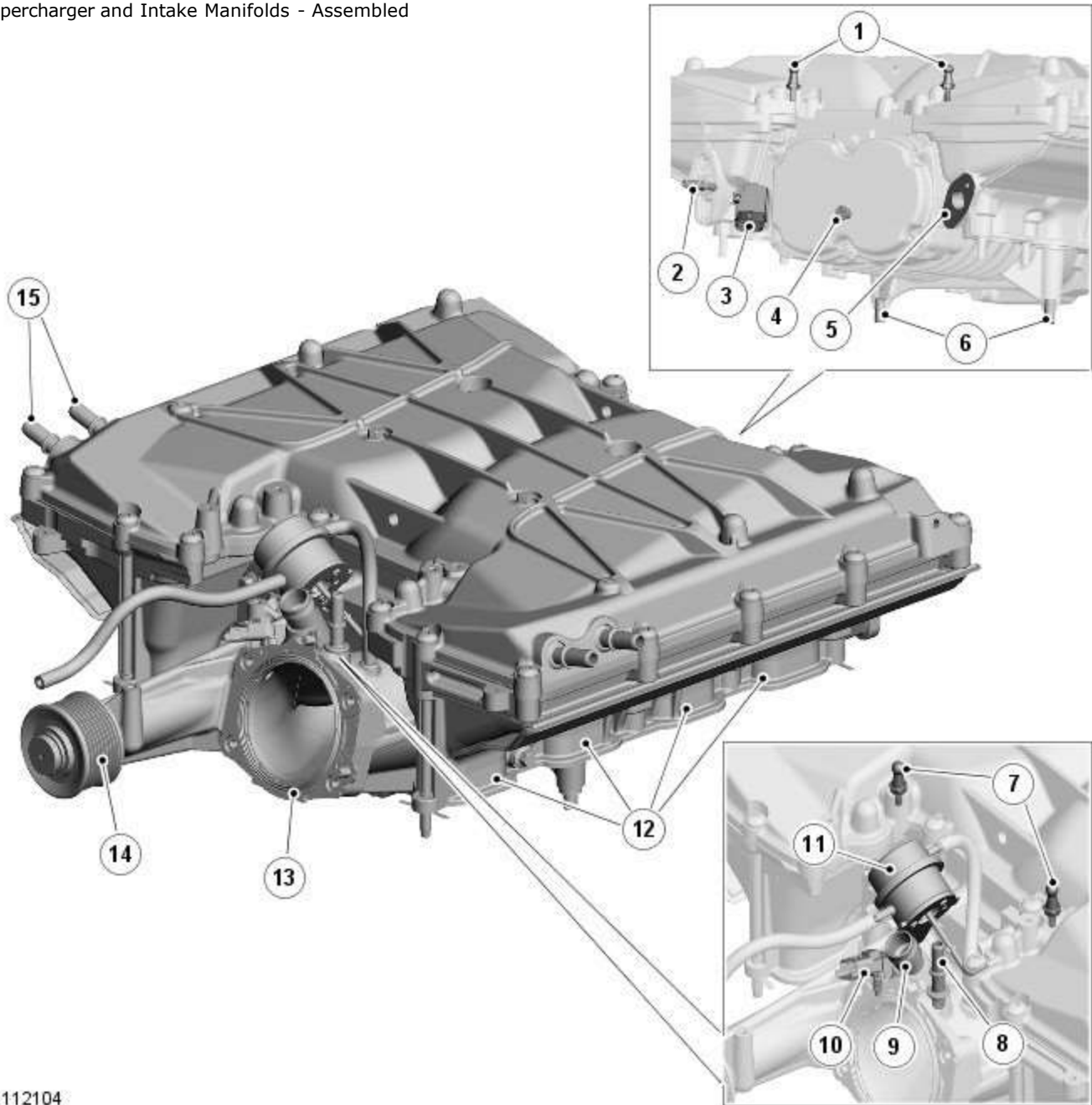
SUPERCHARGER AND INTAKE MANIFOLDS

The [SC](#) increases the pressure, and thus mass, of the air supplied to the engine, to increase the engine's power output. Two separate intake manifolds direct air from the [SC](#) to the cylinder inlet ports.

The intake manifolds are attached to their related cylinder heads and the sides of the [SC](#). Two dowels locate the [SC](#) in position on the cylinder block. A charge air cooler tank top is installed on top of the [SC](#) and intake manifolds to form the air duct from the [SC](#) outlet to the intake manifolds. A charge air cooler is installed in each intake manifold.

The charge air cooler tank top incorporates four studs for the attachment of the engine cover. A [NVH \(noise, vibration and harshness\)](#) pad is attached to the side of each intake manifold.

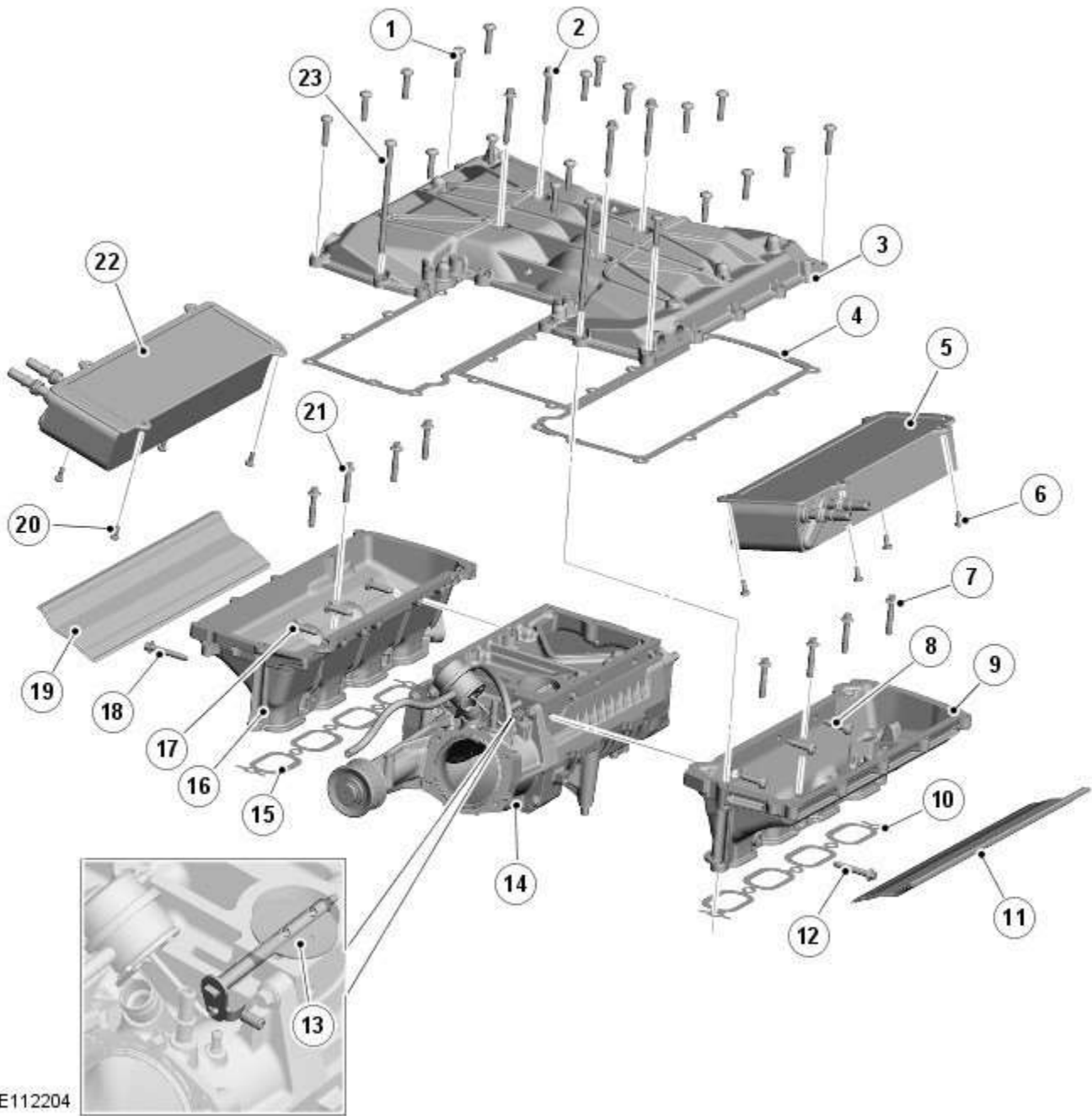
Supercharger and Intake Manifolds - Assembled



E112104

Item	Description
1	Engine cover rear attachment points
2	Vacuum connector stub
3	MAPT (manifold absolute pressure and temperature) sensor
4	SC filler/level plug
5	Symposer inlet pipe connection
6	Dowels
7	Engine cover front attachment points
8	EVAP (evaporative emissions) connector stub
9	Part load breather connector stub
10	MAP (manifold absolute pressure) sensor
11	Bypass valve pneumatic actuator
12	Outlet ports
13	Inlet port
14	Pulley
15	Coolant inlet and outlet connections

Supercharger and Intake Manifolds - Exploded



E112204

Item	Description
1	M08 x 35 mm screw (19 off)
2	M08 x 65 mm screw (4 off)
3	Charge air cooler tank top
4	Gasket
5	LH charge air cooler
6	M6 x 15 mm screw (4 off)
7	M08 x 45 mm screw (4 off)
8	M08 x 30 mm screw (3 off)
9	LH intake manifold
10	Gasket
11	N.H. (noise vibration and harshness) pad

12	M08 x 50 mm screw
13	Bypass valve
14	SC
15	Gasket
16	RH intake manifold
17	M08 x 30 mm crew (3 off)
18	M08 x 50 mm screw
19	N.H. pad
20	M6 x 15 mm screw (4 off)
21	M08 x 45 mm screw (4 off)
22	RH charge air cooler
23	M08 x 150 mm screw

Supercharger

The [SC](#) is a Roots blower with high angle helix rotors driven at 2.1 x engine speed by the secondary belt of the accessory drive.

The two rotors of the [SC](#) are contained in a housing. The ends of the rotors are supported in bearings in the front cover and the bearing plate. A rear cover seals the bearing plate and incorporates a filler/level plug for lubricant. A pulley transfers power from the accessory drive to the shaft of one of the rotors.

A pneumatic actuator on the front cover is attached to a by-pass valve in the housing. The bypass valve regulates a flow of air from the outlet of the [SC](#) back to the inlet side of the rotors, to control the outlet pressure of the [SC](#). Hoses connect the pneumatic actuator to the throttle T-piece of the air ducts, upstream of the electric throttle, and to the front cover, downstream of the electric throttle. A lever connects the actuating rod of the pneumatic actuator to the shaft of the bypass valve. A screw in the front cover limits movement of the lever in the closed direction to allow calibration of the [SC](#) output.

The front cover also incorporates:

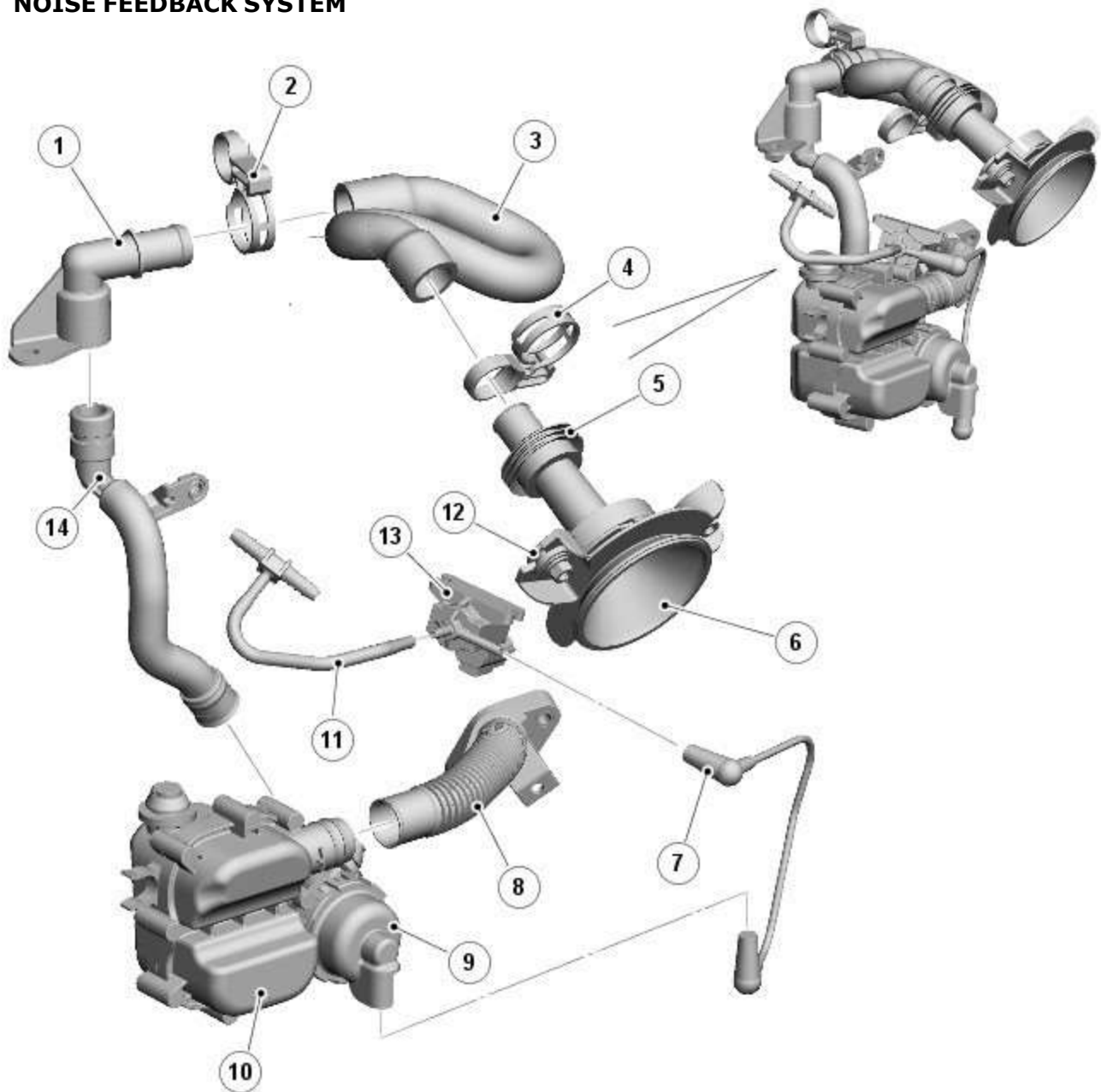
- The [SC](#) air inlet and mounting face for the electric throttle.
- A connector stub for the part load breather.
- A [MAP \(manifold absolute pressure\)](#) sensor.
- A connector stub for a hose from the [EVAP \(evaporative emission\)](#) canister purge valve.

Intake Manifolds

Each intake manifold is attached to the [SC](#) with three screws and a bolt. Two dowels ensure correct alignment of each intake manifold. The [RHD \(right-hand drive\)](#) intake manifold incorporates a connection port for the noise feedback system. The [LH](#) intake manifold incorporates:

- A connector stub for the brake vacuum system.
- A [MAPT \(manifold absolute pressure and temperature\)](#) sensor.

NOISE FEEDBACK SYSTEM



E118129

Item	Description
1	Outlet adapter
2	Clip
3	Feedback tube
4	Clip
5	Hose seal
6	Resonator
7	Vacuum hose - tuning valve to pneumatic actuator
8	Inlet pipe
9	Pneumatic valve
10	Symposer
11	Vacuum hose - tuning valve to brake vacuum system
12	Grommet assembly
13	Tuning valve
14	Outlet pipe

The noise feedback system generates a sporty, powerful engine sound in the passenger compartment, at high engine load and speed settings, to enhance the driving experience. The noise feedback system consists of a symposer system, a feedback tube and a resonator. Activation of the noise feedback system is controlled by the [ECM](#).

Symposer System

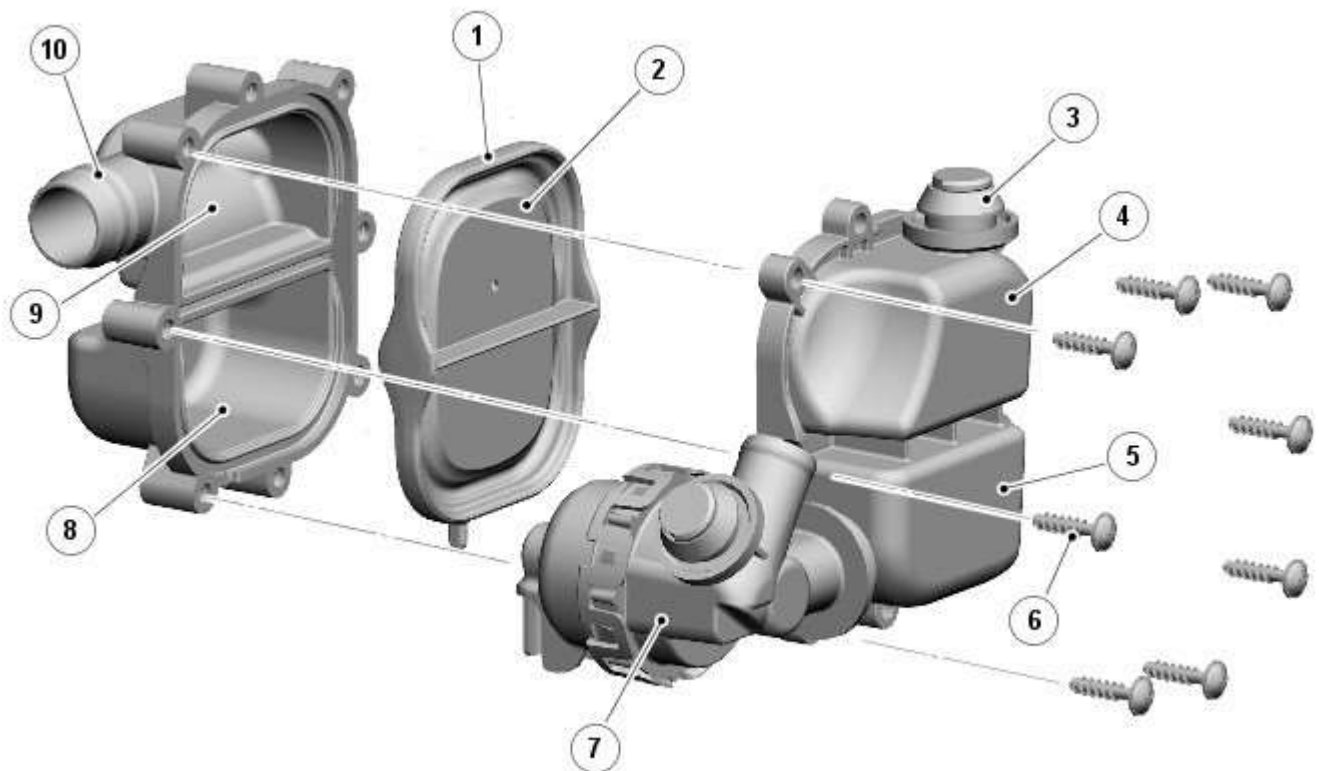
The symposer system modifies induction sound waves of a specific frequency range, at given engine settings, to produce the required engine sound. The symposer system consists of:

- An inlet pipe and flange.
- A symposer and pneumatic valve assembly. A
- tuning valve and associated vacuum tubes.
- An outlet pipe.
- An outlet adapter.

The inlet pipe and flange transfer induction noise from the [RH](#) intake manifold to the symposer. The pipe is a push fit on the symposer and the flange, which is attached to the rear face of the [RH](#) intake manifold.

The symposer contains two pairs of chambers, one pair on the inlet side and one pair on the outlet side. The inlet pipe connects to one of the chambers on the inlet side of the symposer, and the pneumatic valve connects to one of the chambers on the outlet side of the symposer. A calibrated orifice in the inlet pipe connection on the symposer limits the range of sound waves that pass through it. A 'paddle' installed in a diaphragm forms the separating wall in each pair of chambers. The paddle is able to pivot about its lateral axis where it passes through the wall that separates the two pairs of chambers.

Symposer



E112106

Item	Description
1	Diaphragm
2	Paddle
3	Isolator
4	Inlet chamber (sealed)
5	Outlet chamber (open to pneumatic valve)
6	Screw (8 off)
7	Pneumatic valve
8	Outlet chamber
9	Inlet chamber (open to inlet pipe)
10	Inlet pipe connection

The pneumatic valve controls the flow of sound from the symposer outlet. It is a normally-closed valve connected directly to the outlet of the symposer and operated by vacuum pressure. Two isolators, one on the pneumatic valve and one on the symposer, locate the assembly on a bracket attached to the [SC](#) rear cover.

The tuning valve controls the application of vacuum pressure to the pneumatic valve. Two screws attach the tuning valve to the same bracket as the symposer and pneumatic valve. The tuning valve is a normally-closed solenoid-operated valve installed in the vacuum line between a T-connection in the brake vacuum system and the pneumatic valve. A vent cap on the tuning valve allows atmospheric pressure into the vacuum line to the pneumatic valve when the tuning valve is closed.

The outlet pipe carries sound from the pneumatic valve to the feedback tube via the outlet adapter. The outlet pipe is a push fit on the pneumatic valve and in the outlet adapter. A screw attaches the outlet adapter to an engine harness bracket installed between the two intake manifolds.

Feedback Tube

The feedback tube transfers the sound from the symposer system to the resonator. Clips secure the feedback tube to the outlet adapter of the symposer system and to the resonator.

Resonator

The resonator directs the sound from the feedback tube into the passenger compartment. The resonator is installed in the passenger compartment side of the engine bulkhead, on two mounting grommets each consisting of an isolator and a compression limiter. A hose seal isolates the resonator where it passes through the secondary bulkhead.

Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Intake Air Distribution and Filtering

Diagnosis and Testing

Principles of Operation

For a detailed description of the intake air distribution and filtering system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol)

[Intake Air Distribution and Filtering](#) (Description and Operation),
[Intake Air Distribution and Filtering](#) (Description and Operation),
[Intake Air Distribution and Filtering](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.



NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Hoses and ducts (damage/connections) • Air cleaner element (contaminated/blocked) • Restricted air intake • Supercharger • Supercharger (cooling fan) drive belt • Supercharger seals and gaskets • Charge air coolers (damage/connection) 	<ul style="list-style-type: none"> • Mass Air Flow (MAF) sensor • Manifold Absolute Pressure (MAP) sensor • Manifold Absolute Pressure/Temperature (MAPT) sensor • Throttle body • Harness (security/damage) • Connections (security/damage)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Vehicle does not start/hard starting/poor performance	<ul style="list-style-type: none"> • Restricted/Blocked air intake • Restricted/Blocked air cleaner element 	Clear the restriction. Replace the air cleaner element as necessary. Refer to the relevant workshop manual section.
Excessive intake noise	<ul style="list-style-type: none"> • Intake pipe disconnected/damaged after the air cleaner • Air cleaner assembly incorrectly assembled/damaged 	Check the intake system and hoses for correct installation/damage. Refer to the relevant workshop manual section.
Lack of boost	<ul style="list-style-type: none"> • Supercharger drive belt broken/slipping • Supercharger fault • Supercharger air intake fault • Major air leakage (after the supercharger) 	Check the supercharger and drive belt. Check the charge air coolers. Refer to the relevant workshop manual section.
Noise	<ul style="list-style-type: none"> • Supercharger drive belt slipping • Supercharger fault • Major air leakage (after the supercharger) 	Check the supercharger and drive belt. Remove the supercharger drive belt and recheck for noise. Turn the supercharger by hand and check for excessive resistance. Check for excessive play at the supercharger pulley. Check the charge air coolers. Refer to the relevant workshop manual section.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged in the Engine Control Module (ECM), please refer to Section 303-14.
REFER to: [Electronic Engine Controls](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).


Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner Element

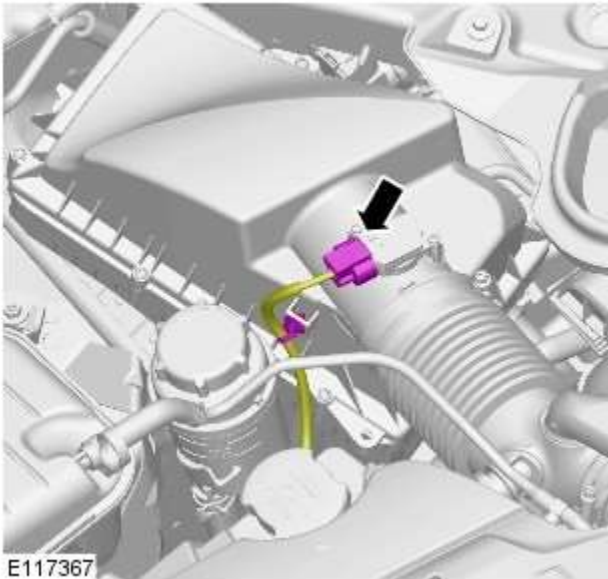
Removal and Installation

Removal

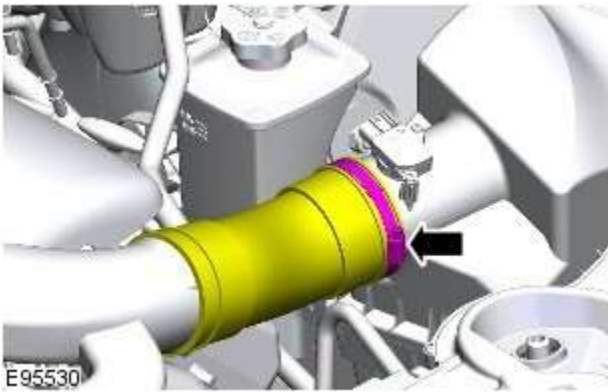
NOTES:

 Removal steps in this procedure may contain installation details.

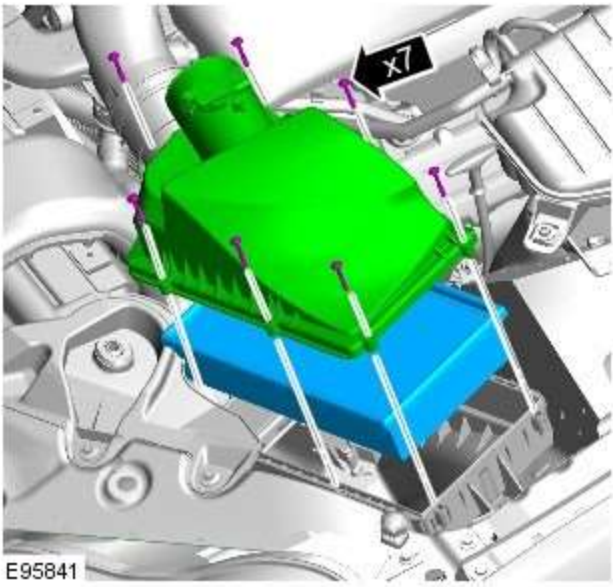
 Some variation in the illustrations may occur, but the essential information is always correct.



1.  NOTE: Left-hand shown, right-hand similar.



2.  NOTE: Left-hand shown, right-hand similar.



3.  NOTE: Left-hand shown, right-hand similar.

4. Repeat the above procedure on the opposite side.

Installation

1. To install, reverse the removal procedure.

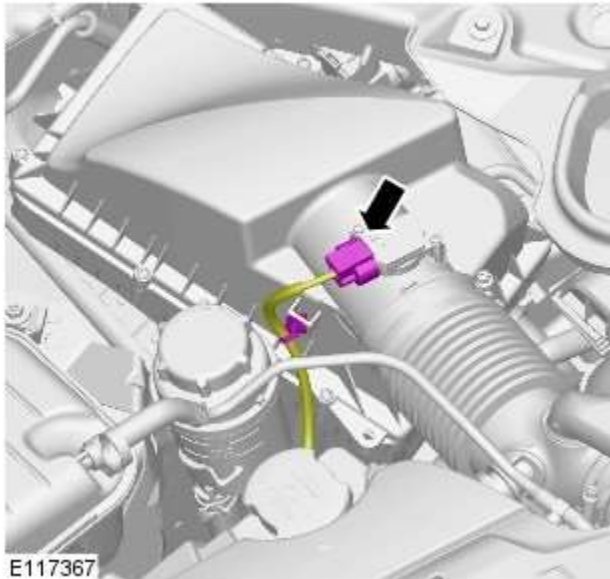
Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner LH

Removal and Installation

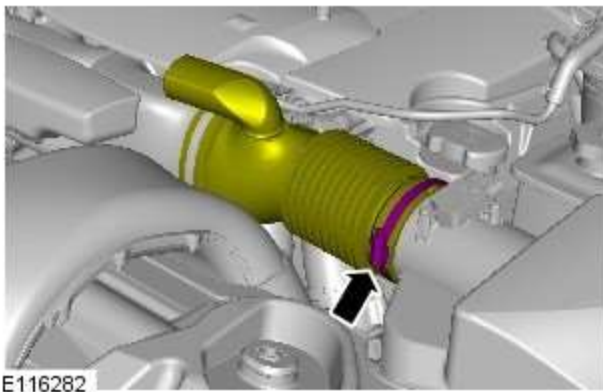
Removal



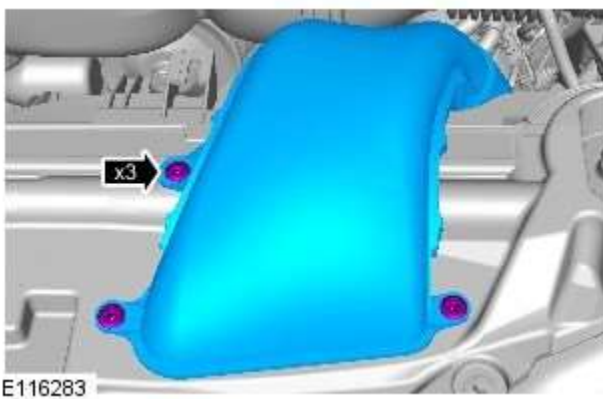
NOTE: Removal steps in this procedure may contain installation details.



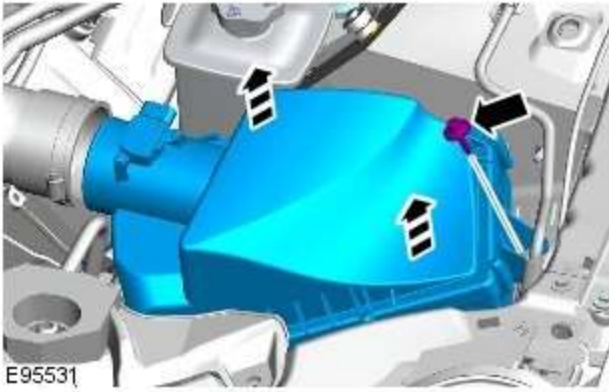
1.



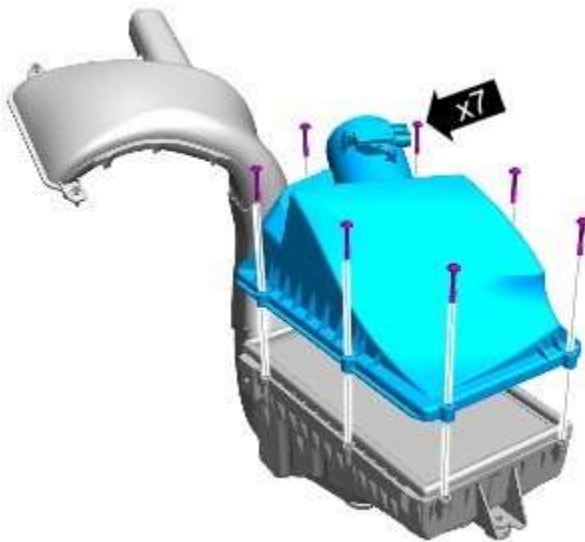
2.




3.



4. Torque: 8 Nm



5. NOTES:


 Do not disassemble further if the component is removed for access only.

 Some variation in the illustrations may occur, but the essential information is always correct.

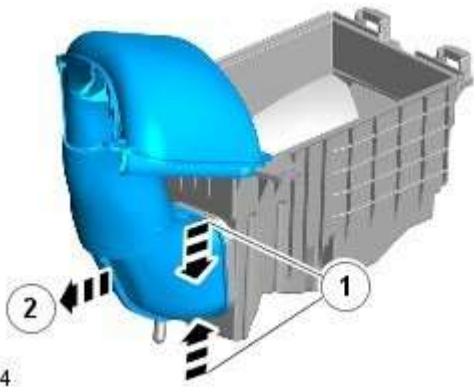
 LH illustration shown, RH is similar.


E100506



6.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

E100473



7.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner RH

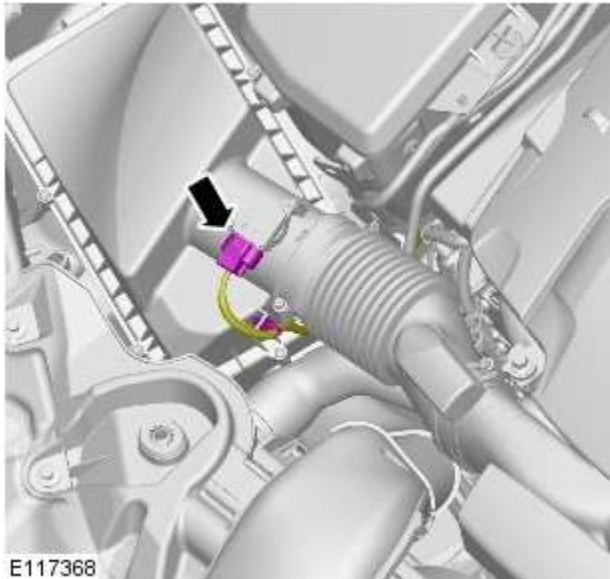
Removal and Installation

Removal

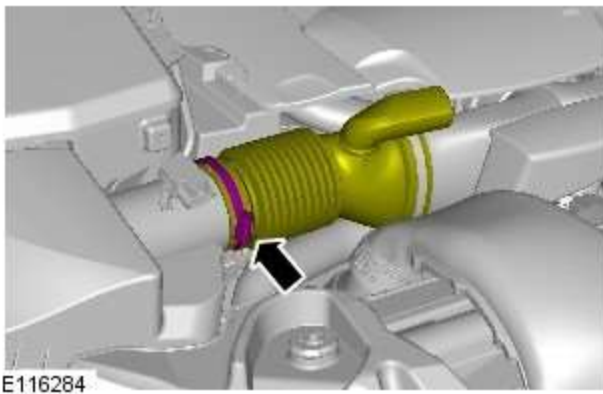


NOTE: Removal steps in this procedure may contain installation details.

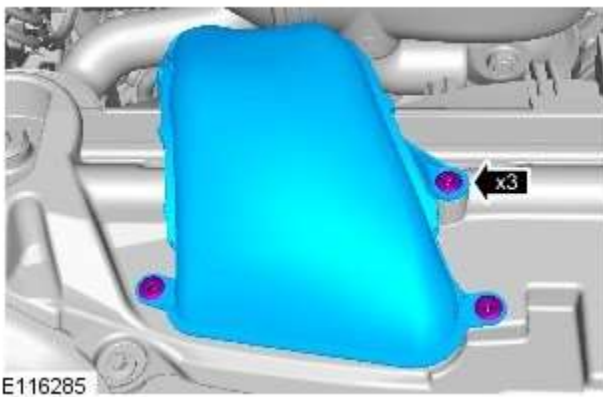
1.



2.

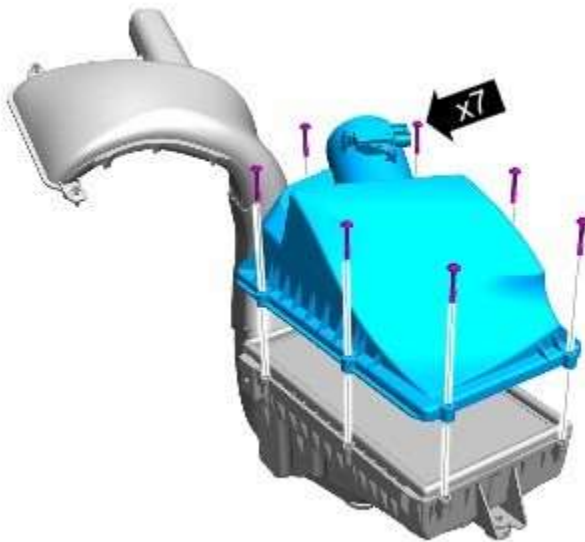


3.






4. Torque: 8 Nm



5. NOTES:

 Do not disassemble further if the component is removed for access only.

 Some variation in the illustrations may occur, but the essential information is always correct.

 LH illustration shown, RH is similar.

E100506

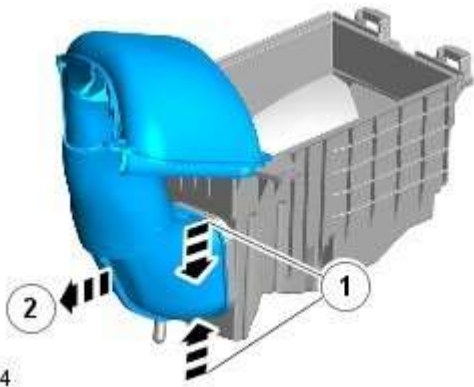


6. NOTES:


 Some variation in the illustrations may occur, but the essential information is always correct.

 LH illustration shown, RH is similar.

E100473



7. NOTES:

 Some variation in the illustrations may occur, but the essential information is always correct.

 LH illustration shown, RH is similar.

Installation

1. To install, reverse the removal procedure.

Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner Outlet Pipe LH

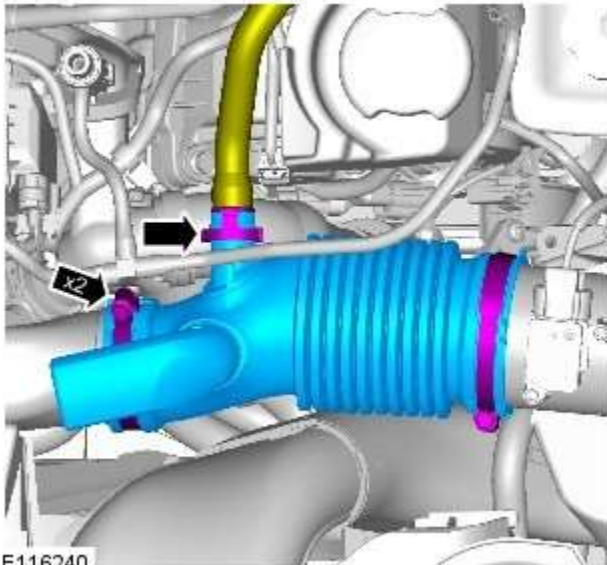
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1.



Installation

1. To install, reverse the removal procedure.

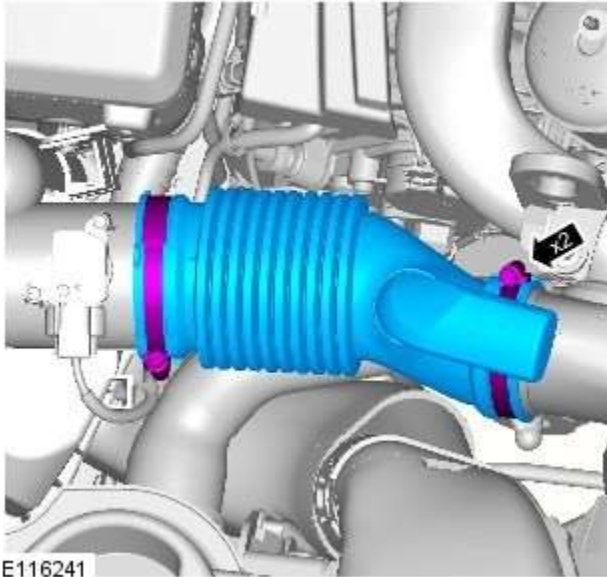
Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner Outlet Pipe RH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.



1.

Installation

1. To install, reverse the removal procedure.

Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner Outlet

Pipe T-Connector

Removal and Installation

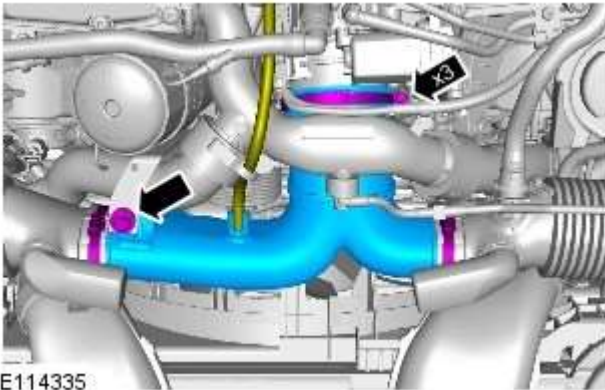
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. Torque: 10 Nm



Installation

1. To install, reverse the removal procedure.

Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Charge Air Cooler

Removal and Installation

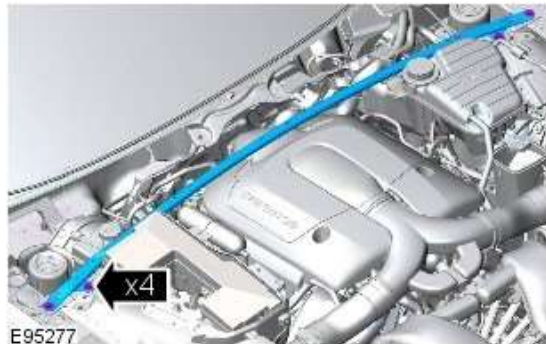
Removal



NOTE: Removal steps in this procedure may contain installation details.

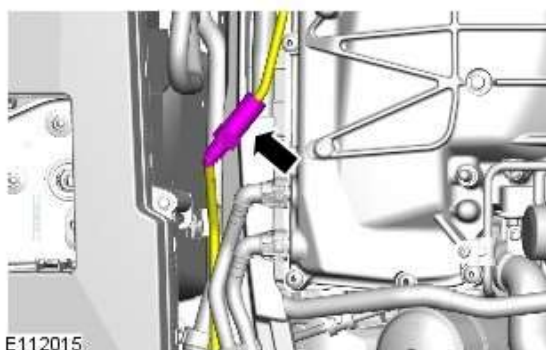


1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
4. Refer to: [Secondary Bulkhead Center Panel](#) (501-02 Front End Body Panels, Removal and Installation).
5. Refer to: [Fuel Injection Component Cleaning](#) (303-04D Fuel Charging and Controls - V8 5.0L Petrol, General Procedures).
6. Refer to: [Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).
7. Refer to: [Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (310-00 Fuel System - General Information, General Procedures).

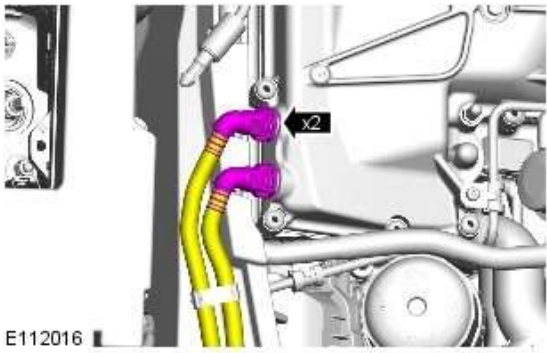


8. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

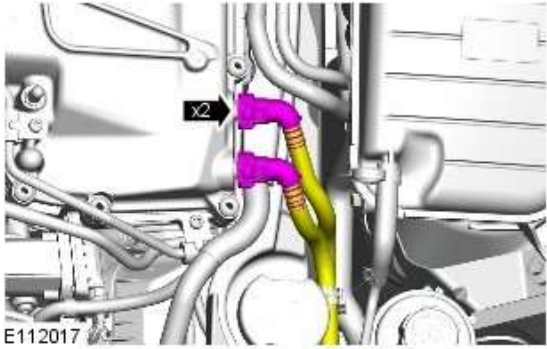
Torque: 25 Nm



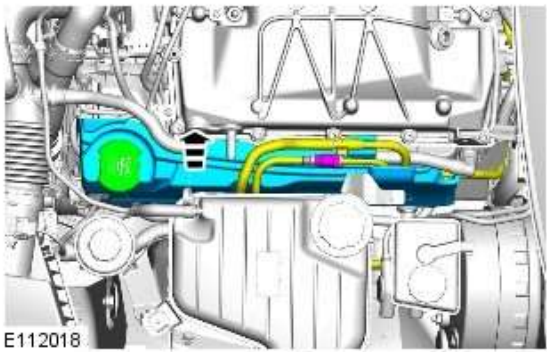
- 9.



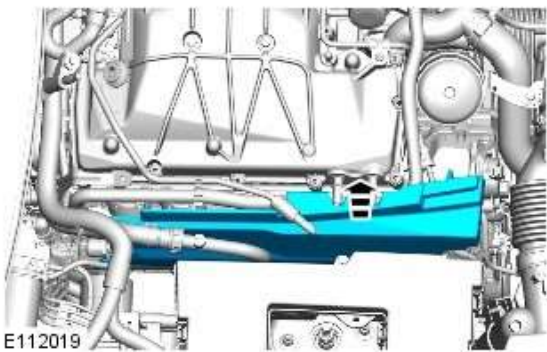
10.



11.

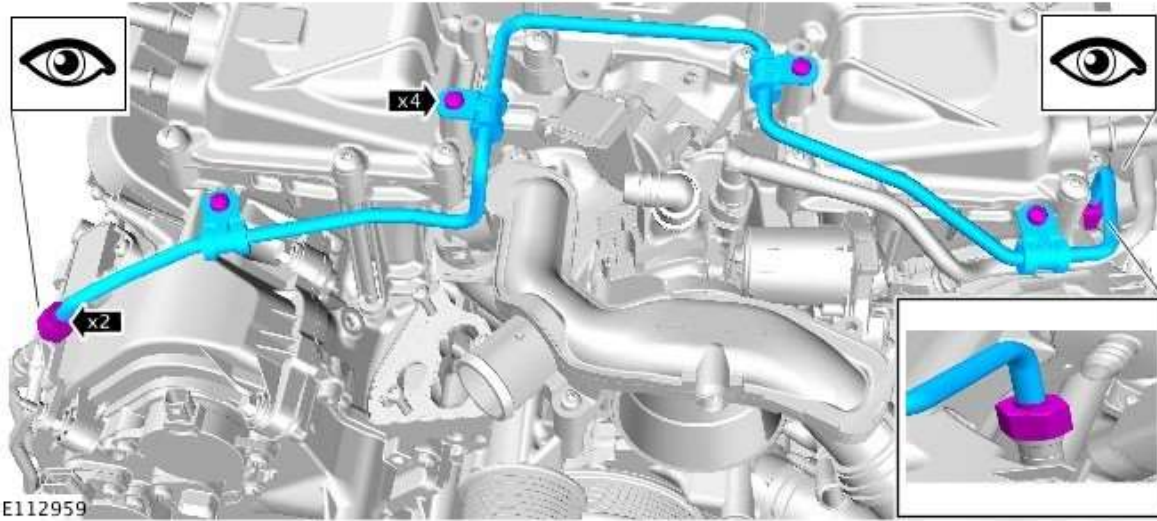
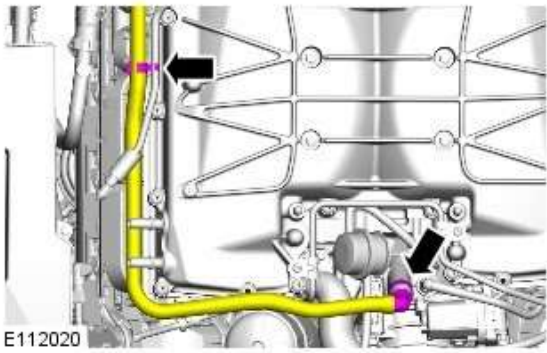


12.  CAUTION: Be prepared to collect escaping fluids.





13.

14.





15. WARNINGS:

 Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

 Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

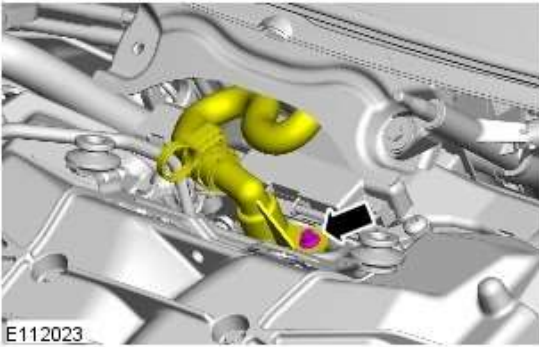
CAUTIONS:

 Make sure that the fuel line union does not rotate.

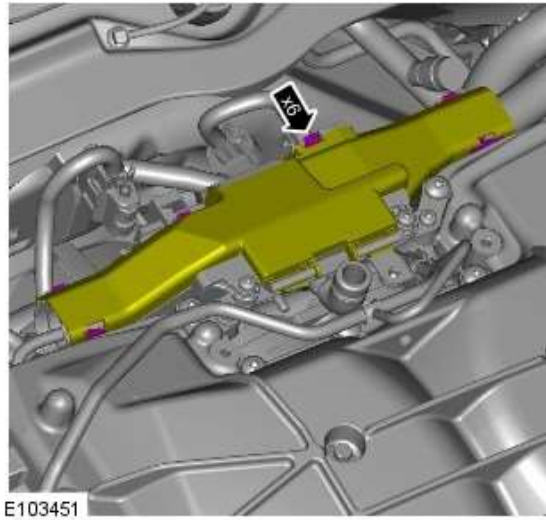
 Be prepared to collect escaping fluids.

 Make sure that all openings are sealed. Use new blanking caps.

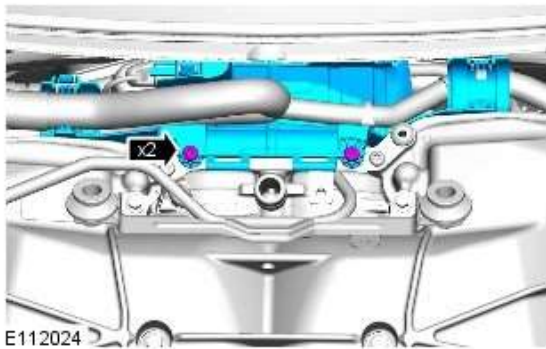
16. Torque: 10 Nm



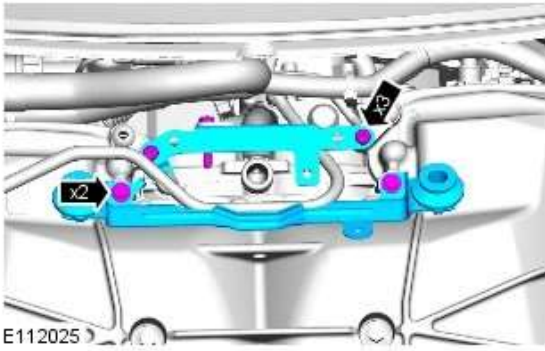
17.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



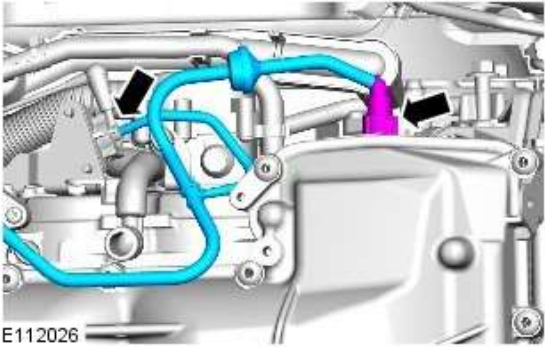
18. Torque: 10 Nm



19. Torque: 10 Nm



20.



21. NOTES:



Install and lightly tighten bolts in sequence illustrated.

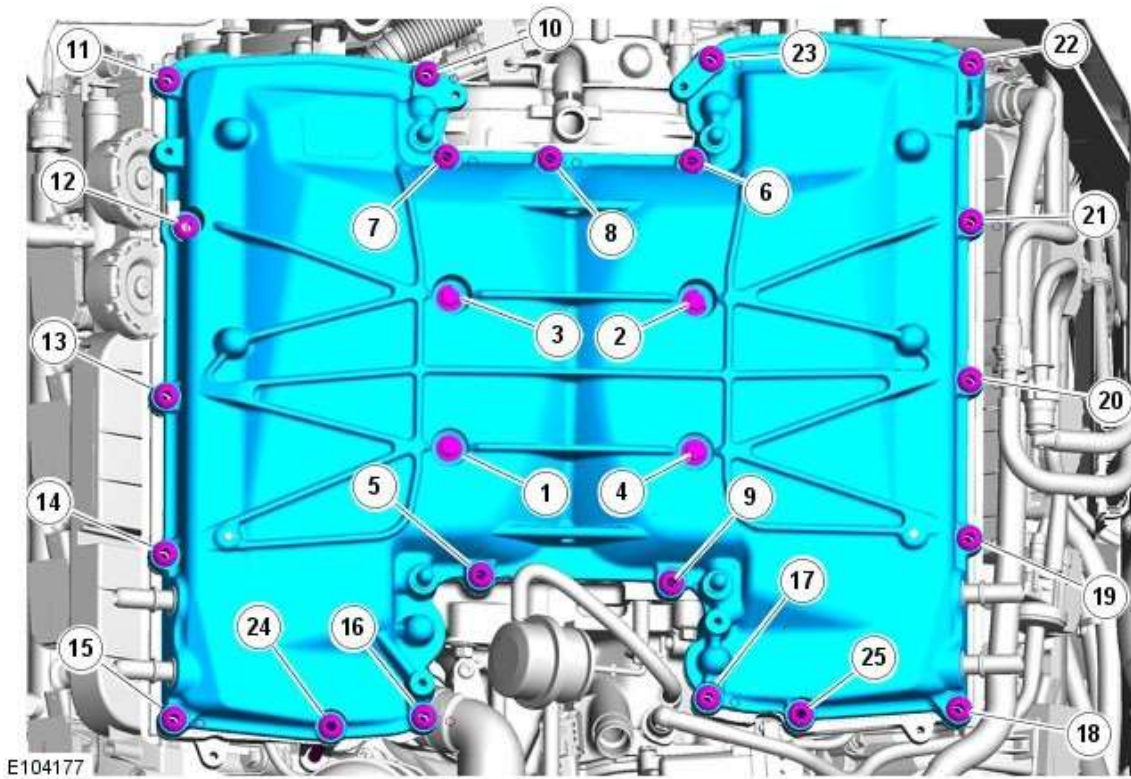


Complete the tightening sequence.



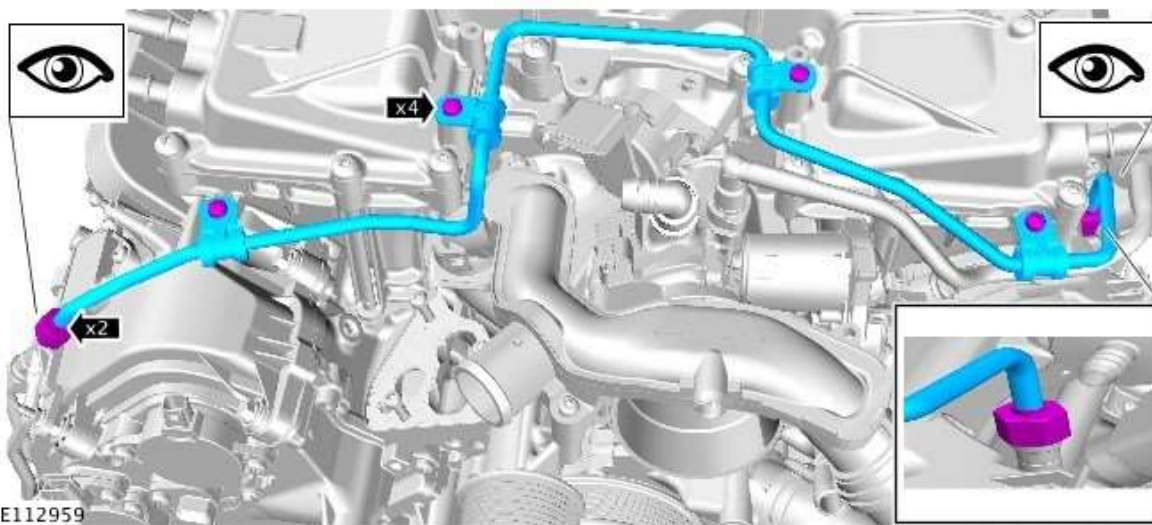
Remove and discard the gasket.


Torque: 25 Nm




Installation

1. To install, reverse the removal procedure.



2.  **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

NOTES:

 Lubricate only the union threads with clean engine oil.

 Do not tighten at

this stage.

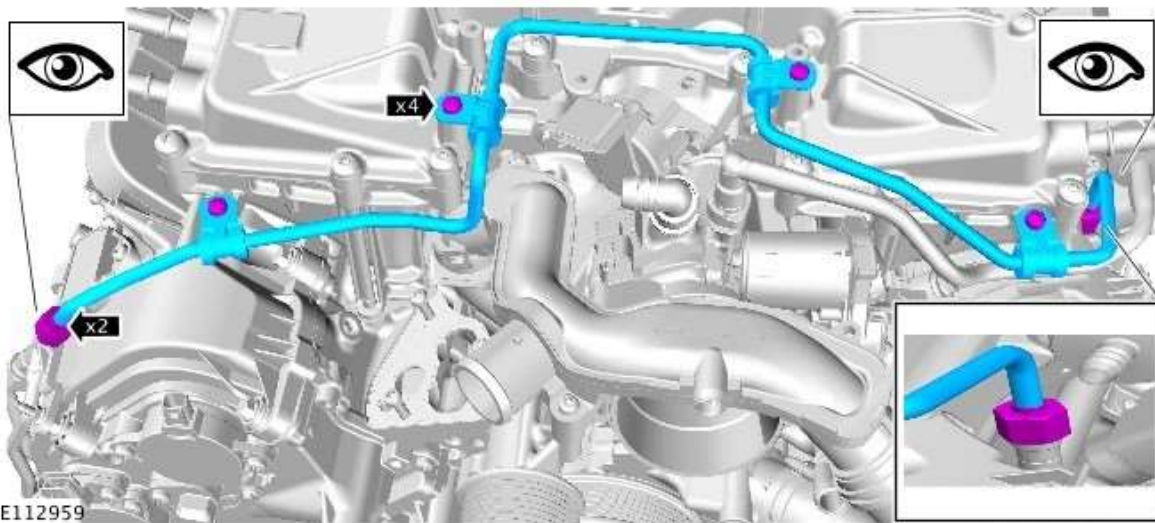


Remove and discard the blanking caps.





3. **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

Torque:
Union 21
Nm
M6 12
Nm

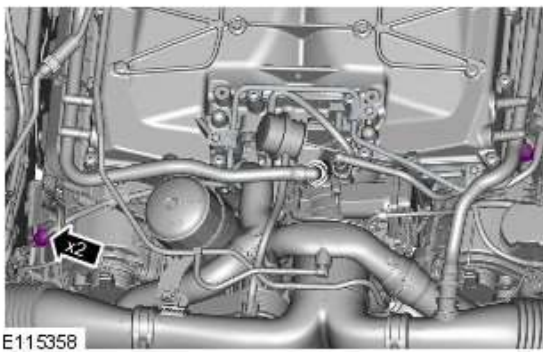


4. **WARNINGS:**

 Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

 After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow these instructions may result in personal injury.



Torque: 21 Nm



Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Supercharger

Removal and Installation

Special Tool(s)

 <p>E115267</p>	<p>303-1449-01 Supercharger Installation Guide Pins - Threaded</p>
 <p>E115267</p>	<p>303-1449-02 Supercharger Installation Guide Pins - Unthreaded</p>

Removal



CAUTION: If a new cylinder head has been installed, then new [taptite bolts](#) must be used to install the supercharger.

NOTES:



New [taptite bolts](#) when used cut their own threads on the first application.



Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

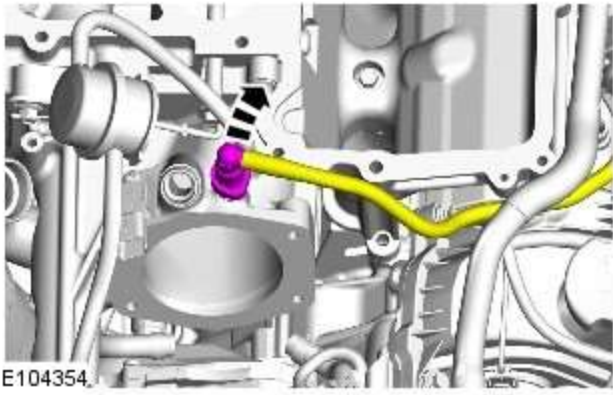
Raise and support the vehicle.

3. Refer to: [Charge Air Cooler](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

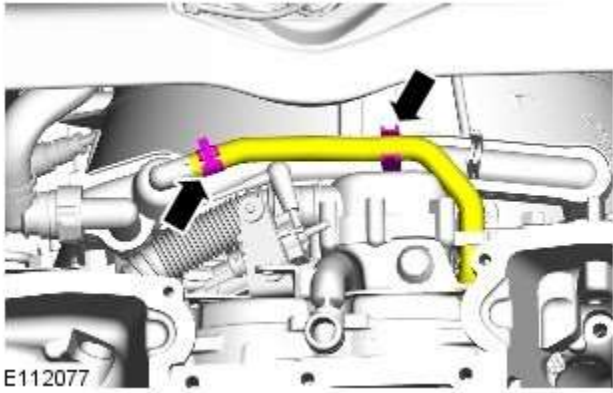
4. Refer to: [Throttle Body](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Removal and Installation).

5. Refer to: Supercharger Belt (303-05 Accessory Drive - 5.0L, Removal and Installation).

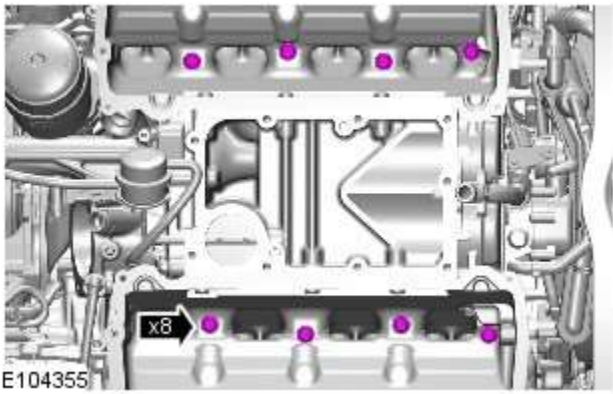
6. Refer to: [Manifold Absolute Pressure \(MAP\) Sensor](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Removal and Installation).



7.

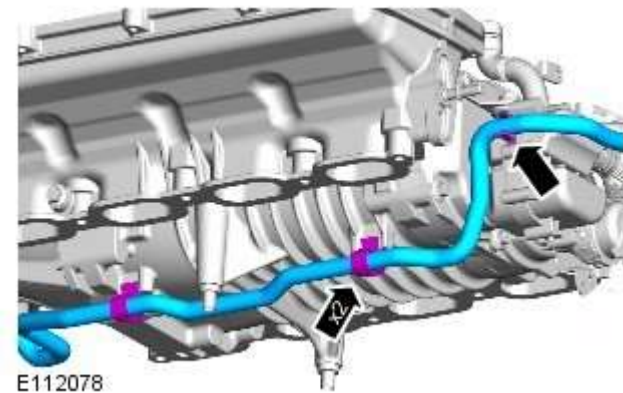
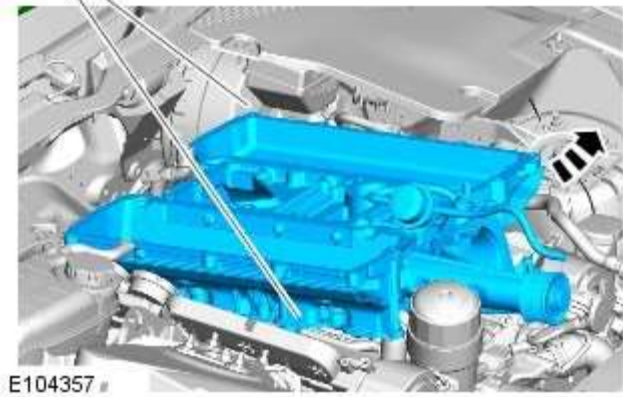
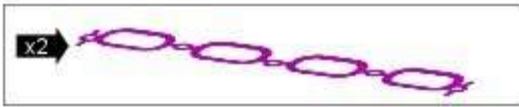



8.

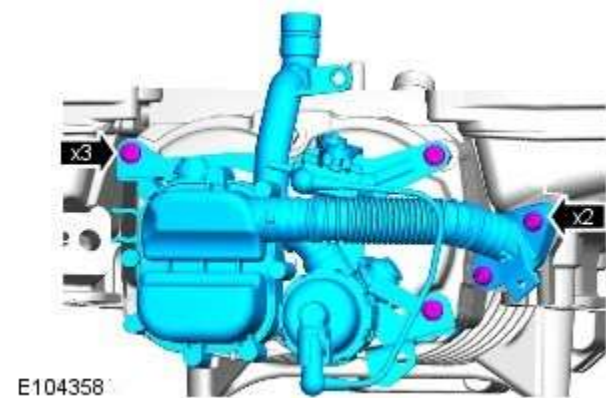


9.

10. Discard the gaskets.

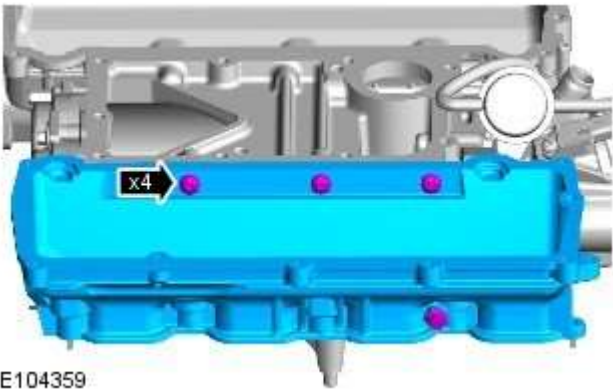


11.  NOTE: Do not disassemble further if the component is removed for access only.



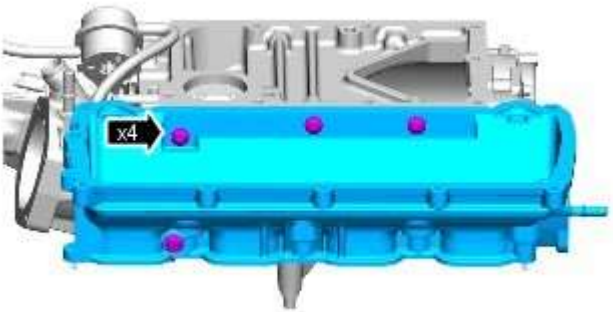
12.

13.




E104359

14.



E104360

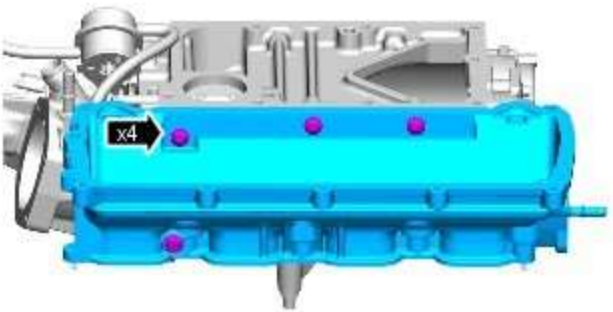
Installation

1.  CAUTION: If a new cylinder head has been installed, then new taptite bolts must be used to install the supercharger.

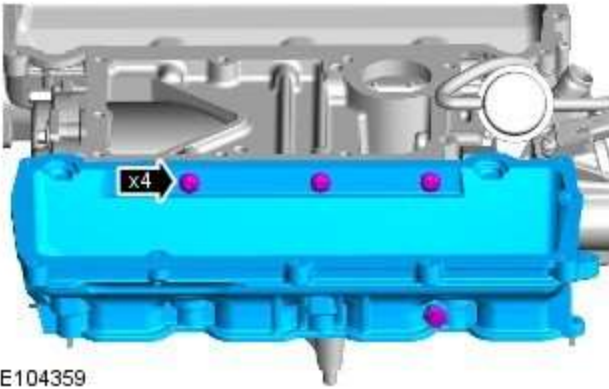
 NOTE: New taptite bolts when used cut their own threads on the first application.

To install, reverse the removal procedure.

2. Torque: 25 Nm

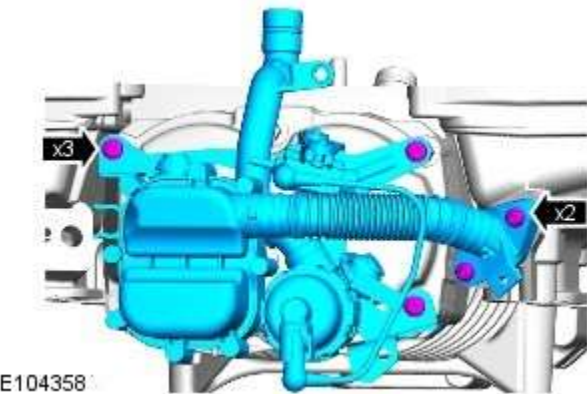


E104360



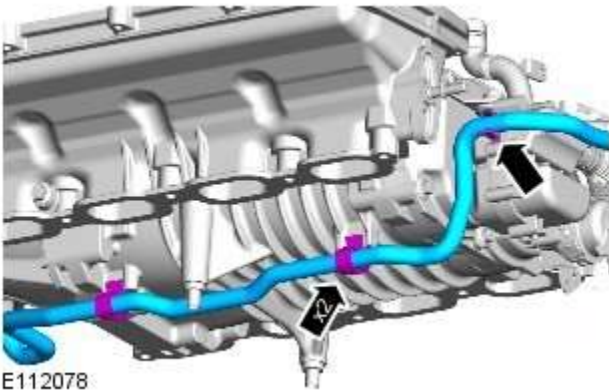
E104359

3. Torque: 25 Nm



E104358

4. Torque: 10 Nm



E112078


5.




E112079

6.

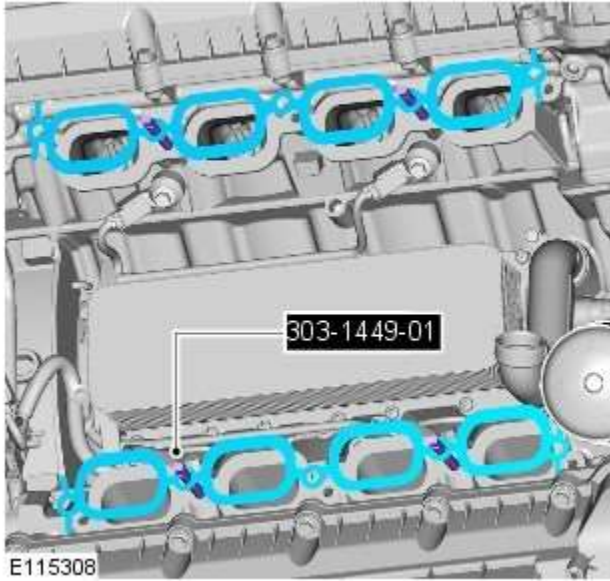
• CAUTIONS:


 If a new cylinder head has been installed then the special tool 303-1449-02 without the thread must be used to install the supercharger.

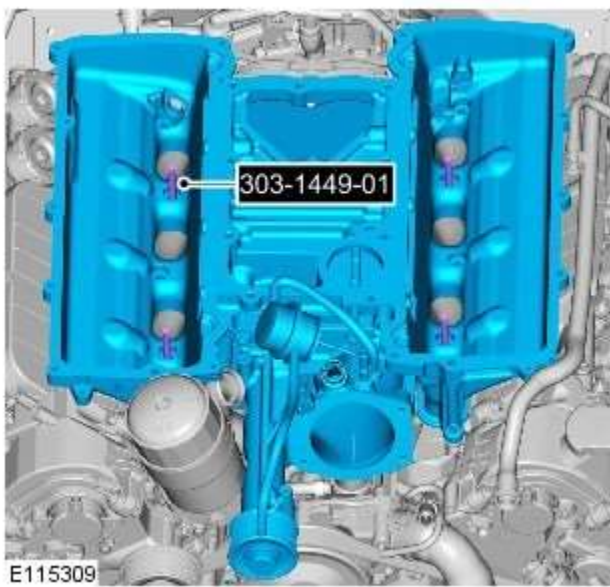
 If a new cylinder head has been installed, then new taptite bolts must be used to install the supercharger.


 NOTE: New taptite bolts when used cut their own threads on the first application.

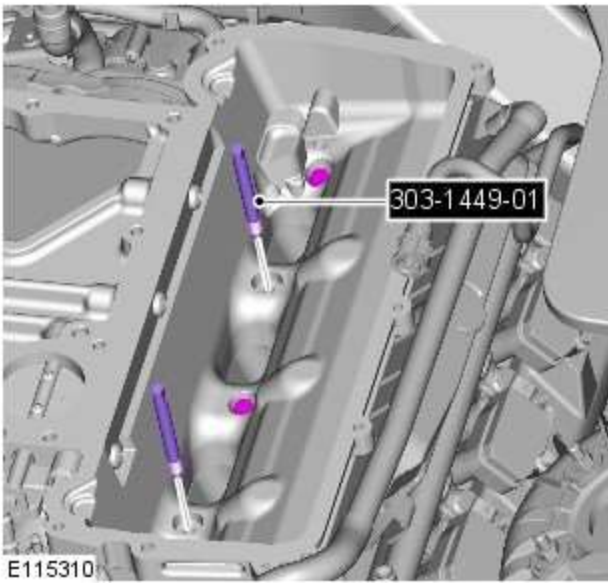
Special Tool(s): [303-1449-01](#), [303-1449-02](#)




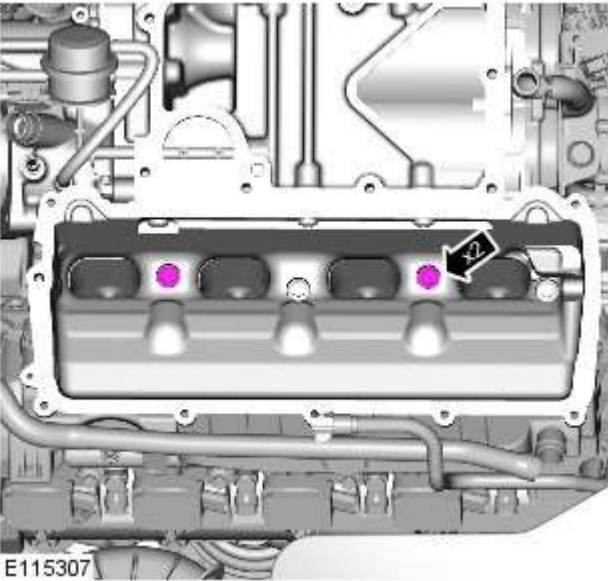
7.  CAUTION: Make sure that the mating faces are clean and free of foreign material.
 - Install new gaskets.



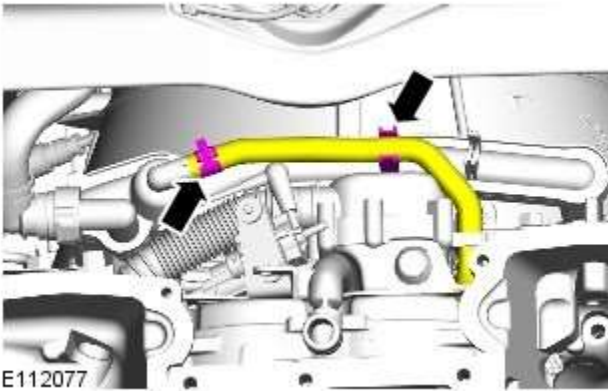
8.  CAUTION: Make sure that the mating faces are clean and free of foreign material.



9.  NOTE: Left-hand shown, right-hand similar.
Special Tool(s): [303-1449-01](#), [303-1449-02](#)
Torque: 25 Nm

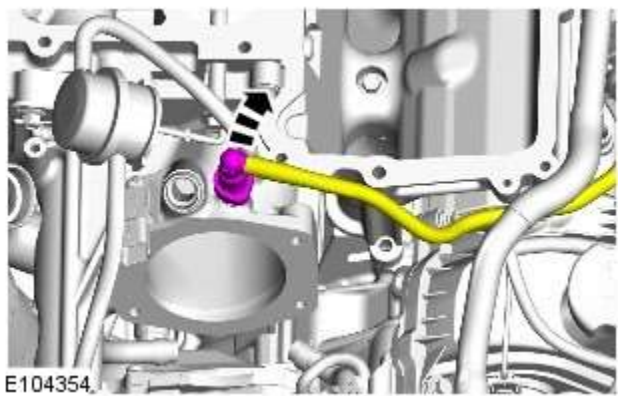


10.  NOTE: Left-hand shown, right-hand similar.
Torque: 25 Nm



- 11.

12.



13. Refer to: [Manifold Absolute Pressure \(MAP\) Sensor](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Removal and Installation).
14. Refer to: Supercharger Belt (303-05 Accessory Drive - 5.0L, Removal and Installation).
15. Refer to: [Throttle Body](#) (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Removal and Installation).
16. Refer to: [Charge Air Cooler](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
17. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Supercharger

Spring Isolator

Removal and Installation

Removal



CAUTION: Make sure that all open ports are covered to prevent any foreign material ingress.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

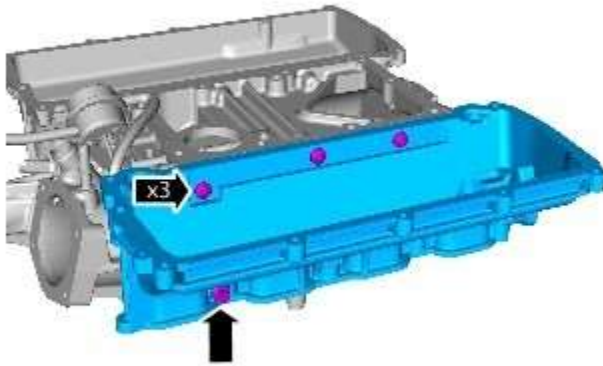


1. **WARNING:** Make sure to support the vehicle with axle stands.

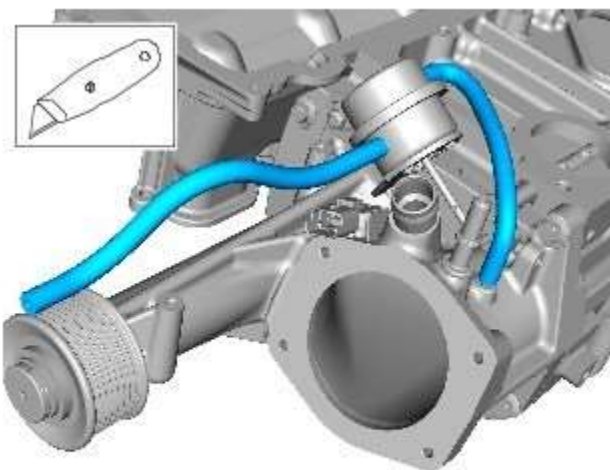
Raise and support the vehicle.

2. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

3.




E160352

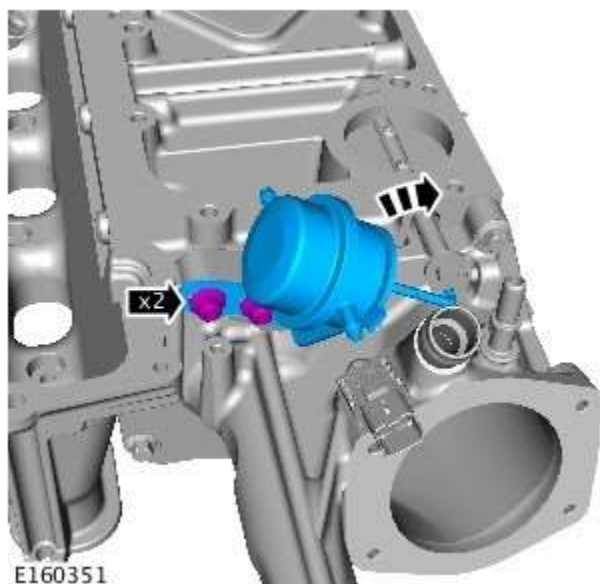


4. NOTES:

 Note the orientation prior to removal.

 Hoses must be cut off to prevent damage to the actuator.

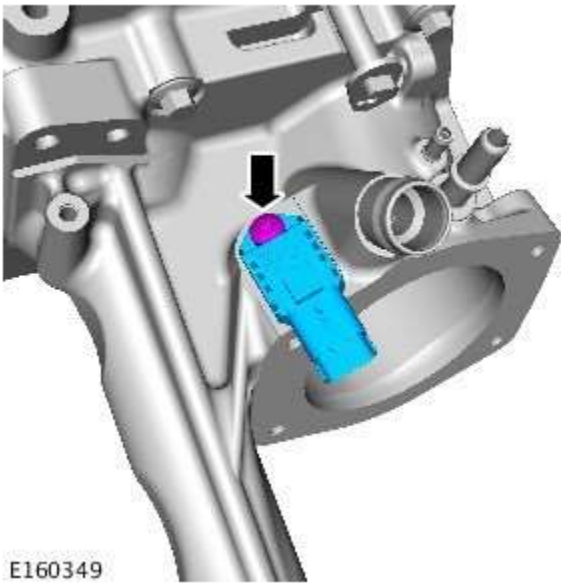
E160350



5.

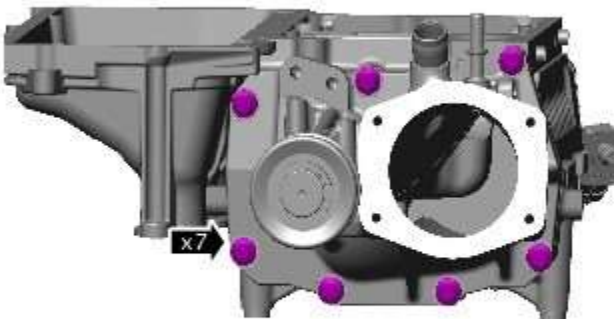
E160351

6.

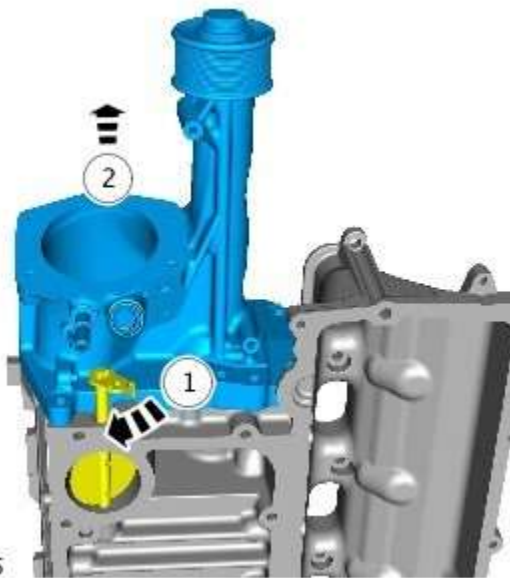



E160349

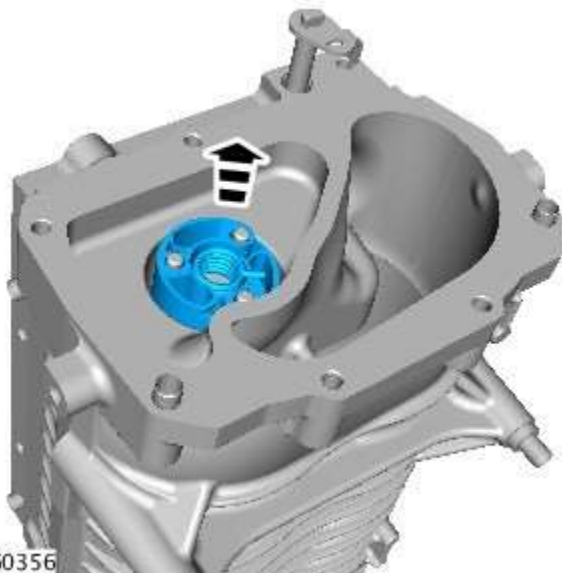
7.




E160344

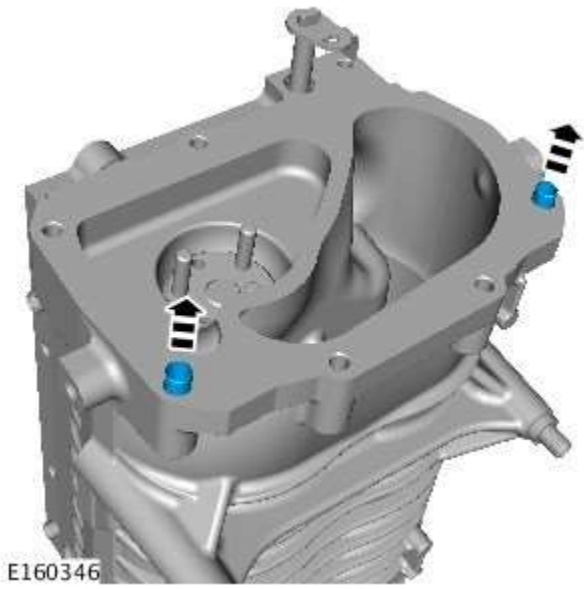


8.  CAUTION: Make sure the actuator arm is rotated to allow the front cover to be removed. Failure to follow this instruction may result in damage to the component.




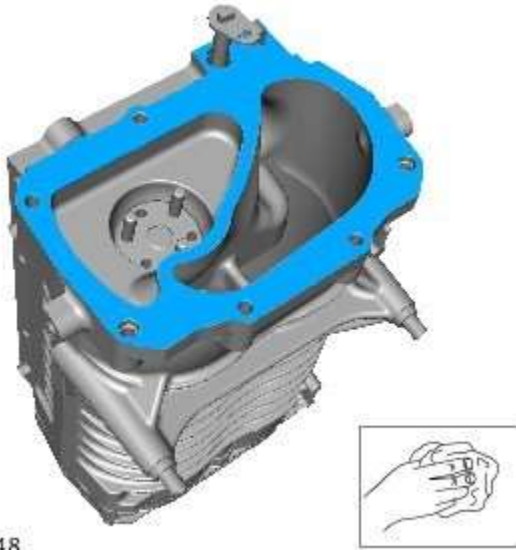
9.  CAUTION: Make sure that all open ports are covered to prevent any foreign material ingress.

10.



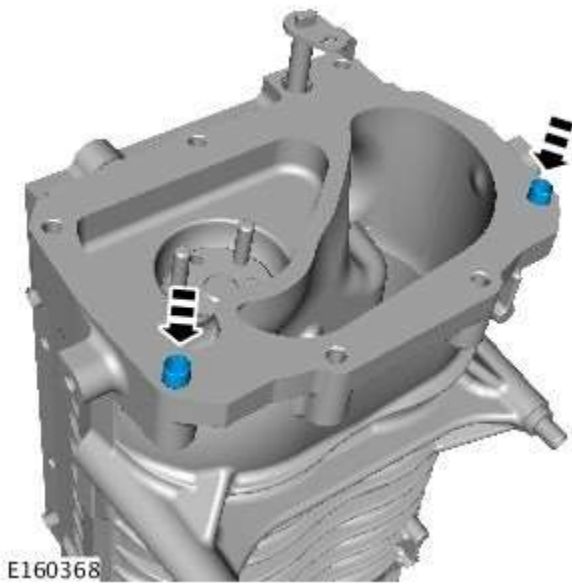
E160346

11.  CAUTION: Make sure that all open ports are covered to prevent any foreign material ingress.

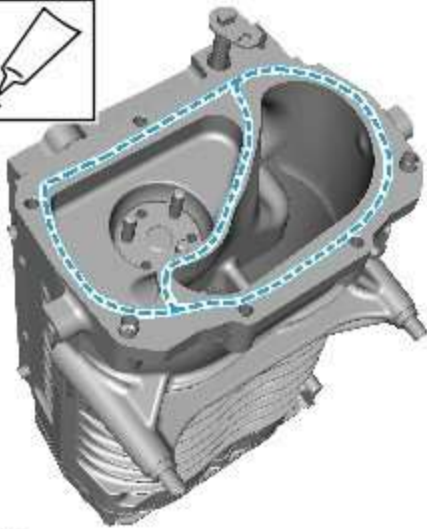


E160348

Installation

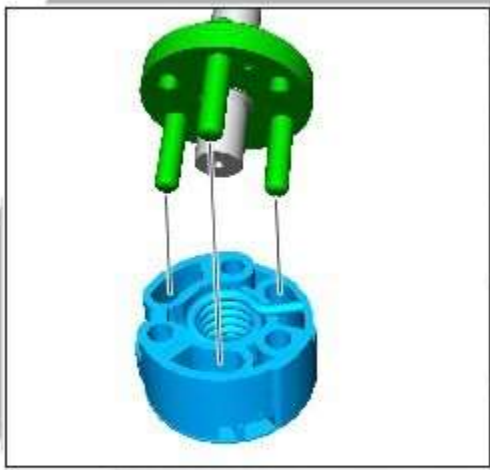


1. **CAUTION:** Make sure that all open ports are covered to prevent any foreign material ingress.



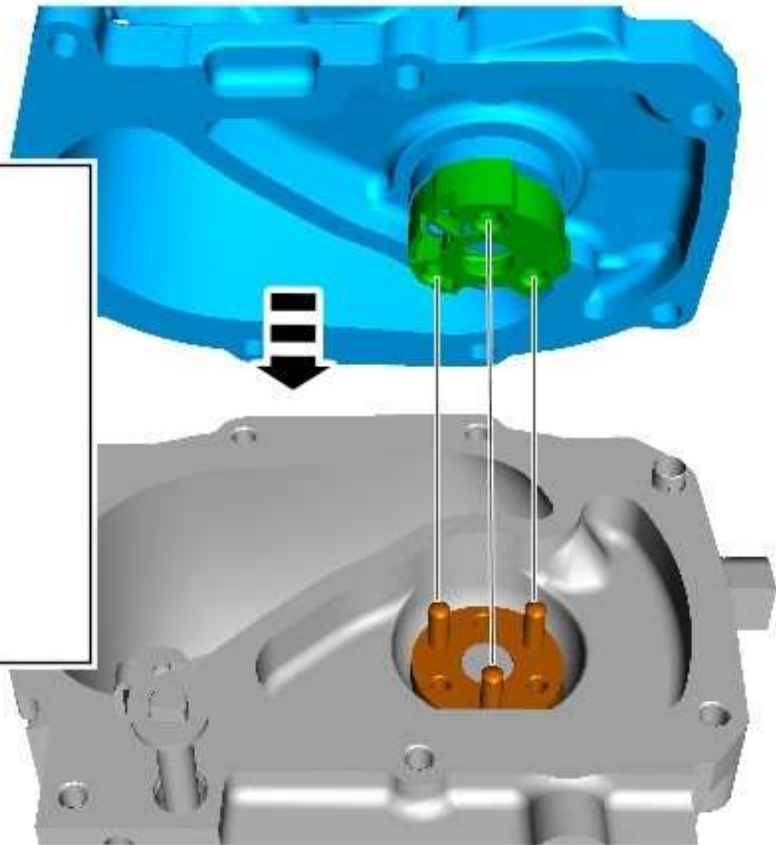
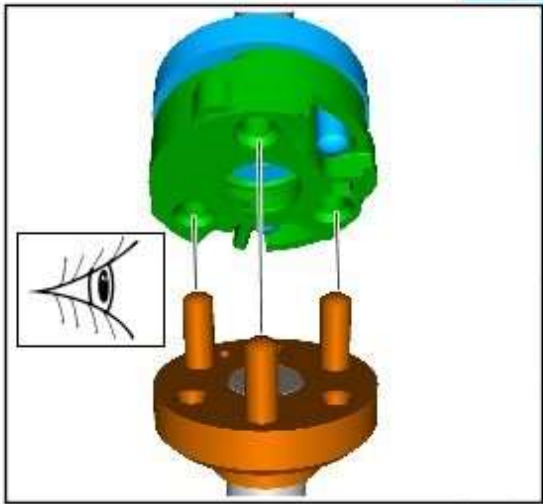
2. **CAUTION:** Apply a continuous bead of gasket sealant as shown on the illustration. The application of the sealant must be 1mm diameter. Install the component immediately after applying the sealant without smearing the sealant.

3.



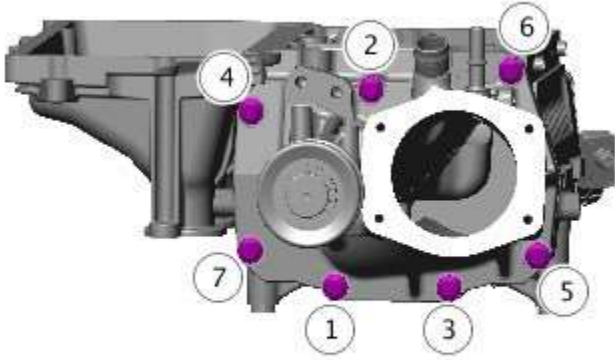
E160363

4.

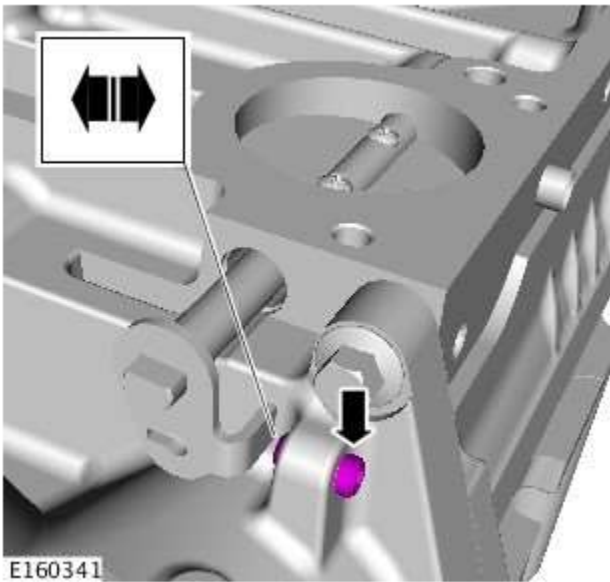



E160362

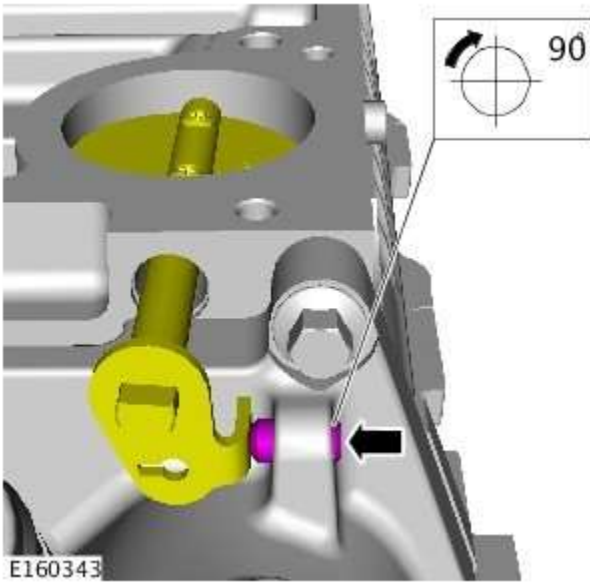
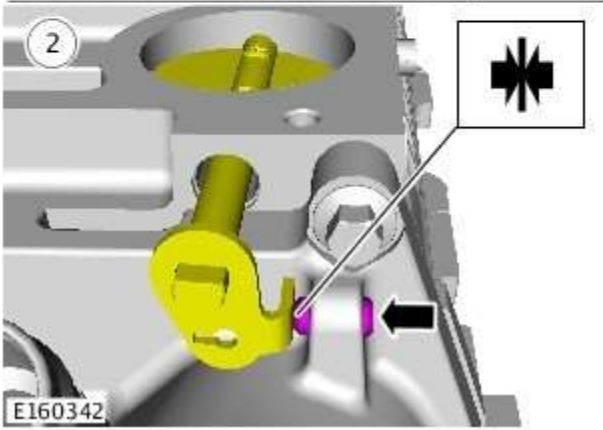
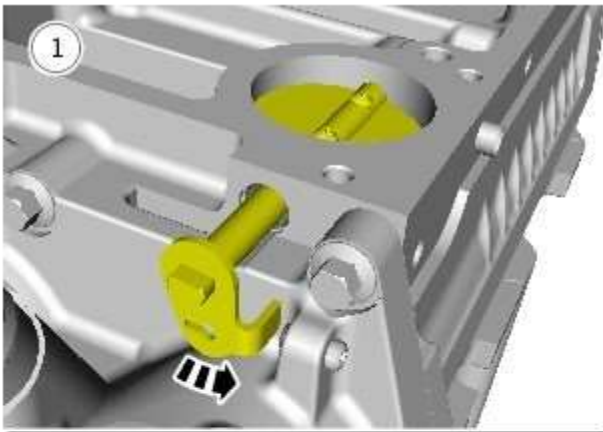
5. Torque: 27 Nm



E160365



6.  NOTE: Loosen the adjustment screw.

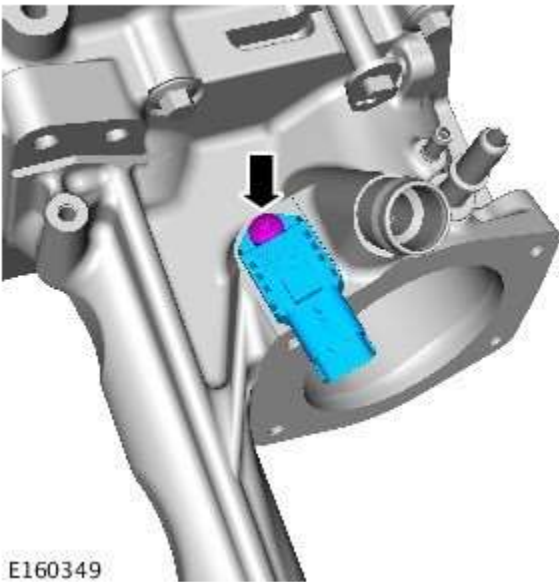


7.

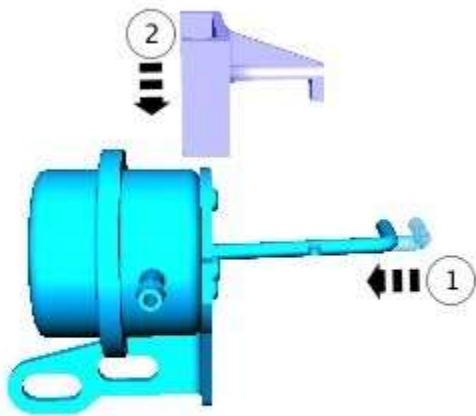
1. Using light pressure rotate the arm counter clockwise and hold.
2. Tighten the adjustment screw until no gap is visible.

8.

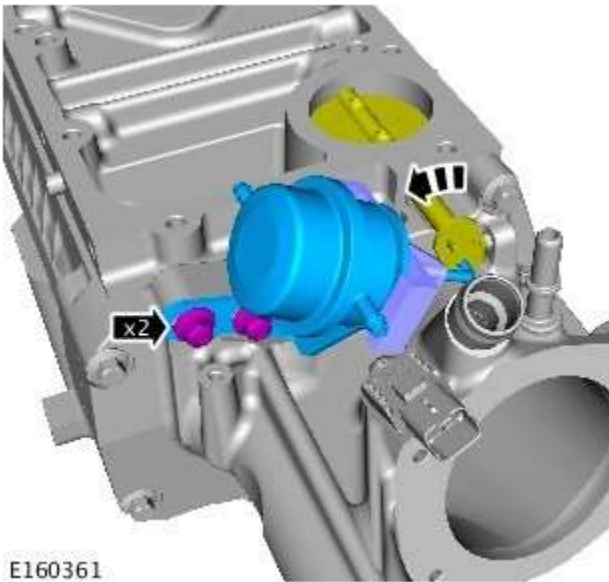
9. Torque: 5 Nm



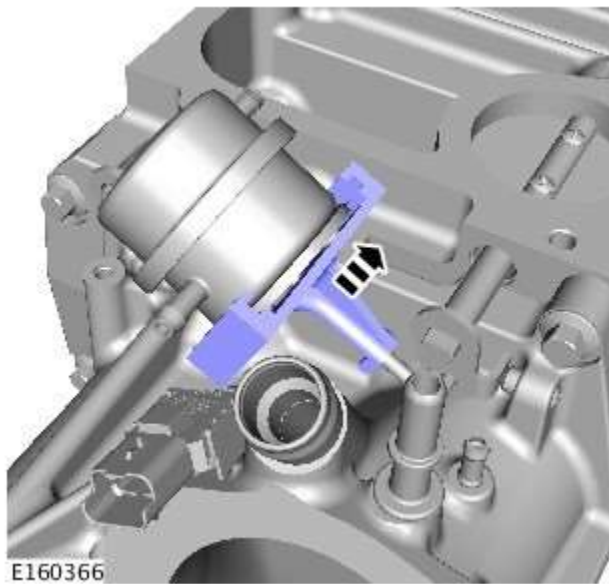
10. Assemble the installation tool, supplied, to the actuator.



11. Torque: 20 Nm



12. Remove the installation tool.



13. CAUTIONS:



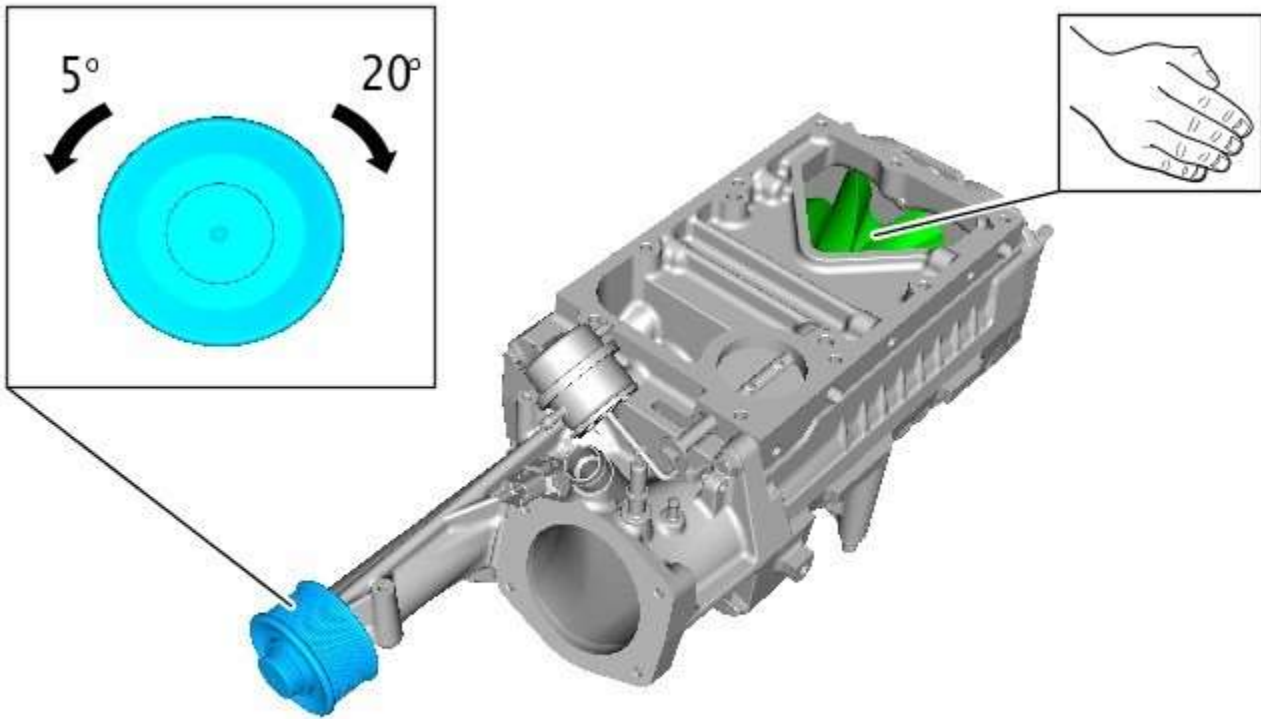
Make sure that spring resistance is felt in both directions of the pulley as shown.



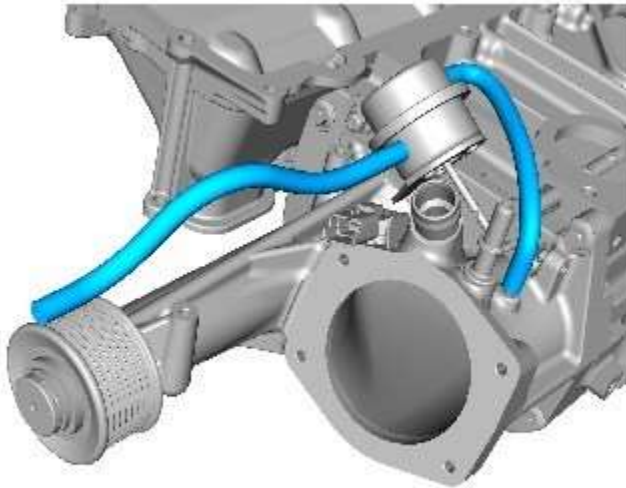
Make sure that all open ports are covered to prevent any foreign material ingress.




NOTE: Supercharger rotors will appear polished, this is normal.



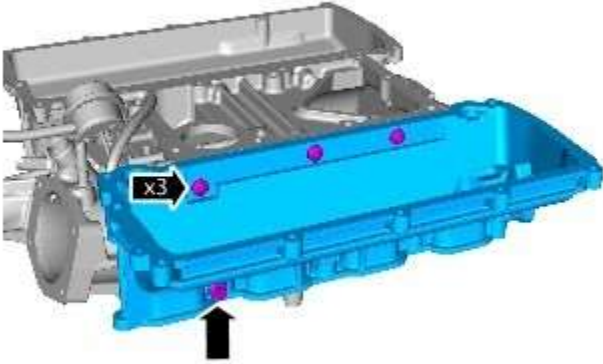
E160353



E160367

14.  **CAUTION:** Make sure the components are installed as noted on removal. Failure to follow this instruction may result in damage to the component.

15. Torque: 25 Nm



E160352

16. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

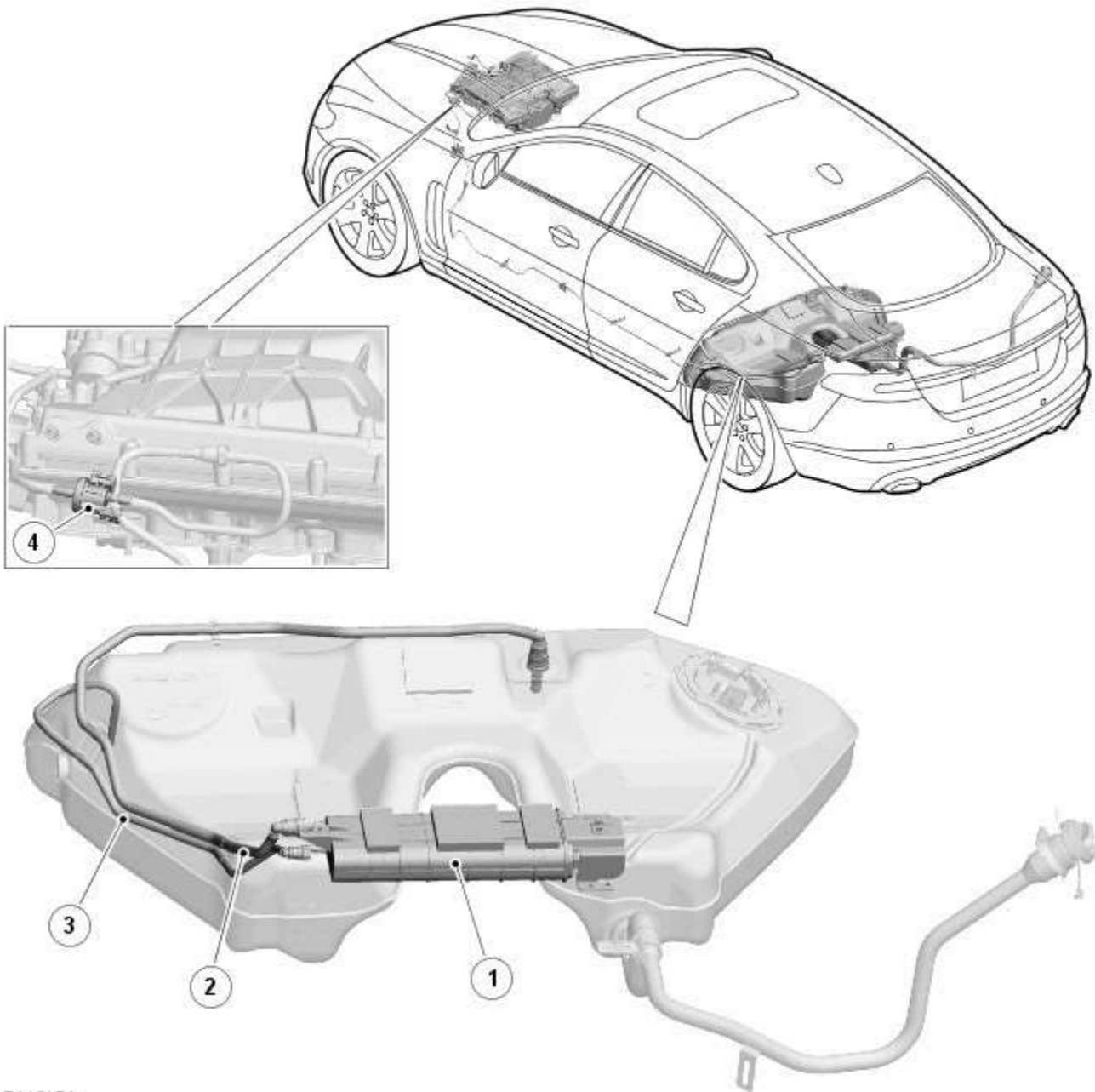
Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol -**Torque Specifications**

Description	Nm	lb-ft	lb-in
Evaporative emission canister retaining nut	9	-	80

Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Evaporative Emissions - Component Location

Description and Operation

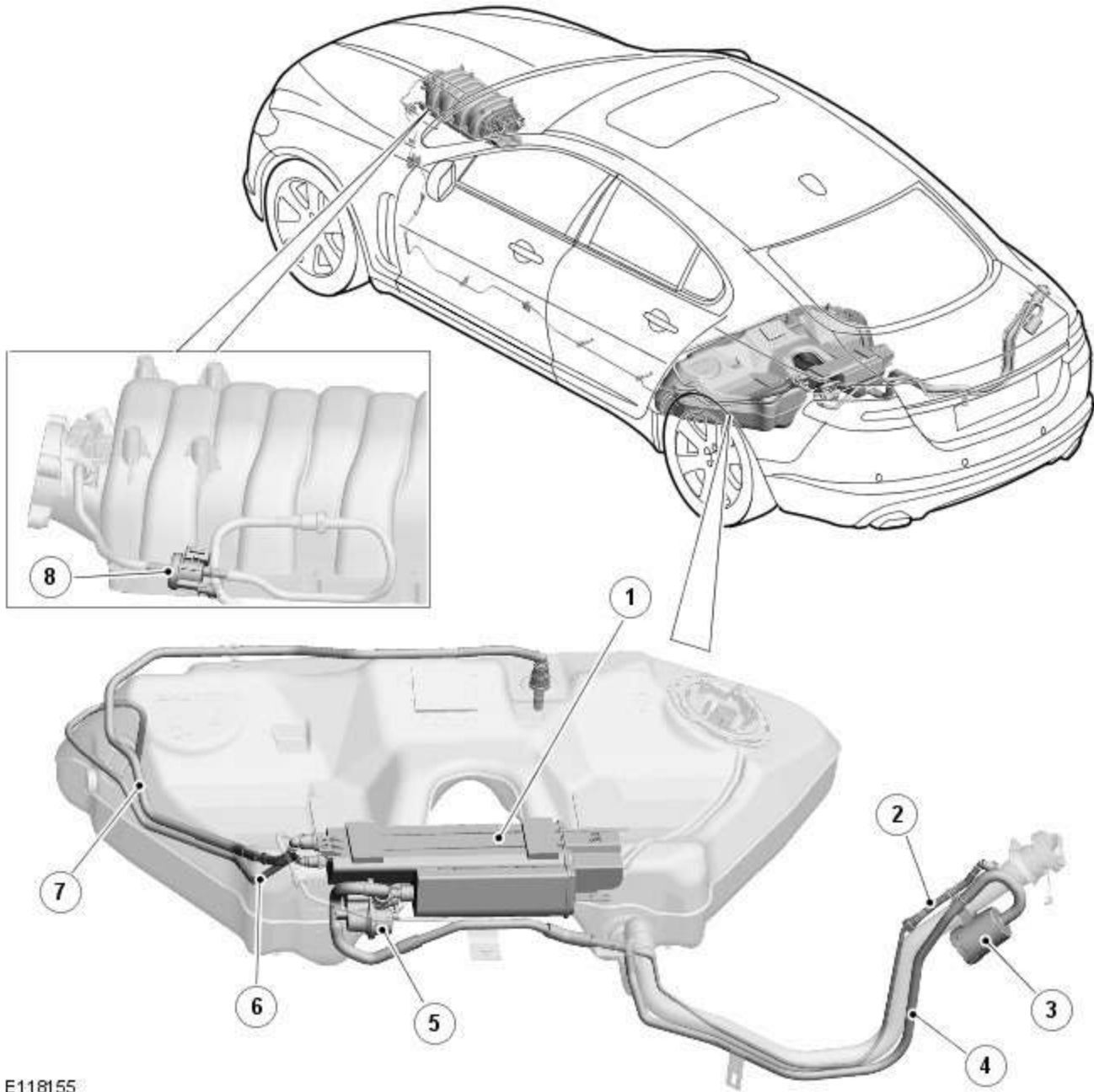
COMPONENT LOCATION (ALL EXCEPT NORTH AMERICAN SPECIFICATION)



E118154

Item	Description
NOTE: System on supercharger vehicle shown, system on naturally aspirated vehicle similar.	
1	EVAP (evaporative emissions) canister
2	Vapor pipe - fuel tank to EVAP canister
3	Vapor pipe - EVAP canister to EVAP canister purge valve
4	EVAP canister purge valve

COMPONENT LOCATION (NORTH AMERICAN SPECIFICATION)



E118155

Item	Description
NOTE: System on naturally aspirated vehicle shown, system on supercharger vehicle similar.	
1	EVAP canister
2	Vapor pipe (filler head communication) - fuel tank to filler pipe
3	DMTL (diagnostic module - tank leakage) filter
4	Atmospheric vent pipe - DMTL pump to filter
5	DMTL pump
6	Vapor pipe - EVAP canister to EVAP canister purge valve
7	Vapor pipe - fuel tank to EVAP canister
8	EVAP canister purge valve

Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Evaporative Emissions - Overview

Description and Operation

OVERVIEW

The [EVAP \(evaporative emission\)](#) system reduces the level of hydrocarbons released into the atmosphere by fuel vapor venting from the fuel tank. The system comprises of an [EVAP](#) canister, an [EVAP](#) purge valve, interconnecting vapor pipes and, on NAS vehicles, a DMTL pump and filter. The vapor pipes are connected to the system components using quick release connectors.

Fuel vapor is generated by the fuel in the tank and the amount of vapor produced increases as the fuel heats up. Fuel vapor can flow freely to the [EVAP](#) canister via the tank venting system.

On NAS vehicles the vapor generated in the fuel tank during refueling flows without restriction to the [EVAP](#) canister.

On all vehicles except NAS, the vapor is restricted in its path to the [EVAP](#) canister, but can flow freely during the refueling operation to atmosphere via the fuel filler pipe opening.

The vapor passes into the [EVAP](#) canister where it is absorbed and stored by the charcoal. Because there is a limit to the amount of vapor the canister can contain, the fuel vapor is purged from the canister when the engine is running and burned in the engine.

Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Evaporative Emissions - System Operation and Component Description

Description and Operation

System Operation

DIAGNOSTIC MODULE - TANK LEAKAGE PUMP (NAS ONLY)

To check the fuel tank and the [EVAP \(evaporative emission\)](#) system for leaks, the [ECM \(engine control module\)](#) operates the DMTL pump and monitors the current draw. Initially, the [ECM](#) establishes a reference current by pumping air through the reference orifice and back to atmosphere. Once the reference current is determined, the [ECM](#) closes the change-over valve, which seals the [EVAP](#) system. The [EVAP](#) canister purge valve remains de-energized and is therefore closed. The output from the air pump is diverted from the reference orifice and into the [EVAP](#) system.

When the change-over valve is closed, the load on the air pump falls to zero. Providing there are no leaks, the air pump will begin to pressurize the [EVAP](#) system and the load and current draw in the pump increases. By monitoring the rate and level of the current increase, the [ECM](#) can determine if there is a leak in the [EVAP](#) system.

During normal vehicle operation, 15 seconds after the engine has started, the [ECM](#) energizes the heating element in the pump to prevent condensation formation and possible incorrect readings. The heater remains energized until either the engine and ignition are off (if no DMTL test is running) or until after the DMTL test is completed.

Leaks are classified as:

- Minor - equivalent to a hole diameter of 0.5 to 1.0 mm (0.02 to 0.04 in.).
- Major - equivalent to a hole diameter of 1.0 mm (0.04 in.) or greater.

The [ECM](#) performs a check for major leaks each time the ignition is switched off, providing the following conditions are met:

- The vehicle speed is zero.
- The engine speed is zero.
- The atmospheric pressure is above 70 kPa (10.15 lbf/in²), i.e. the altitude is less than approximately 3047 m (10000 feet).
- The ambient temperature is between 0 and 40 °C (32 and 104 °F).
- The [EVAP](#) canister vapor concentration factor is 5 or less (where 0 is no fuel vapor, 1 is stoichiometric fuel vapor and greater than 1 is rich fuel vapor).
- The fuel tank level is valid and between 15 and 85% of nominal capacity.
- The engine running time during the previous cycle was more than 10 minutes.
- The battery voltage is between 10 and 15 volts.
- The last engine off time was more than 180 minutes.
- No errors are detected with the [EVAP](#) components, the ambient air temperature and the fuel level.



NOTE: A leak test can be performed using a Jaguar recognized diagnostic tool. This overrides the above conditions and is useful for checking correct system and component operation.

The [ECM](#) performs a check for minor leaks after every 2nd major leak check.

When the leak check is complete, the [ECM](#) stops the DMTL pump and opens (de-energizes) the change-over valve.

If the fuel filler cap is opened or refueling is detected during the leak check, by a sudden drop in the current draw or a rise in the fuel level, the [ECM](#) aborts the leak check.

If a leak is detected during the check, the [ECM](#) stores an appropriate fault code in its memory. If a leak is detected on two consecutive checks, the [ECM](#) illuminates the [MIL \(malfunction indicator lamp\)](#) in the instrument cluster on the next drive cycle.

The duration of a leak check can be between 60 and 900 seconds depending on the results and fuel tank level.

EVAP CANISTER PURGE VALVE

The [ECM](#) waits until the engine is running above 55 °C (131 °F) coolant temperature with closed loop fuel operational before the purging process is activated. Under these conditions the engine should be running smoothly with no warm up enrichment. The [EVAP](#) canister purge valve duty (and flow) is initially ramped slowly because the vapor concentration is unknown (a sudden increase in purge could cause unstable engine running or cause it to stall due to an extremely "rich" air/fuel mixture). The concentration is then determined from the amount of adjustment that the closed loop fueling is required to make to achieve the target AFR (air fuel ratio). Once the concentration has been determined, the purge flow can be increased rapidly and the injected fuel can be pro-actively adjusted to compensate for the known purge vapor and the target AIR control is maintained.

When the purging process is active, fresh air is drawn into the [EVAP](#) canister via the DMTL filter and pump on NAS vehicles, or via the vent port on the [EVAP](#) canister of non NAS vehicles.

Component Description

DIAGNOSTIC MODULE - TANK LEAKAGE PUMP (NAS ONLY)



E67816

The DMTL (diagnostic module - tank leakage) pump periodically checks the [EVAP](#) system and the fuel tank for leaks when the ignition is switched off. The DMTL system comprises the previously described components of the [EVAP](#) system with the following additional components; a DMTL pump and a DMTL filter.

The DMTL pump is connected to the atmospheric vent of the [EVAP](#) canister and incorporates an electric air pump, a [PTC \(positive temperature coefficient\)](#) heating element, a normally open change-over valve and a reference orifice. The DMTL pump is only operated when the ignition is switched off and is controlled by the [ECM](#). The [ECM](#) also monitors the electric air pump operation and the change-over valve for faults.

The DMTL filter protects the pump from dust being drawn into the system when the pump is being operated. The filter is located on the fuel filler head and is connected to the DMTL pump by a vapor pipe.

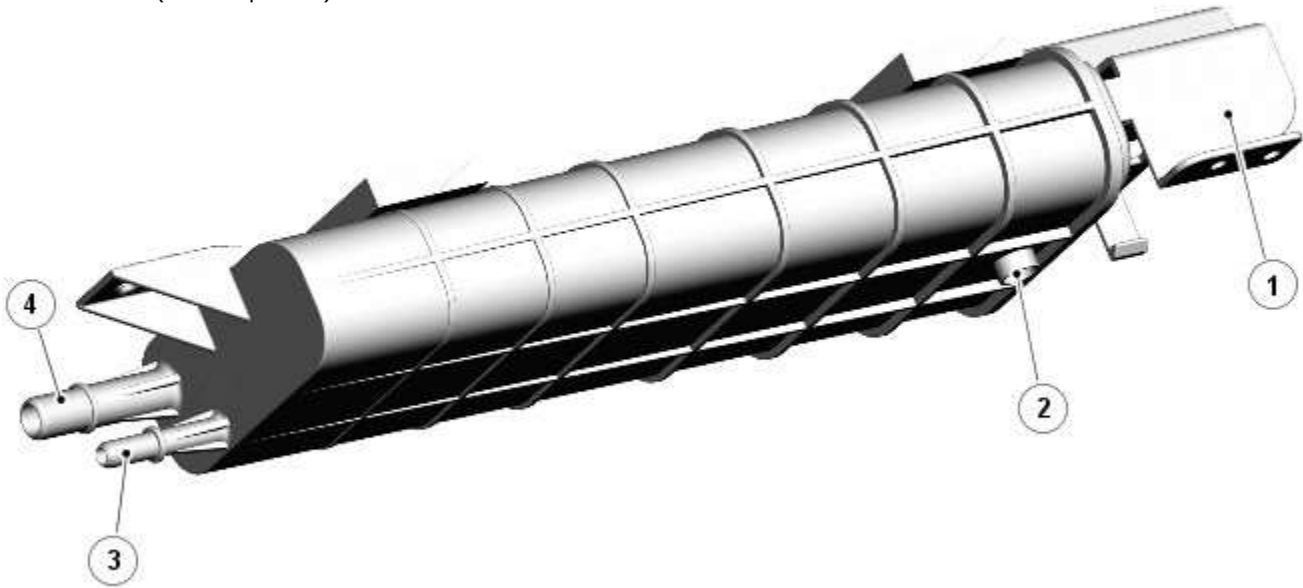
The DMTL test is performed after the engine has stopped following a run of 10 minutes or more, providing that the vehicle fuel tank is between 15 and 85% full, the ambient temperature is above 0 °C (32 °F) and less than 40 °C (104 °F) and the vehicle was not started for at least 180 minutes prior to this run.

The DMTL pump is driven to pressurize the fuel tank and the current is measured with the change-over valve in different states.

A comparison of the current draw in each state indicates the degree of any leak, and the [ECM](#) then sets the appropriate [DTC \(diagnostic trouble code\)](#).

EVAP CANISTER

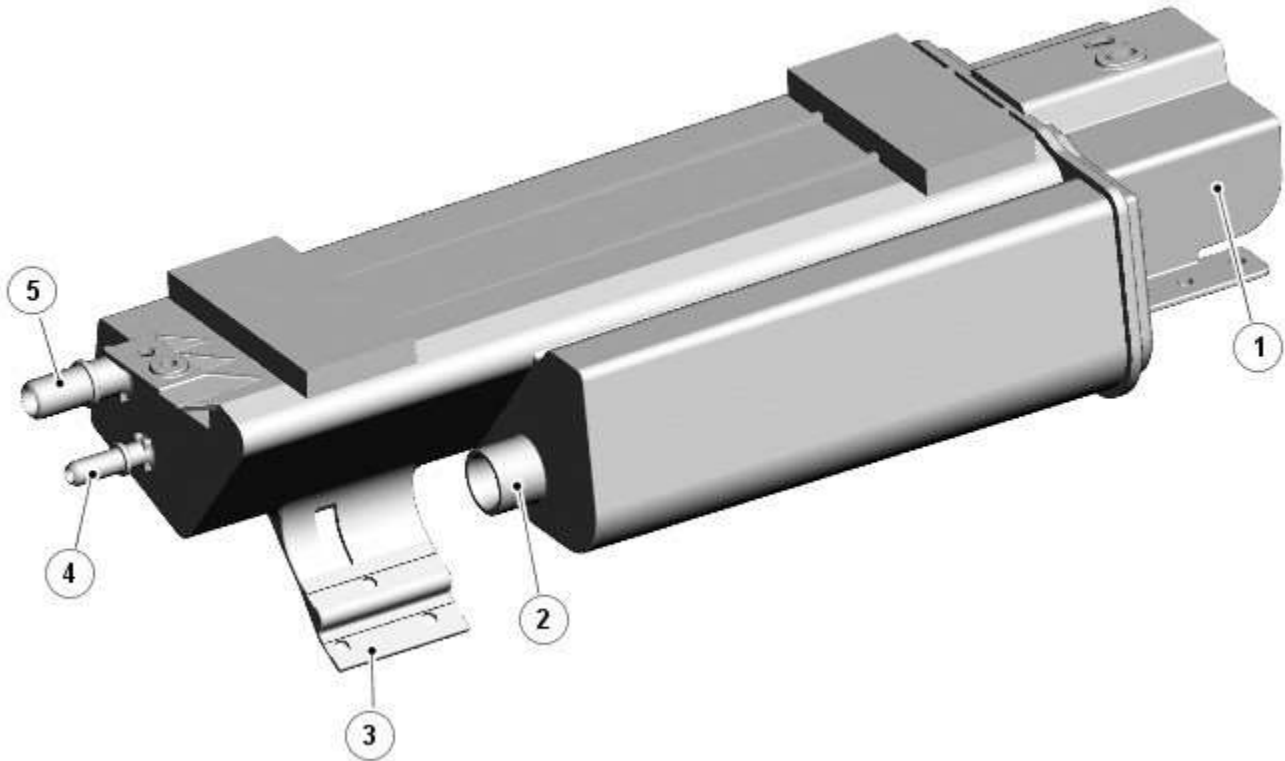
EVAP Canister (All Except NAS)



E113634

Item	Description
1	FPDM (fuel pump driver module) mounting bracket
2	Atmospheric vent
3	Connector for vapor pipe to EVAP canister purge valve
4	Connector for vapor pipe from fuel tank

EVAP Canister (NAS)



E113635

Item	Description
1	FPDM mounting bracket
2	Connector for DMTL pump
3	DMTL pump bracket
4	Connector for vapor pipe to EVAP canister purge valve
5	Connector for vapor pipe from fuel tank

The [EVAP](#) canister is located immediately behind the fuel tank. Two nuts attach the [EVAP](#) canister to the underside of the center floor pan.

The [EVAP](#) canister contains a bed of activated charcoal or carbon. The charcoal is produced using special manufacturing techniques to treat the charcoal with oxygen. The oxygen treatment opens up millions of pores between the carbon atoms resulting in a highly porous charcoal with a very large effective surface area which is capable of absorbing large quantities of fuel vapor. Once treated the charcoal is known as 'activated' carbon or charcoal. The [EVAP](#) canister on NAS vehicles uses a higher grade of charcoal to meet the stricter emissions' regulations.

A mounting bracket on the **RH (right-hand)** end of the [EVAP](#) canister contains the [FPDM \(fuel pump driver module\)](#). For additional information, refer to 310-01D Fuel Tank and Lines.

On all except NAS vehicles, the [EVAP](#) canister has a capacity of 1400 cc (85.4 in.³). Two connectors on the [EVAP](#) canister allow for the attachment of the vapor pipe from the fuel tank and the vapor pipe to the [EVAP](#) canister purge valve. An atmospheric vent is located on the underside of the [EVAP](#) canister.

On NAS vehicles, the [EVAP](#) canister has a capacity of 3000 cc (183 in.³). Three connectors on the [EVAP](#) canister allow for the attachment of the vapor pipe from the fuel tank, the vapor pipe to the [EVAP](#) canister purge valve and the DMTL pump.

EVAP CANISTER PURGE VALVE



E113636

The [EVAP](#) canister purge valve is located on the [LH \(left-hand\)](#) side of the engine, below the ignition coils cover. A vapor pipe is routed from the [EVAP](#) canister purge valve to the inlet of the intake manifold (naturally aspirated vehicles) or the supercharger (supercharged vehicles). The [EVAP](#) canister purge valve is controlled by the [ECM](#) and is operated when engine operating conditions are correct to allow purging of the [EVAP](#) canister. The [EVAP](#) canister purge valve is a solenoid operated valve which is closed when de-energized.

A vapor pipe, which runs parallel with the fuel delivery line under the [LH](#) side of the vehicle, connects the [EVAP](#) canister purge valve to the [EVAP](#) canister.

The [EVAP](#) canister purge valve is operated at 10 Hz by a [PWM \(pulse width modulation\)](#) signal from the [ECM](#). At this high frequency, the pulses of fuel vapor flow into the intake manifold/supercharger in an almost continuous flow. The valve operates between 7% and 100% duty or mark space ratio (percentage open time).

Atmospheric pressure is higher than the pressure at the inlet of the intake manifold/supercharger under all throttle settings and engine running conditions. It is this pressure differential that causes air to flow through the [EVAP](#) system to the engine.

Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Evaporative Emissions

Diagnosis and Testing

Principles of Operation

For a detailed description of the Evaporative Emissions system, refer to the relevant Description and Operation section in the workshop manual.

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Fuel filler cap and seal • Fuel filler neck • Fuel pipes • Fuel tank • Evaporative emissions canister • Purge valve 	<ul style="list-style-type: none"> • Fuses • Wiring harnesses and connectors • Engine Control Module (ECM) • Purge valve

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart

Symptom	Possible Causes	Action
Difficulty in filling fuel tank	<ul style="list-style-type: none"> • Restriction in the vapour line between the fuel tank and the carbon canister outlet/atmospheric port 	<ul style="list-style-type: none"> • Check for restrictions/damage
Fuel smell	<ul style="list-style-type: none"> • System leak • Purge valve inoperative 	<ul style="list-style-type: none"> • Check for leaks • Check the purge valve operation

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Evaporative Emission Canister

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

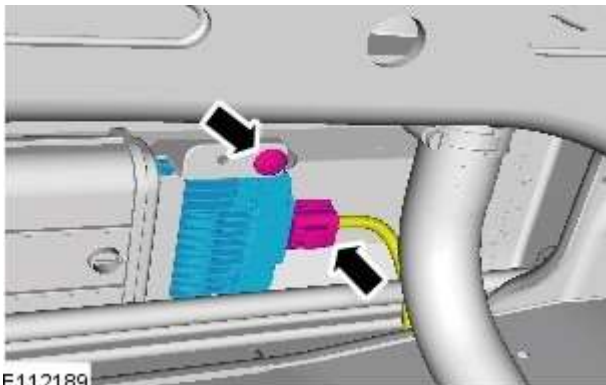
1. Refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Differential Case - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-02 Rear Drive Axle/Differential, Removal and Installation).



E112189

4.



E112190

5. Torque: 9 Nm

Installation

1. To install, reverse the removal procedure.

Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Evaporative Emission Canister Purge Valve V8 S/C 5.0L Petrol

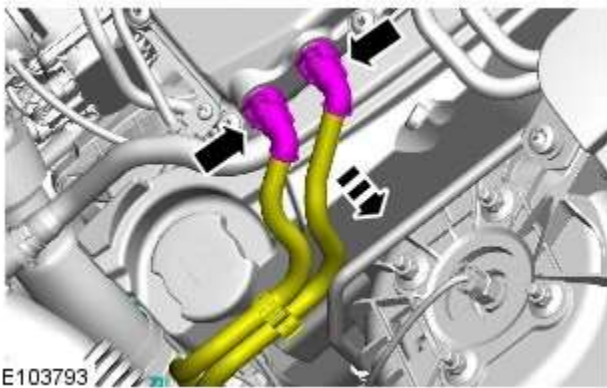
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
2. Refer to: Engine Cover - 5.0L, Vehicles With: Supercharger (501-05, Removal and Installation).
3. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).

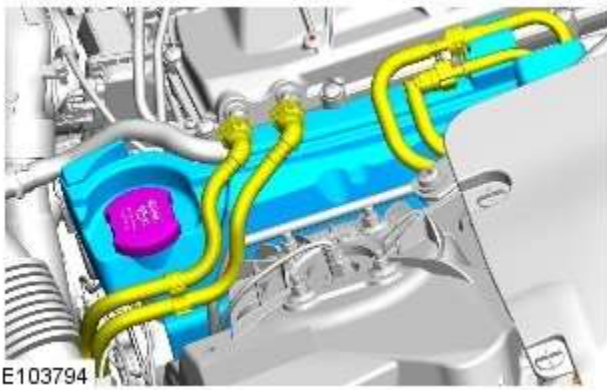


E103793


4.  CAUTION: Be prepared to collect escaping coolant.

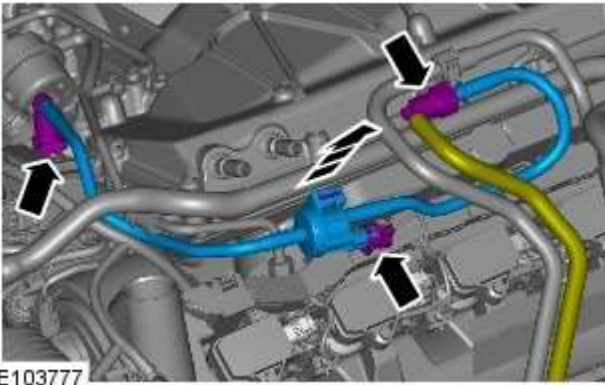


NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E103794

5.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E103777

6.  CAUTION: Be prepared to collect escaping fluids.

Installation

1. To install, reverse the removal procedure.

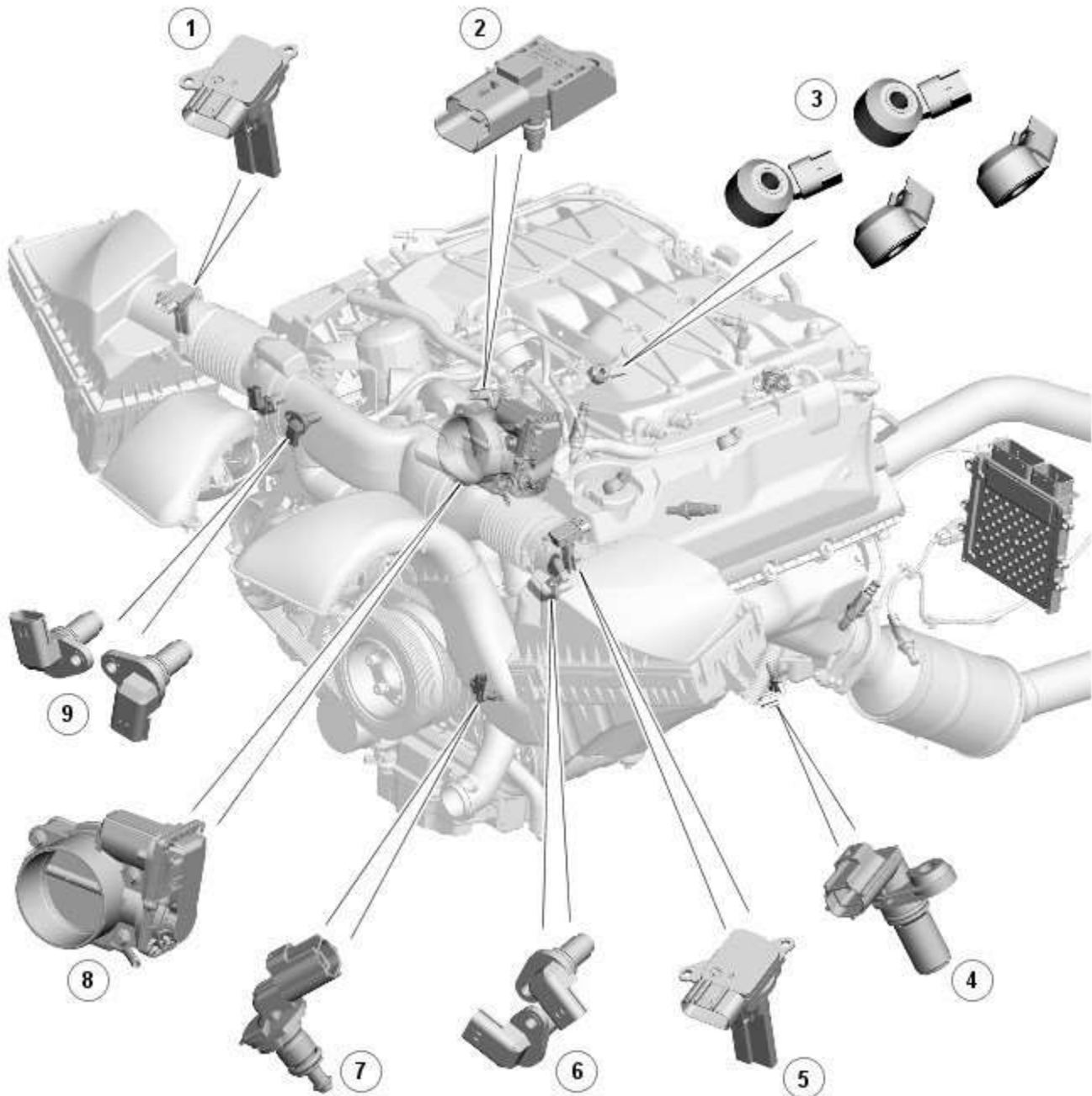
Electronic Engine Controls - V8 S/C 5.0L Petrol -**Torque Specifications**

Description	Nm	lb-ft	lb-in
Camshaft position (CMP) sensor(s) retaining bolt	10	7	-
Crankshaft position (CKP) sensor retaining bolt	10	7	-
Heated oxygen sensor(s) (HO2S)	48	35	-
Catalyst monitor sensor(s)	48	35	-
Knock sensor(s) (KS) retaining bolt	20	15	-
Fuel rail pressure (FRP) sensor	32	24	-
Manifold absolute pressure and temperature (MAPT) sensor	5	-	44
Engine oil level sensor retaining bolts	11	8	-
Variable valve timing (VVT) oil control solenoid(s) retaining bolts	10	7	-
Engine control module (ECM) retaining bolts	7	-	62
ECM retaining bracket bolts	7	-	62

Electronic Engine Controls - V8 S/C 5.0L Petrol - Electronic Engine Controls - Component Location

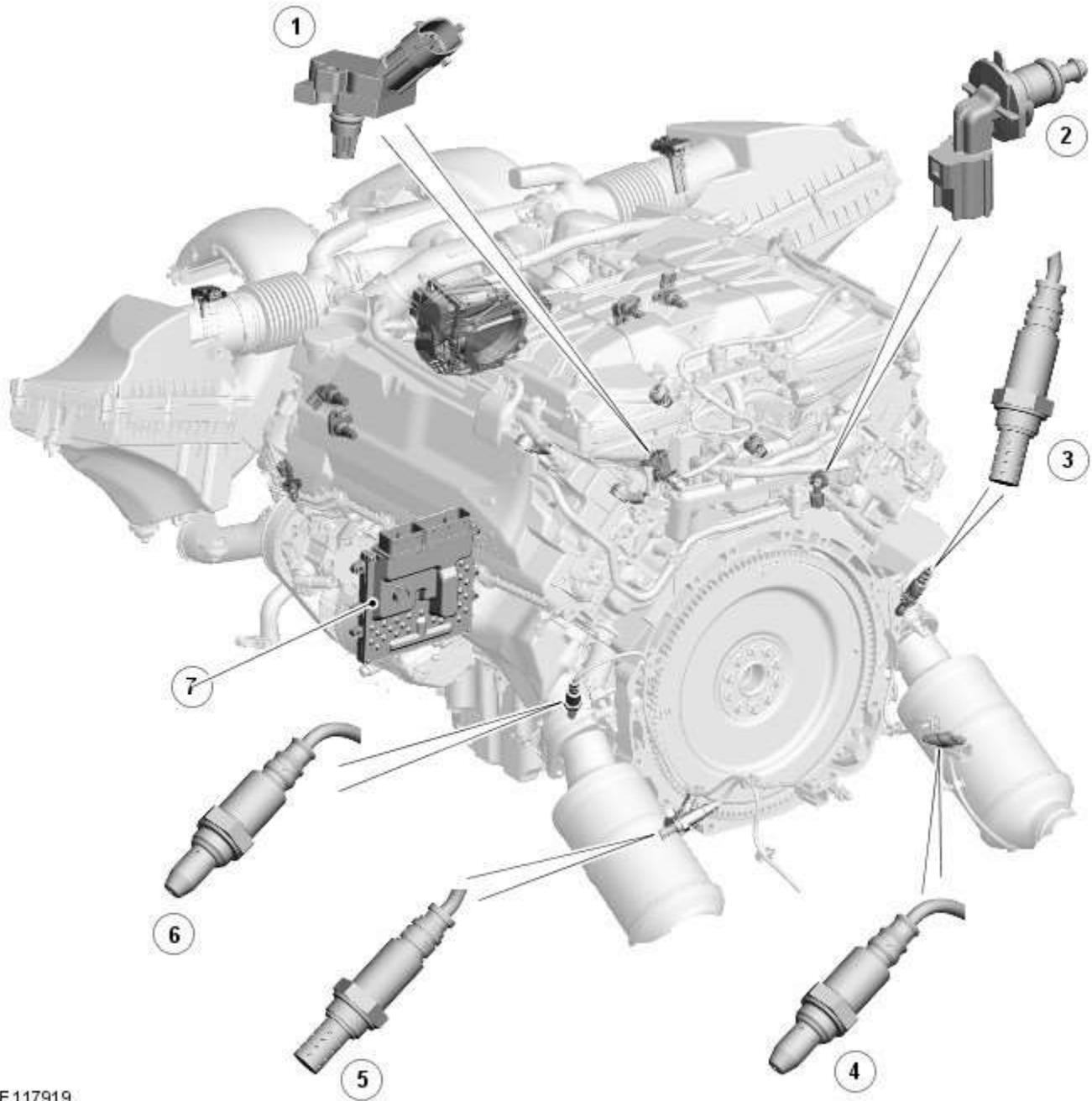
Description and Operation

COMPONENT LOCATION - SHEET 1 OF 3



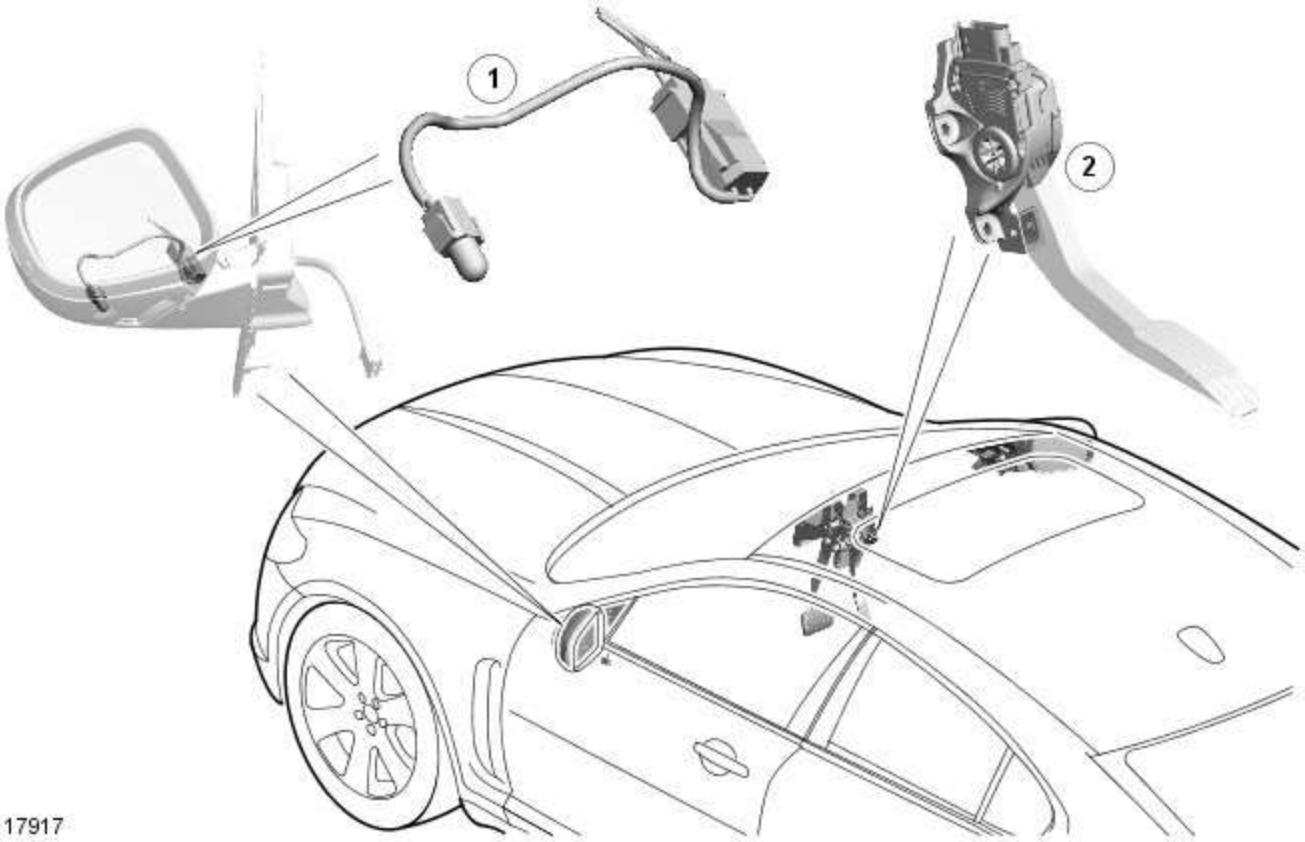
E117918

Item	Description
1	MAFT (mass air flow and temperature) sensor
2	MAP (manifold absolute pressure) sensor
3	Knock sensors
4	CKP (crankshaft position) sensor
5	MAFT sensor
6	CMP (camshaft position) sensors
7	ECT (engine coolant temperature) sensor (ECT 2)
8	Electronic throttle
9	CMP sensors



E117919

Item	Description
1	MAPT (manifold absolute pressure and temperature) sensor
2	ECT sensor (ECT 1)
3	Upstream HO2S (heated oxygen sensor)
4	Downstream HO2S
5	Downstream HO2S
6	Upstream HO2S
7	ECM (engine control module)



E117917

Item	Description
1	AAT (ambient air temperature) sensor
2	APP (accelerator pedal position) sensor

Electronic Engine Controls - V8 S/C 5.0L Petrol - Electronic Engine Controls -

Overview

Description and Operation

OVERVIEW

The [EEC \(electronic engine control\)](#) system operates the engine to generate the output demanded by the accelerator pedal and loads imposed by other systems. The [EEC](#) system has an [ECM \(engine control module\)](#) that uses a torque-based strategy to evaluate inputs from sensors and other systems, then produces outputs to engine actuators to produce the required torque.

The [EEC](#) system controls the following:

- Charge air
- Fueling
- Ignition timing
- Valve timing
- Cylinder knock
- Noise feedback system
- Idle speed
- Engine cooling fan
- Evaporative emissions
- On-board diagnostics
- Immobilization system interface
- Speed control.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Electronic Engine Controls - System Operation and Component Description

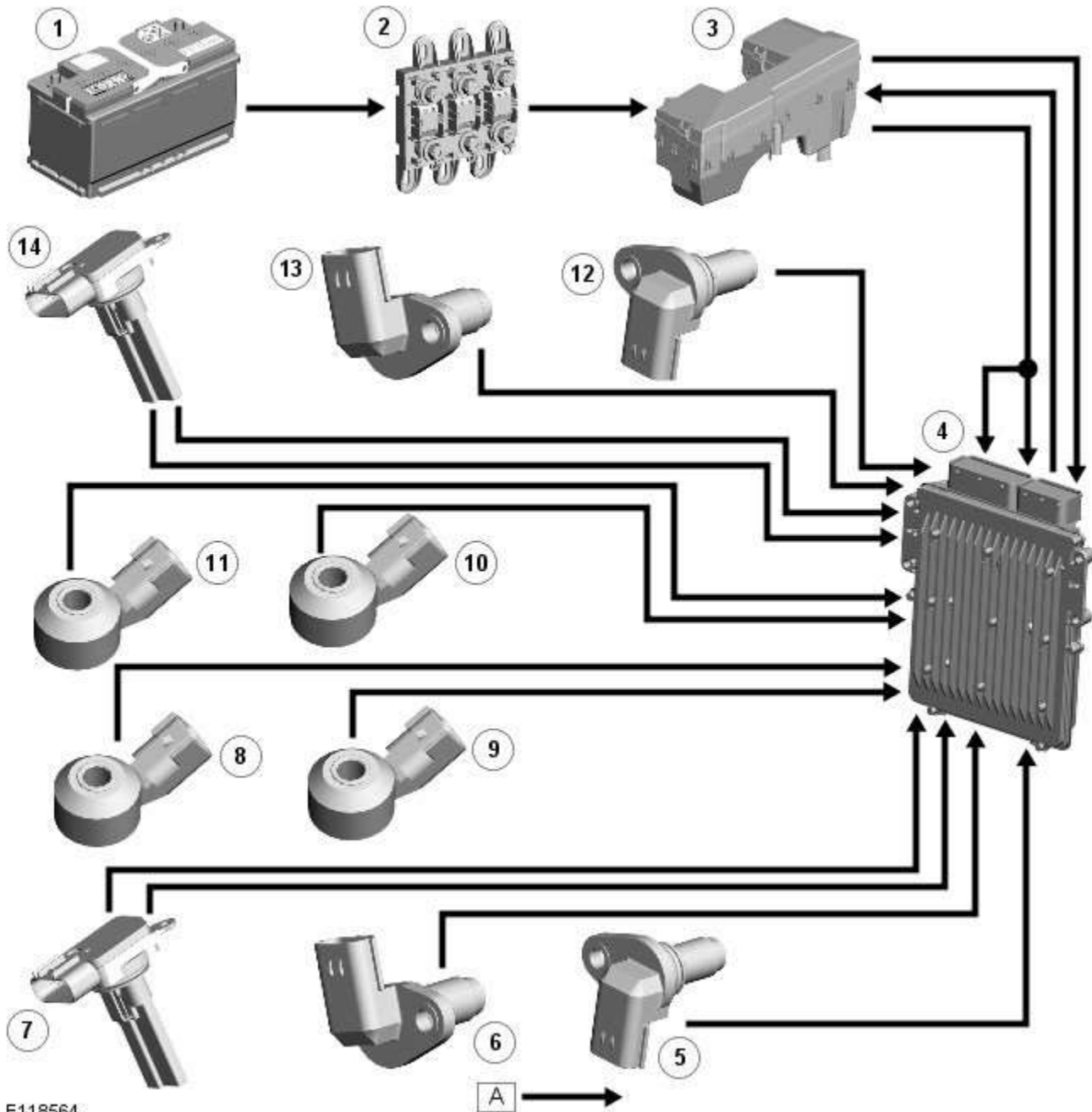
Description and Operation

Control Diagram



NOTE: A = Hardwired; D = High speed CAN (controller area network) bus.

CONTROL DIAGRAM SHEET 1 OF 2

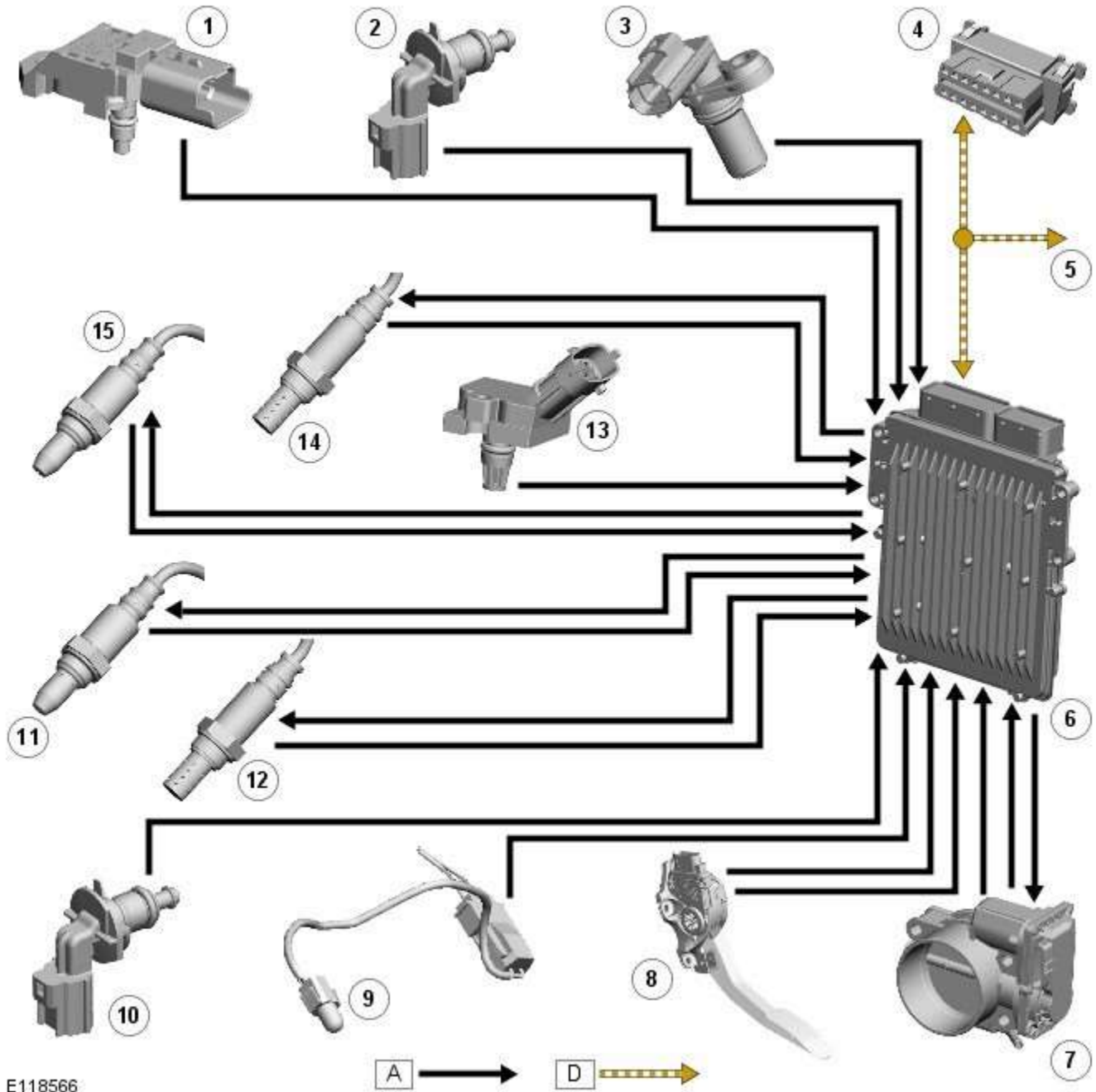


E118564

Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse)
3	EJB (engine junction box)
4	ECM

5	LH (left hand) intake CMP sensor
6	LH exhaust CMP sensor
7	LH MAFT sensor
8	LH front knock sensor
9	LH rear knock sensor
10	RH (right hand) rear knock sensor
11	RH front knock sensor
12	RH intake CMP sensor
13	RH exhaust CMP sensor
14	RH MAFT sensor

CONTROL DIAGRAM SHEET 2 OF 2



E118566

Item	Description
1	MAP sensor
2	ECT sensor (ECT 2)

3	CKP sensor
4	Diagnostic socket
5	To other system control modules
6	ECM
7	Electronic throttle
8	APP sensor
9	AAT sensor
10	ECT sensor (ECT 1)
11	LH upstream HO2S
12	LH downstream HO2S
13	MAPT (manifold absolute pressure and temperature) sensor
14	RH downstream HO2S
15	RH upstream HO2S

System Operation

ECM ADAPPTIONS

The [ECM \(engine control module\)](#) has the ability to adapt the input values it uses to control certain outputs. This capability maintains engine refinement and ensures the engine emissions remain within the legislated limits. The components which have adaptions associated with them are:

- The [APP \(accelerator pedal position\)](#) sensor
- The heated oxygen sensors
- The [MAFT \(mass air flow and temperature\)](#) sensors
- The [CKP \(crankshaft position\)](#) sensor
- Electronic throttle.

OXYGEN AND MAFT SENSORS

There are several adaptive maps associated with the fueling strategy. Within the fueling strategy the [ECM](#) calculates short-term adaptions and long term adaptions. The [ECM](#) will monitor the deterioration of the heated oxygen sensors over a period of time. It will also monitor the current correction associated with the sensors.

The [ECM](#) will store a fault code in circumstances where an adaption is forced to exceed its operating parameters. At the same time, the [ECM](#) will record the engine speed, engine load and intake air temperature.

CRANKSHAFT POSITION SENSOR

The characteristics of the signal supplied by the [CKP](#) sensor are learned by the [ECM](#). This enables the [ECM](#) to set an adaption and support the engine misfire detection function. Due to the small variation between different drive plates and different [CKP](#) sensors, the adaption must be reset if either component is renewed, or removed and refitted. It is also necessary to reset the drive plate adaption if the [ECM](#) is renewed or replaced. The [ECM](#) supports four drive plate adaptions for the [CKP](#) sensor. Each adaption relates to a specific engine speed range. The engine speed ranges are detailed in the table below:

Adaption	Engine Speed, rev/min
1	1800 - 3000
2	3001 - 3800
3	3801 - 4600
4	4601 - 5400

MISFIRE DETECTION

Legislation requires that the [ECM](#) must be able to detect the presence of an engine misfire. It must be able to detect misfires at two separate levels. The first level is a misfire that could lead to the legislated emissions limit being exceeded by a given amount. The second level is a misfire that may cause catalytic converter damage.

The [ECM](#) monitors the number of misfire occurrences within two engine speed ranges. If the [ECM](#) detects more than a predetermined number of misfire occurrences within either of these two ranges, over two consecutive journeys, it will record a fault code and details of the engine speed, engine load and engine coolant temperature. In addition, the [ECM](#) monitors the number of misfire occurrences that happen in a 'window' of 200 engine revolutions. The misfire occurrences are assigned a weighting according to their likely impact on the catalytic converters. If the number of misfires exceeds a given value, the [ECM](#) stores catalytic converter damage fault codes, along with the engine speed, engine load and engine coolant temperature.

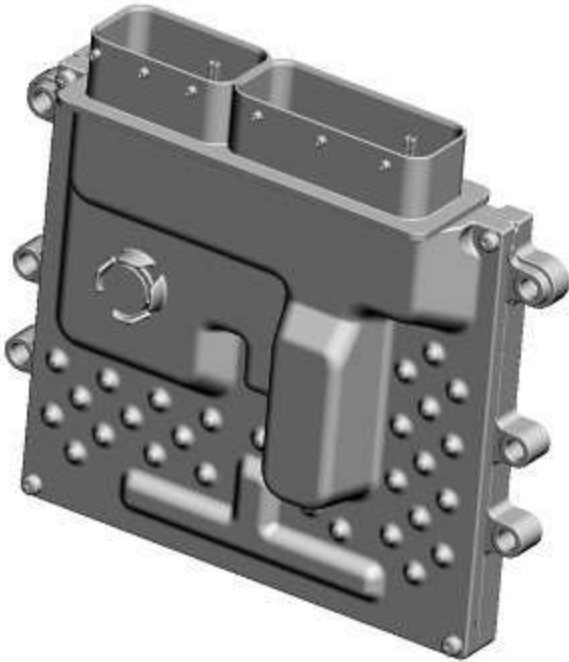
The signal from the [CKP](#) sensor indicates how fast the poles on the drive plate are passing the sensor tip. A sine wave is generated each time a pole passes the sensor tip. The [ECM](#) can detect variations in drive plate speed by monitoring the sine wave signal supplied by the crankshaft position sensor. By assessing this signal, the [ECM](#) can detect the presence of an engine misfire. At this time, the [ECM](#) will assess the amount of variation in the signal received from the [CKP](#) sensor and assign a roughness value to it. This roughness value can be viewed within the real time monitoring feature using Jaguar approved diagnostic equipment. The [ECM](#) will evaluate the signal against a number of factors and will decide whether to record the occurrence or ignore it. The [ECM](#) can assign a roughness and misfire signal for each cylinder.

DIAGNOSTICS

The [ECM](#) stores each fault as a [DTC \(diagnostic trouble code\)](#). The [DTC](#) and associated environmental and freeze frame data can be read using Jaguar approved diagnostic equipment, which can also read real time data from each sensor, the adaption values currently being employed and the current fueling, ignition and idle speed settings.

Component Description

ENGINE CONTROL MODULE



E108394

The [ECM](#) is installed in the front passenger side of the engine compartment, on a bracket attached to the engine bulkhead.

The [ECM](#) has the capability of adapting its fuel and ignition control outputs in response to several sensor inputs.

The [ECM](#) receives inputs from the following:

- [CKP](#) sensor.
- [CMP \(camshaft position\)](#) sensors (4 off).
- [ECT \(engine coolant temperature\)](#) sensor.
- Knock sensors (4 off).
- [MAP \(manifold absolute pressure\)](#) sensor.
- [MAFT](#) sensors (2 off).
- [MAPT \(manifold absolute pressure and temperature\)](#) sensor.
- Throttle position sensor.
- Heated oxygen sensors (4 off).
- [APP](#) sensor.
- Ambient air temperature sensor.
- [FRP \(fuel rail pressure\)](#) sensor. For additional information, refer to 303-04G Fuel Charging and Controls.
- Engine cooling fan. For additional information, refer to 303-03D Engine Cooling.
- Stoplamp switch. For additional information, refer to 206-09 Anti-Lock Control - Stability Assist.
- Speed control cancel/suspend switch. For additional information, refer to 310-03D Speed Control.
- Oil level and temperature sensor. For additional information, refer to 303-01F Engine.
- Fuel LP (low pressure) sensor. For additional information, refer to 310-01D Fuel Tank and Lines.
- Fuel pump driver module. For additional information, refer to 310-01D Fuel Tank and Lines.

The [ECM](#) provides outputs to the following:

- Electronic throttle.
- Main relay.
- Heater elements of the heated oxygen sensors (4 off).
- Fuel injectors (8 off). For additional information, refer to 303-04G Fuel Charging and Controls.

- Ignition coils (8 off). For additional information, refer to 303-07C Engine Ignition.
- **VCT (variable camshaft timing)** solenoids (4 off). For additional information, refer to 303-01F Engine.
- Noise feedback system tuning valve. For additional information, refer to 303-12F Intake Air Distribution and Filtering.
- **EVAP (evaporative emission)** canister purge valve. For additional information, refer to 303-13C Evaporative Emissions.
- Engine starter relay. For additional information, refer to 303-06D Starting System.
- Engine cooling fan. For additional information, refer to 303-03D Engine Cooling.
- Intercooler water pump relay. For additional information, refer to 303-03F Supercharger Cooling.
- Generator. For additional information, refer to 414-02D Generator and Regulator.
- HP fuel pumps. For additional information, refer to 303-04G Fuel Charging and Controls.
- Fuel pump driver module. For additional information, refer to 310-01D Fuel Tank and Lines.
- DMTL (diagnostic module - tank leakage). For additional information, refer to 303-13C Evaporative Emissions.

CRANKSHAFT POSITION SENSOR



E116086

The **CKP** sensor is an inductive sensor that allows the **ECM** to determine the angular position of the crankshaft and the engine speed.

The **CKP** sensor is installed in the rear left side of the sump body, in line with the engine drive plate. The sensor is secured with a single screw and sealed with an O-ring. A two pin electrical connector provides the interface with the engine harness.

The head of the **CKP** sensor faces a reluctor ring pressed into the outer circumference of the engine drive plate. The reluctor ring has a 60 minus 2 tooth pattern. There are 58 teeth at 6° intervals, with two teeth removed to provide a reference point with a centerline that is 21° **BTDC (before top dead center)** on cylinder 1 of bank A.

If the **CKP** sensor fails, the **ECM**:

- Uses signals from the **CMP** sensors to determine the angular position of the crankshaft and the engine speed
- Adopts a limp home mode where engine speed is limited to a maximum of 3000 rev/min.

With a failed **CKP** sensor, engine starts will require a long crank time while the **ECM** determines the angular position of the crankshaft.

CAMSHAFT POSITION SENSORS



E116087

The **CMP** sensors are MRE (magneto resistive element) sensors that allow the **ECM** to determine the angular position of the camshafts. MRE sensors produce a digital output which allows the **ECM** to detect speeds down to zero.

The four **CMP** sensors are installed in the front upper timing covers, one for each camshaft.

Each **CMP** sensor is secured with a single screw and sealed with an O-ring. On each **CMP** sensor, a three pin electrical connector provides the interface with the engine harness.

The head of each **CMP** sensor faces a sensor wheel attached to the front of the related **VCT** unit.

If a [CMP](#) sensor fails, the [ECM](#):

- Defaults to base mapping for the ignition timing, with no cylinder correction
- Disables the [VCT](#) system.

ENGINE COOLANT TEMPERATURE SENSORS



E108397

The [ECT](#) sensors are [NTC \(negative temperature coefficient\)](#) thermistors that allow the [ECM](#) to monitor the engine coolant temperature.

There are two identical [ECT](#) sensors installed, which are identified as ECT 1 and ECT 2. Each sensor is secured with a twist-lock and latch mechanism, and is sealed with an O-ring. A two pin electrical connector provides the interface between the sensor and the engine harness.

ECT 1

ECT 1 is installed in the heater manifold, at the rear of the [RH \(right-hand\)](#) cylinder head. The input from this sensor is used in calibration tables and by other systems.

ECT 2

ECT 2 is installed in the lower hose connector which attaches to the bottom of the thermostat. The input from this sensor is used for [OBD \(on-board diagnostic\)](#) 2 diagnostics and, in conjunction with the input from ECT 1, to confirm that the thermostat is functional.

KNOCK SENSORS



E108400

The knock sensors are piezo-ceramic sensors that allow the [ECM](#) to employ active knock control and prevent engine damage from pre-ignition or detonation.

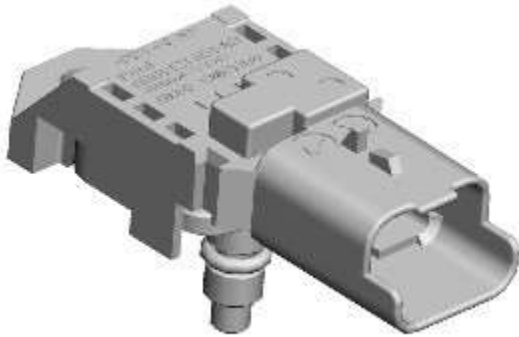
Two knock sensors are installed on the inboard side of each cylinder head, one mid-way between cylinders 1 and 2, and one mid-way between cylinders 3 and 4. Each knock sensor is secured with a single screw. On each knock sensor, a two pin electrical connector provides the interface with the engine harness.

The [ECM](#) compares the signals from the knock sensors with mapped values stored in memory to determine when detonation occurs on individual cylinders. When detonation is detected, the [ECM](#) retards the ignition timing on that cylinder for a number of engine cycles, then gradually returns it to the original setting.

The [ECM](#) cancels closed loop control of the ignition system if the signal received from a knock sensor becomes implausible. In these circumstances the [ECM](#) defaults to base mapping for the ignition timing. This ensures the engine will not become damaged if low quality fuel is used. The [MIL \(malfunction indicator lamp\)](#) will not illuminate, although the driver may notice that the engine 'pinks' in some driving conditions and displays a drop in performance and smoothness.

The [ECM](#) calculates the default value if one sensor fails on each bank of cylinders

MANIFOLD ABSOLUTE PRESSURE SENSOR



E108402

The [MAP](#) sensor allows the [ECM](#) to calculate the load on the engine, which is used in the calculation of fuel injection time.

The [MAP](#) sensor is installed in the air inlet of the [SC \(supercharger\)](#). The sensor is secured with a single screw and sealed with an O-ring. A three pin electrical connector provides the interface with the engine harness.

If the [MAP](#) sensor fails, the [ECM](#) adopts a default value of 1 bar (14.5 lbf/in.²).

With a failed [MAP](#) sensor, the engine will suffer from poor starting, rough running and poor driveability.

MASS AIR FLOW AND TEMPERATURE SENSORS



E116091

The [MAFT](#) sensors allow the [ECM](#) to measure the mass and the temperature of the air flow into the engine. The mass air flow is measured with a hot film element in the sensor. The temperature of the air flow is measured with a [NTC](#) thermistor in the sensor. The mass air flow is used to determine the fuel quantity to be injected in order to maintain the stoichiometric air/fuel mixture required for correct operation of the engine and the catalytic converters.

There are two [MAFT](#) sensors installed, one in each air cleaner outlet duct. Each [MAFT](#) sensor is secured with two screws and sealed with an O-ring. On each [MAFT](#) sensor, a five pin electrical connector provides the interface with the engine harness.

If the hot film element signal fails the [ECM](#) invokes a software backup strategy to calculate the mass air flow from other inputs. Closed loop fuel control, closed loop idle speed control and evaporative emissions control are discontinued. The engine will suffer from poor starting, poor throttle response and, if the failure occurs while driving, the engine speed may dip before recovering.

If the [NTC](#) thermistor signal fails the [ECM](#) adopts a default value of 25 °C (77 °F) for the intake air temperature.

MANIFOLD ABSOLUTE PRESSURE AND TEMPERATURE SENSOR



E116088

The [MAPT](#) sensor allows the [ECM](#) to calculate the air charge density immediately before it enters the cylinders. This is used to adjust the ignition timing relative to the boost pressure, and to monitor the performance of the charge air coolers.

The [MAPT](#) sensor is installed in the rear of the LH intake manifold. The sensor is secured with a single screw and sealed with an O-ring. A four pin electrical connector provides the interface with the engine harness.

THROTTLE POSITION SENSORS

The [TP](#) (throttle position) sensors allow the [ECM](#) to determine the position and angular rate of change of the throttle blade.

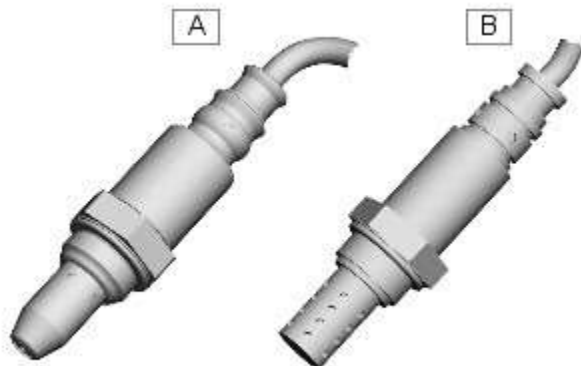
There are two [TP](#) sensors located in the electronic throttle. See below for details of the electronic throttle.

If a [TP](#) sensor fails, the [ECM](#):

- Adopts a limp home mode where engine speed is limited to a maximum of approximately 2000 rev/min
- Discontinues evaporative emissions control
- Discontinues closed loop control of engine idle speed.

With a failed [TP](#) sensor, the engine will suffer from poor running and throttle response.

HEATED OXYGEN SENSORS



E116092

Item	Description
A	Upstream heated oxygen sensor
B	Downstream heated oxygen sensor

The heated oxygen sensors allow the [ECM](#) to measure the oxygen content of the exhaust gases, for closed loop control of the fuel:air mixture and for catalytic converter monitoring.

An upstream heated oxygen sensor is installed in the outlet of each exhaust manifold, which enables independent control of the fuel:air mixture for each cylinder bank. A downstream heated oxygen sensor is installed in each catalytic converter, which enables the performance of the catalytic converters to be monitored.

Oxygen sensors need to operate at high temperatures in order to function correctly. To achieve the high temperatures required, the sensors are fitted with heater elements that are controlled by a [PWM](#) (pulse width modulation) signal from the [ECM](#). The heater elements are operated immediately after each engine start and during low load conditions when the temperature of the exhaust gases is insufficient to maintain the required sensor temperature. The [PWM](#) duty cycle is carefully controlled to prevent thermal shock to cold sensors. A non-functioning heater delays the sensor's readiness for closed loop control and increases emissions.

The upstream heated oxygen sensors produce a constant voltage, with a variable current that is proportional to the lambda ratio. The downstream heated oxygen sensors produce an output voltage dependant on the ratio of the exhaust gas oxygen to

the ambient oxygen.

The heated oxygen sensors age with mileage, increasing their response time to switch from rich to lean and lean to rich. This increase in response time influences the [ECM](#) closed loop control and leads to progressively increased emissions. Measuring the period of rich to lean and lean to rich switching monitors the response rate of the upstream sensors.

Diagnosis of electrical faults is continually monitored in both the upstream and downstream sensors. This is achieved by checking the signal against maximum and minimum threshold, for open and short circuit conditions.

If a heated oxygen sensor fails:

- The [ECM](#) defaults to open loop fueling for the related cylinder bank
- The [CO](#) (carbon monoxide) and emissions content of the exhaust gases increases
- The exhaust smells of rotten eggs (hydrogen sulphide).

With a failed heated oxygen sensor, the engine will suffer from unstable operation and reduced performance.

ACCELERATOR PEDAL POSITION SENSOR



E118973

The [APP](#) sensor allows the [ECM](#) to determine the driver requests for vehicle speed, acceleration and deceleration. The [ECM](#) uses this information to determine the setting of the electronic throttle.

The [APP](#) sensor is installed on the pedal box and secured with three screws. A six pin electrical connector provides the interface with the vehicle harness. The accelerator pedal is connected to a spindle on the [RH](#) side of the [APP](#) sensor.

The [APP](#) sensor is a twin track potentiometer. Each track receives an independent power supply from the [ECM](#) and returns an independent analog signal to the [ECM](#). Both signals contain the same positional information, but the signal from track 2 is half the voltage of the signal from track1 at all positions.

If both signals have a fault, the [ECM](#) adopts a limp home mode, which limits the engine speed to 2000 rev/min maximum.

The [ECM](#) constantly checks the range and plausibility of the two signals and stores a fault code if it detects a fault.

AMBIENT AIR TEMPERATURE SENSOR



E116093

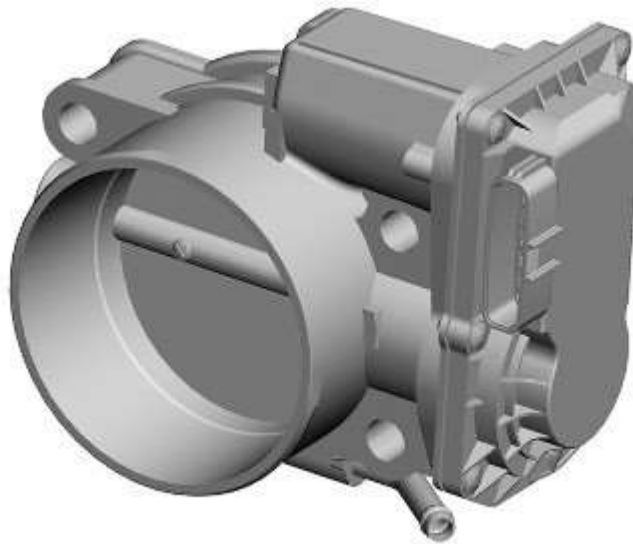
The AAT (ambient air temperature) sensor is a [NTC](#) thermistor that allows the [ECM](#) to monitor the temperature of the air around the vehicle. The [ECM](#) uses the AAT input for a number of functions, including engine cooling fan control. The [ECM](#) also transmits the ambient temperature on the high speed [CAN](#) bus for use by other control modules.

The AAT sensor is installed in the [LH \(left-hand\)](#) exterior mirror, with the bulb of the sensor positioned over a hole in the bottom of the mirror casing.

The [ECM](#) supplies the sensor with a 5 V reference voltage and a ground, and translates the return signal voltage into a temperature.

If there is a fault with the AAT sensor, the [ECM](#) calculates the AAT from the temperature inputs of the [MAFT](#) sensors. If the AAT sensor and the temperature inputs of the [MAFT](#) sensors are all faulty, the [ECM](#) adopts a default ambient temperature of 20 °C (68 °F).

ELECTRONIC THROTTLE



E116090

The [ECM](#) uses the electronic throttle to regulate engine torque.

The electronic throttle is installed between the T piece duct, of the intake air distribution and filtering system, and the inlet of the [SC](#). For additional information, refer to 303-12F Intake Air Distribution and Filtering.

The throttle plate is operated by an electric DC (direct current) motor integrated into the throttle body. The [ECM](#) uses a [PWM](#) signal to control the DC motor. The [ECM](#) compares the [APP](#) sensor inputs against an electronic map to determine the required position of the throttle plate. The [ECM](#) and electronic throttle are also required to:

- Monitor requests for cruise control operation
- Automatically operate the electronic throttle for accurate cruise control
- Perform all dynamic stability control engine interventions
- Monitor and carry out maximum engine speed and road speed cut outs
- Provide different engine maps for the ride and handling optimization system.

A software strategy within the [ECM](#) calibrates the position of the throttle plate at the beginning of each ignition cycle. When the ignition is turned on, the [ECM](#) performs a self test and calibration routine by fully closing the throttle plate and then opening it again. This tests the default position springs and allows the [ECM](#) to learn the position of the closed hard stop. Subsequently the [ECM](#) keeps the throttle plate a minimum of 0.5 degree from the closed hard stop.

MAIN RELAY

The main relay is used to initiate the power up and power down routines within the [ECM](#). The main relay is installed in the [EJB \(engine junction box\)](#).

When the ignition is turned on, battery voltage is applied to the ignition sense input. The [ECM](#) then starts its power up routines and energizes the main relay.

When the ignition is turned off, the [ECM](#) maintains its powered up state while it conducts the power down routines (up to 20 minutes in extreme cases, when cooling fans are required) and on completion will turn off the main relay.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Electronic Engine Controls

Diagnosis and Testing

Principle of Operation

For a detailed description of electronic engine controls, refer to the relevant Description and Operation section of the workshop manual. REFER to: (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol)

[Electronic Engine Controls](#) (Description and Operation),
[Electronic Engine Controls](#) (Description and Operation),
[Electronic Engine Controls](#) (Description and Operation).

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Engine oil level and condition • Cooling system coolant level • Fuel level • Fuel contamination/grade/quality • Throttle body • Front End Accessory Drive (FEAD) belt • Air cleaner condition 	<ul style="list-style-type: none"> • Fuses • Wiring harness • Electrical connector(s) • Sensor(s) • Engine Control Module • Transmission Control Module

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the customer concern and refer to the Symptom Chart below, alternatively, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Engine non-start		
Engine does not crank	<ul style="list-style-type: none"> • Security system /Immobilizer engaged • Engine in shut-down mode • ECM relay • Battery • Starting system • Engine seized 	<ul style="list-style-type: none"> • Check that the security system is disarmed • Read DTCs and refer to DTC Index in this section for ECM relay tests • Ensure the battery is in fully charged and serviceable condition • For starting system tests refer to the relevant section of the workshop manual • For engine system tests refer to the relevant section of the workshop manual
Engine cranks, but does not fire	<ul style="list-style-type: none"> • Engine breather system disconnected/restricted • Ignition system • Fuel system • Electronic engine controls 	<ul style="list-style-type: none"> • Ensure the engine breather system is free from restriction and is correctly installed • For ignition system tests refer to the relevant section of the workshop manual • For fuel system tests refer to the relevant section of the workshop manual • Read DTCs and refer to DTC Index in this section for electronic engine control tests
Engine cranks and fires, but will not start	<ul style="list-style-type: none"> • Evaporative emissions purge valve • Fuel pump • Spark plugs • Ignition coil failure(s) 	<ul style="list-style-type: none"> • For purge valve tests refer to the relevant section of the workshop manual • For fuel system tests refer to the relevant section of the workshop manual • For ignition system tests refer to the relevant section of the workshop manual
Difficult to start		
Difficult cold start	<ul style="list-style-type: none"> • Check engine coolant level/anti-freeze content • Battery • Electronic engine controls • Exhaust gas recirculation 	<ul style="list-style-type: none"> • Check the engine coolant level and condition. Refer to the relevant sections of the workshop manual • Ensure the battery is in a fully charged and serviceable condition. Refer to the battery

Symptom	Possible Cause	Action
	(EGR) valve stuck open <ul style="list-style-type: none"> • Fuel pump • Evaporative emissions purge valve 	care manual and the relevant sections of the workshop manual. <ul style="list-style-type: none"> • Read DTCs and refer to DTC Index in this section for electronic engine control tests • Refer to the relevant section of the workshop manual and check the Exhaust Gas Recirculation (EGR) valve and associated hoses and connections. • For fuel system tests refer to the relevant section of the workshop manual • Refer to the relevant section of the workshop manual and check the purge valve and associated hoses and connections.
Difficult hot start	<ul style="list-style-type: none"> • Injector leak • Electronic engine controls • Evaporative emissions purge valve • Fuel pump • Ignition system • EGR valve stuck open 	<ul style="list-style-type: none"> • Refer to the relevant section of the workshop manual, carry out injector leak tests, install new injectors as necessary. • Read DTCs and refer to DTC Index in this section for electronic engine control tests • Refer to the relevant section of the workshop manual and check the purge valve and associated hoses and connections. • For fuel system tests refer to the relevant section of the workshop manual • For ignition system tests refer to the relevant section of the workshop manual • Refer to the relevant section of the workshop manual and check the Exhaust Gas Recirculation (EGR) valve and associated hoses and connections.
Difficult to start after hot soak (vehicle standing, engine off, after engine has reached operating temperature)	<ul style="list-style-type: none"> • Injector leak • Electronic engine controls • Evaporative emissions purge valve • Fuel pump • Ignition system • EGR valve stuck open 	<ul style="list-style-type: none"> • Refer to the relevant section of the workshop manual, carry out injector leak tests, install new injectors as necessary. • Read DTCs and refer to DTC Index in this section for electronic engine control tests • Refer to the relevant section of the workshop manual and check the purge valve and associated hoses and connections. • For fuel system tests refer to the relevant section of the workshop manual • For ignition system tests refer to the relevant section of the workshop manual • Refer to the relevant section of the workshop manual and check the Exhaust Gas Recirculation (EGR) valve and associated hoses and connections.
Engine cranks too fast/slow	<ul style="list-style-type: none"> • Compressions high/low • Battery • Starting system 	<ul style="list-style-type: none"> • Refer to the relevant section of the workshop manual, carry out compression tests. • Ensure the battery is in a fully charged and serviceable condition. Refer to the battery care manual and the relevant sections of the workshop manual. • For starting system tests refer to the relevant section of the workshop manual
Engine stalls		
Engine stalls soon after start	<ul style="list-style-type: none"> • Breather system disconnected/restricted • ECM relay • Electronic engine controls • Ignition system • Air intake system restricted • Air leakage • Fuel lines 	<ul style="list-style-type: none"> • Ensure the engine breather system is free from restriction and is correctly installed • Read DTCs and refer to DTC Index in this section for ECM relay tests • Read DTCs and refer to DTC Index in this section for electronic engine control tests • For ignition system tests refer to the relevant section of the workshop manual • Check for blockage in air cleaner element and air intake system • Check for leakage in air intake system • For fuel system tests refer to the relevant section of the workshop manual

Symptom	Possible Cause	Action
Engine stalls on overrun	<ul style="list-style-type: none"> ECM relay Throttle position (TP) sensors 	<ul style="list-style-type: none"> Read DTCs and refer to DTC Index in this section for ECM relay and TP sensor tests
Engine stalls at steady speed	<ul style="list-style-type: none"> ECM relay crankshaft position sensor TP sensors 	<ul style="list-style-type: none"> Read DTCs and refer to DTC Index in this section for ECM relay, crankshaft position sensor, and TP sensor tests
Engine stalls with speed control enabled	<ul style="list-style-type: none"> ECM relay 	<ul style="list-style-type: none"> Read DTCs and refer to DTC Index in this section for ECM relay tests
Engine stalls when manoeuvring	<ul style="list-style-type: none"> ECM relay TP sensors Additional engine loads (PAS, air conditioning, etc) Transmission malfunction CAN malfunction 	<ul style="list-style-type: none"> Read DTCs and refer to DTC Index in this section for ECM relay, and TP sensor tests Check for excessive loads being placed on the engine from PAS, air conditioning systems etc. Refer to the workshop manual or transmission troubleshooting guide for transmission system tests. Refer to the relevant section of the workshop manual and the electrical wiring diagrams to perform CAN network tests.
Poor driveability		
Engine hesitates/poor acceleration	<ul style="list-style-type: none"> Fuel pressure, fuel pump, fuel lines Injector leak Air leakage Electronic engine controls Ignition system EGR valve stuck Transmission malfunction Restricted pedal travel (carpet, etc) 	<ul style="list-style-type: none"> For fuel system tests refer to the relevant section of the workshop manual Carry out fuel injector leak tests, install new injectors as necessary. Check for leakage from air intake system Read DTCs and refer to DTC Index in this section for electronic engine control tests For ignition system tests refer to the relevant section of the workshop manual Refer to the relevant section of the workshop manual and check the Exhaust Gas Recirculation (EGR) valve and associated hoses and connections. Refer to the workshop manual or transmission troubleshooting guide for transmission system tests. Ensure accelerator pedal is free from restriction
Engine backfires	<ul style="list-style-type: none"> Fuel pump, fuel lines Air leakage Electronic engine controls Ignition system Sticking variable camshaft timing (VCT) hub 	<ul style="list-style-type: none"> For fuel system tests refer to the relevant section of the workshop manual Check for leakage from air intake system Read DTCs and refer to DTC Index in this section for electronic engine control tests For ignition system tests refer to the relevant section of the workshop manual Read DTCs and refer to DTC Index in this section for VCT system tests
Engine surges	<ul style="list-style-type: none"> Fuel pump, fuel lines Electronic engine controls Ignition system 	<ul style="list-style-type: none"> For fuel system tests refer to the relevant section of the workshop manual Read DTCs and refer to DTC Index in this section for electronic engine control tests For ignition system tests refer to the relevant section of the workshop manual
Engine detonates/knocks	<ul style="list-style-type: none"> Electronic engine controls Fuel pump, fuel lines, fuel quality Air leakage Sticking VCT hub 	<ul style="list-style-type: none"> Read DTCs and refer to DTC Index in this section for electronic engine control tests For fuel system tests refer to the relevant section of the workshop manual Check for leakage from air intake system Read DTCs and refer to DTC Index in this section for VCT system tests

Symptom	Possible Cause	Action
No throttle response	<ul style="list-style-type: none"> Electronic engine controls 	<ul style="list-style-type: none"> Read DTCs and refer to DTC Index in this section for electronic engine control tests
Speed control inhibited or disabled	<ul style="list-style-type: none"> Default mode enabled Speed control, brake switch Electronic engine controls CAN fault 	<ul style="list-style-type: none"> Check message center for default message, read DTCs and refer to DTC Index Refer to the relevant section of the workshop manual for speed control, and brake switch tests. Read DTCs and refer to DTC Index in this section for electronic engine control tests Refer to the relevant section of the workshop manual and the electrical wiring diagrams to perform CAN network tests.
Poor throttle response	<ul style="list-style-type: none"> Breather system disconnected/restricted Electronic engine controls Transmission malfunction Traction control event Air leakage 	<ul style="list-style-type: none"> Ensure engine breather system is free from restriction and is correctly installed Read DTCs and refer to DTC Index in this section for electronic engine control tests Refer to the workshop manual or transmission troubleshooting guide for transmission system tests. Check for leakage in air intake system
Engine defaults, warning light and messages. Refer to the owner handbook	<ul style="list-style-type: none"> Electronic engine controls 	<ul style="list-style-type: none"> Read DTCs and refer to DTC Index in this section for electronic engine control tests

DTC Index



WARNING: Fuel injector voltage will reach 65Volts during operation and have a high current requirement.



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the module/component is suspect and the vehicle remains under the Manufacturers warranty, refer to the Warranty Policy and Procedure manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer-approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Causes	Action
B10A2-31	Crash Input - No signal	<ul style="list-style-type: none"> Loss of communication between Restraints Control Module (RCM) and Engine Control Module (ECM) 	Refer to the electrical circuit diagrams and check Restraints Control Module (RCM) Pulse Width Modulated (PWM) SRS signal line circuit, hard wired connection between Engine Control Module (ECM) and Restraints Control Module (RCM) for short to ground, short to power, open circuit. Repair circuit as required, clear DTC and retest system to confirm repair.

DTC	Description	Possible Causes	Action
B10AC-81	Cruise Control Switch - invalid serial data received	<ul style="list-style-type: none"> The Engine Control Module (ECM) has received an invalid command from the steering wheel switch pack 	Clear the DTC and press all the steering wheel switches, re-check for DTCs. Refer to the electrical circuit diagrams and check the Cruise control switch circuit for open circuit, short to power, short to ground, disconnected. Check and install a new Steering Wheel Module (SWM) as required.
B10AC-82	Cruise Control Switch - alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> Cruise Buttons alive counter is not incrementing. Which suggests that the LIN bus is faulty Steering Wheel Module (SWM) is not connected Steering Wheel Module (SWM) failure 	Refer to the electrical circuit diagrams and check the Cruise control switch circuit for open circuit, short to power, short to ground, disconnected. Check and install a new Steering Wheel Module (SWM) as required.
B10AC-83	Cruise Control Switch - value of signal protection calculation incorrect	<ul style="list-style-type: none"> Cruise buttons checksum incorrect, incorrect cruise switches fitted to vehicle 	Check and install new cruise switches as required.
B10AC-96	Cruise Control Switch - component internal failure	<ul style="list-style-type: none"> Cruise control switch circuit, open circuit, short to power, short to ground, disconnected Cruise Control Switch failure Steering Wheel Module (SWM) failure 	Check for related DTCs in other Central Junction Box (CJB)s. Refer to the electrical circuit diagrams and check the Cruise control switch circuit for open circuit, short to power, short to ground, disconnected. Check and install a new cruise control switch as required. Check and install a new Steering Wheel Module (SWM) as required.
B10FF-68	Ignition Control - Event information	<ul style="list-style-type: none"> Spark plug(s) fault Wiring harness fault Ignition coil(s) fault 	Refer to repair manual and check spark plug(s) for condition and security. Replace any defective components as required. Refer to electrical wiring diagrams and check ignition coil circuit for intermittent open circuit, short to power, short to ground. Check and install a new coil(s) as required.
B11DB-01	Battery Monitoring Module - General Electrical Failure	<ul style="list-style-type: none"> Charging system fault Battery monitoring signal line circuit fault Vehicle battery fault 	Refer to electrical wiring diagrams and check charging system for faults. Perform any repairs required. Refer to the electrical wiring diagrams and check the Battery Monitoring System (BMS) module circuit for open circuit, short to ground, short to power. Refer to the battery care manual and check and install a new battery.
B11DB-87	Battery Monitoring Module - missing message	<ul style="list-style-type: none"> Battery signal line circuit fault 	Refer to the electrical wiring diagrams and check the Battery Monitoring System (BMS) module circuit for open circuit, short to ground, short to power.
B1206-68	Crash Occurred - event information	<ul style="list-style-type: none"> Engine control Module (ECM) has detected the vehicle has crashed - event information DTC only 	Refer to the electrical circuit diagrams and check the Engine Control Module (ECM) to Restraints Control Module (RCM) circuit for short to ground, short to power, open circuit. Repair circuit as required, clear DTC and retest system to confirm repair.
C0031-00	Left Front Wheel Speed Sensor - No sub type information	<ul style="list-style-type: none"> Invalid data received from Anti-lock Braking System (ABS) module - left front wheel speed signal fault 	Check Anti-lock Braking System (ABS) module for related DTCs and refer to relevant DTC Index.
C0034-00	Right Front Wheel Speed Sensor - No sub type information	<ul style="list-style-type: none"> Invalid data received from Anti-lock Braking System (ABS) module - right front wheel speed signal fault 	Check Anti-lock Braking System (ABS) module for related DTCs and refer to relevant DTC Index.
C0037-00	Left Rear Wheel Speed Sensor - No sub type information	<ul style="list-style-type: none"> Invalid data received from Anti-lock Braking System (ABS) module - left rear wheel speed signal fault 	Check Anti-lock Braking System (ABS) module for related DTCs and refer to relevant DTC Index.
C003A-00	Right Rear Wheel Speed Sensor - No sub type information	<ul style="list-style-type: none"> Invalid data received from Anti-lock Braking System (ABS) module - right rear wheel speed signal fault 	Check Anti-lock Braking System (ABS) module for related DTCs and refer to relevant DTC Index.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Powertrain Control Module (PCM) Long Drive Cycle Self-Test

General Procedures



WARNING: Where possible, all road tests should be on well surfaced and dry roads. Always comply with speed limits and local traffic regulations.

NOTES:



This procedure is an overcheck only. If fault codes are found, interrogation of the relevant system must be carried out and claimed against.



The vehicle must exceed 50mph (80 km/h) during the road test.

1. Connect the diagnostic equipment to the vehicle.
2. Follow on screen prompts and check for engine management fault codes.
3. Clear the fault codes following the on screen procedure.
4. Disconnect the diagnostic equipment from the vehicle.
5. **NOTE:** Make sure cruise control is not engaged. Make sure the engine temperature is above 60 °C (140 °F).
Carry out a road test and perform the following operations.
 1. Accelerate to 55 mph (88 km/h) in 5th gear and cruise for 2 minutes with the engine speed at or above 1800rpm.
 2. Lift off the throttle and allow the vehicle to decelerate until the engine speed is less than 1000 rpm.
 3. Stop the vehicle.
 4. Release brake, allow the vehicle to move with no throttle for 1 minute.
 5. Road test is now complete.
6. Connect the diagnostic equipment to the vehicle.
7. **NOTE:** If fault codes are found, interrogation of the relevant system must be carried out and claimed against.
Follow on screen prompts and check for engine management fault codes.
8. Disconnect the diagnostic equipment from the vehicle.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Powertrain Control Module (PCM) Short Drive Cycle Self-Test

General Procedures



NOTE: This procedure is an overcheck only. If fault codes are found, interrogation of the relevant system must be carried out and claimed against.

1. Connect the diagnostic equipment to the vehicle.
2. Follow on screen prompts and check for engine management fault codes.
3. Clear the fault codes following the on screen procedure.
4. Start the engine.
 - Allow the engine to idle for 30 seconds.
 - Raise the engine speed to 1500 rpm and hold for 3 minutes until a temperature of 70°C (158 °F) is achieved.
 - Allow the engine to idle for 30 seconds.
 - Switch off the engine.
5. **NOTE:** If fault codes are found, interrogation of the relevant system must be carried out and claimed against.

Follow on screen prompts and check for engine management fault codes.
6. Disconnect the diagnostic equipment from the vehicle.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Camshaft Position (CMP)

Sensor LH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

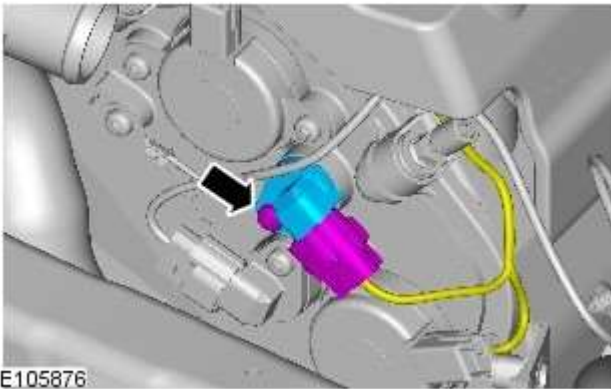
Refer to: Specifications (414-00 Charging System - General Information, Specifications).




2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

3. Refer to: Thermostat Housing - 5.0L SC V8 - AJ133 (303-03 Engine Cooling - 5.0L NA V8 - AJ133/5.0L SC V8 - AJ133, Removal and Installation).



4.  **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 10 Nm

Installation

1. **CAUTIONS:**



Make sure that the mating faces are clean and free of foreign material.



Make sure that the sensor tip is clean and free of foreign material.



NOTE: Lubricate the O-ring seal with clean engine oil.

To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Camshaft Position (CMP)

Sensor RH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

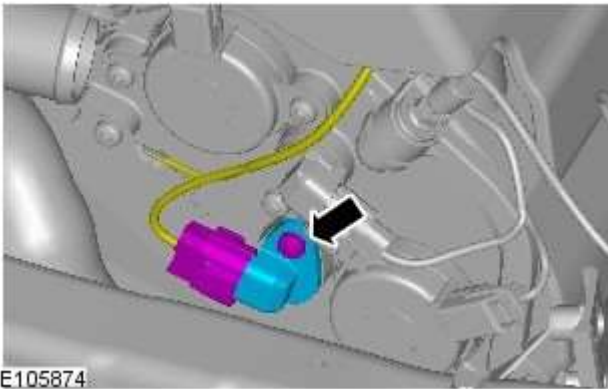
Refer to: Specifications (414-00 Charging System - General Information, Specifications).



2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

3. Refer to: Thermostat Housing - 5.0L SC V8 - AJ133 (303-03 Engine Cooling - 5.0L NA V8 - AJ133/5.0L SC V8 - AJ133, Removal and Installation).



4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

- Torque: 10 Nm

Installation

1. **CAUTIONS:**



Make sure that the mating faces are clean and free of foreign material.



Make sure that the sensor tip is clean and free of foreign material.



NOTE: Lubricate the O-ring seal with clean engine oil.

To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Catalyst Monitor Sensor LH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



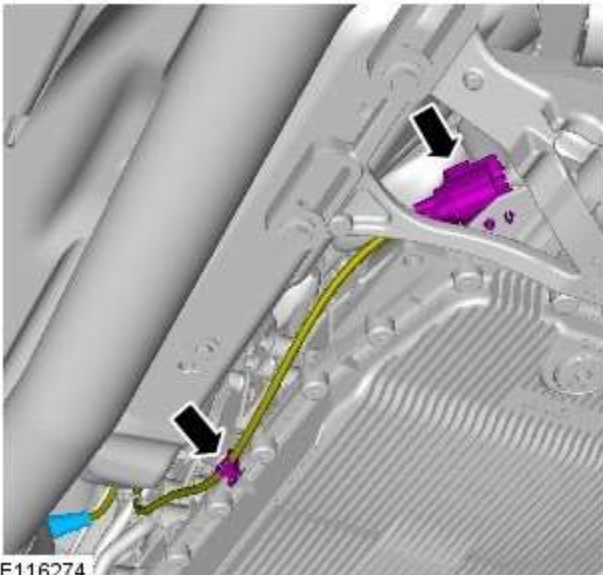
2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

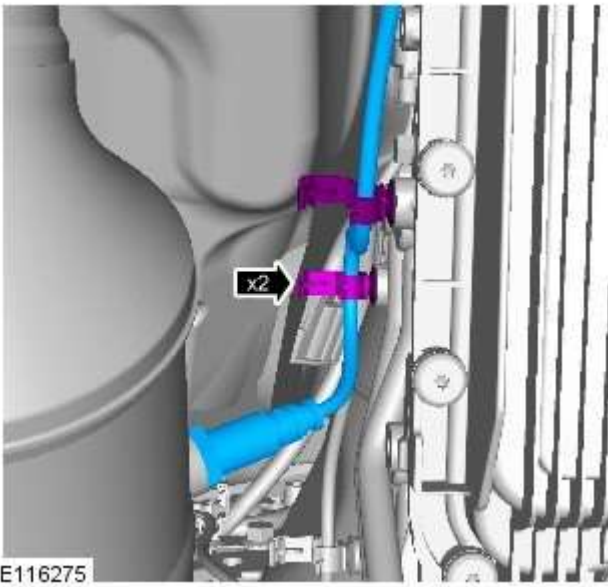
3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).




4. **CAUTION:** Note the fitted position of the component prior to removal.



E116274



5.  CAUTION: Make sure that the mating faces are clean and free of foreign material.
 - Torque: 48 Nm

Installation

1. CAUTIONS:



If accidentally dropped or knocked install a new sensor.



Make sure the catalyst monitor sensor wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.



Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.



NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

To install, reverse the removal procedure.

2. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Long Drive Cycle Self-Test](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures).

Electronic Engine Controls - V8 S/C 5.0L Petrol - Catalyst Monitor Sensor RH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

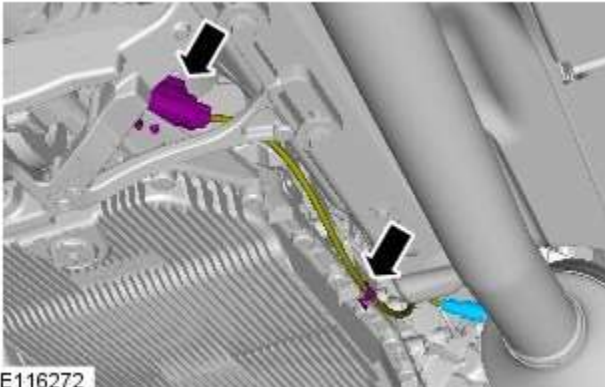
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

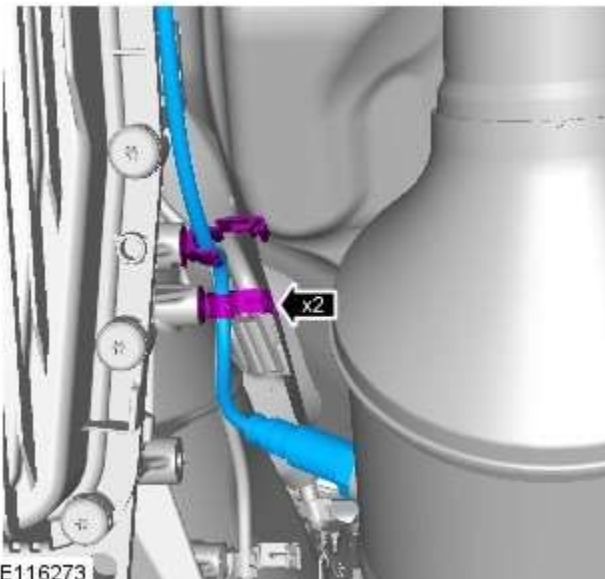
3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).



E116272



4. **CAUTION:** Note the fitted position of the component prior to removal.



E116273



5. **CAUTION:** Make sure that the mating faces are clean and free of foreign material.

- Torque: 48 Nm

Installation

1. CAUTIONS:



Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.



If accidentally dropped or knocked install a new sensor.



Make sure the catalyst monitor sensor wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.



NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

To install, reverse the removal procedure.

2. NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Long Drive Cycle Self-Test \(303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures\)](#).

Electronic Engine Controls - V8 S/C 5.0L Petrol - Crankshaft Position (CKP)

Sensor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.



1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).



3. **NOTE:** Clean the components general area prior to dismantling.

Torque: 10 Nm

Installation

1. **CAUTIONS:**



Make sure that the mating faces are clean and free of foreign material.



Make sure that the component is clean, free of foreign material and lubricant.

To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Engine Control Module (ECM)

Removal and Installation

Removal

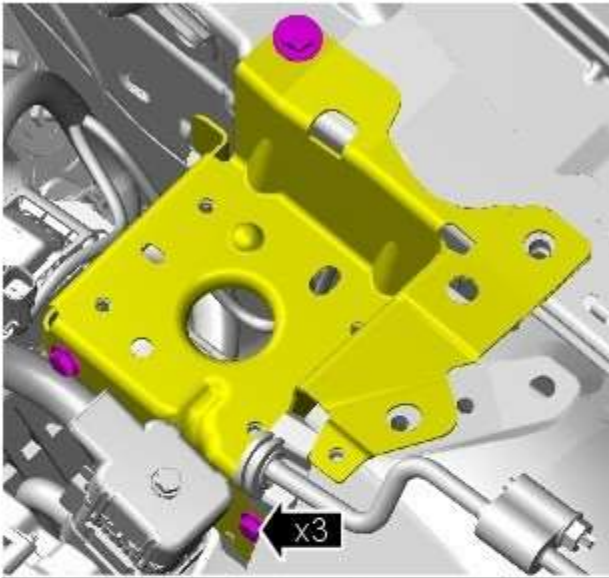


NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).
3. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).



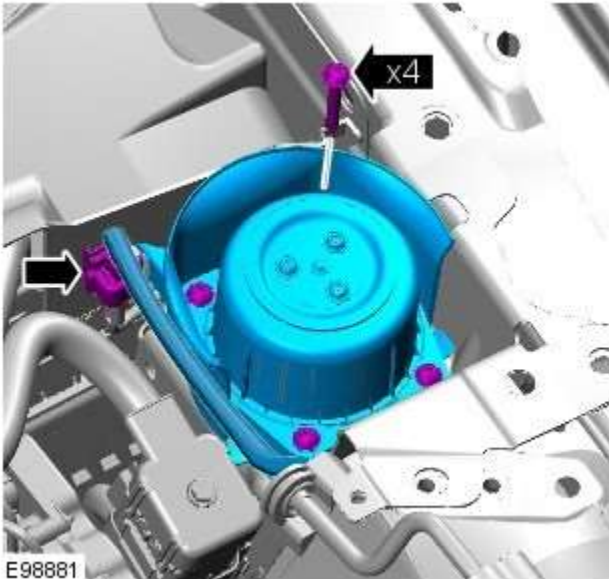
4. Torque: 25 Nm



5. Torque: 25 Nm



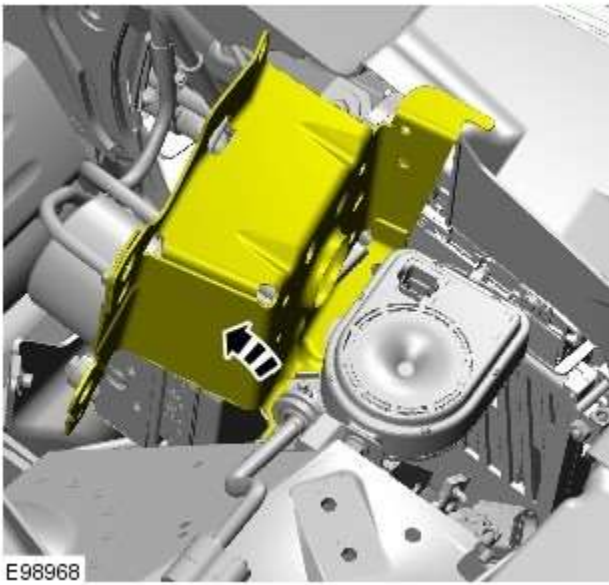
E98882



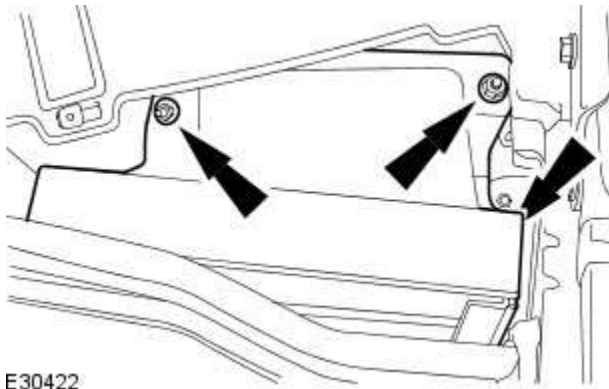
6. Torque: 8 Nm

E98881

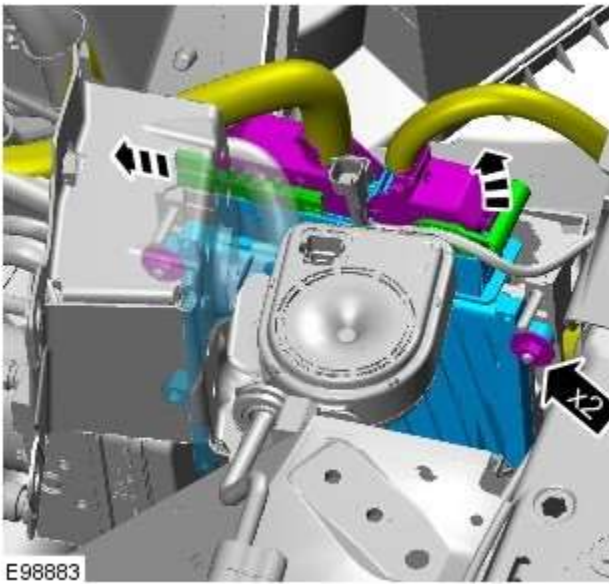
7. Torque: 6 Nm



8. Torque: 10 Nm



9.



Installation

1. NOTE: New units must be configured using the Programmable Module Installation Routine in the diagnostic tool.

To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Engine Coolant Temperature (ECT) Sensor

Removal and Installation

Removal

NOTES:



Some variation in the illustrations may occur, but the essential information is always correct.



Removal steps in this procedure may contain installation details.



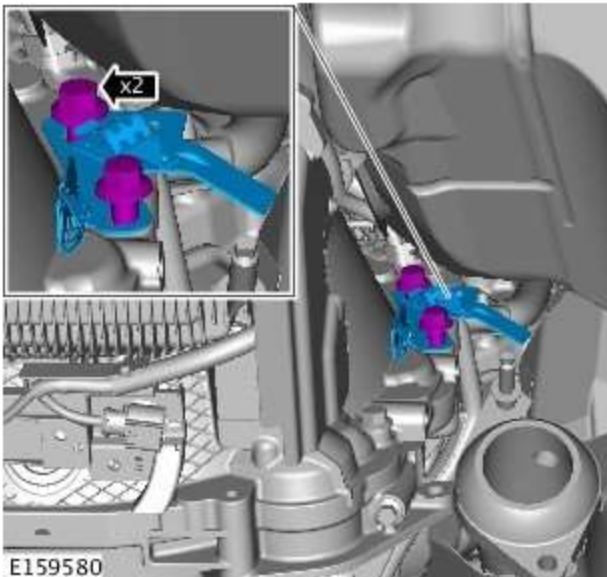
1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

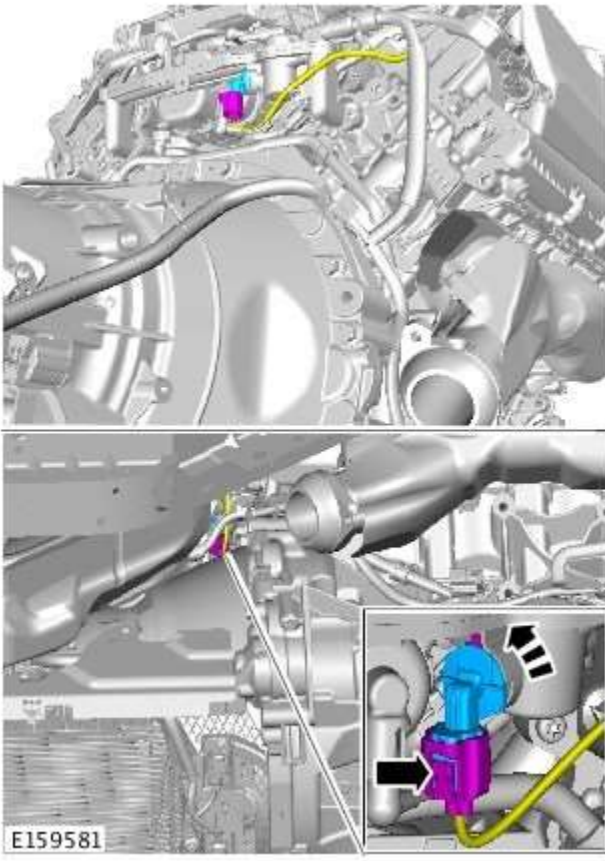
Raise and support the vehicle.


2. Refer to: [Cooling System Partial Draining, Filling and Bleeding](#) (303-03B Engine Cooling - V6 3.0L Petrol, General Procedures).


3. Refer to: [Catalytic Converter RH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

4. Torque: 48 Nm





5.  **WARNING:** Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.

 **CAUTION:** Engine coolant will damage the paint finished surfaces. If spilt, immediately remove the coolant and clean the area with water.

Lift the tang and rotate the engine coolant temperature (ECT) sensor counter clockwise.

Installation

1. To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Engine Oil Level Sensor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

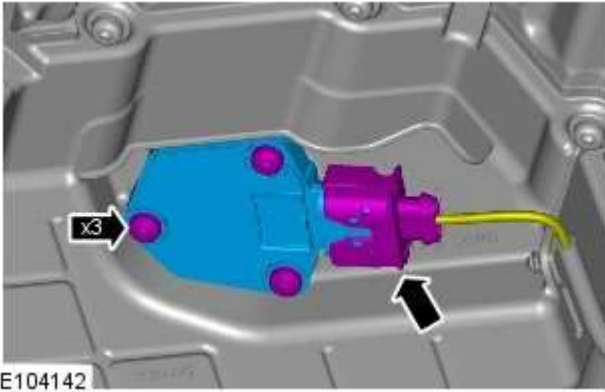


1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

2. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

3. Refer to: [Engine Oil Draining and Filling](#) (303-01D Engine - V8 S/C 5.0L Petrol, General Procedures).



4. **CAUTION:** Be prepared to collect escaping fluids.

Torque: 11 Nm

Installation



1. **CAUTION:** A new O-ring seal is to be installed.

To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Front Knock Sensor (KS) LH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

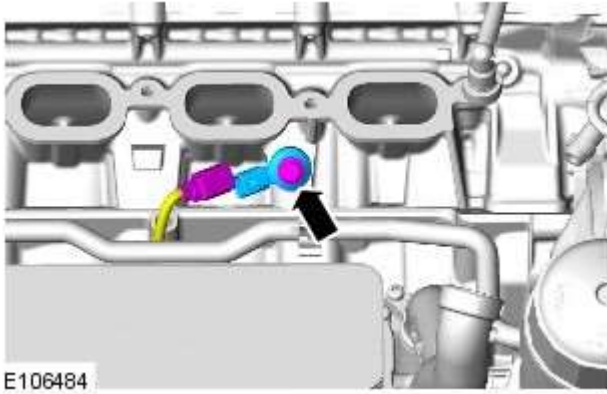


2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

4. *Torque:* 20 Nm



Installation

1. To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Front Knock Sensor (KS) RH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

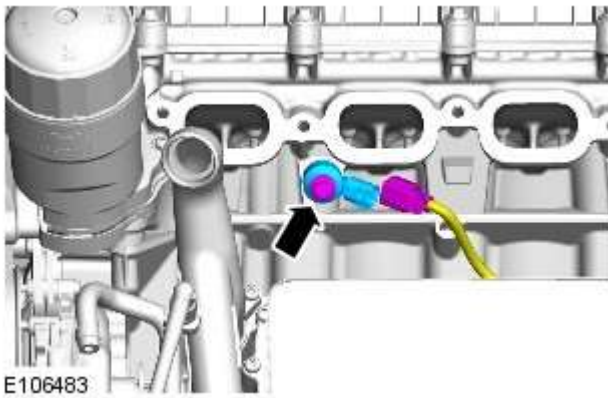


2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

4. Torque: 20 Nm



Installation

1. To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Fuel Rail Pressure (FRP)

Sensor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (310-00 Fuel System - General Information, General Procedures).

2. Disconnect the battery ground cable.

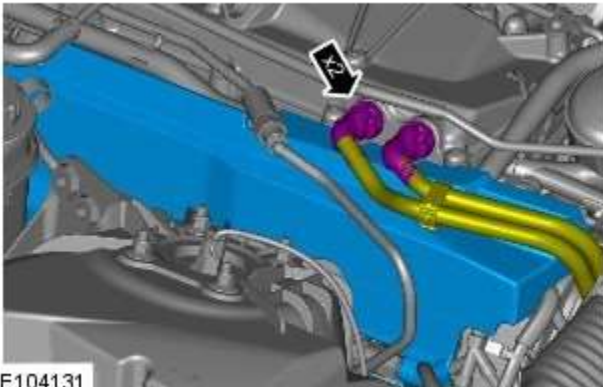
Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).

4. Refer to: [Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).

5. Refer to: [Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-02 Front End Body Panels, Removal and Installation).

6. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



7.  WARNING: Be prepared to collect escaping fluids.



8.  **WARNING:** Be prepared to collect escaping fluids.

 **CAUTION:** Make sure that all openings are sealed. Use new blanking caps.

Torque: 32 Nm

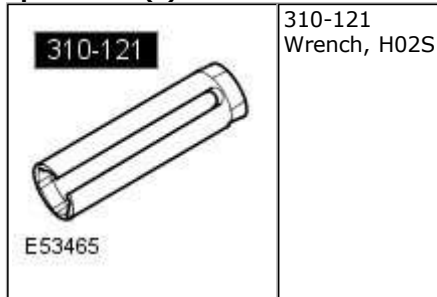
Installation

1. To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Heated Oxygen Sensor (HO2S) LH

Removal and Installation

Special Tool(s)



Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

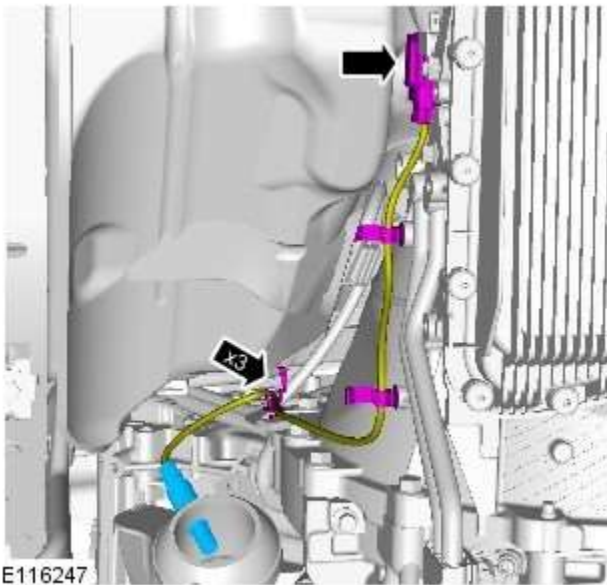
Raise and support the vehicle.

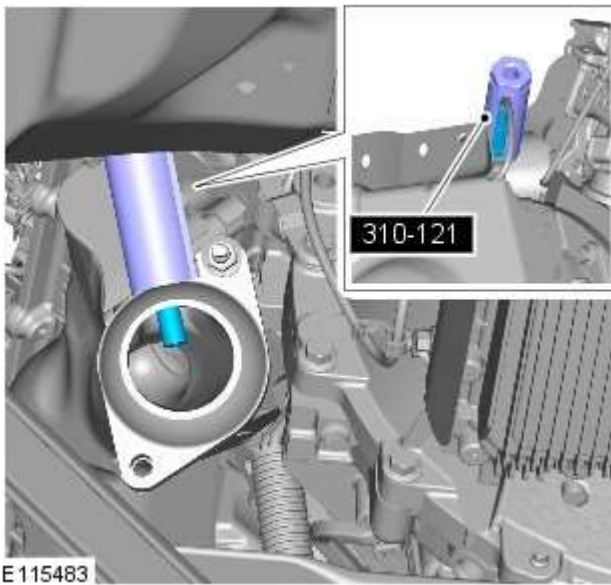
3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).


4. Refer to: [Catalytic Converter LH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).



5. **CAUTION:** Note the fitted position of the component prior to removal.





6.  CAUTION: Make sure that the mating faces are clean and free of foreign material.

Special Tool(s): [310-121](#)
Torque: 48 Nm

Installation

1. CAUTIONS:



Make sure the anti-seize compound does not contact the HO2S tip.



If accidentally dropped or knocked install a new sensor.



Make sure the HO2S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.



NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

To install, reverse the removal procedure.

2.  NOTE: For NAS vehicles only.

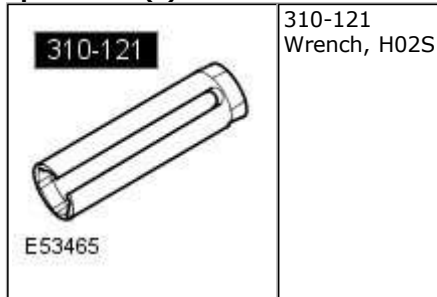
If required, carry out a long drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Long Drive Cycle Self-Test](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures).

Electronic Engine Controls - V8 S/C 5.0L Petrol - Heated Oxygen Sensor (HO2S) RH

Removal and Installation

Special Tool(s)



Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

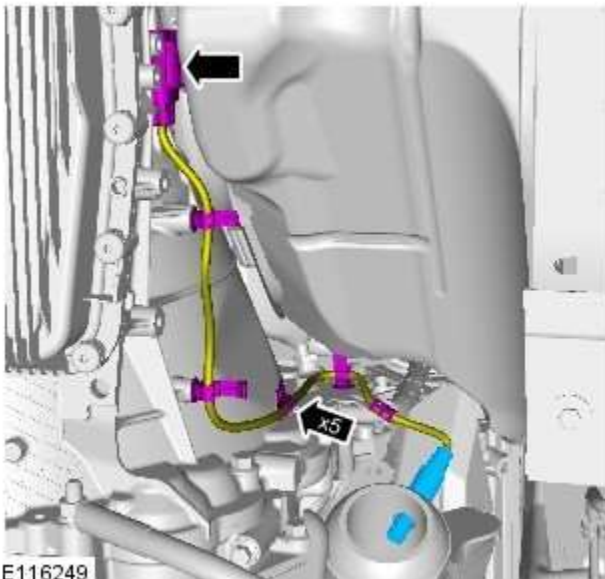
Raise and support the vehicle.

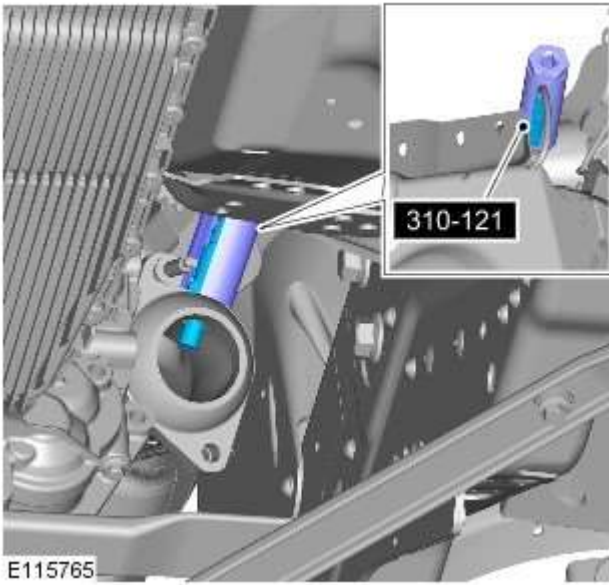
3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).


4. Refer to: [Catalytic Converter RH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).



5. **CAUTION:** Note the fitted position of the component prior to removal.





6.  CAUTION: Make sure that the mating faces are clean and free of foreign material.

Special Tool(s): [310-121](#)
Torque: 48 Nm

Installation

1. CAUTIONS:



Make sure the anti-seize compound does not contact the HO2S tip.



If accidentally dropped or knocked install a new sensor.



Make sure the HO2S wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.



NOTE: If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

To install, reverse the removal procedure.

2.  NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Long Drive Cycle Self-Test](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures).

Electronic Engine Controls - V8 S/C 5.0L Petrol - Manifold Absolute Pressure (MAP) Sensor

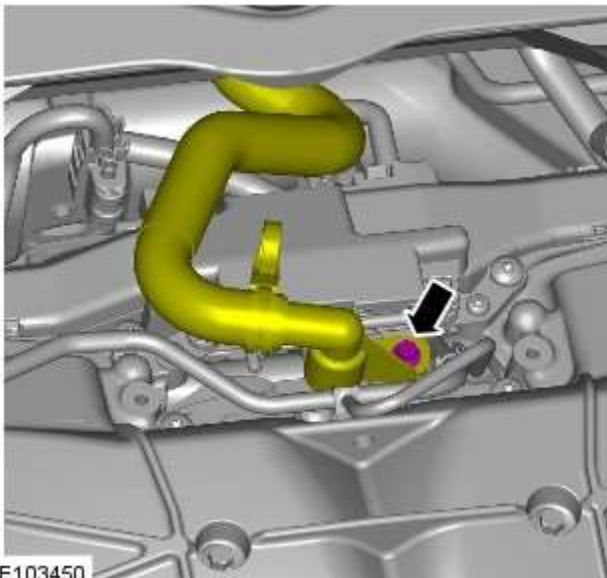
Removal and Installation

Removal



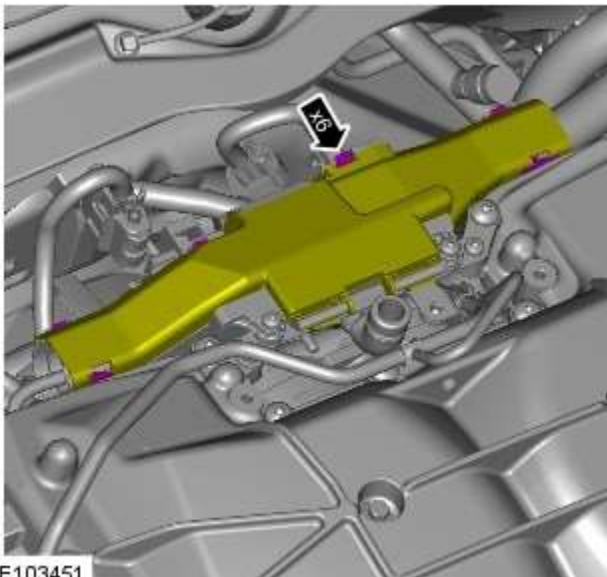
NOTE: Removal steps in this procedure may contain installation details.


1. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).

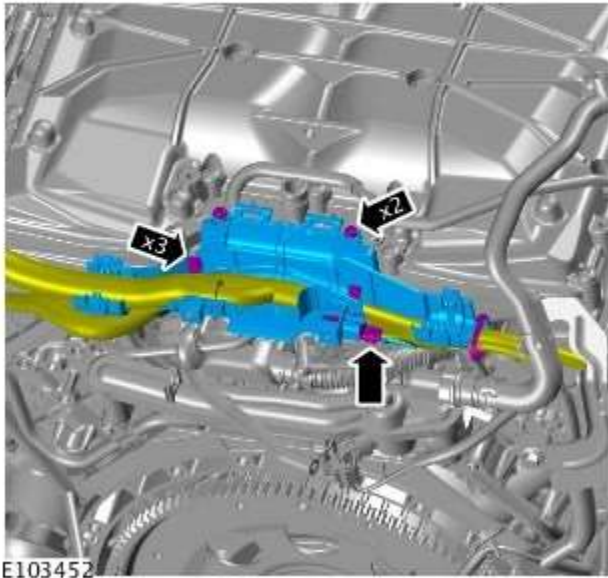


3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.


Torque: 10 Nm



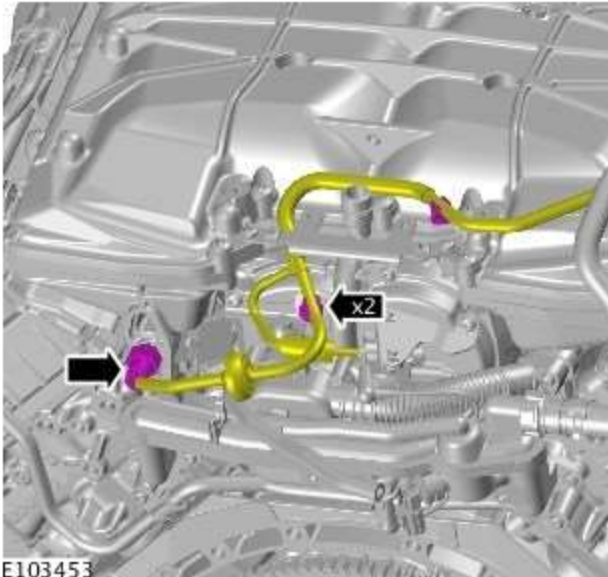
4.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.




E103452

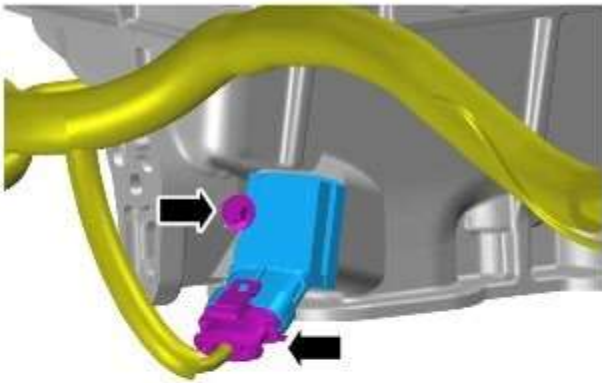
5.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.


Torque: 10 Nm



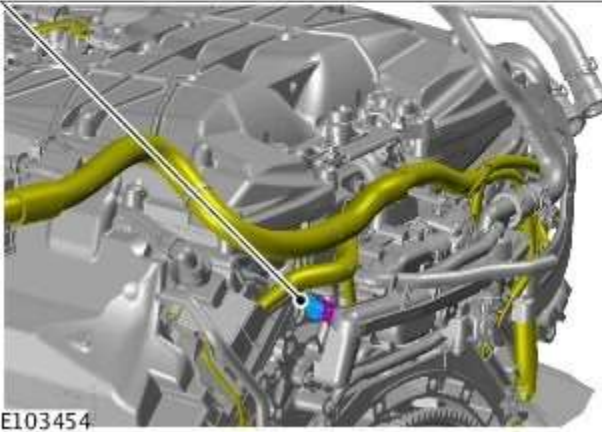
E103453

6.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



7.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 5 Nm



Installation

1. To install, reverse the removal procedure.

2.  NOTE: For NAS vehicles only.

If required, carry out a short drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Short Drive Cycle Self-Test \(303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures\)](#).

Electronic Engine Controls - V8 S/C 5.0L Petrol - Mass Air Flow (MAF) Sensor

Removal and Installation

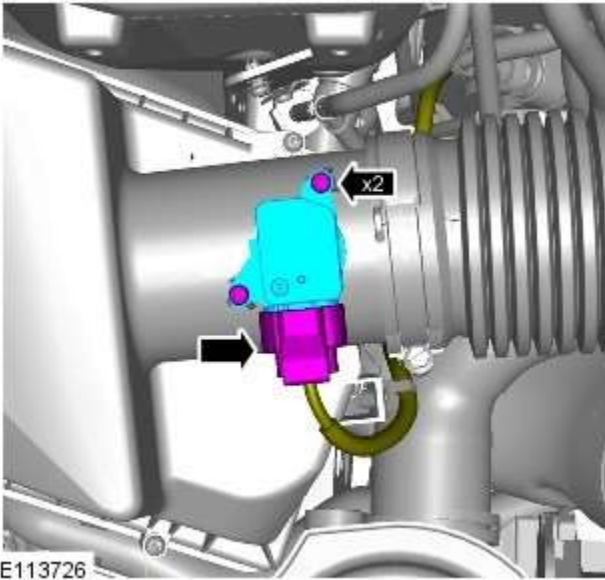
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2.



Installation

1. To install, reverse the removal procedure.



2. NOTE: For NAS vehicles only.

If required, carry out a short drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Short Drive Cycle Self-Test](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures).

Electronic Engine Controls - V8 S/C 5.0L Petrol - Rear Knock Sensor (KS) LH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

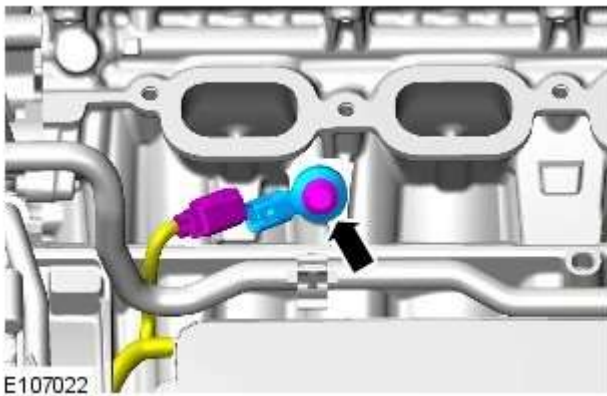


2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

4. Torque: 20 Nm



Installation

1. To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Rear Knock Sensor (KS) RH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

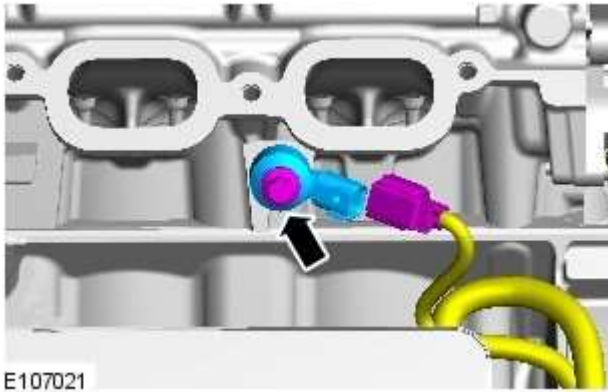


2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Supercharger](#) (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

4. Torque: 20 Nm



Installation

1. To install, reverse the removal procedure.

Electronic Engine Controls - V8 S/C 5.0L Petrol - Variable Valve Timing (VVT) Oil Control Solenoid LH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

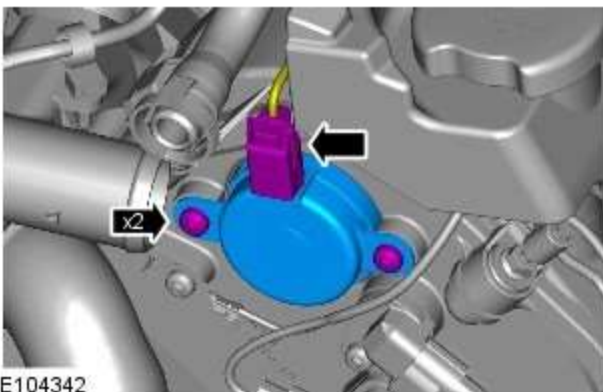
Refer to: Specifications (414-00, Specifications).



2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

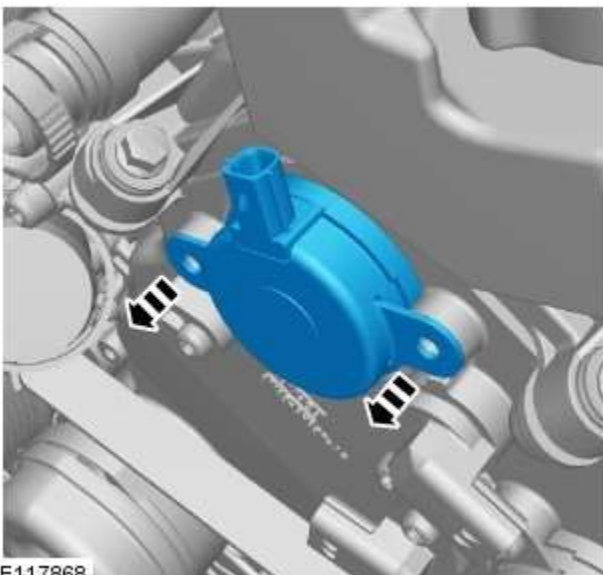
3. Refer to: Thermostat Housing - Vehicles With: Supercharger (303-03, Removal and Installation).



E104342

4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 10 Nm



E117868

5. **CAUTION:** Evenly and progressively, remove the VVT units from each side.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation



1. CAUTION: Make sure that the mating faces are clean and free of foreign material.



NOTE: Lubricate the O-ring seal with clean engine oil.

To install, reverse the removal procedure.



2. NOTE: For NAS vehicles only.

If required, carry out a short drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Short Drive Cycle Self-Test](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures).

Electronic Engine Controls - V8 S/C 5.0L Petrol - Variable Valve Timing (VVT)

Oil Control Solenoid RH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

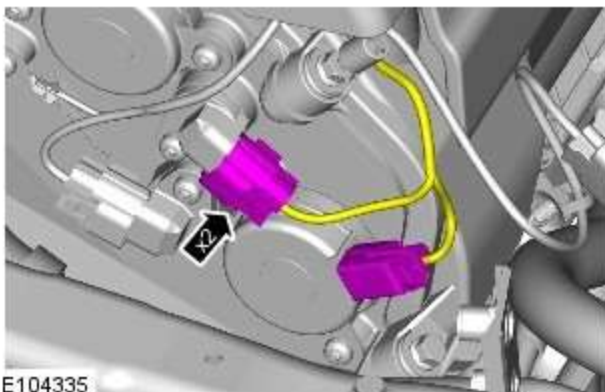
Refer to: Specifications (414-00, Specifications).



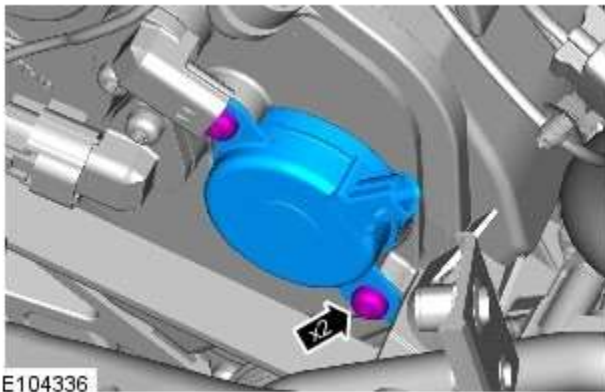
2. **WARNING:** Make sure to support the vehicle with axle stands.


Raise and support the vehicle.

3. Refer to: Thermostat Housing - Vehicles With: Supercharger (303-03, Removal and Installation).

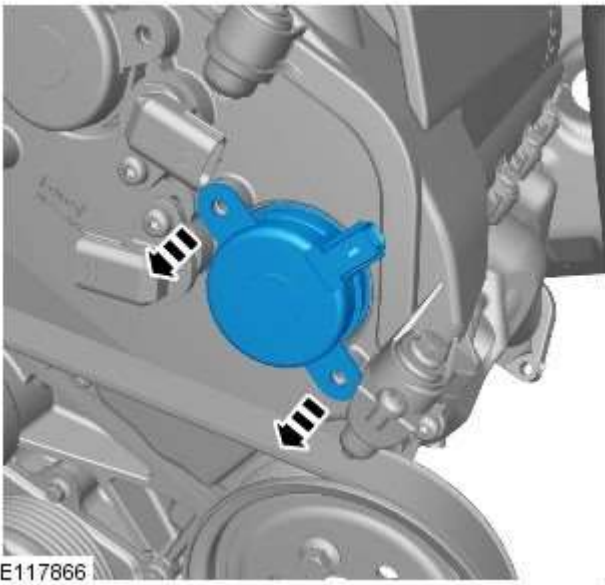


4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.




5.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.


Torque: 10 Nm



6.  **CAUTION:** Evenly and progressively, remove the VVT units from each side.

 **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1.  **CAUTION:** Make sure that the mating faces are clean and free of foreign material.

 **NOTE:** Lubricate the O-ring seal with clean engine oil.

To install, reverse the removal procedure.

2.  **NOTE:** For NAS vehicles only.

If required, carry out a short drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Short Drive Cycle Self-Test](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures).

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol -



CAUTION: CAUTION: Use only Shell M1375.4 Automatic transmission fluid. Use of any other fluids may result in a transmission malfunction or failure.

Description	Intervals
Normal maintenance	Filled for life.
Severe duty maintenance	Change the fluid at 48,000 km (30,000 miles) intervals.



NOTE: Lubricants, Fluids, Sealers and Adhesives

Description	Specification
Transmission fluid	Shell M1375.4
Sealant	WSS-M4G323-A6
Metal surface cleaner	WSW-M5B392-A
High temperature grease	Molecote FB180



NOTE: General Specifications

Vehicle	Engine	Approximate Liters	Refill capacity approximate dry capacity, includes cooler and tubes. Check the level at normal operating temperature. DO NOT OVERFILL. If it is necessary to add or change fluid, use only fluid which has been certified by the supplier as meeting the Jaguar Cars Ltd specification shown. U.S. Quarts
XJ	All vehicles	10.0	10.57



NOTE: Torque Specifications

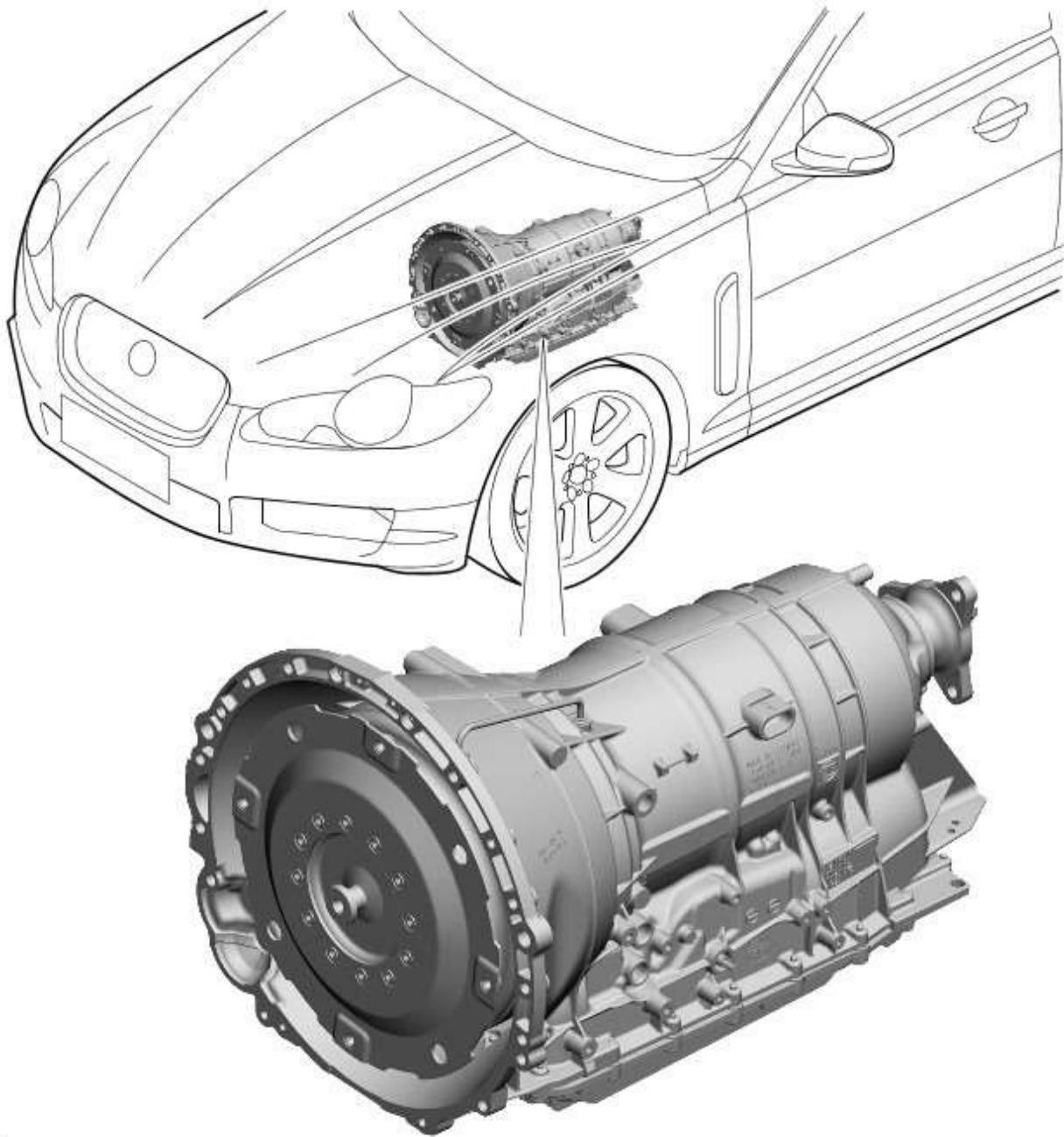
Description	Nm	lb-ft	lb-in
Transmission retaining bolts	48	35	-
Transmission mount retaining bolts	51	38	-
Transmission fluid fill plug	A	A	A
Transmission control module (TCM) and main control valve body retaining bolts	8	-	53
Output shaft flange retaining nut	60	44	-
Torque converter retaining bolts	62	46	-
Transmission fluid cooler tube retaining bolt	22	16	-
Transmission fluid drain plug	8	-	53
Transmission fluid pan, gasket and filter retaining bolts	8	-	53

A = refer to the procedure for correct torque sequence

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Description - Component Location

Description and Operation

COMPONENT LOCATION



E117880

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Description - Overview

Description and Operation

OVERVIEW

The ZF 6HP28 transmission is an electronically controlled, hydraulically operated, six speed automatic unit. The hydraulic and electronic control elements of the transmission, including the [TCM \(transmission control module\)](#), are incorporated in a single unit located inside the transmission and is known as 'Mechatronic'.

5.1L [SC \(supercharger\)](#) and 3.0L diesel models use an updated derivative of the ZF 6HP28 transmission used in the 5.0L naturally aspirated models.

The ZF 6HP28 transmission has the following features:

- Designed to be maintenance free
- Transmission fluid is 'fill for life'
- The torque converter features a controlled slip feature with electronically regulated control of lock-up, creating a smooth transition to the fully locked condition
- Shift programs controlled by the [TCM](#)
- Electronic park lock, controlled by the [TCM](#), with a mechanical emergency release
- ASIS (adaptive shift strategy), to provide continuous adaptation of shift changes to suit the driving style of the driver, which can vary from sporting to economical.
- Connected to the [ECM \(engine control module\)](#) via the high speed [CAN \(controller area network\)](#) bus for communications
- Default mode if major faults occur
- Diagnostics available from the [TCM](#) via the high speed [CAN](#) bus.

The transmission selections are made using the rotary JaguarDrive selector in the floor console and two paddle switches on the steering wheel. For additional information, refer to 307-05B Automatic Transmission/Transaxle External Controls - 5.0L/3.0L Diesel).

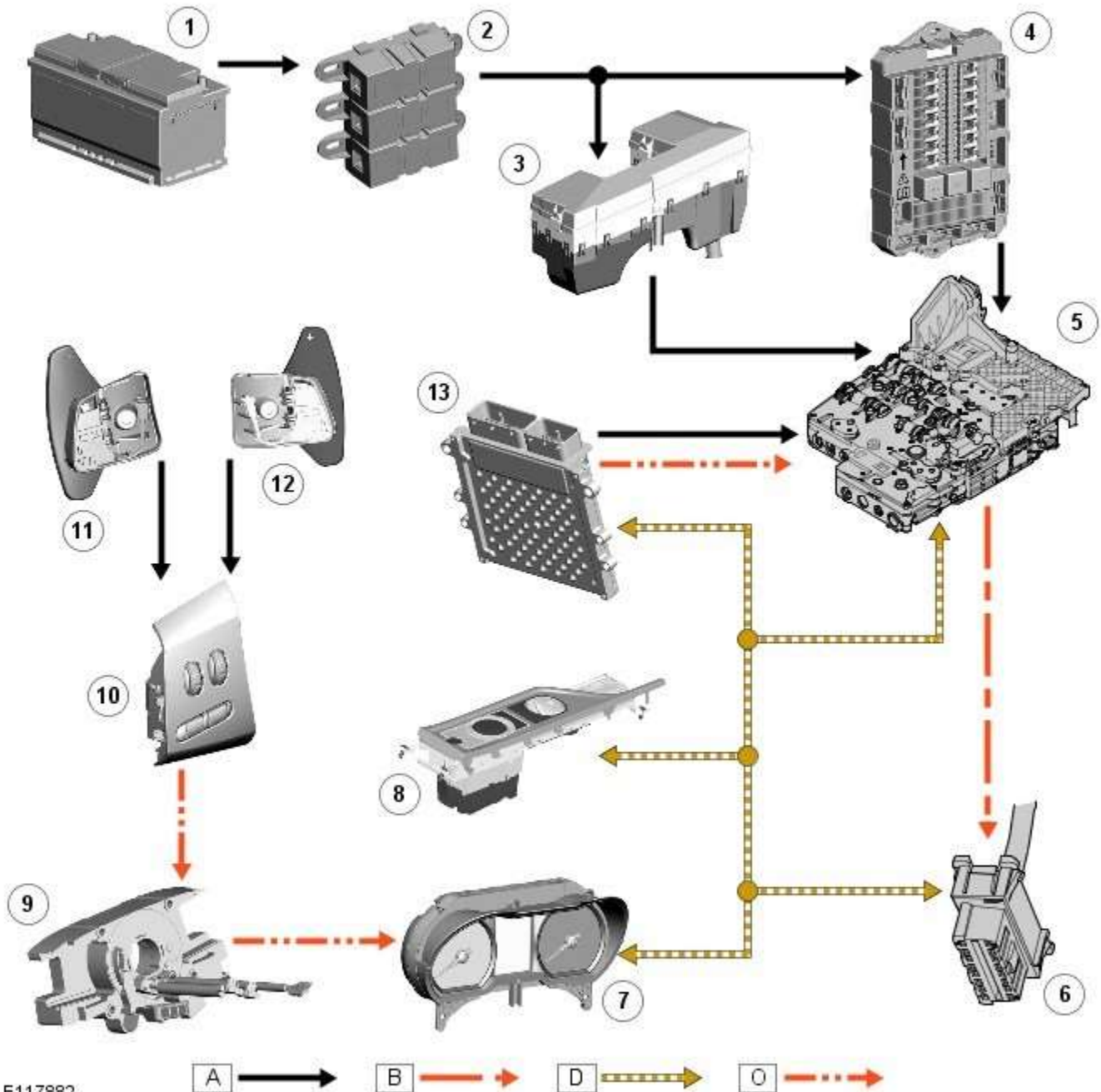
Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Description - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired; B = K bus; D = High speed CAN (controller area network) bus; O = LIN (local interconnect network) bus



E117882

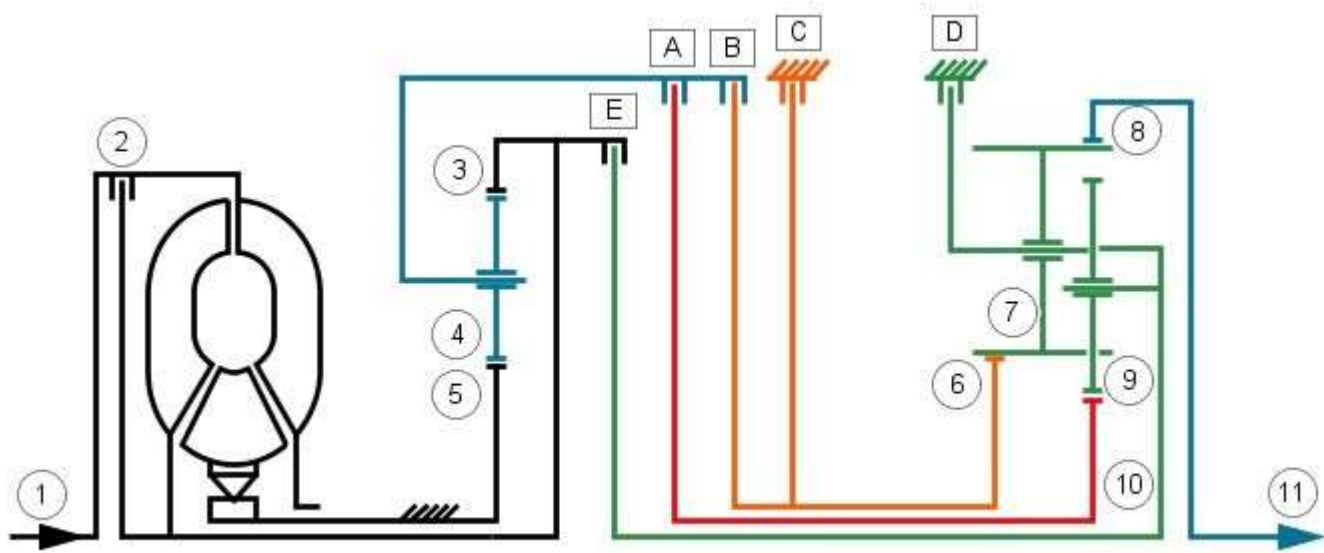
Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse)
3	EJB (engine junction box)
4	CJB (central junction box)

5	TCM (transmission control module)
6	Diagnostic socket
7	Instrument cluster
8	JaguarDrive selector
9	Clockspring
10	Steering wheel audio switches
11	Downshift paddle switch
12	Upshift paddle switch
13	ECM (engine control module)

System Operation

POWER FLOWS

Operation of the transmission is controlled by the [TCM \(transmission control module\)](#), which electrically activates various solenoids to control the transmission gear selection. The sequence of solenoid activation is based on programmed information in the [TCM](#) memory and physical transmission operating conditions such as vehicle speed, throttle position, engine load and JaguarDrive selector position.



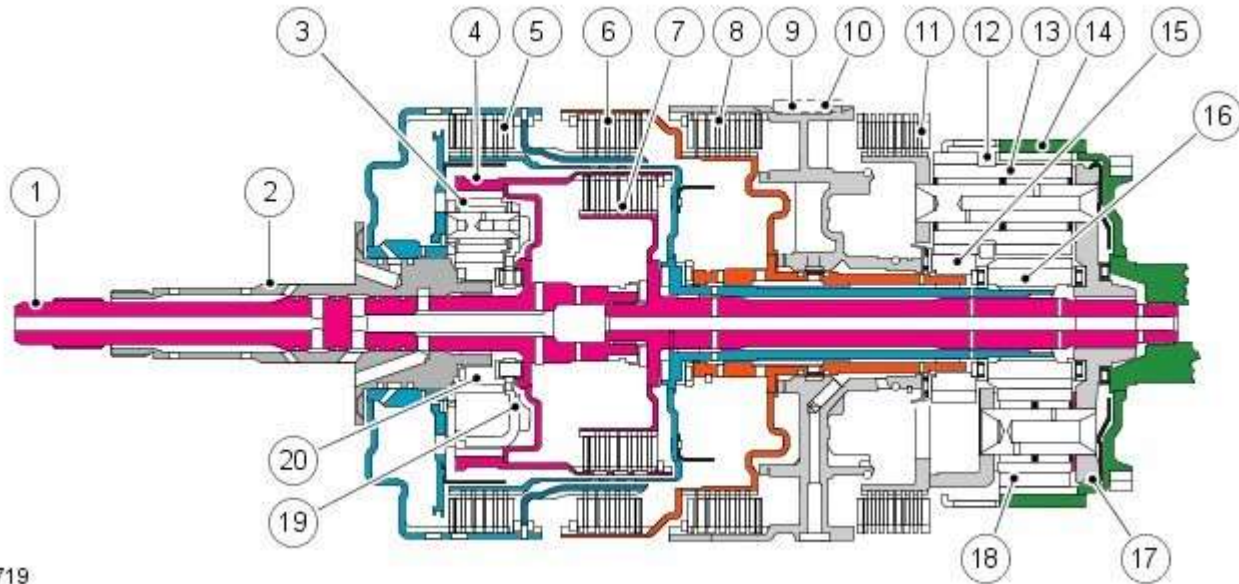
E42718

Item	Description
1	Torque input from engine
2	Torque converter lock-up clutch
3	Single web planetary gear carrier
4	Single web planetary gears
5	Single web sunwheel 1
6	Double web sunwheel 2
7	Double web planetary gears - long
8	Double web planetary gear carrier
9	Double web planetary gears - short
10	Double web sunwheel 3
11	Torque output from transmission
A	Multiplate clutch
B	Multiplate clutch
C	Multiplate brake
D	Multiplate brake
E	Multiplate clutch

Engine torque is transferred, via operation of single or combinations of clutches to the 2 planetary gear trains. Both gear trains are controlled by reactionary inputs from brake clutches to produce the 6 forward gears and 1 reverse gear. The ratios are as follows:

Gear	1st	2nd	3rd	4th	5th	6th	Reverse
Ration	4.171	2.340	1.521	1.143	0.867	0.691	3.403

Shift Elements



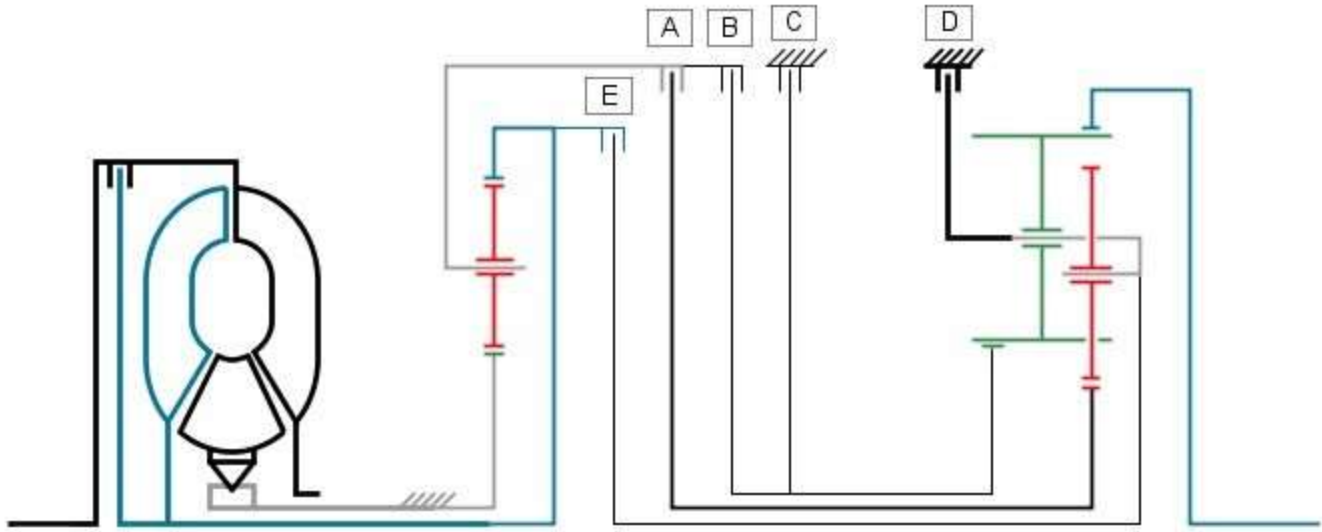
E42719

Item	Description
1	Turbine shaft
2	Stator shaft
3	Single web planetary gear train
4	Ring gear 1
5	Clutch A
6	Clutch B
7	Clutch E
8	Brake clutch C
9	Fixed connection to transmission housing
10	Shaft key
11	Brake clutch D
12	Double web planetary gear train
13	Planetary gears - long
14	Ring gear 2
15	Sunwheel 2
16	Sunwheel 3
17	Double web planetary gear carrier
18	Planetary gears - short
19	Single web planetary gear carrier
20	Sunwheel 1

The shift elements are three rotating multiplate clutches (A, B and E) and two fixed multiplate brakes (C and D). All shifts from 1st to 6th gears are power-on overlapping shifts. Overlapping shifts can be described as one of the clutches continuing to transmit drive at a lower main pressure until the next required clutch is able to accept the input torque.

The shift elements, clutches and brakes are actuated hydraulically. Fluid pressure is applied to the required clutch and/or brake, pressing the plates together and allowing drive to be transmitted through the plates. The purpose of the shift elements is to perform power-on shifts with no interruption to traction and smooth transition between gear ratios.

Power Flow 1st Gear



E42720

The JaguarDrive selector and the selector valve spool are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

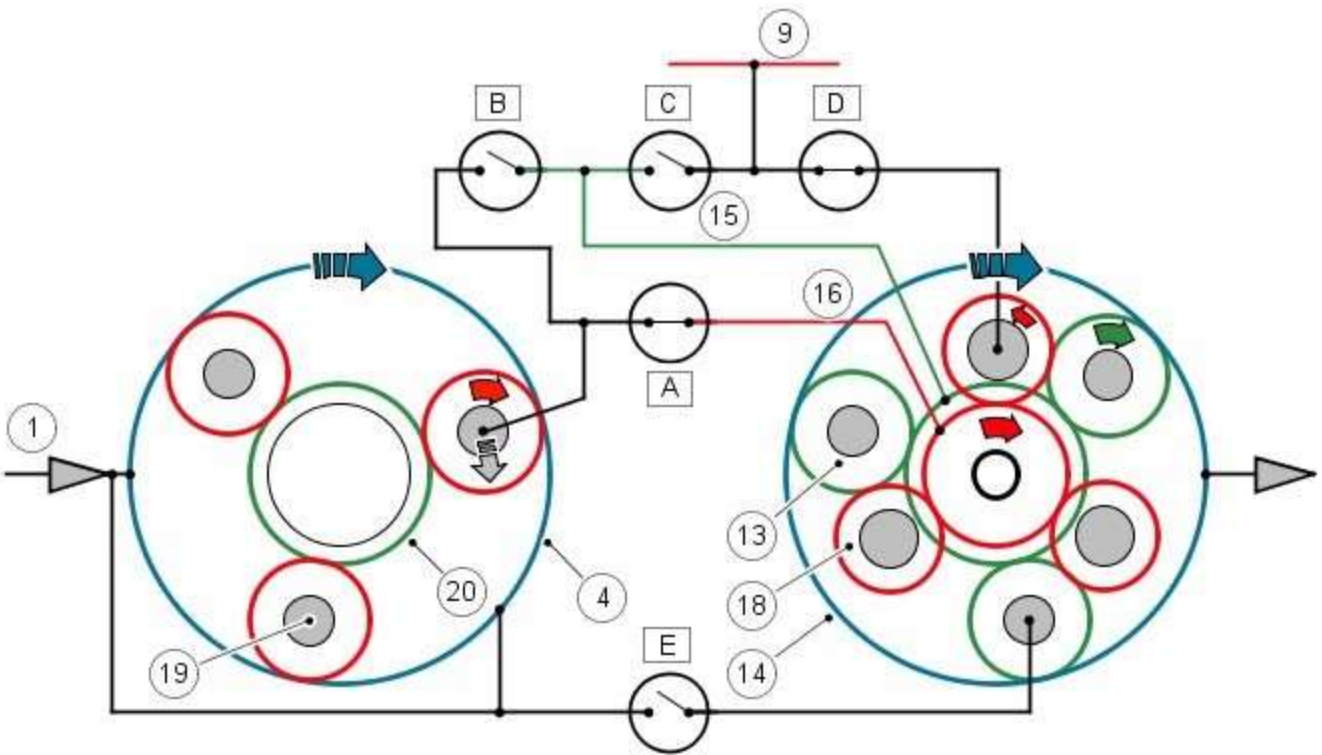
Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

The double web planetary gear train is locked against the transmission housing by brake 'D'. This allows ring gear 2 (output shaft) to be driven in the same direction as the engine via the long planetary gears.

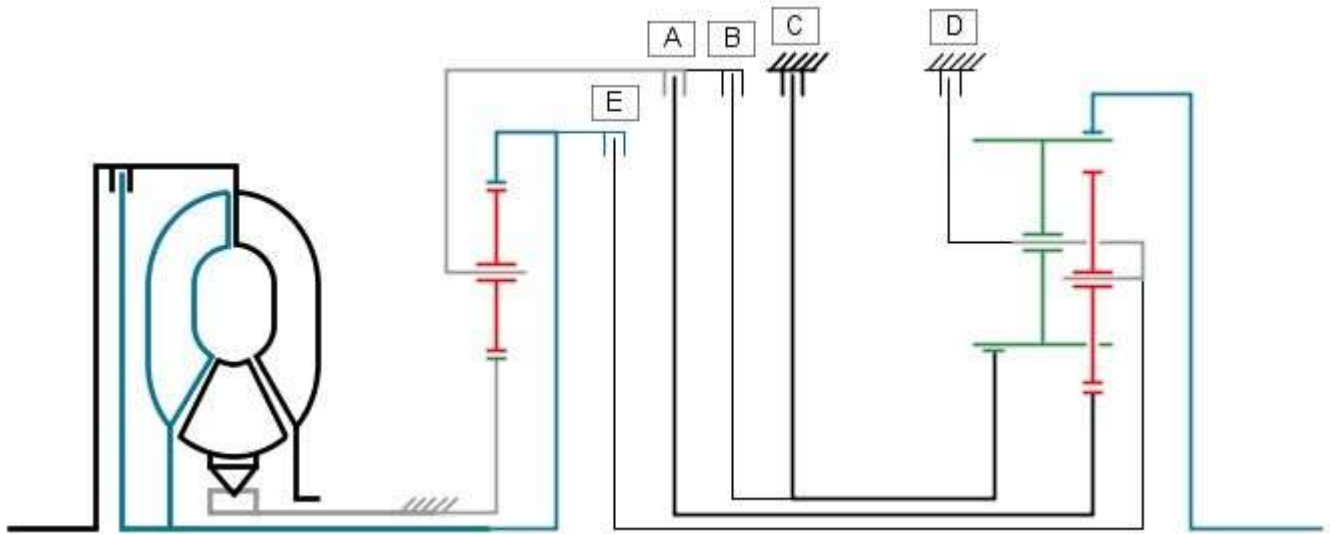


NOTE: Refer to 'Shift Elements' illustration for key



E42721

Power Flow 2nd Gear



E42722

The JaguarDrive selector and the selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

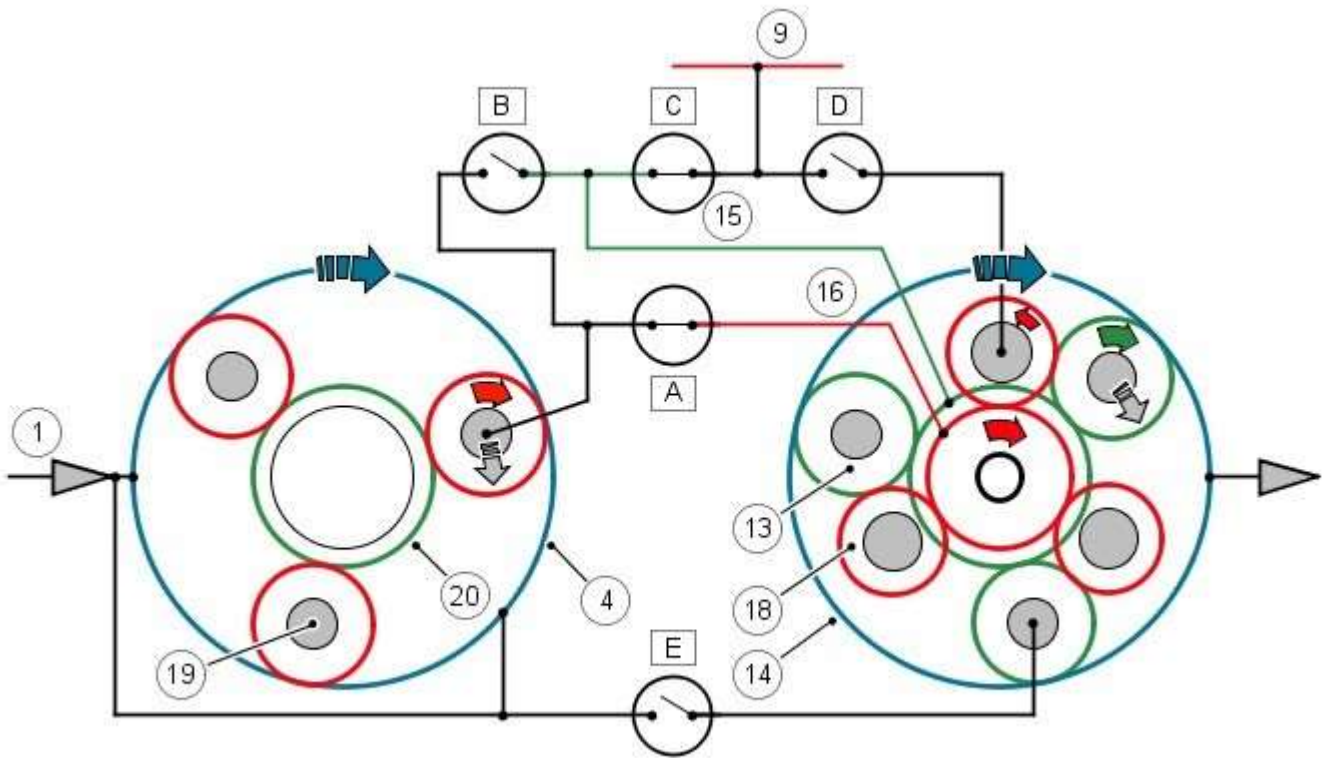
Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

Sunwheel 2 is locked to the transmission housing by brake clutch 'C'. The long planetary gears, which are also meshed with the short planetary gears, roll around the fixed sunwheel 2 and transmit drive to the double web planetary gear train carrier and ring gear 2 in the direction of engine rotation.

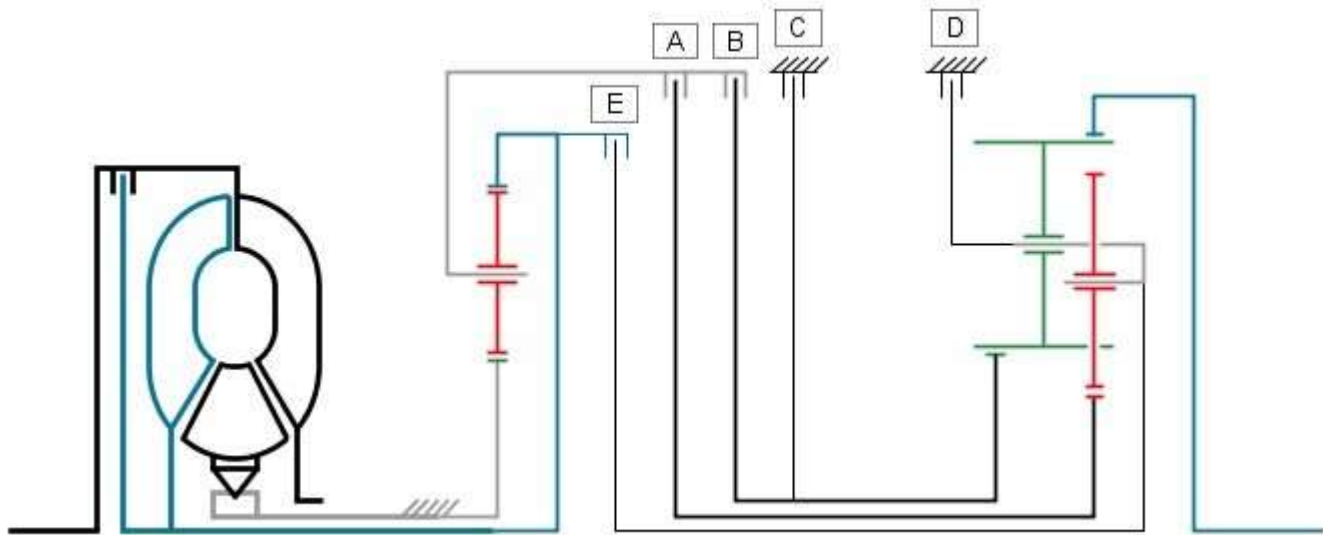


NOTE: Refer to 'Shift Elements' illustration for key



E42723

Power Flow 3rd Gear



E 42724

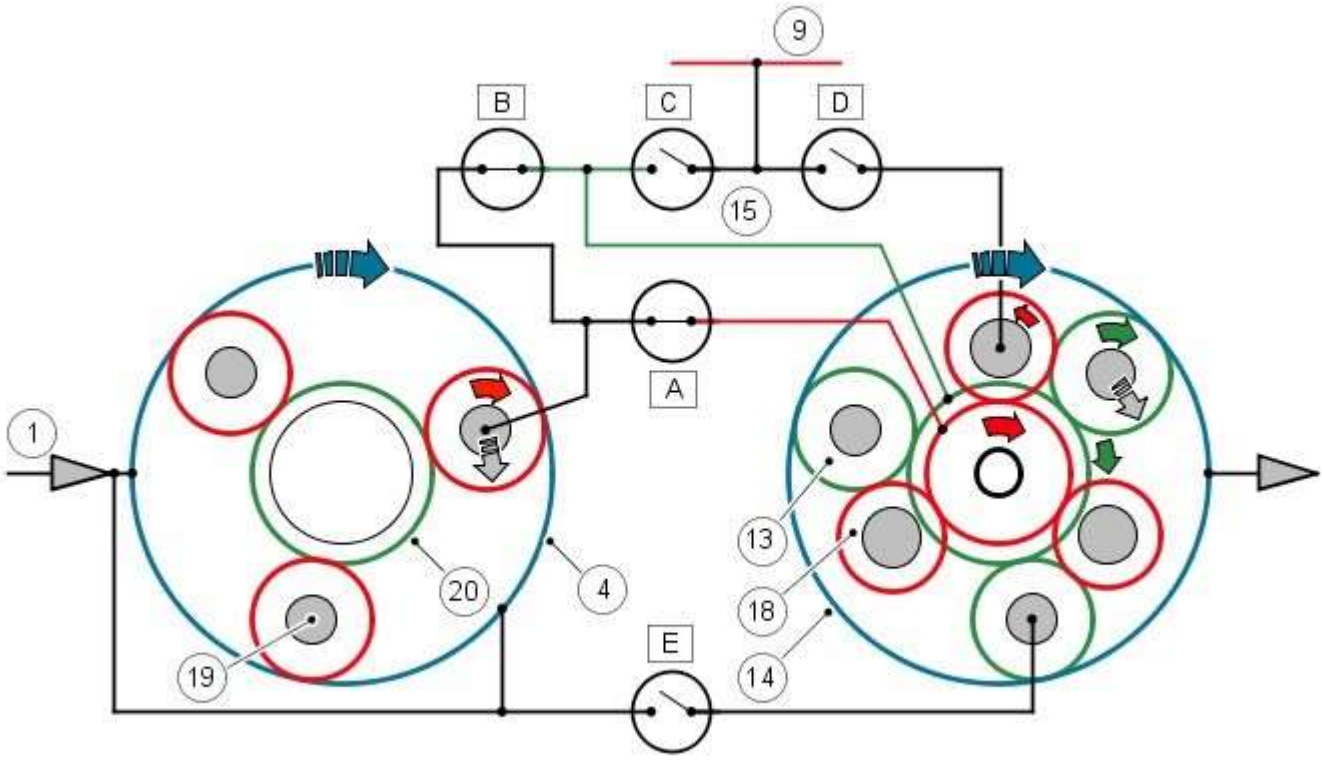
The JaguarDrive selector and the selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to the ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

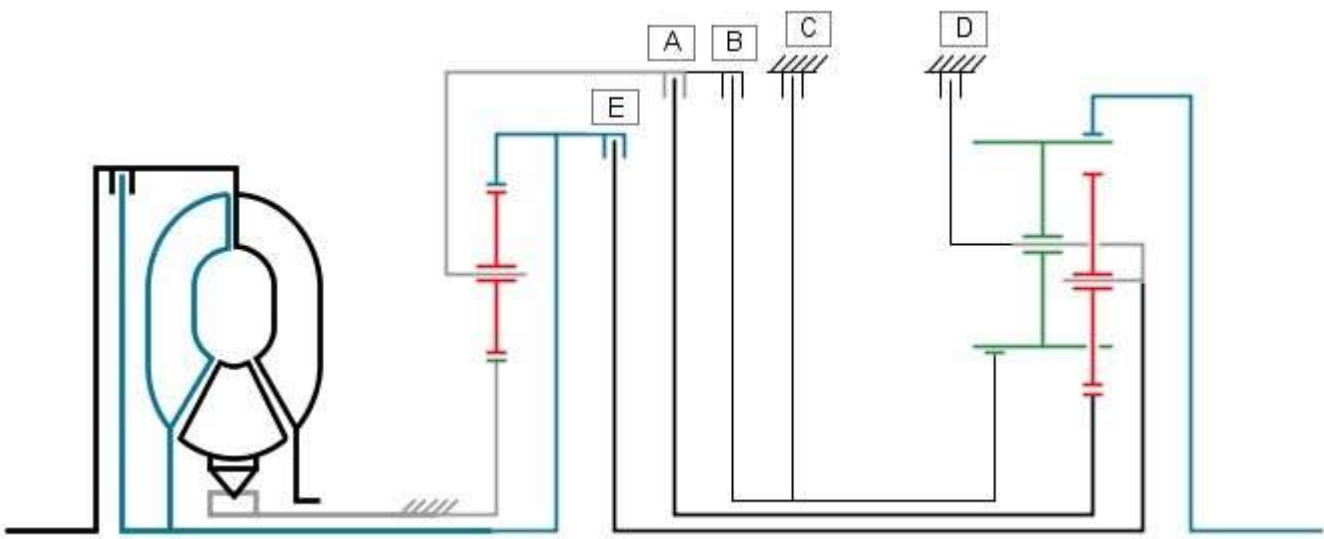
Sunwheel 2 is driven via clutch 'B' which is engaged. The long planetary gears, which are also meshed with the short planetary gears, cannot roll around the fixed sunwheel 2 and therefore transmit drive to the locked double web planetary gear train carrier in the direction of engine rotation.

 NOTE: Refer to 'Shift Elements' illustration for key



E42725

Power Flow 4th Gear



E42726

The JaguarDrive selector and the selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

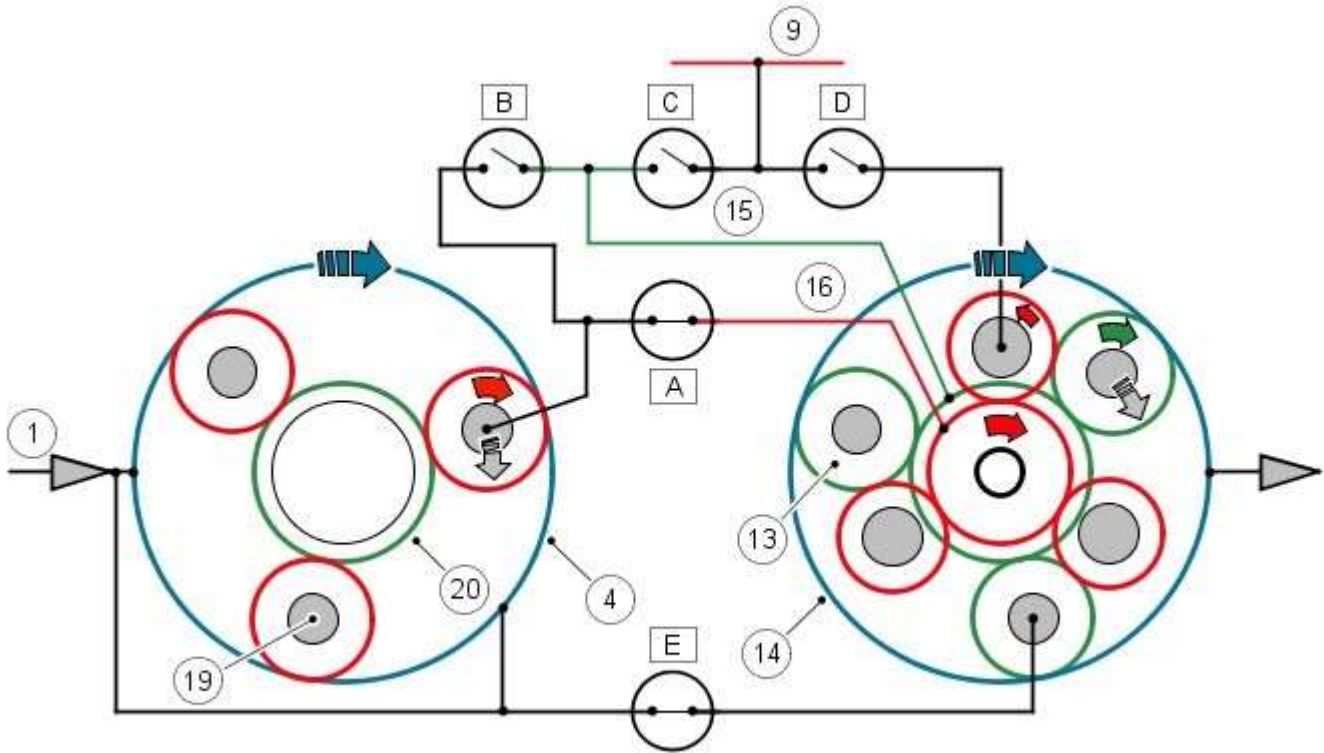
Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary gears.

The double web planetary gear carrier is driven via clutch 'E' which is engaged. The long planetary gears, which are also

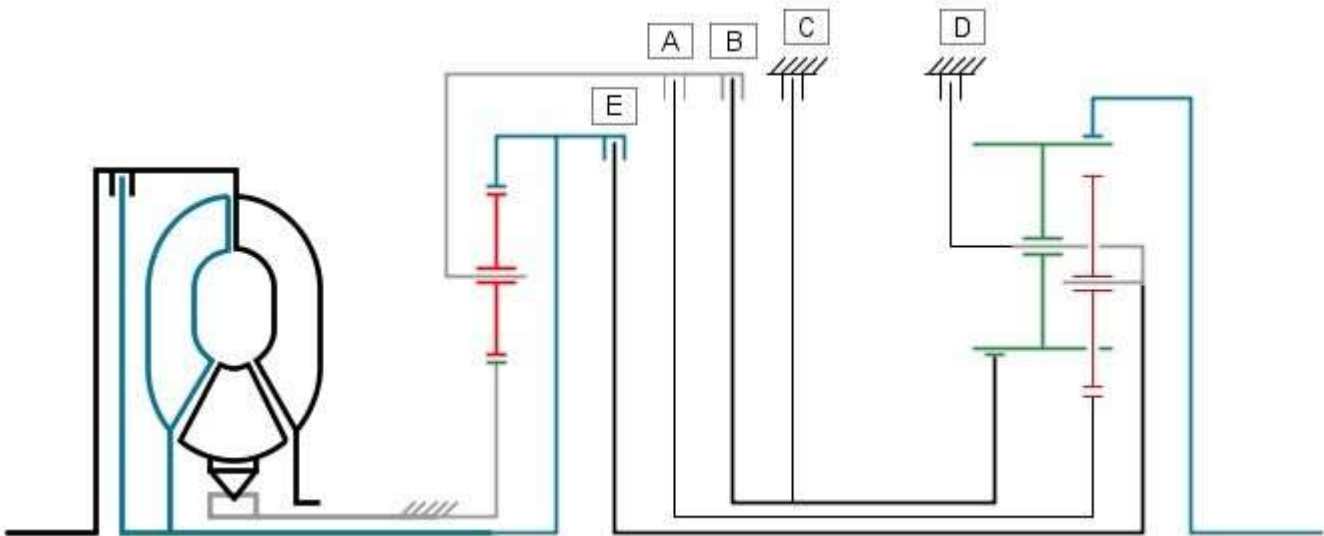
meshed with the short planetary gears and the double web planetary gear carrier, drive ring gear 2 in the direction of engine rotation.

 NOTE: Refer to 'Shift Elements' illustration for key



E42727

Power Flow 5th Gear



E42728

The JaguarDrive selector and the selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears which rotate around sunwheel 1. This drives the planetary gear carrier 1 and also the outer plate carrier of clutch 'A' and the inner plate carrier of clutch 'B'.

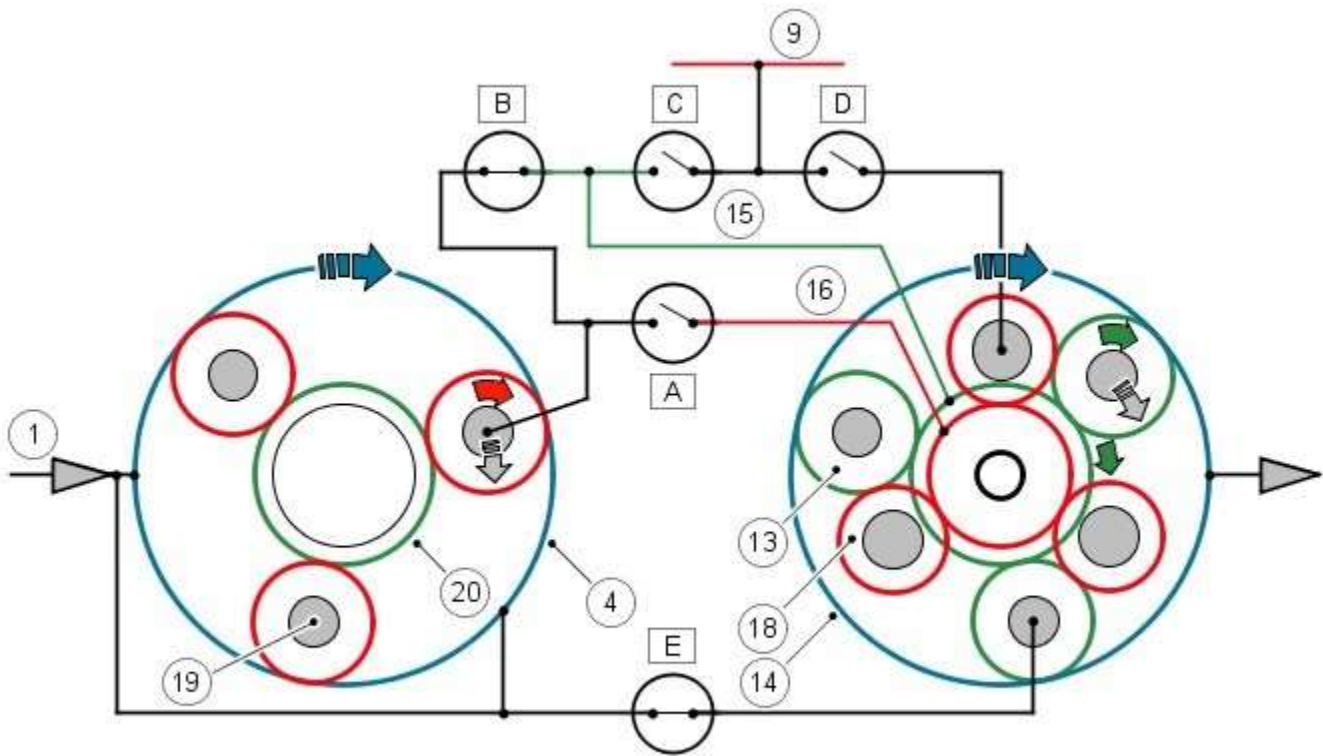
When clutch 'A' is engaged, sunwheel 3 in the double web planetary gear train is driven and meshes with the short planetary

gears.

The long planetary gears, which are also meshed with the short planetary gears and the double web planetary gear carrier, drive ring gear 2 in the direction of engine rotation.

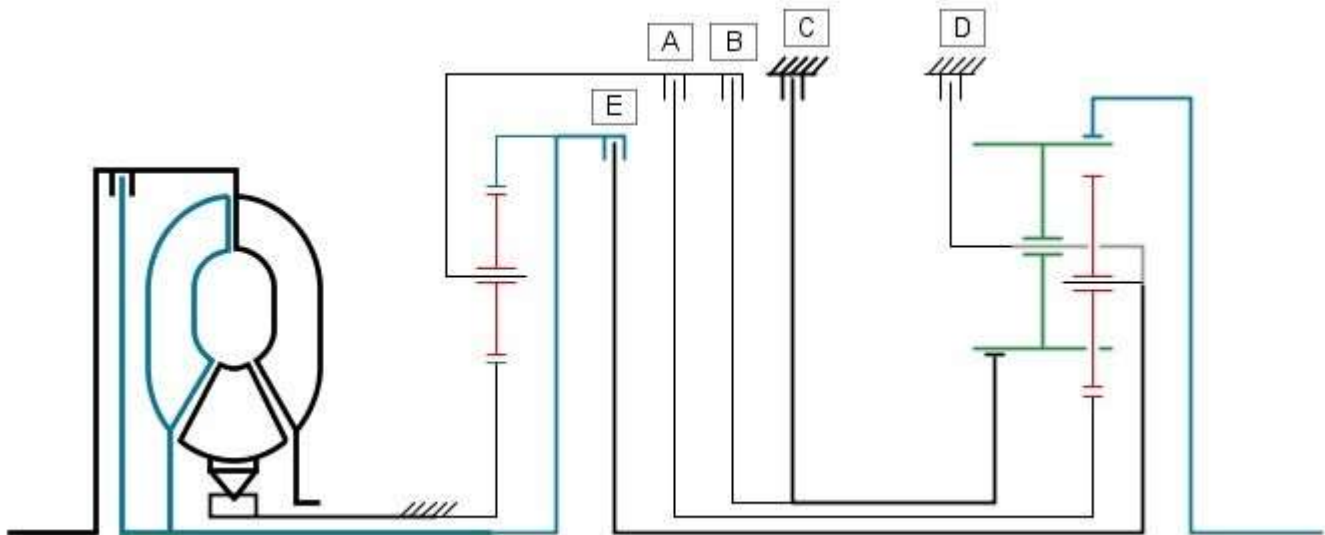


NOTE: Refer to 'Shift Elements' illustration for key



E42729

Power Flow 6th Gear



E42730

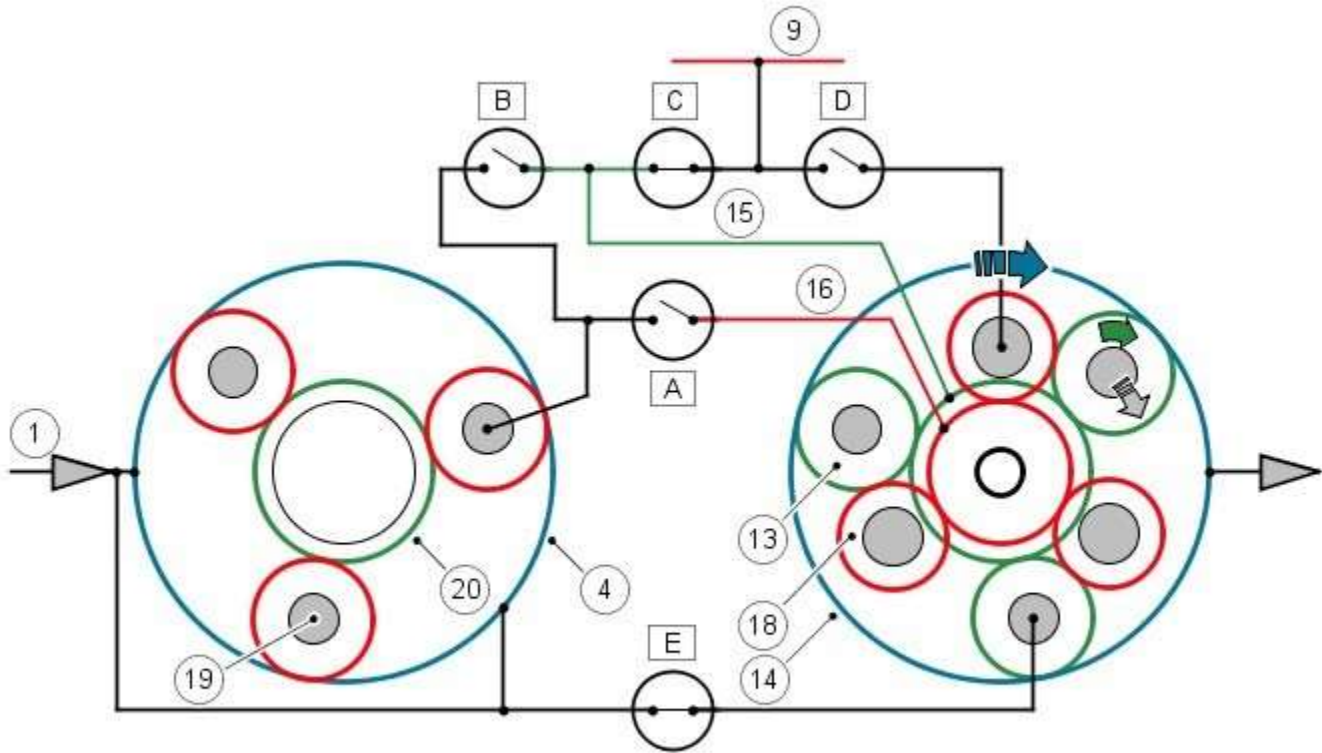
The JaguarDrive selector and the selector spool valve are in the 'D' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Clutches 'A' and 'B' are released, removing the effect of the single web planetary gear train.

Clutch brake 'C' is applied which locks sunwheel 2 to the transmission housing.

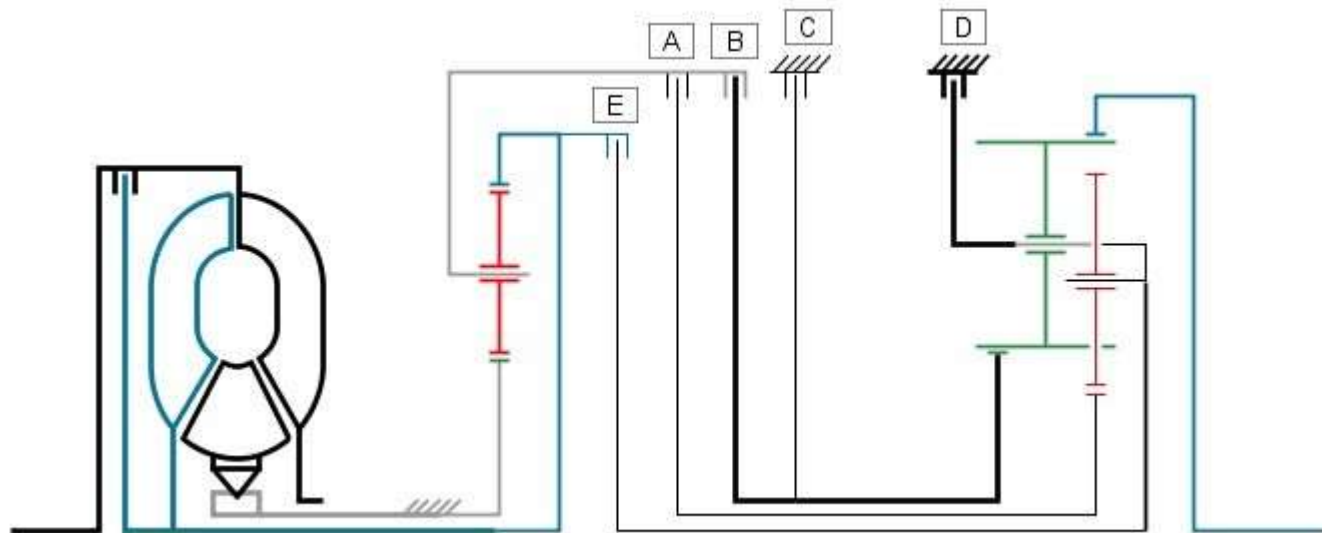
Clutch 'E' is engaged and drives the double web planetary gear carrier. This causes the long planetary gears to rotate around the fixed sunwheel 2 and transmit drive to ring gear 2 which is driven in the direction of engine rotation.

 NOTE: Refer to 'Shift Elements' illustration for key



E42731

Power Flow Reverse Gear



E42732

The JaguarDrive selector and the selector spool valve are in the 'R' position. Engine torque is transmitted from the torque converter turbine shaft to ring gear 1 of the single web planetary gear train and the outer plate carrier of clutch 'E'.

Ring gear 1 drives the planetary gears of the single web planetary gear train which rotate around the fixed sunwheel 1. This transmits the drive to the single web planetary gear carrier, the outer plate carrier of clutch 'A' and the inner plate carrier of

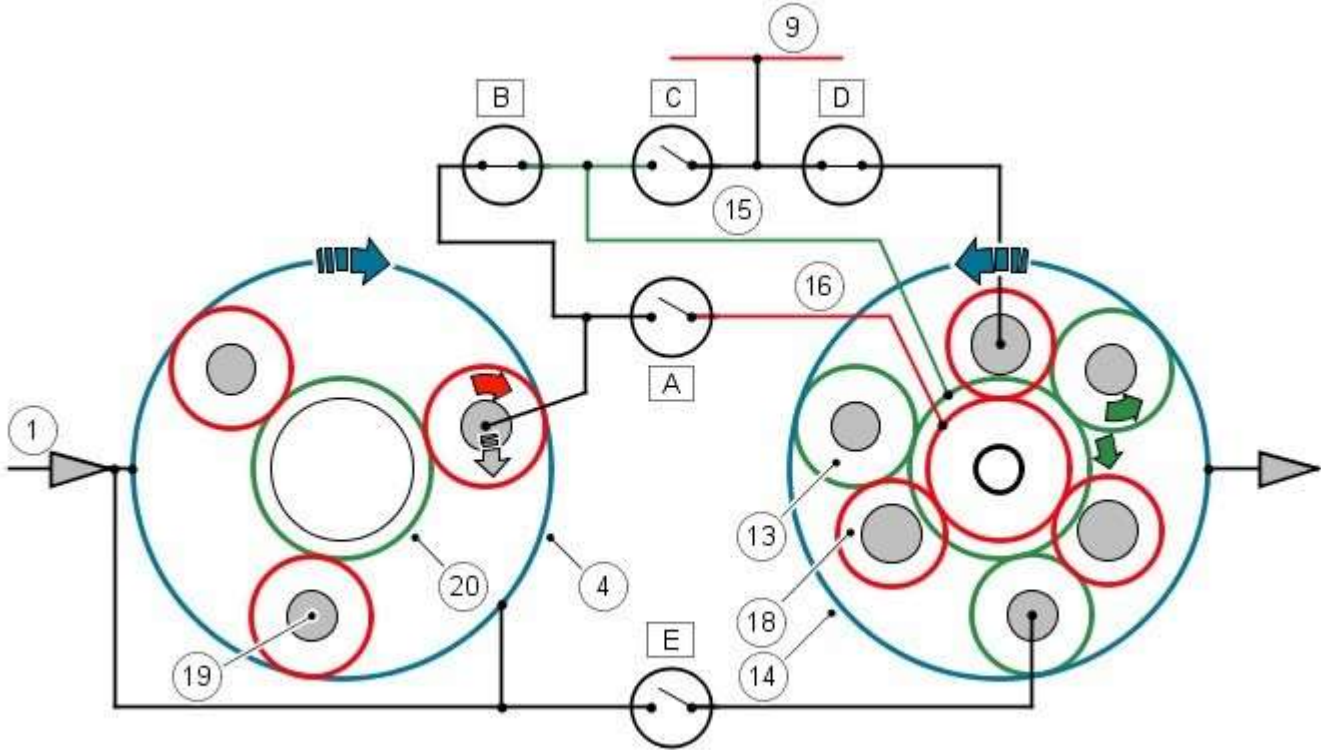
clutch 'B'.

With clutch 'B' applied, sunwheel 2 in the double web planetary gear train is driven and meshes with the long planetary gears.

The double web planetary gear carrier is locked to the transmission housing by brake clutch 'D'. This allows ring gear 2 to be driven in the opposite direction to engine rotation by the long planetary gears.

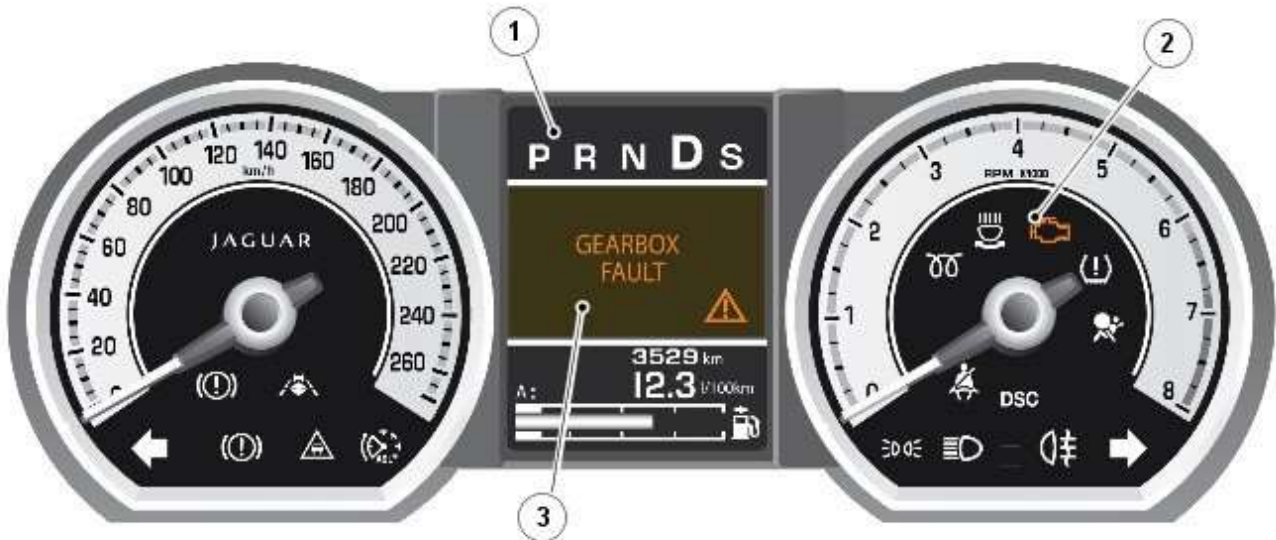


NOTE: Refer to 'Shift Elements' illustration for key



E42733

INSTRUMENT CLUSTER



E118106

Item	Description
1	Transmission selected gear status
2	MIL (malfunction indicator lamp)
3	Message center

The instrument cluster is connected to the [TCM](#) via the high speed [CAN](#) bus. Transmission status is transmitted by the [TCM](#) and displayed to the driver in one of two displays in the instrument cluster. For additional information, refer to 413-01 Instrument Cluster.

Malfunction Indicator Lamp

The [MIL \(malfunction indicator lamp\)](#) is located in the tachometer in the instrument cluster. Transmission related faults which may affect the vehicle emissions output will illuminate the [MIL](#).

The [MIL](#) is illuminated by the [ECM \(engine control module\)](#) on receipt of a relevant fault message from the [TCM](#) on the high speed [CAN](#). The nature of the fault can be diagnosed using a Jaguar approved diagnostic system which reads the fault codes stored in the [TCM](#) memory.

Transmission Status Display

The transmission status display is located in a [LCD \(liquid crystal display\)](#) at the top of the instrument cluster, between the speedometer and the tachometer. The [LCD](#) shows the JaguarDrive selector position or the selected gear when in manual 'Jaguar Sequential Shift' mode.

The following table shows the displays and their descriptions.

Symbol	Description
P	Park selected
R	Reverse selected
N	Neutral selected
D	Drive selected
S	Sport mode selected
1	1st gear selected (manual Jaguar sequential shift mode)
2	2nd gear selected (manual Jaguar sequential shift mode)
3	3rd gear selected (manual Jaguar sequential shift mode)
4	4th gear selected (manual Jaguar sequential shift mode)
5	5th gear selected (manual Jaguar sequential shift mode)
6	6th gear selected (manual Jaguar sequential shift mode)

The message center is located in the lower center of the instrument cluster. The message center is a [LCD](#) to relay vehicle status and operating information to the driver and can display messages relating to a number of the vehicle systems. If a transmission fault occurs, the message center will display the message 'GEARBOX FAULT'.

TRANSMISSION CONTROL MODULE

The [TCM](#) outputs signals to control the shift control solenoid valve and the EPRS (electronic pressure regulating solenoid) to control the hydraulic operation of the transmission.

The [TCM](#) processes signals from the transmission speed and temperature sensors, the [ECM](#) and other vehicle systems. From the received signal inputs and pre-programmed data, the module calculates the correct gear, torque converter clutch setting and optimum pressure settings for gear shift and lock-up clutch control.

The [ECM](#) supplies the engine management data over the high speed [CAN](#) bus. The [TCM](#) requires engine data to efficiently control the transmission operation, for example; flywheel torque, engine speed, accelerator pedal angle, engine temperature. The steering angle sensor and the [ABS \(anti-lock brake system\)](#) module also supply data to the [TCM](#) on the high speed [CAN](#) bus. The [TCM](#) uses data from these systems to suspend gear changes when the vehicle is cornering and/or the [ABS](#) module is controlling braking or traction control.

Using the signal inputs and the memorized data, the [TCM](#) control program computes the correct gear and torque converter lock-up clutch setting and the optimum pressure settings for gear shift and lock-up clutch control. Special output-side modules (power output stages, current regulator circuits), allow the [TCM](#) to control the solenoid valves and pressure regulators and consequently precisely control the hydraulics of the automatic transmission. In addition, the amount and duration of engine interventions are supplied to the engine management by way of the [CAN](#) bus.

The transmission has a fully electronic JaguarDrive selector with no Bowden cable connection to the transmission. The transmission selections are made using a rotary JaguarDrive selector which rises from the floor console once the engine is running. Rotation of the JaguarDrive selector to any of the five positions is sensed by the [TCM](#) via the high speed [CAN](#) bus. The [TCM](#) then reacts according to the selected position. The 'S' (sport) position selection allows the [TCM](#) to operate the transmission using the semi-automatic 'Jaguar Sequential Shift'.

Gear selections are sensed by the [TCM](#) when the driver operates the steering wheel paddle switches. Once the JaguarDrive selector position is confirmed, the [TCM](#) outputs appropriate information on the high speed [CAN](#) bus.

If the JaguarDrive selector is in 'D', 'Jaguar Sequential Shift' is temporary and will cancel after a time period or can be cancelled by pressing and holding the + paddle for approximately 2 seconds.

If the JaguarDrive selector is in 'S', 'Jaguar Sequential Shift' is permanent and can only be cancelled by pressing and holding the + paddle for approximately 2 seconds or by moving the JaguarDrive selector to the 'D' position.

The [TCM](#) can be reprogrammed using a Jaguar approved diagnostic system using a flash code. The [TCM](#) processor has a 440 kb internal flash memory. Of this capacity, approximately 370 kb are used by the basic transmission program. The remainder, approximately 70 kb is used to store vehicle-specific application data.

Engine Stall

If the vehicle stalls it will coast down in gear, with the transmission providing drive to the engine. A restart can be attempted at this point and the engine may start and the driver can continue.

If the coast down speed reduces such that the speed of the engine is less than 600 rev/min, the transmission will go to neutral, D illumination will flash in the instrument cluster. The driver needs to select neutral or park and then press the brake pedal to restart the engine.

If the start/stop button is pressed when driving, the message ENGINE STOP BUTTON PRESSED is displayed in the message center but there will be no change to the ignition state. If the driver requires to switch off the engine, the start/stop button must be pressed for a second time. The engine will be stopped and will be back driven by the transmission as the vehicle coasts down. When the engine speed is less than 600 rev/min the transmission engages neutral (flashing D illumination in the instrument cluster). When vehicle speed is less than 2 km/h (1.2 mph) Park is engaged. The JaguarDrive selector automatically rotates back to its lowered P position and the vehicle ignition is switched off.

The park engagement is prevented in a stall case as the ignition power is on and D was the last selected gear. The park engagement speed at ignition off is from the least value of the wheel speeds ([CAN](#) signal) and transmission output speed (internal signal).

Component Description

TRANSMISSION

The transmission comprises the main casing which houses all of the transmission components. The main casing also incorporates an integral bell housing.

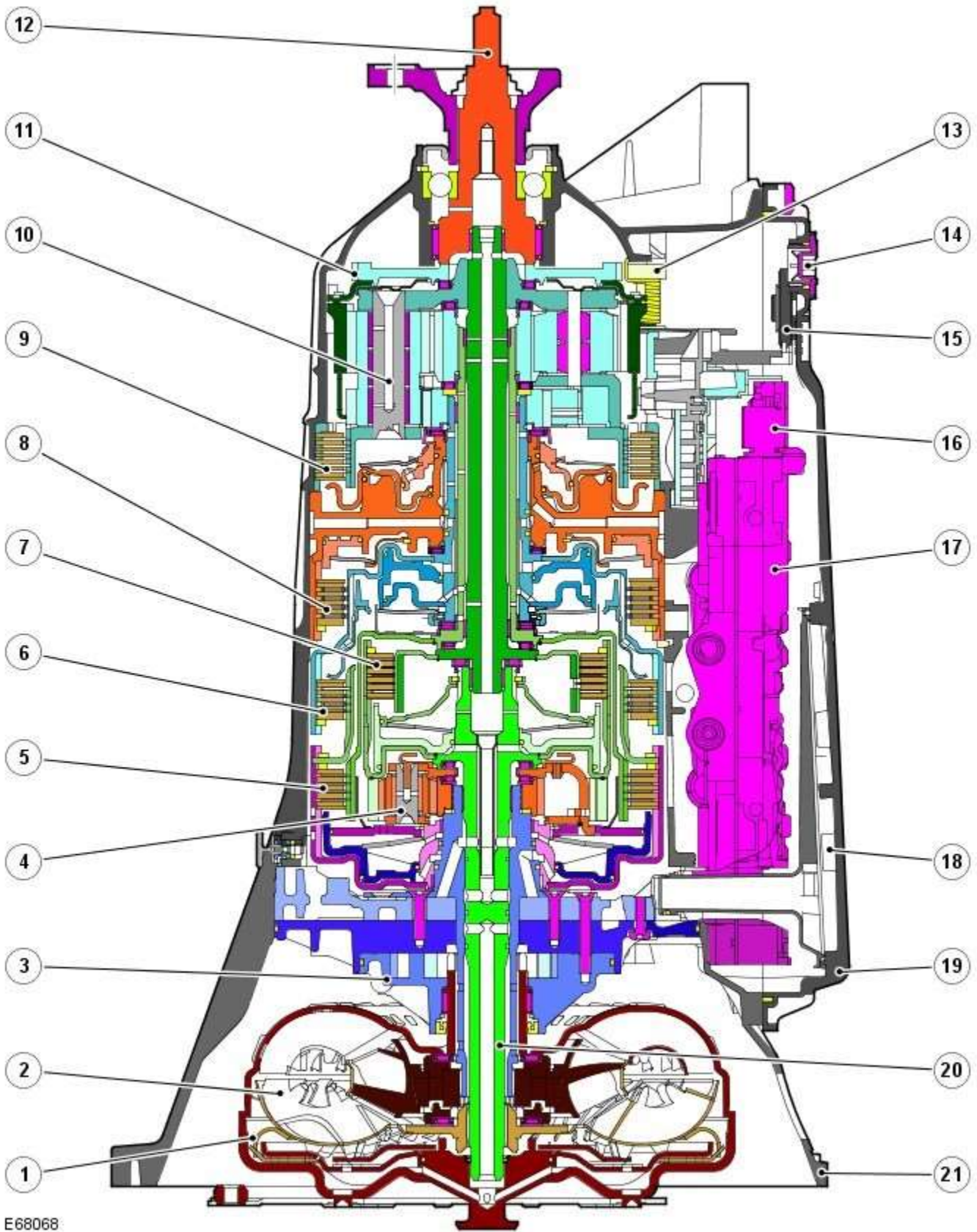
A fluid pan is attached to the lower face of the main casing and is secured with bolts. The fluid pan is sealed to the main casing with a gasket. Removal of the fluid pan allows access to the Mechatronic valve block. The fluid pan has a magnet located around the drain plug which collects any metallic particles present in the transmission fluid.

A fluid filter is located inside the fluid pan. If the transmission fluid becomes contaminated or after any service work, the fluid pan with integral filter must be replaced.

The integral bell housing provides protection for the torque converter assembly and also provides the attachment for the gearbox to the engine cylinder block. The torque converter is a non-serviceable assembly which also contains the lock-up clutch mechanism. The torque converter drives a crescent type pump via drive tangs. The fluid pump is located in the main casing, behind the torque converter.

The main casing contains the following major components:

- Input shaft
- Output shaft
- Mechatronic valve block which contains the solenoids, speed sensors and the [TCM](#)
- Three rotating multiplate drive clutches
- Two fixed multiplate brake clutches
- A single planetary gear train and a double planetary gear train.

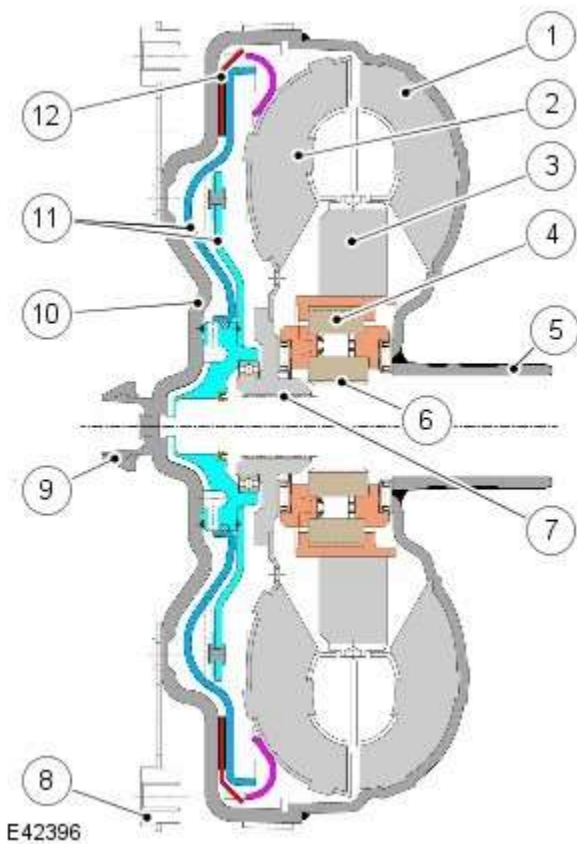


E68068

Item	Description
1	Torque converter lock-up clutch
2	Torque converter
3	Fluid pump
4	Single planetary gearset

5	Clutch A
6	Clutch B
7	Clutch E
8	Brake C
9	Brake D
10	Double planetary gearset
11	Park lock gear
12	Output shaft
13	Park lock pawl
14	Drain plug
15	Magnet
16	Pressure regulator
17	Mechatronic valve block
18	Fluid filter
19	Fluid pan
20	Input shaft
21	Bell housing

TORQUE CONVERTER



Item	Description
1	Impeller
2	Turbine
3	Stator
4	Freewheel clutch
5	Torque converter hub
6	Stator shaft
7	Turbine shaft

8	Drive plate
9	Journal - Drive plate/crankshaft location
10	Torque converter cover
11	Lock-up clutch piston
12	Lock-up clutch plate

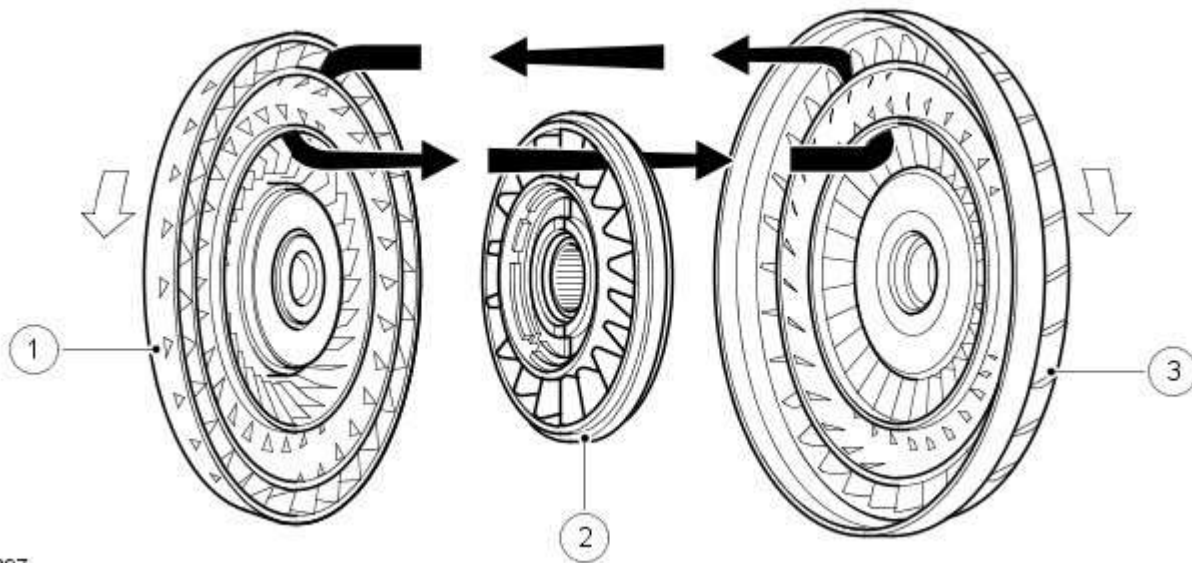
The torque converter is the coupling element between the engine and the transmission and is located in the bell housing, on the engine side of the transmission. The driven power from the engine crankshaft is transmitted hydraulically and mechanically through the torque converter to the transmission. The torque converter is connected to the engine by a drive plate attached to the rear of the crankshaft.

The torque converter comprises an impeller, a stator and a turbine. The torque converter is a sealed unit with all components located between the converter housing cover and the impeller. The two components are welded together to form a sealed, fluid filled housing. With the impeller welded to the converter housing cover, the impeller is therefore driven at engine crankshaft speed.

The converter housing cover has four threaded bosses, which provide for attachment of the engine drive plate. The threaded bosses also provide for location of special tools which are required to remove the torque converter from the bell housing.

Impeller

Fluid Flow



E42397

Item	Description
1	Turbine
2	Stator
3	Impeller

When the engine is running the rotating impeller acts as a centrifugal pump, picking up fluid at its center and discharging it at high velocity through the blades on its outer rim. The design and shape of the blades and the curve of the impeller body cause the fluid to rotate in a clockwise direction as it leaves the impeller. This rotation improves the efficiency of the fluid as it contacts the outer row of blades on the turbine.

The centrifugal force of the fluid leaving the blades of the impeller is passed to the curved inner surface of the turbine via the tip of the blades. The velocity and clockwise rotation of the fluid causes the turbine to rotate.

Turbine

The turbine is similar in design to the impeller with a continuous row of blades. Fluid from the impeller enters the turbine through the tip of the blades and is directed around the curved body of the turbine to the root of the blades. The curved surface redirects the fluid back in the opposite direction to which it entered the turbine, effectively increasing the turning force applied to the turbine from the impeller. This principle is known as torque multiplication.

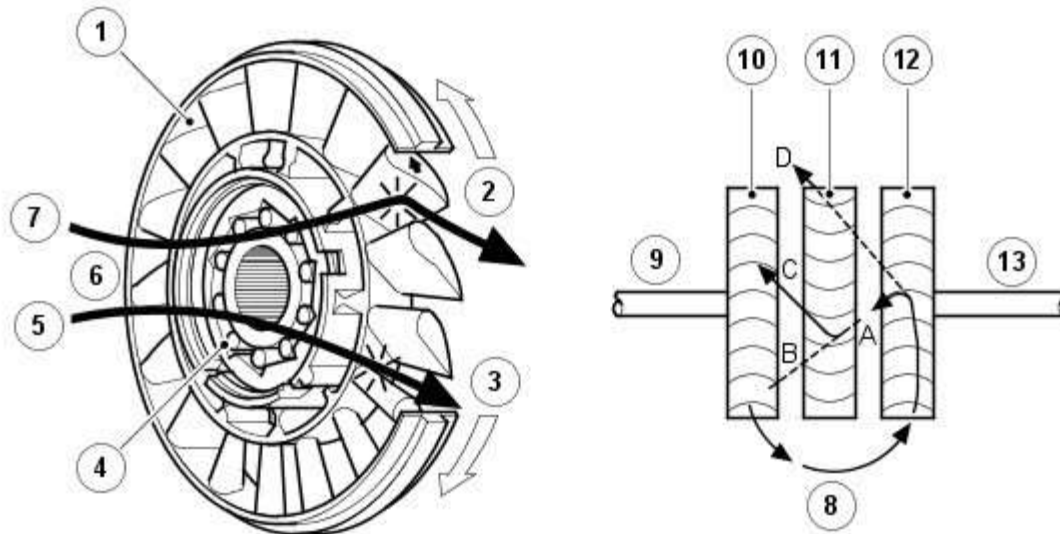
When engine speed increases, turbine speed also increases. The fluid leaving the inner row of the turbine blades is rotated in a counter-clockwise direction due to the curve of the turbine and the shape of the blades. The fluid is now flowing in the opposite direction to the engine rotation and therefore the impeller. If the fluid was allowed to hit the impeller in this condition, it would have the effect of applying a brake to the impeller, eliminating the torque multiplication effect. To prevent this, the stator is located between the impeller and the turbine.

Stator

The stator is located on the splined transmission input shaft via a freewheel clutch. The stator comprises a number of blades which are aligned in an opposite direction to those of the impeller and turbine. The main function of the stator is to redirect the returning fluid from the turbine, changing its direction to that of the impeller.

The redirected fluid from the stator is directed at the inner row of blades of the impeller, assisting the engine in turning the impeller. This sequence increases the force of the fluid emitted from the impeller and thereby increases the torque multiplication effect of the torque converter.

Stator Functions



E 42398

Item	Description
1	Blades
2	Stator held – fluid flow redirected
3	Stator rotates freely
4	Roller
5	Converter at coupling speed
6	Fluid flow from turbine
7	Converter multiplying
8	Fluid flow from impeller
9	Drive from engine
10	Impeller
11	Stator
12	Turbine
13	Output to transmission

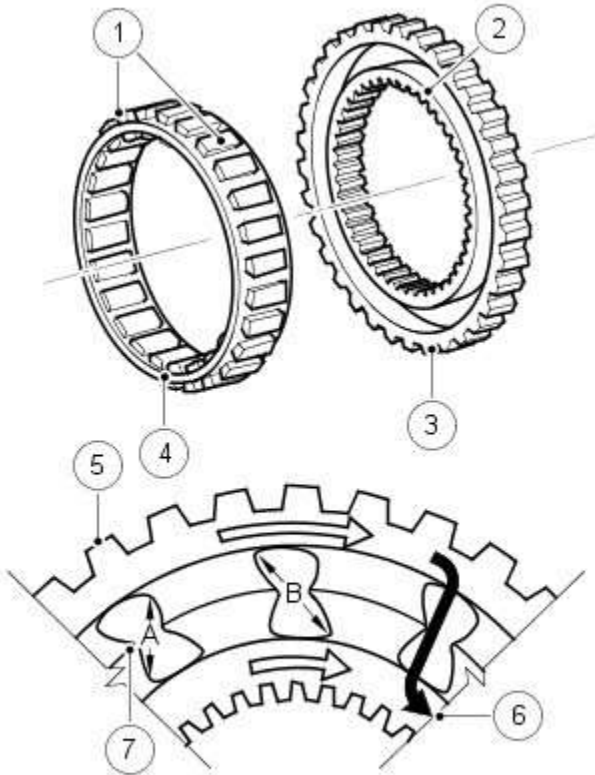
Fluid emitted from the impeller acts on the turbine. If the turbine is rotating at a slower speed than the fluid from the impeller, the fluid will be deflected by the turbine blades in the path 'A'. The fluid is directed at and deflected by the stator blades from path 'B' to path 'C'. This ensures that the fluid is directed back to the pump in the optimum direction. In this condition the sprag clutch is engaged and the force of the fluid on the stator blades assists the engine in rotating the impeller.

As the rotational speed of the engine and therefore the turbine increases, the direction of the fluid leaving the turbine changes to path 'D'. The fluid is now directed from the turbine to the opposite side of the stator blades, rotating the stator in the opposite direction. To prevent the stator from resisting the smooth flow of the fluid from the turbine, the sprag clutch releases, allowing the stator to rotate freely on its shaft.

When the stator becomes inactive, the torque converter no longer multiplies the engine torque. When the torque converter reaches this operational condition it ceases to multiply the engine torque and acts solely as a fluid coupling, with the impeller and the turbine rotating at approximately the same speed.

The stator uses a sprag type, one way, freewheel clutch. When the stator is rotated in a clockwise direction the sprags twist and are wedged between the inner and outer races. In this condition the sprags transfer the rotation of the outer race to the inner race which rotates at the same speed.

One Way Free Wheel Clutch – Typical



E 42712

Item	Description
1	Sprags
2	Inner race
3	Outer race
4	Sprag and cage assembly
5	Sprag outer race
6	Sprag inner race
7	Retaining ring

The free wheel clutch can perform three functions; hold the stator stationary, drive the stator and free wheel allowing the stator to rotate without a drive output. The free wheel clutch used in the ZF 6HP28 transmission is of the sprag type and comprises an inner and outer race and a sprag and cage assembly. The inner and outer races are pressed into their related components with which they rotate. The sprag and cage assembly is located between the inner and outer races.

The sprags are located in a cage which is a spring which holds the sprags in the 'wedge' direction and maintains them in contact with the inner and outer races.

Referring to the illustration, the sprags are designed so that the dimension 'B' is larger than the distance between the inner and outer race bearing surfaces. When the outer race rotates in a clockwise direction, the sprags twist and the edges across the dimension 'B' wedge between the races, providing a positive drive through each sprag to the inner race. The dimension 'A' is smaller than the distance between the inner and outer race bearing surfaces. When the outer race rotates in an anti-clockwise direction, the dimension 'A' is too small to allow the sprags to wedge between the races, allowing the outer race to rotate freely.

On the illustration shown, when the outer race is rotated in a clockwise direction, the sprags twist and are 'wedged' between the inner and outer races. The sprags then transfer the rotation of the outer race to the inner race, which rotates at the same speed.

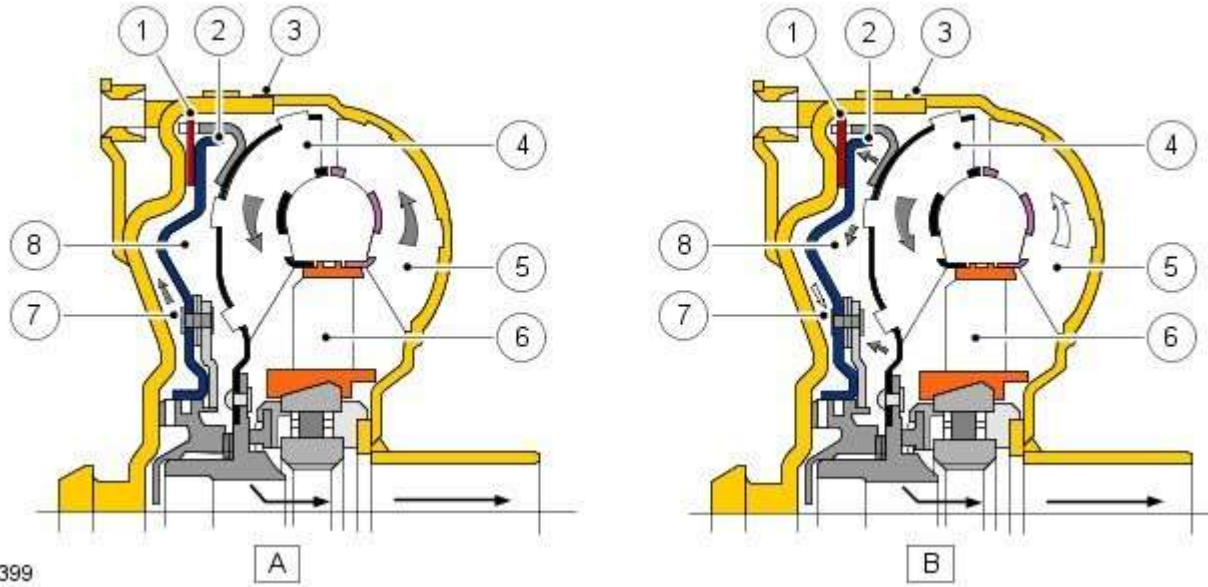
Lock-Up Clutch Mechanism

The [TCC \(torque converter clutch\)](#) is hydraulically controlled by an EPRS, which is controlled by the [TCM](#). This allows the torque converter to have three states of operation as follows:

- Fully engaged
- Controlled slip variable engagement
- Fully disengaged.

The [TCC](#) is controlled by two hydraulic spool valves located in the valve block. These valves are actuated by pilot pressure supplied via a solenoid valve which is also located in the valve block. The solenoid valve is operated by [PWM \(pulse width](#)

modulation) signals from the [TCM](#) to give full, partial or no lock-up of the torque converter.



Item	Description
A	Unlocked condition
B	Locked condition
1	Clutch plate
2	Clutch piston
3	Torque converter body
4	Turbine
5	Impeller
6	Stator
7	Piston chamber
8	Turbine chamber

The lock-up clutch is a hydro-mechanical device which eliminates torque converter slip, improving fuel consumption. The engagement and disengagement is controlled by the [TCM](#) to allow a certain amount of controlled 'slip'. This allows a small difference in the rotational speeds of the impeller and the turbine which results in improved shift quality. The lock-up clutch comprises a piston and a clutch friction plate.

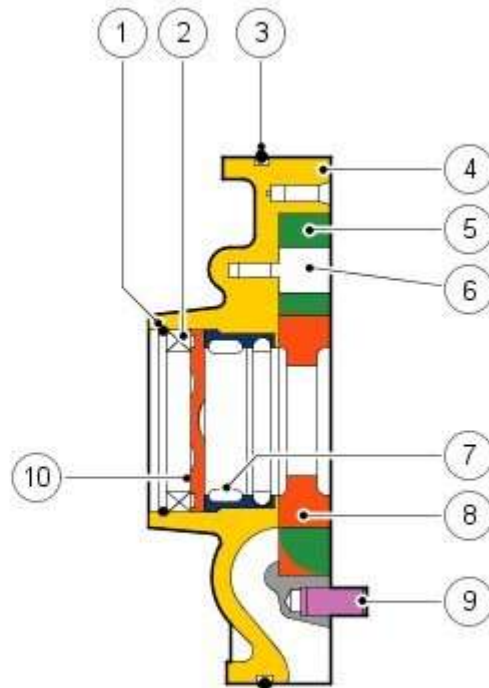
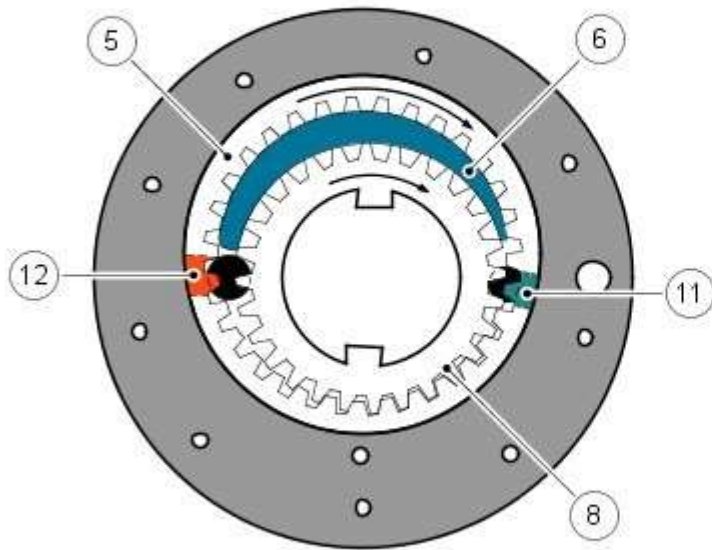
In the unlocked condition, the oil pressure supplied to the piston chamber and the turbine chamber is equal. Pressurized fluid flows through a drilling in the turbine shaft and through the piston chamber to the turbine chamber. In this condition the clutch plate is held away from the torque converter body and torque converter slip is permitted.

In the locked condition, the [TCC](#) spool valves are actuated by the EPRS. The fluid flow in the unlocked condition is reversed and the piston chamber is vented. Pressurized fluid is directed into the turbine chamber and is applied to the clutch piston. The piston moves with the pressure and pushes the clutch plate against the torque converter body. As the pressure increases, the friction between the clutch plate and the body increases, finally resulting in full lock-up of the clutch plate with the body. In this condition there is direct mechanical drive from the engine crankshaft to the transmission planetary gear train.

FLUID PUMP

The fluid pump is an integral part of the transmission. The fluid pump is used to supply hydraulic pressure for the operation of the control valves and clutches, to pass the fluid through the transmission cooler and to lubricate the gears and shafts.

The ZF 6HP28 fluid pump is a crescent type pump and is located between the intermediate plate and the torque converter. The pump has a delivery rate of 16 cm³ per revolution.



E42400

Item	Description
1	Securing ring
2	Shaft oil seal
3	O-ring seal
4	Pump housing
5	Ring gear
6	Crescent spacer
7	Roller bearing
8	Impeller
9	Centering pin
10	Spring washer
11	Outlet port (high pressure)
12	Inlet port (low pressure)

The pump comprises a housing, a crescent spacer, an impeller and a ring gear. The housing has inlet and outlet ports to direct flow and is located in the intermediate plate by a centering pin. The pump action is achieved by the impeller, ring gear and crescent spacer.

The crescent spacer is fixed in its position by a pin and is located between the ring gear and the impeller. The impeller is driven by drive from the torque converter hub which is located on a needle roller bearing in the pump housing. The impeller teeth mesh with those of the ring gear. When the impeller is rotated, the motion is transferred to the ring gear which rotates in the same direction.

The rotational motion of the ring gear and the impeller collects fluid from the intake port in the spaces between the teeth. When the teeth reach the crescent spacer, the oil is trapped in the spaces between the teeth and is carried with the rotation of the gears. The spacer tapers near the outlet port. This reduces the space between the gear teeth causing a build up of fluid pressure as the oil reaches the outlet port. When the teeth pass the end of the spacer the pressurized fluid is released into the outlet port.

The fluid emerging from the outlet port is passed through the fluid pressure control valve. At high operating speeds the pressure control valve maintains the output pressure to the gearbox at a predetermined maximum level. Excess fluid is relieved from the pressure control valve and is directed, via the main pressure valve in the valve block, back to the pump inlet port. This provides a pressurized feed to the pump inlet which prevents cavitation and reduces pump noise.

MECHATRONIC VALVE BLOCK

The Mechatronic valve block is located in the bottom of the transmission and is covered by the fluid pan. The valve block houses the [TCM](#), electrical actuators, speed sensors and control valves which provide all electro-hydraulic control for all transmission functions. The Mechatronic valve block comprises the following components:

- [TCM](#)
- Pressure regulator solenoids
- Shift control solenoid
- Damper
- Hydraulic spool valves
- Selector valve
- Temperature sensor
- Turbine speed sensor
- Output shaft speed sensor.

Sensors

Speed Sensors

The turbine speed sensor and the output shaft speed sensor are Hall effect type sensors located in the Mechatronic valve block and are not serviceable items. The [TCM](#) monitors the signals from each sensor to determine the input (turbine) speed and the output shaft speed.

The turbine speed is monitored by the [TCM](#) to calculate the slip of the torque converter clutch and internal clutch slip. This signal allows the [TCM](#) to accurately control the slip timing during shifts and adjust clutch application or release pressure for overlap shift control.

The output shaft speed is monitored by the [TCM](#) and compared to engine speed signals received on the [CAN](#) bus from the [ECM](#). Using a comparison of the two signals the [TCM](#) calculates the transmission slip ratio for plausibility and maintains adaptive pressure control.

Temperature Sensor

The temperature sensor is also located in the Mechatronic valve block. The [TCM](#) uses the temperature sensor signals to determine the temperature of the transmission fluid. These signals are used by the [TCM](#) to control the transmission operation to promote faster warm-up in cold conditions or to assist with fluid cooling by controlling the transmission operation when high fluid temperatures are experienced. If the sensor fails, the [TCM](#) will use a default value and a fault code will be stored in the [TCM](#).

Damper

There is one damper located in the valve housing. The damper is used to regulate and dampen the regulated pressure supplied via EPRS. The damper is load dependent through modulation of the damper against return spring pressure.

The damper comprises a piston, a housing bore and a spring. The piston is subject to the pressure applied by the spring. The bore has a connecting port to the function to which it applies. Fluid pressure applied to the applicable component (i.e. a clutch) is also subjected to the full area of the piston, which moves against the opposing force applied by the spring. The movement of the piston creates an action similar to a shock absorber, momentarily delaying the build up of pressure in the circuit. This results in a more gradual application of clutches improving shift quality.

Spool Valves

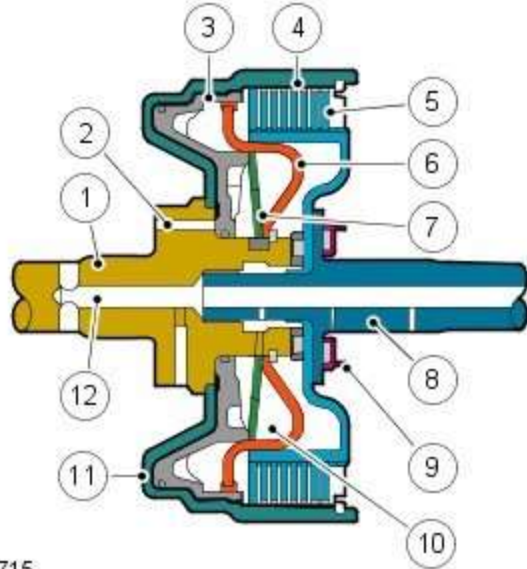
The valve block spool valves control various functions of the transmission. The spool valves are of conventional design and are operated by fluid pressure.

Each spool valve is located in its spool bore and held in a default (unpressurized) position by a spring. The spool bore has a number of ports which allow fluid to flow to other valves and clutches to enable transmission operation. Each spool has a piston which is waisted to allow fluid to be diverted into the applicable ports when the valve is operated.

When fluid pressure moves a spool, one or more ports in the spool bore are covered or uncovered. Fluid is prevented from flowing or is allowed to flow around the applicable waisted area of the spool and into another uncovered port. The fluid is either passed through galleries to actuate another spool, operate a clutch or is returned to the fluid pan.

DRIVE CLUTCHES

Multiplate Drive or Brake Clutch – Typical



E42715

Item	Description
1	Input shaft
2	Main pressure supply port
3	Piston
4	Cylinder – external plate carrier
5	Clutch plate assembly
6	Baffle plate
7	Diaphragm spring
8	Output shaft
9	Bearing
10	Dynamic pressure equalization chamber
11	Piston chamber
12	Lubrication channel

There are three drive clutches and two brake clutches used in the ZF 6HP28 transmission. Each clutch comprises one or more friction plates dependent on the output controlled. A typical clutch consists of a number of steel outer plates and inner plates with friction material bonded to each face.

On 5.0L [SC \(supercharger\)](#) and 3.0L diesel models, the updated transmission includes additional clutch plates to enable the transmission to manage the additional power output from these engines.

The clutch plates are held apart mechanically by a diaphragm spring and hydraulically by dynamic pressure. The pressure is derived from a lubrication channel which supplies fluid to the bearings etc. The fluid is passed via a drilling in the output shaft into the chamber between the baffle plate and the piston. To prevent inadvertent clutch application due to pressure build up produced by centrifugal force, the fluid in the dynamic pressure equalization chamber overcomes any pressure in the piston chamber and holds the piston off the clutch plate assembly.

When clutch application is required, main pressure from the fluid pump is applied to the piston chamber from the supply port. This main pressure overcomes the low pressure fluid present in the dynamic pressure equalization chamber. The piston moves, against the pressure applied by the diaphragm spring, and compresses the clutch plate assembly. When the main pressure falls, the diaphragm spring pushes the piston away from the clutch plate assembly, disengaging the clutch.

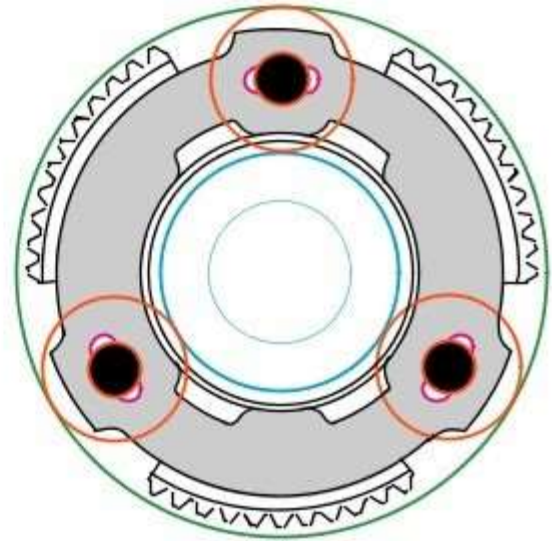
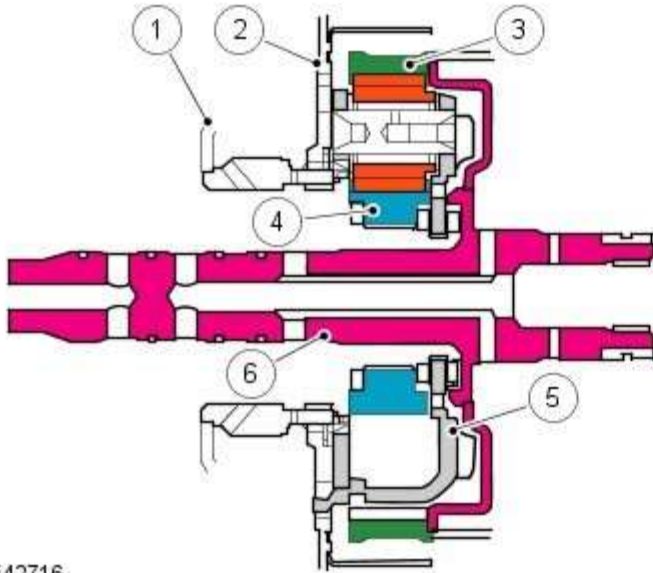
PLANETARY GEAR TRAINS

The planetary gear trains used on the ZF 6HP28 transmission comprise a single web planetary gear train and a double web planetary gear train. These gear trains are known as Lepelletier type gear trains and together produce the six forward gears and the one reverse gear.

Single Web Planetary Gear Train

The single web planetary gear train comprises:

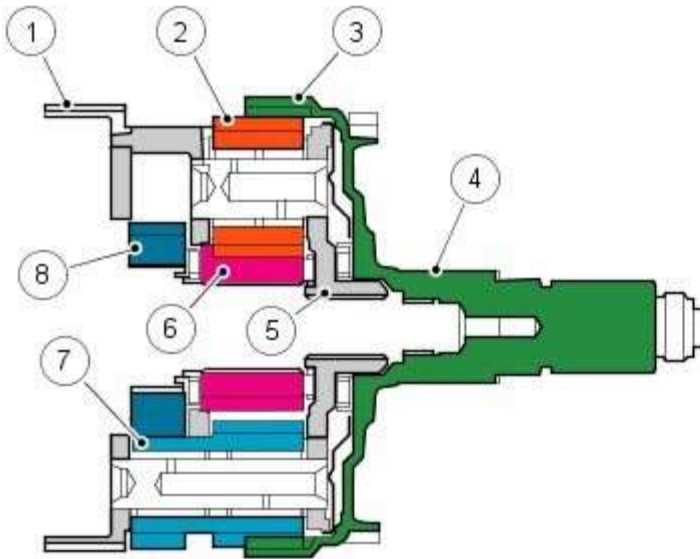
- Sunwheel
- Three (naturally aspirated versions) or four (5.0L [SC](#) and 3.0L diesel versions) planetary gears
- Planetary gear carrier (spider)
- Ring gear or annulus.



E42716

Item	Description
1	Cylinder
2	Baffle plate
3	Ring gear
4	Sun gear
5	Planetary gear spider
6	Torque converter input shaft

Torque Converter Input Shaft



E42717

Item	Description
1	Planetary gear spider
2	Planetary gears (short)
3	Ring gear
4	Output shaft
5	Planetary gear carrier
6	Sunwheel
7	Double planetary gears (long)
8	Sunwheel

The double planetary gear train comprises:

- Two sunwheels
- Three short planetary gears
- Three long planetary gears
- Planetary gear carrier
- Ring gear or annulus

ELECTRONIC PARK LOCK

The park lock is electronically actuated by solenoid valve located in the valve block. The park lock is engaged by a mechanical spring system comprising a parking disc and a lock cylinder controlled by a solenoid valve.

The park lock is engaged when the [TCM](#) receives a park request from the JaguarDrive selector. When the park lock is released, a solenoid valve in the valve housing directs hydraulic pressure to the lock cylinder, which moves the piston within the cylinder and releases the park lock pawl at the rear of the transmission by means of a connecting rod. The solenoid on the lock cylinder is energized and locks the cylinder piston in the unlocked position. Additional locking of the piston is achieved with ball catches within the lock cylinder.

When park is selected, the solenoid on the lock cylinder is de-energized, the ball catches are released and the piston is free to move in the lock cylinder. The solenoid in the valve housing is also de-energized. The spring loaded parking disc pulls the cylinder piston in the park direction which allows the park disc to move on its mounting. This movement is transferred via the connecting rod to parking pawl, which is engaged in the park lock gear.

If an electrical failure occurs, the park lock can be manually released by means of an emergency park release lever located in the floor console. The lever is connected to the parking disc by a cable and allows the park lock to be released manually. For additional information, refer to 307-05B Automatic Transmission/Transaxle External Controls.

TRANSMISSION CONTROL MODULE

The [TCM](#) is an integral part of the Mechatronic valve block which is located at the bottom of the transmission, within the fluid pan. The [TCM](#) is the main controlling component of the transmission.

The [TCM](#) processes signals from the transmission speed and temperature sensors, [ECM](#) and other vehicle systems. From the received signal inputs and pre-programmed data, the module calculates the correct gear, torque converter clutch setting and optimum pressure settings for gear shift and lock-up clutch control.

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Diagnostics

Diagnosis and Testing

Principle of Operation

For a detailed description of the automatic transmission/transaxle, refer to the relevant Description and Operation section in the workshop manual. REFER to: (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol)

[Transmission Description](#) (Description and Operation),
[Transmission Description](#) (Description and Operation),
[Transmission Description](#) (Description and Operation).

Fluid Level and Condition Check



CAUTION: The vehicle should not be driven if the fluid level is low as internal failure can result.



NOTE: The transmission fluid temperature must not be allowed to exceed 50°C (122°F) whilst checking level. Should the temperature rise above this figure, abort the check and allow the transmission fluid to cool to below 30°C (86°F).

This vehicle is not equipped with a fluid level indicator. An incorrect level may affect the transmission operation and could result in transmission damage. To correctly check and add fluid to the transmission.

REFER to: [Transmission Fluid Level Check](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

High Fluid Level

A fluid level that is too high may cause the fluid to become aerated due to the churning action of the rotating internal parts. This will cause erratic control pressure, foaming, loss of fluid from the vent tube and possible transmission damage. If an overfill condition is identified, with the engine at idle ensure the fluid temperature is within the specified range and allow the excess fluid to drain until a small thread of fluid runs from the filler/level plug hole.

Low Fluid Level

A low fluid level could result in poor transmission engagement, slipping, or damage. This could also indicate a leak in one of the transmission seals or gaskets.

REFER to: [Transmission Fluid Level Check](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

Adding Fluid



CAUTION: The use of any other type of transmission fluid other than that specified can result in transmission damage.

If fluid needs to be added, add fluid in 0.50 liter increments through the fill hole Opening. Do not overfill the fluid. For fluid type, refer to the General Specification chart in this section.

REFER to: [Specifications](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Specifications).

Fluid Condition Check

1. Check the fluid level.
REFER to: [Transmission Fluid Level Check](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).
2. Observe the color and the odor of the fluid. The color under normal circumstances should be Honey.
3. Allow the fluid to drip onto a facial tissue and examine the stain.
4. If evidence of solid material is found, the transmission fluid pan should be removed for further inspection.

NOTE: In the event of a transmission unit replacement for internal failure, the oil cooler and pipes must also be replaced.

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical	Hydraulic
<ul style="list-style-type: none"> Damaged/stuck shift mechanism Damaged automatic transmission casing 	<ul style="list-style-type: none"> Blown fuse(s) Damaged, loose or corroded connectors Wiring harness 	<ul style="list-style-type: none"> Fluid level too high/low Poor condition of fluid Fluid leak

- If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
- If the cause is not visually evident check for diagnostic trouble codes (DTCs) and refer to the DTC Index.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the control module/transmission is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/transmission.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
P0121-86	Throttle/Pedal Position Sensor A Circuit Range/Performance - signal invalid	<ul style="list-style-type: none"> Throttle/Pedal Position Sensor Fault (Data received over CAN Bus) 	Check Engine Control Module for stored DTCs
P0219-86	Engine Overspeed Condition - signal invalid	<ul style="list-style-type: none"> Engine speed too low or too high (Data received over CAN Bus) 	Check Engine Control Module for stored DTCs
P0500-81	Vehicle Speed Sensor A - invalid serial data received	<ul style="list-style-type: none"> Vehicle Speed Sensor fault (Data received over CAN Bus) 	Check DSC module for stored DTCs
P0501-81	Vehicle Speed Sensor A Range/Performance invalid serial data received	<ul style="list-style-type: none"> Vehicle Speed receive over CAN Bus does not match Transmission Output-Shaft speed 	Check Anti-lock braking system module for stored DTCs. Check correct Differential is installed to the vehicle
P0561-1C	System Voltage Unstable - Circuit voltage out of range	<ul style="list-style-type: none"> Power supply voltage out of range when engine running 	Check Engine control module for stored DTCs. Check Charging System and Battery condition
P0562-21	System Voltage Low - signal amplitude < minimum	<ul style="list-style-type: none"> Circuit low voltage. Battery supply voltage to Transmission Control Module (Transmission 	Refer to Circuit diagrams and check Power and Ground Circuit for fault. Check Engine control module for stored DTCs. Check Charging System and Battery condition

DTC	Description	Possible Cause	Action
		control module)	
P0563-22	System Voltage High - signal amplitude > maximum	<ul style="list-style-type: none"> High Battery charge, alternator fault 	Check Engine control module for stored DTCs. Check Charging System and Battery condition
P0601-41	Internal Control Module Memory Check Sum Error - general checksum failure	<ul style="list-style-type: none"> Software error Transmission control module failure 	Re-configure the Transmission control module using the manufacturer approved diagnostic system, clear DTC and re-test. If DTC remains, Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0604-00	Internal Control Module Random Access Memory (RAM) Error - no sub type information	<ul style="list-style-type: none"> Shift-by-Wire fault 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0605-41	Internal Control Module Read Only Memory (ROM) Error - general checksum failure	<ul style="list-style-type: none"> General checksum failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0606-04	Transmission control module Processor - System Internal Failures	<ul style="list-style-type: none"> Micro controller component faults 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0606-26	Transmission control module Processor - signal rate of change below threshold	<ul style="list-style-type: none"> Micro controller component faults 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0606-49	Transmission control module Processor-internal electronic failure	<ul style="list-style-type: none"> Micro controller component faults 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-04	Transmission control module Processor - System Internal Failures	<ul style="list-style-type: none"> Micro controller component faults 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-06	Transmission control module Processor - Algorithm Based Failures	<ul style="list-style-type: none"> Micro controller component faults 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-11	Transmission control module Processor - Circuit Short to Ground	<ul style="list-style-type: none"> Watchdog fault 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-12	Transmission control module Processor - Circuit Short to Battery	<ul style="list-style-type: none"> Watchdog fault 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-13	Transmission control module Processor - Circuit Open	<ul style="list-style-type: none"> Watchdog fault 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-14	Transmission control module Processor - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Watchdog fault 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-21	Transmission control module Processor - signal amplitude < minimum	<ul style="list-style-type: none"> Watchdog fault 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-22	Transmission control module Processor - signal amplitude > maximum	<ul style="list-style-type: none"> Watchdog fault 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-47	Transmission control module Processor - watchdog / safety Micro controller failure	<ul style="list-style-type: none"> Watchdog fault 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-49	Transmission control module Processor - internal electronic failure	<ul style="list-style-type: none"> Micro controller component faults 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0613-68	Transmission control module Processor-Event Information	<ul style="list-style-type: none"> Watchdog fault 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index

DTC	Description	Possible Cause	Action
P061B-02	Internal Control Module Torque Calculation Performance - general signal failure	<ul style="list-style-type: none"> Transmission control module - positive torque signal not valid 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P061B-26	Internal Control Module Torque Calculation Performance - signal rate of change below threshold	<ul style="list-style-type: none"> Transmission control module positive torque signal not valid 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P062F-04	Internal Control Module EEPROM Error - System Internal Failures	<ul style="list-style-type: none"> EEPROM communication error 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0642-21	Sensor Reference Voltage A Circuit Low - signal amplitude < minimum	<ul style="list-style-type: none"> Sensor supply voltage fault low 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0643-22	Sensor Reference Voltage A Circuit High - signal amplitude > maximum	<ul style="list-style-type: none"> Sensor supply voltage fault high 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0657-13	Actuator Supply Voltage A Circuit / Open - Circuit Open	<ul style="list-style-type: none"> Actuator supply (pressure control valves etc) Open Circuit 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0657-1C	Actuator Supply Voltage A Circuit / Open - Circuit voltage out of range	<ul style="list-style-type: none"> Actuator supply (pressure control valves etc) voltage plausibility fault 	Refer to electrical Circuit diagrams and check Transmission control module connector for signs of water ingress or damage, check pin 7 for Short to Power or Ground (should NOT be connected and harness terminal should have a bung fitted). If no fault identified, suspect the Transmission control module. Check and install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0658-11	Actuator Supply Voltage A Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Actuator supply (pressure control valves etc) voltage Short to Ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0659-12	Actuator Supply Voltage A Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Actuator supply (pressure control valves etc) voltage Short to Power 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0667-01	PCM / Engine control module / Transmission control module Internal Temperature Sensor A Range/Performance - General Electrical Failure	<ul style="list-style-type: none"> General electrical failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0667-04	PCM / Engine control module / Transmission control module Internal Temperature Sensor A Range/Performance - System Internal Failures	<ul style="list-style-type: none"> Internal Electronic Failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0667-49	PCM / Engine control module / Transmission control module Internal Temperature Sensor A Range/Performance - internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0700-02	Transmission Control System (MIL Request) - General signal failure	<ul style="list-style-type: none"> General Signal failure 	Clear DTC, Road test and re-test, Read DTCs and Investigate as required
P0700-22	Transmission Control System (MIL Request) - signal amplitude > maximum	<ul style="list-style-type: none"> Double fault from monitoring of internal power supply and pressure regulator/solenoid control software 	If any of the following DTCs are also present; P074013, P096712, P273912, P273012, P272112, P096312, P276312, P097112, suspect the Transmission control module, check and install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0700-75	Transmission Control System (MIL Request) - Emergency Position Not Reachable	<ul style="list-style-type: none"> Emergency Position Not Reachable 	Clear DTC, Road test and re-test, Read DTCs and investigate as required

DTC	Description	Possible Cause	Action
P0710-13	Transmission Fluid Temperature Sensor A Circuit - Circuit Open	<ul style="list-style-type: none"> Transmission fluid temperature sensor Circuit Open Circuit 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0711-01	Transmission Fluid Temperature Sensor A Circuit Range/Performance - General Electrical Failure	<ul style="list-style-type: none"> General electrical failure 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0711-22	Transmission Fluid Temperature Sensor A Circuit Range/Performance - signal amplitude > maximum	<ul style="list-style-type: none"> Signal amplitude > maximum. Excessive jump in temperature 	Clear DTC. Carry out cold start road test, continue driving vehicle until normal operating temperature is achieved. Reads DTCs, if DTC returns, suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0712-11	Transmission Fluid Temperature Sensor A Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Transmission fluid temperature sensor Circuit Short to Ground 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0713-01	Transmission Fluid Temperature Sensor A Circuit High-General Electrical Failure	<ul style="list-style-type: none"> General electrical failure 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0713-12	Transmission Fluid Temperature Sensor A Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Transmission fluid temperature sensor Circuit Short to Power 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0716-14	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Turbine/Input Shaft Speed Sensor Circuit Short to Ground or Open Circuit 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0716-21	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance - signal amplitude < minimum	<ul style="list-style-type: none"> Turbine/Input Shaft Speed Sensor signal too small 	Clear DTC and road test, if DTC returns suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0716-22	Turbine/Input Shaft Speed Sensor A Circuit Range/Performance - signal amplitude > maximum	<ul style="list-style-type: none"> Turbine/Input Shaft Speed Sensor signal above maximum 	Clear DTC and road test, if DTC returns suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0717-12	Turbine/Input Shaft Speed Sensor A Circuit No Signal - Circuit Short to Battery	<ul style="list-style-type: none"> Turbine/input shaft speed sensor A Circuit Short to Power 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0720-12	Output Shaft Speed Sensor Circuit - Circuit Short to Battery	<ul style="list-style-type: none"> Transmission output shaft speed sensor Circuit Short to Power 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0720-14	Output Shaft Speed Sensor Circuit - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Transmission output shaft speed sensor Circuit Short to Ground or Open Circuit 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0721-22	Output Shaft Speed Sensor Circuit Range/Performance - signal amplitude > maximum	<ul style="list-style-type: none"> Transmission output shaft speed sensor signal above maximum 	Clear DTC and road test, if DTC returns suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0721-27	Output Shaft Speed Sensor Circuit Range/Performance - signal rate of change above threshold	<ul style="list-style-type: none"> Output shaft speed negative gradient too high 	Clear DTC and road test, if DTC returns suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index

DTC	Description	Possible Cause	Action
P0721-64	Output Shaft Speed Sensor Circuit Range/Performance - signal plausibility failure	<ul style="list-style-type: none"> Signal plausibility failure 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0731-07	Incorrect Gear Ratio-Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0732-07	Incorrect Gear Ratio-Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0733-07	Incorrect Gear Ratio-Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0734-07	Incorrect Gear Ratio-Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0735-07	Incorrect Gear Ratio-Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0736-07	Incorrect Gear Ratio-Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0740-13	Torque Converter Clutch Solenoid Circuit / Open - Circuit Open	<ul style="list-style-type: none"> Pressure control solenoid 2 Circuit Open Circuit 	Clear DTC and test. If code re-detects suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0741-07	Torque Converter Clutch Solenoid Circuit Performance/Stuck Off - Mechanical Failures	<ul style="list-style-type: none"> Too high slip at torque converter clutch. Mechanical Failures 	Suspect torque converter lockup clutch. Install a new torque converter, refer to the new module/component installation note at the top of the DTC Index. If transmission fluid is in very poor condition and dirty, install a new transmission, refer to the new module/component installation note at the top of the DTC Index
P0745-04	Pressure Control Solenoid A - System Internal Failures	<ul style="list-style-type: none"> System Internal Failures 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0745-48	Pressure Control Solenoid A - Supervision Software Failure	<ul style="list-style-type: none"> Supervision Software Failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0758-12	Shift Solenoid B Electrical - Circuit Short to Battery	<ul style="list-style-type: none"> Circuit Short to Power 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0758-13	Shift Solenoid B Electrical - Circuit Open	<ul style="list-style-type: none"> Solenoid valve 1 or Pressure control Solenoid G Circuit Open Circuit 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0771-71	Shift Solenoid E Performance/Stuck Off - actuator stuck	<ul style="list-style-type: none"> Actuator stuck 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0775-04	Pressure Control Solenoid B - System Internal Failures	<ul style="list-style-type: none"> System Internal Failures 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0775-48	Pressure Control Solenoid B - Supervision Software Failure	<ul style="list-style-type: none"> Supervision Software Failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index


DTC	Description	Possible Cause	Action
P0781-07	1-2 Shift - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0781-77	2-1 Shift - commanded position not reachable	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0782-07	2-3 Shift - commanded position not reachable	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0782-77	3-2 Shift - commanded position not reachable	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0783-07	3-4 Shift - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0783-77	3-4 Shift - commanded position not reachable	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0784-07	4-5 Shift - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0784-77	4-5 Shift - commanded position not reachable	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0798-1A	Pressure Control Solenoid C Electrical - Circuit Resistance Below Threshold	<ul style="list-style-type: none"> • Pressure control solenoid C Circuit resistance below threshold 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0798-1E	Pressure Control Solenoid C Electrical - Circuit Short to Ground	<ul style="list-style-type: none"> • Pressure control solenoid C electrical circuit short to ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0798-21	Pressure Control Solenoid C Electrical - signal amplitude < minimum	<ul style="list-style-type: none"> • Pressure Control Solenoid C Electrical signal amplitude < minimum 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0814-62	Transmission Range Display Circuit - signal compare failure	<ul style="list-style-type: none"> • Transmission Range Display Circuit signal compare failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0826-08	Up and Down Switch circuit - Bus Signal Message Failures	<ul style="list-style-type: none"> • Invalid CAN signal from BCM/Instrument cluster • Stuck switch • CAN bus circuit fault 	Check Central junction box and Instrument cluster for stored DTCs. Check gear change switches for correct operation. Refer to circuit diagrams and check CAN bus for a circuit fault
P0826-81	Up and Down Switch Circuit - invalid serial data received	<ul style="list-style-type: none"> • Invalid Can signal from BCM / Instrument cluster • Stuck switch • CAN Bus Circuit fault 	Check Central junction box and Instrument cluster for stored DTCs. Check Gear Change Switches for correct operation. Refer to Circuit diagrams and check CAN Bus for Circuit fault
P0826-88	Up and Down Switch Circuit - Bus off	<ul style="list-style-type: none"> • SWM to BCM / Instrument cluster LIN Bus failure 	Check Central junction box and Steering Wheel Ice Switches for stored DTCs. Refer to Circuit diagrams and check LIN Bus for Circuit fault

DTC	Description	Possible Cause	Action
P0829-07	5-6 Shift - Mechanical Failures	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P0829-77	6-5 Shift - Commanded Position Not Reachable	<ul style="list-style-type: none"> • Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P084F-01	Park / Neutral Switch Input Circuit - General Electrical Failure	<ul style="list-style-type: none"> • Wrong voltage level detected on Park/No Park signal 	Check for correct output at Transmission control module park signal pin (check in all positions) 12 volts in Park, 0 volts in all other positions. If fault identified, suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index. If no fault identified, check Park signal circuit to Transmission Shift Module for short, open circuit.
P0850-01	Park / Neutral Switch Input Circuit - General Electrical Failure	<ul style="list-style-type: none"> • General electrical failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0850-02	Park / Neutral Switch Input Circuit - General signal failure	<ul style="list-style-type: none"> • General signal failure 	Check park lock mechanism. If park lock operation is correct, suspect the transmission control module. Check and install a new transmission control module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P0850-29	Park / Neutral Switch Input Circuit - signal invalid	<ul style="list-style-type: none"> • Signal invalid 	Check park lock mechanism. If park lock operation is correct, suspect the transmission control module. Check and install a new transmission control module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
P850-1C	Park / Neutral Switch Input Circuit - circuit voltage out of range	<ul style="list-style-type: none"> • Circuit voltage out of range 	Check park lock mechanism, if park lock operation correct suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0919-93	Gear Shift Position Control Error - no operation	<ul style="list-style-type: none"> • No shifting despite driver request 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0919-94	Gear Shift Position Control Error - unexpected operation	<ul style="list-style-type: none"> • Shifting without driver request 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0938-29	Hydraulic Oil Temperature Sensor Range/Performance - signal invalid	<ul style="list-style-type: none"> • Transmission fluid temperature compared with module temperature fault 	Clear DTC. Carry out cold start road test, continue driving vehicle until normal operating temperature is achieved. Read DTCs, if DTC returns, suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0963-12	Pressure Control Solenoid A Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> • Pressure control solenoid 1 Circuit Short to Power 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0964-13	Pressure Control Solenoid B Control Circuit / Open - Circuit Open	<ul style="list-style-type: none"> • Pressure Control Solenoid B Control Circuit Open 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0964-14	Pressure Control Solenoid B Control Circuit / Open - Circuit Short to Ground or Open	<ul style="list-style-type: none"> • Pressure Control Solenoid B Control Circuit Short to Ground or Open 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0966-11	Pressure Control Solenoid B Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> • Pressure control solenoid 2 Circuit Short to Ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index

DTC	Description	Possible Cause	Action
P0967-12	Pressure Control Solenoid B Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Pressure control solenoid 2 Circuit Short to Power 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0968-14	Pressure Control Solenoid C Control Circuit / Open - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Pressure control solenoid 3 Circuit Short to Ground or Open Circuit 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0970-11	Pressure Control Solenoid C Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Pressure control solenoid 3 Circuit Short to Ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0971-12	Pressure Control Solenoid C Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Pressure control solenoid 3 Circuit Short to Power 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0972-22	Shift Solenoid A Control Circuit Range/Performance - signal amplitude > maximum	<ul style="list-style-type: none"> Pressure control solenoid 1 current too large 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0973-11	Shift Solenoid A Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Shift solenoid A control Circuit Short to Ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0973-14	Shift Solenoid A Control Circuit Low - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Pressure control solenoid 1 Circuit Short to Ground or Open Circuit 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0973-1A	Shift Solenoid A Control Circuit Low - Circuit Resistance Below Threshold	<ul style="list-style-type: none"> Shift Solenoid A control circuit resistance below threshold 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0973-1E	Shift Solenoid A Control Circuit Low - Circuit Resistance Out Of Range	<ul style="list-style-type: none"> Shift Solenoid A control circuit resistance out of range 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0976-11	Shift Solenoid B Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Solenoid valve 2 Circuit Short to Ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P0976-14	Shift Solenoid B Control Circuit Low - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Solenoid valve 2 Circuit Short to Ground or Open Circuit 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P1674-04	Control Module Software Corrupted - System Internal Failures	<ul style="list-style-type: none"> System internal failures 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P1674-48	Control Module Software Corrupted - Supervision Software Failure	<ul style="list-style-type: none"> Supervision software failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P1707-07	Transfer Case Neutral or Park/Neutral Indication Circuit - commanded position not reachable	<ul style="list-style-type: none"> Transfer case neutral or park/neutral indication circuit - mechanical failures 	Clear the DTC. Test drive the Vehicle, engaging and disengaging the parking lock several times. If the DTC recurs, check parking lock components and replace as required. If no faulty park lock component is found Clear DTC and the DTC returns suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P1707-72	Transfer Case Neutral or Park/Neutral Indication Circuit - Actuator Stuck Open	<ul style="list-style-type: none"> Transfer case neutral or park/neutral indication circuit - Actuator stuck open 	Clear the DTC. Test drive the Vehicle, engaging and disengaging the parking lock several times. If the DTC recurs, check parking lock components and replace as required. If no faulty park lock component is found Clear DTC and the DTC returns suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index

DTC	Description	Possible Cause	Action
P1707-77	Transfer Case Neutral or Park/Neutral Indication Circuit - commanded position not reachable	<ul style="list-style-type: none"> Commanded position not reachable 	Clear the DTC. Test drive the Vehicle, engaging and disengaging the parking lock several times. If the DTC recurs, check parking lock components and replace as required. If no faulty park lock component is found Clear DTC and the DTC returns suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2700-07	Transmission Friction Element A Apply Time Range/Performance - Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P2701-07	Transmission Friction Element B Apply Time Range/Performance - Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P2702-07	Transmission Friction Element C Apply Time Range/Performance - Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P2703-07	Transmission Friction Element D Apply Time Range/Performance - Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P2704-07	Transmission Friction Element E Apply Time Range/Performance - Mechanical Failures	<ul style="list-style-type: none"> Gear Ratio Monitoring. Mechanical Failures 	Check and correct oil level. Clear DTC. If code re-detects suspect Transmission (Gearbox) internal fault. Install a new Transmission as required, refer to the new module/component installation note at the top of the DTC Index
P2713-04	Pressure Control Solenoid D - System Internal Failures	<ul style="list-style-type: none"> System internal failures 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2713-48	Pressure Control Solenoid D - Supervision Software Failure	<ul style="list-style-type: none"> Supervision software failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2716-22	Pressure Control Solenoid D Electrical - signal amplitude > maximum	<ul style="list-style-type: none"> Pressure Control Solenoid D Electrical signal amplitude > maximum 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2716-1A	Pressure Control Solenoid D Electrical - Circuit Resistance Below Threshold	<ul style="list-style-type: none"> Pressure control solenoid D circuit resistance below threshold 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2716-1E	Pressure Control Solenoid D Electrical - Circuit Resistance Out Of Range	<ul style="list-style-type: none"> Pressure control solenoid D circuit resistance out of range 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2718-14	Pressure Control Solenoid D Control Circuit / Open - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Pressure control solenoid D Circuit Short to Ground or Open Circuit 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2720-11	Pressure Control Solenoid D Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Pressure control solenoid D Circuit Short to Ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2721-12	Pressure Control Solenoid D Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Pressure control solenoid D Circuit Short to Power 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2722-04	Pressure Control Solenoid E - System Internal Failures	<ul style="list-style-type: none"> Pressure Control Solenoid E system internal failures 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index

DTC	Description	Possible Cause	Action
P2722-48	Pressure Control Solenoid E - Supervision Software Failure	<ul style="list-style-type: none"> Pressure Control Solenoid E supervision control software failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2725-22	Pressure Control Solenoid E Electrical - signal amplitude > maximum	<ul style="list-style-type: none"> Pressure Control Solenoid E Electrical signal amplitude > maximum 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2725-1A	Pressure Control Solenoid E Electrical - Circuit Resistance Below Threshold	<ul style="list-style-type: none"> Pressure control solenoid E electrical resistance below threshold 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2725-1E	Pressure Control Solenoid E Electrical - Circuit Resistance Out Of Range	<ul style="list-style-type: none"> Pressure control solenoid E circuit resistance out of range 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2727-14	Pressure Control Solenoid E Control Circuit / Open - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Pressure Control Solenoid E Control Circuit Short to Ground or Open Circuit 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2729-11	Pressure Control Solenoid E Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Pressure control solenoid E Circuit Short to Ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2730-12	Pressure Control Solenoid E Control Circuit High-Circuit Short to Battery	<ul style="list-style-type: none"> Pressure control solenoid E Circuit Short to Power 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2731-04	Pressure Control Solenoid F-System Internal Failures	<ul style="list-style-type: none"> Pressure Control Solenoid F no sub type information 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2731-48	Pressure Control Solenoid F - Supervision Software Failure	<ul style="list-style-type: none"> Pressure Control Solenoid F supervision software failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2734-22	Pressure Control Solenoid F Electrical-signal amplitude > maximum	<ul style="list-style-type: none"> Pressure Control Solenoid F Electrical signal amplitude > maximum 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2734-1A	Pressure Control Solenoid F Electrical-Circuit Resistance Below Threshold	<ul style="list-style-type: none"> Pressure control solenoid F electrical circuit resistance below threshold 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2734-1E	Pressure Control Solenoid F Electrical-Circuit Resistance Out Of Range	<ul style="list-style-type: none"> Pressure control solenoid F electrical circuit resistance out of range 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2736-14	Pressure Control Solenoid F Control Circuit / Open - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Pressure Control Solenoid F Control Circuit Short to Ground or Open 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2738-11	Pressure Control Solenoid F Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Pressure Control Solenoid F Control Circuit Short to Ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2739-12	Pressure Control Solenoid F Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Pressure Control Solenoid F Control Circuit Short to Power 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2763-12	Torque Converter Clutch Pressure Control Solenoid Control Circuit High - Circuit Short to Battery	<ul style="list-style-type: none"> Pressure control solenoid F Circuit Short to Power 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index

DTC	Description	Possible Cause	Action
P2764-11	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low - Circuit Short to Ground	<ul style="list-style-type: none"> Torque converter clutch pressure control solenoid control Circuit Short to Ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2764-1A	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low-Circuit Resistance Below Threshold	<ul style="list-style-type: none"> Torque converter clutch pressure control solenoid control circuit resistance below threshold 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2764-1E	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low-Circuit Resistance Out Of Range	<ul style="list-style-type: none"> Torque converter clutch pressure control solenoid control circuit resistance out of range 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2807-11	Pressure Control Solenoid G - Circuit Short to Ground	<ul style="list-style-type: none"> Park solenoid Circuit Short to Ground 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2807-12	Pressure Control Solenoid G - Circuit Short to Battery	<ul style="list-style-type: none"> Park solenoid Circuit Short to Power 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2807-13	Pressure Control Solenoid G - Circuit Open	<ul style="list-style-type: none"> Park solenoid Circuit Open Circuit 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
P2807-14	Pressure Control Solenoid G - Circuit Short to Ground or Open	<ul style="list-style-type: none"> Park solenoid Circuit Short to Ground or Open Circuit 	Carry out any diagnostic pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
B1087-82	LIN Bus "A" - alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> Alive counter fault 	Check Transmission Shift Module for stored DTCs. Refer to the electrical Circuit diagrams and check Transmission control module to Transmission Shift Module for Short to Ground or Open Circuit (LIN Bus)
B1087-83	LIN Bus "A" - value of signal protection calculation incorrect	<ul style="list-style-type: none"> Checksum error 	Check Transmission Shift Module for stored DTCs Refer to the electrical Circuit diagrams and check Transmission control module to Transmission Shift Module for Short to Ground or Open Circuit (LIN Bus)
B1087-87	LIN Bus "A" - missing message	<ul style="list-style-type: none"> GSM is NOT visible to the Transmission control module on the LIN Bus 	Check Transmission Shift Module for stored DTCs Refer to the electrical Circuit diagrams and check Transmission control module to Transmission Shift Module for Short or Open Circuit (LIN Bus)
B1087-88	LIN Bus "A" - Bus off	<ul style="list-style-type: none"> LIN Bus Circuit fault. Check hardware of LIN connection between transmission and GSM 	Refer to the electrical Circuit diagrams and check Transmission control module to Transmission shift module for Short, Open Circuit (LIN Bus). Check Transmission Shift Module for related DTCs
U0001-88	High Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> CAN Bus off 	Refer to the electrical Circuit diagrams and check CAN Bus for Circuit fault
U0100-82	Lost Communication With Engine control module/PCM "A" - alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> Alive counter fault 	Check Engine control module for stored DTCs
U0100-83	Lost Communication With Engine control module/PCM "A" - value of signal protection calculation incorrect	<ul style="list-style-type: none"> Checksum fault 	Check Engine control module for stored DTCs
U0100-87	Lost Communication With Engine control module/PCM "A" - missing message	<ul style="list-style-type: none"> CAN Timeout 	 NOTE: Do NOT install a new Engine control module if an Engine control module Timeout DTC is only logged in the Transmission control module, the failure is NOT with the Engine control module Check Engine control module for stored DTCs. Check CAN Bus Circuit for fault

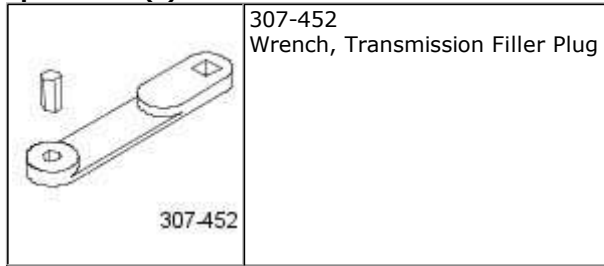
DTC	Description	Possible Cause	Action
U0103-82	Lost Communication With Gear Shift Control Module A - alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> • Alive counter fault 	Check Transmission shift module for stored DTCs. Check CAN Bus Circuit for fault
U0103-83	Lost Communication With Gear Shift Control Module A - value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Checksum fault 	Check Transmission shift module for stored DTCs. Check CAN Bus Circuit for fault
U0103-87	Lost Communication With Gear Shift Control Module A - missing message	<ul style="list-style-type: none"> • CAN Timeout 	Check Transmission shift module for stored DTCs. Check CAN Bus Circuit for fault
U0122-82	Lost Communication With Vehicle Dynamics Control Module - alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> • Alive counter fault 	Check Anti-lock braking system for stored DTCs. Check CAN Bus Circuit for fault
U0122-83	Lost Communication With Vehicle Dynamics Control Module - value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Checksum fault 	Check Anti-lock braking system for stored DTCs. Check CAN Bus Circuit for fault
U0122-87	Lost Communication With Vehicle Dynamics Control Module - missing message	<ul style="list-style-type: none"> • CAN Timeout 	Check Anti-lock braking system for stored DTCs. Check CAN Bus Circuit for fault
U0126-00	Lost Communication With Steering Angle Sensor Module - no sub type information	<ul style="list-style-type: none"> • Lost Communication With Steering Angle Sensor Module 	Check Steering angle sensor for stored DTCs. Check CAN Bus Circuit for fault
U0128-87	Lost Communication With Park Brake Control Module - missing message	<ul style="list-style-type: none"> • CAN timeout electronic parking brake module 	Check Electronic Parking Brake Module for stored DTCs. Check CAN Bus Circuit for fault
U0140-82	Lost Communication With Body Control Module - alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> • Alive counter fault 	Check Central junction box for stored DTCs. Check CAN Bus Circuit for fault
U0140-83	Lost Communication With Body Control Module - value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Checksum fault 	Check Central junction box for stored DTCs. Check CAN Bus Circuit for fault
U0140-87	Lost Communication With Body Control Module - missing message	<ul style="list-style-type: none"> • CAN Timeout 	Check Central junction box for stored DTCs. Check CAN Bus Circuit for fault
U0155-87	Lost Communication With Instrument Panel Cluster (Instrument cluster) Control Module - missing message	<ul style="list-style-type: none"> • CAN timeout instrument cluster 	Check Instrument cluster for stored DTCs. Check CAN Bus Circuit for fault
U0300-68	Control Module - event information	<ul style="list-style-type: none"> • Transmission software does not match vehicle network 	Check Central junction box software level, Check Transmission control module Software level, Update software as required using the manufacturer approved process
U0401-08	Invalid Data Received From Engine control module/PCM A - Bus Signal Message Failures	<ul style="list-style-type: none"> • Inaccurate engine speed, torque information 	Check Engine control module for stored DTCs, Check CAN Bus circuit for faults
U0401-68	Invalid Data Received from Engine control module/PCM A - event information	<ul style="list-style-type: none"> • Inaccurate engine speed, torque information 	Check Engine control module for stored DTCs. Check CAN Bus Circuit for fault
U0401-86	Invalid Data Received from Engine control module/PCM A - Signal Invalid	<ul style="list-style-type: none"> • Inaccurate engine speed, torque information 	Check Engine control module for stored DTCs. Check CAN Bus Circuit for fault
U0404-68	Invalid Data Received from Gear Shift Control Module A - event information	<ul style="list-style-type: none"> • Incorrect CAN data received from Transmission shift module 	Check Transmission Shift Module for stored DTCs. Refer to Circuit diagrams and check CAN and LIN Bus for Circuit fault
U0404-81	Invalid Data Received from Gear Shift Control Module A - Invalid Serial Data Received	<ul style="list-style-type: none"> • Incorrect LIN data received from Transmission shift module 	Check Transmission Shift Module for stored DTCs. Refer to Circuit diagrams and check CAN and LIN Bus for Circuit fault

DTC	Description	Possible Cause	Action
U0416-68	Invalid Data Received From Vehicle Dynamics Control Module - event information	<ul style="list-style-type: none"> Event information brake information 	Check Engine control module for stored DTCs. Check CAN Bus Circuit for fault
U0422-68	Invalid Data Received From Body Control Module - event information	<ul style="list-style-type: none"> Event information invalid Power mode information 	Check Central junction box for stored DTCs. Check CAN Bus Circuit for fault
U101B-87	Lost Communication With GSM - Multiple Bus-missing message	<ul style="list-style-type: none"> Missing message lost communication with Transmission Shift Module (multiple Bus) 	Check Transmission Shift Module for stored DTCs. Refer to Circuit diagrams and check CAN and LIN Bus for Circuit fault
U3000-49	Control Module - internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	Suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-4B	Control Module - Circuit resistance above threshold	<ul style="list-style-type: none"> Internal electronic failure 	Check and correct oil level. Check hydraulic flow through oil cooler and pipe circuit for restriction or blockage. If no restrictions found, suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-81	Control Module - invalid serial data received	<ul style="list-style-type: none"> Vehicle or Engine type signal incorrect from BCM or incorrect Transmission control module software installed 	Reflash the Transmission control module using the manufacturer approved process
U3001-94	Control Module Improper Shutdown - unexpected operation	<ul style="list-style-type: none"> Control Module Improper Shutdown (voltage related) 	Check Engine control module For Power (generator) faults. Check Power and Ground Circuit and Battery for fault. Clear DTCs. Road Test. If DTC reoccurs suspect the Transmission control module. Install a new Transmission control module as required, refer to the new module/component installation note at the top of the DTC Index

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Fluid Level Check

General Procedures

Special Tool(s)



Activation

WARNINGS:



Observe due care when draining, as the fluid can be very hot.



Observe due care when working near a hot exhaust system.

1.
 - The following steps must be observed before starting the transmission fluid level check.
 - The vehicle must be on a horizontal ramp.
 - The parking brake must be applied.
 - The engine must be running for 2 minutes with the transmission control switch (TCS) in the "P" position.



2. **CAUTION:** Make sure that the transmission fluid temperature is below 30 degrees before starting the fluid level check.

Connect Jaguar approved diagnostic equipment to the vehicle.

3.
 - Apply, and hold, the footbrake.
 - Move the selector lever from 'P' through all the gear positions, pausing in each gear position for 2-3 seconds and return to the 'P' position.

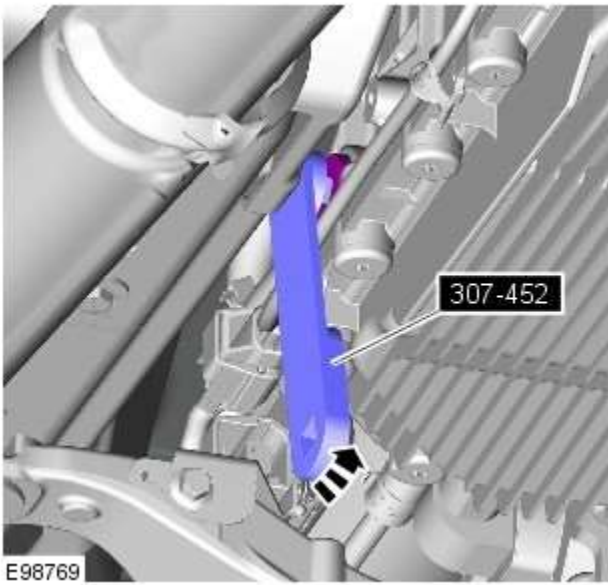


4. **WARNING:** Make sure to support the vehicle with axle stands.


Raise and support the vehicle.

5. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

6. Place a suitable container under the transmission fluid fill plug.

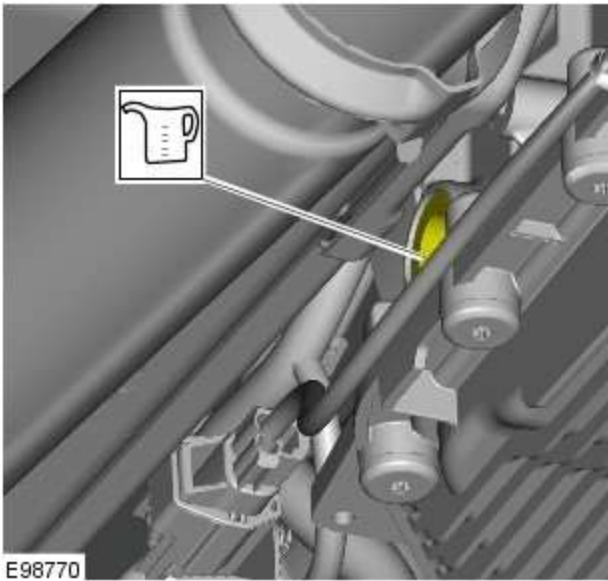


7. CAUTIONS:

 The transmission fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

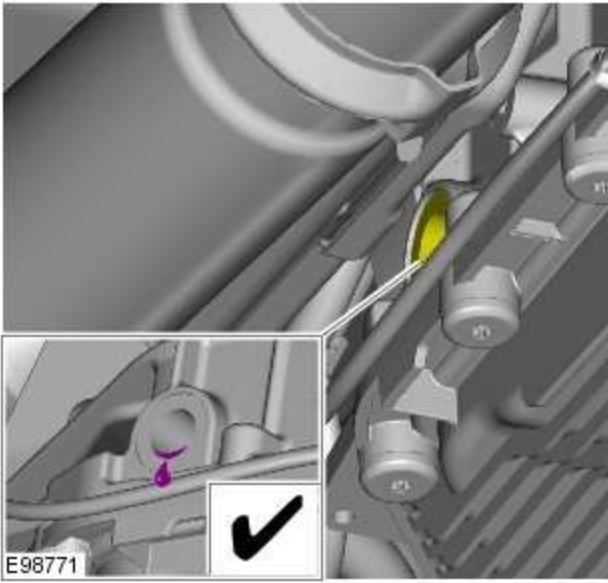
 Discard the seal.


Special Tool(s): [307-452](#)



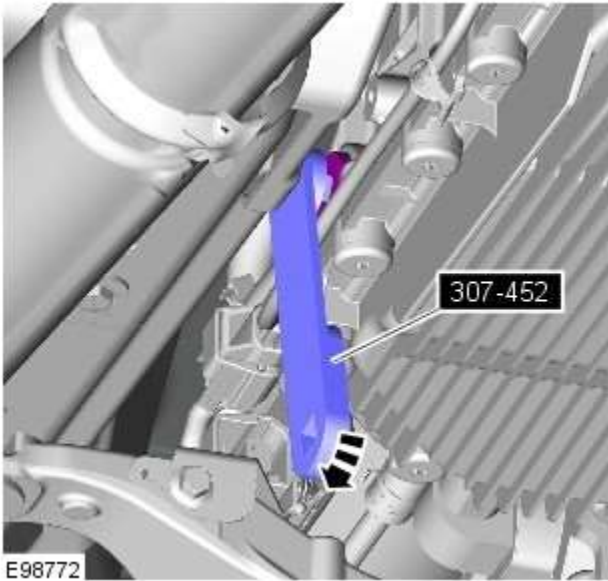
8.  NOTE: Use transmission fluid meeting Jaguar specification.

If the transmission fluid does not come out of the transmission fluid fill plug hole the transmission fluid level is insufficient. If this is the case add the transmission fluid in 0.5 liter units into the transmission fluid fill plug hole until fluid comes out.



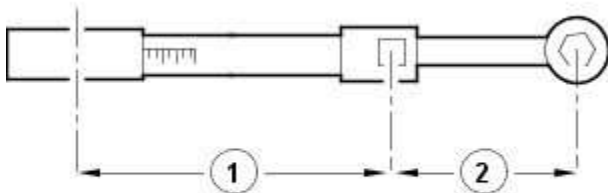
9.  **NOTE:** Make sure the transmission fluid temperature does not exceed 50 °C (122 °F). If the transmission fluid temperature does exceed 50 °C (122 °F) stop the transmission fluid level check and allow the transmission fluid to cool until the temperature is below 30 °C (86 °F).

Allow the transmission fluid to drain from the transmission fluid filler plug hole until the flow almost stops.




10.  **NOTE:** Install a new sealing washer.

Using the special tool, install the new transmission fluid fill plug.



E37107

11.  **CAUTION:** Make sure the transmission fluid fill plug is tightened to the correct specification. Failure to follow this instruction may result in damage to the vehicle.

- To make sure the transmission fill plug is torqued to the correct specification. Using the special tool and torque wrench the following calculation steps must be followed.
- Step 1. Multiply 35 Nm by the effective length of the torque wrench (1).
- Step 2. Add the effective length of the special tool (2) to the effective length of the torque wrench (1).
- Step 3. Divide the total of step 1 by the total of step 2.
- Step 4. Set the torque wrench to the figure arrived at in step 3.
- Tighten the transmission fluid fill plug to the torque given by the calculation.

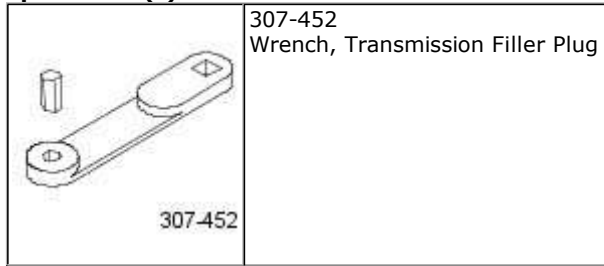
12. Remove the special tool.

13. Remove the container.
14. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
15. Lower the vehicle.
16. Disconnect the Jaguar approved diagnostic equipment from the vehicle.

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Fluid Drain and Refill

General Procedures

Special Tool(s)



WARNINGS:



Observe due care when draining, as the fluid can be very hot.



Observe due care when working near a hot exhaust system.

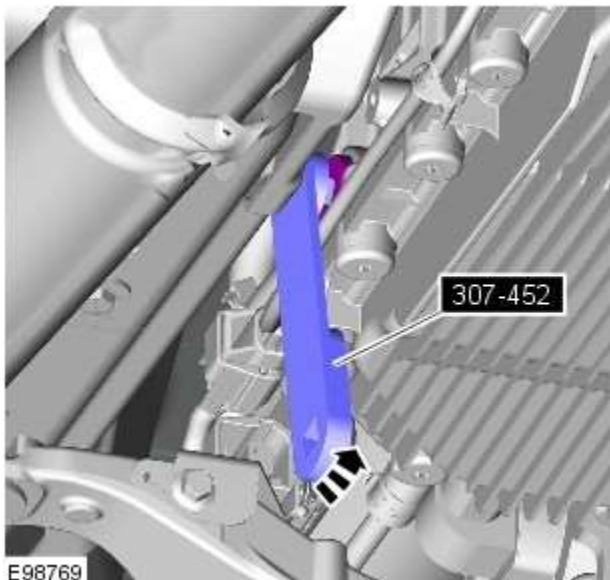


1. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).


3. Place a container under the transmission.



4. **CAUTION:** Discard the seal.

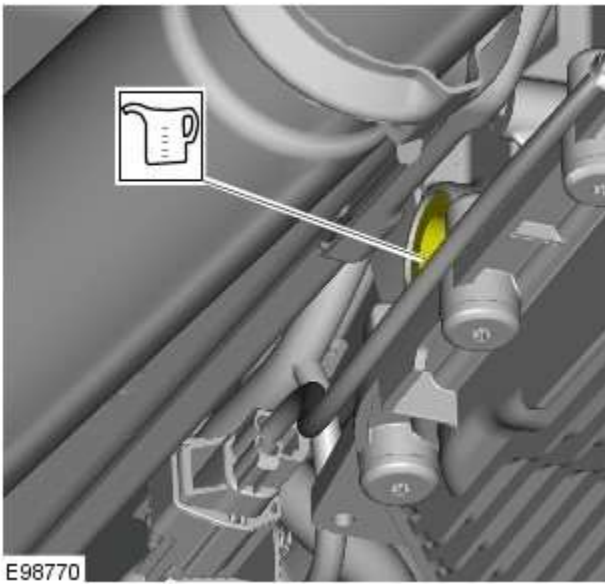
Special Tool(s): [307-452](#)




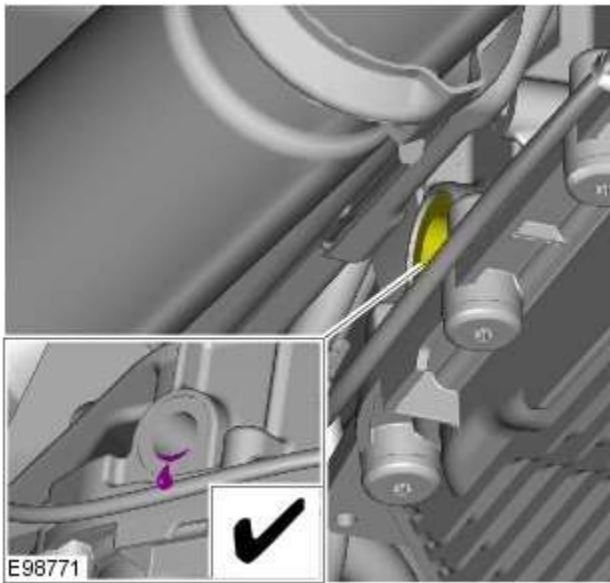
5.  **CAUTION:** Discard the component.
- Allow the fluid to drain.



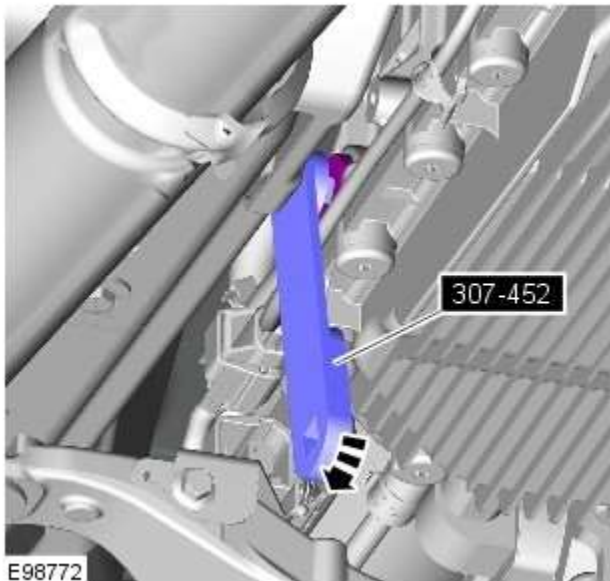
6.  **CAUTION:** Make sure that a new component is installed.
- Torque: 8 Nm*




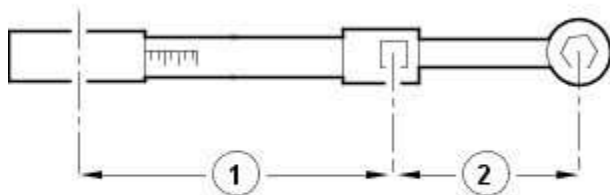
7.  **NOTE:** Use transmission fluid meeting Jaguar specification.
- Refill the transmission with fluid.




8. Allow the transmission fluid to drain from the transmission fluid filler plug hole until the flow almost stops.



9.  **NOTE:** Install a new sealing washer.
 - Loosely install the transmission fluid fill plug.



E37107

10.  **CAUTION:** Make sure the transmission fluid fill plug is tightened to the correct specification. Failure to follow this instruction may result in damage to the vehicle.
 - To make sure the transmission fill plug is torqued to the correct specification. Using the special tool and torque wrench the following calculation steps must be followed.
 - Step 1. Multiply 35 Nm by the effective length of the torque wrench (1).
 - Step 2. Add the effective length of the special tool (2) to the effective length of the torque wrench (1).
 - Step 3. Divide the total of step 1 by the total of step 2.
 - Step 4. Set the torque wrench to the figure arrived at in step 3.
 - Tighten the transmission fluid fill plug to the torque given by the calculation.

11. Carry out a transmission fluid level check.


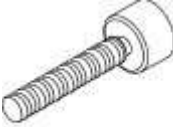
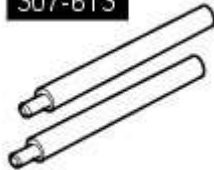
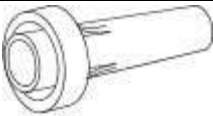

Refer to: [Transmission Fluid Level Check](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C

5.0L Petrol - Input Shaft Seal

Removal and Installation

Special Tool(s)

 <p>100-012</p> <p>E54135</p>	<p>100-012 Slide Hammer</p>
 <p>100-012-01</p>	<p>100-012-01 Slide Hammer Adapter</p>
 <p>307-613</p> <p>E84067</p>	<p>307-613 Holding Pins, Torque Converter</p>
 <p>308246</p>	<p>308-246 Installer, Front Seal</p>
 <p>308-375</p>	<p>308-375 Remover, Input and Output Seal</p>

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

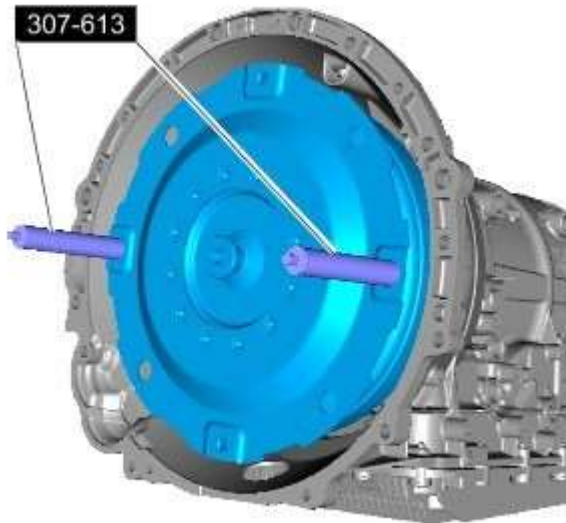


2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

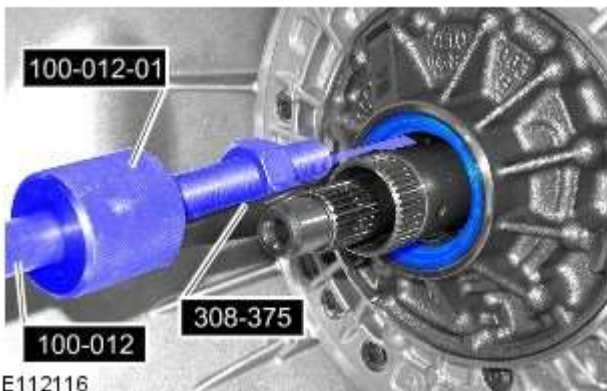
Raise and support the vehicle.

3. Refer to: [Transmission - TDV6 3.0L Diesel](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal).

4. *Special Tool(s)*: [307-613](#)



E112115



E112116

5. CAUTIONS:

 Take extra care not to damage the edges of the component.

 Discard the seal.

Special Tool(s): [100-012](#), [100-012-01](#), [308-375](#)

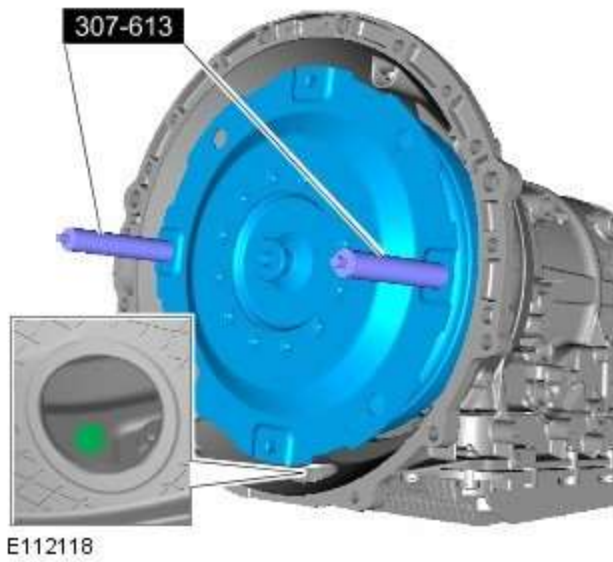
Installation



E112117

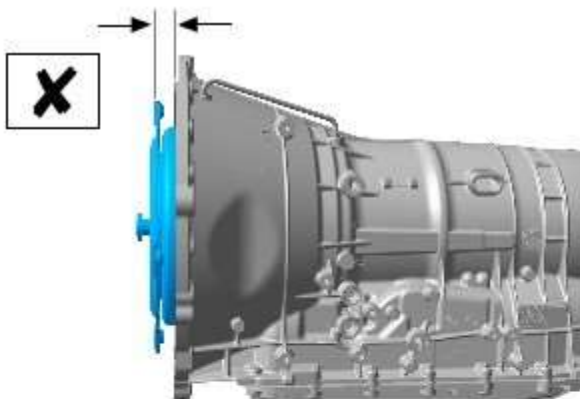
 1. CAUTION: Install a new seal.


Special Tool(s): [308-246](#)

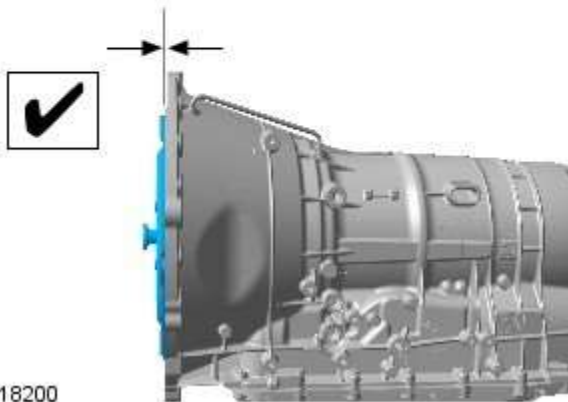


- NOTE: Make sure that the alignment mark is visible through the inspection hole as illustrated.

Special Tool(s): [307-613](#)



-  CAUTION: Make sure the torque converter is fully located into the oil pump drive.


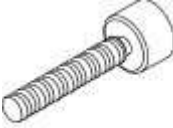
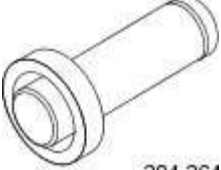
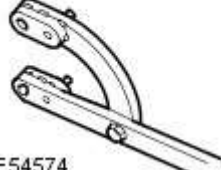




- Refer to: [Transmission - TDV6 3.0L Diesel](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Installation).
- Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Extension Housing Seal

Removal and Installation

Special Tool(s)

 <p>100-012</p> <p>E54135</p>	<p>100-012 Slide Hammer</p>
 <p>100-012-01</p>	<p>100-012-01 Slide Hammer Adapter</p>
 <p>204-264</p>	<p>204-264 Pinion Seal Replacer</p>
 <p>205-053</p> <p>E54574</p>	<p>205-053 Retainer, Drive Flange</p>
 <p>303-D121</p> <p>E64849</p>	<p>303-D121 Puller, General Purpose</p>
 <p>308-375</p>	<p>308-375 Remover, Input and Output Seal</p>

Removal

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and

Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

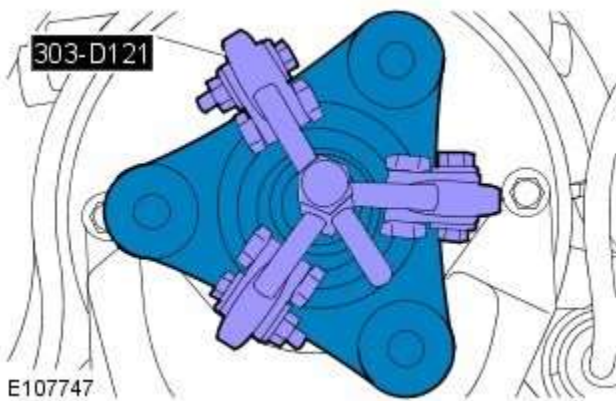
3. Refer to: [Driveshaft - TDV6 3.0L Diesel](#) (205-01 Driveshaft, Removal and Installation).

4. Refer to: [Transmission Support Insulator - TDV6 3.0L Diesel](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

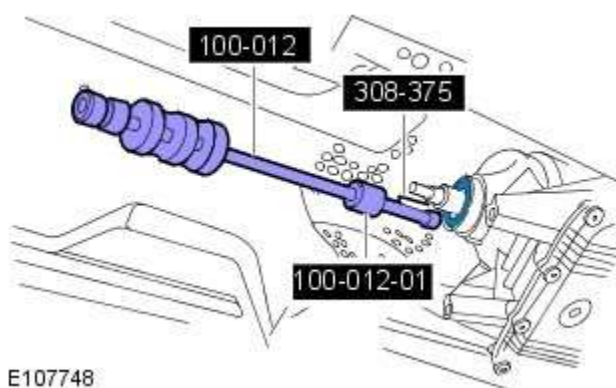


5.  **CAUTION:** Discard the nut.

Special Tool(s): [205-053](#)



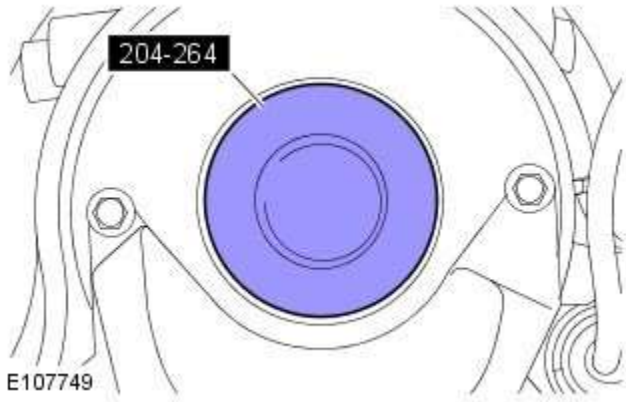
6. *Special Tool(s):* [303-D121](#)



7.  **CAUTION:** Discard the seal.

Special Tool(s): [100-012](#), [100-012-01](#), [308-375](#)

Installation

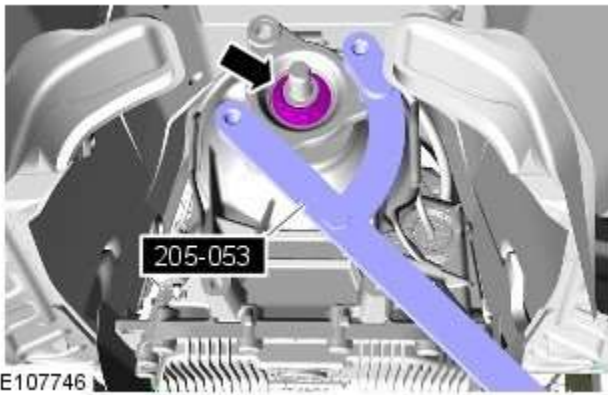


1. CAUTIONS:

 Make sure that the mating faces are clean and free of foreign material.

 Install a new seal.

Special Tool(s): [204-264](#)



2.  WARNING: Make sure that a new nut is installed.

Torque: 60 Nm

3. Refer to: [Transmission Support Insulator - TDV6 3.0L Diesel](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
4. Refer to: [Driveshaft - TDV6 3.0L Diesel](#) (205-01 Driveshaft, Removal and Installation).
5. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Control Module (TCM) and Main Control Valve Body

Removal and Installation

Removal



NOTE: The transmission control module (TCM) is part of the main control valve body and cannot be serviced separately.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

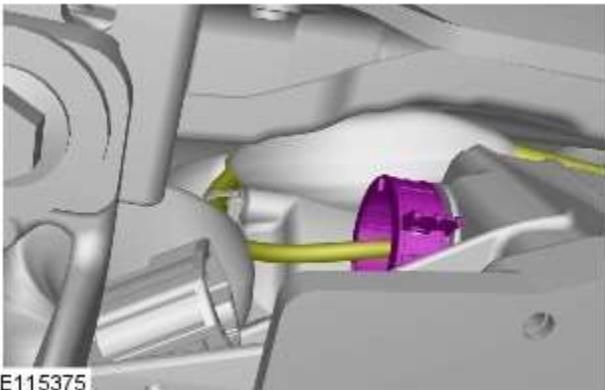


2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

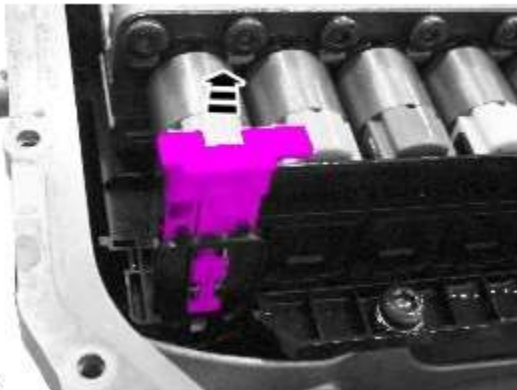
3. Refer to: [Transmission Fluid Pan, Gasket and Filter](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

4.

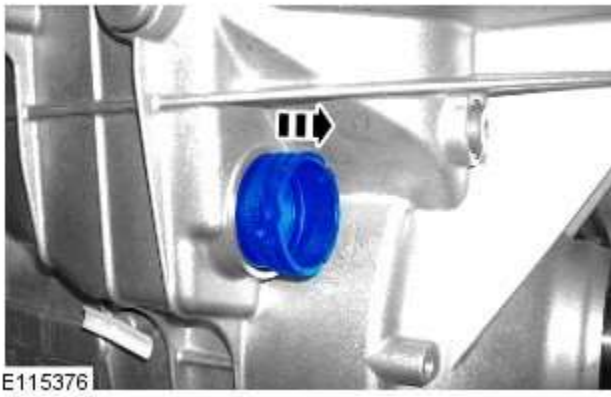


E115375

5.



E115374

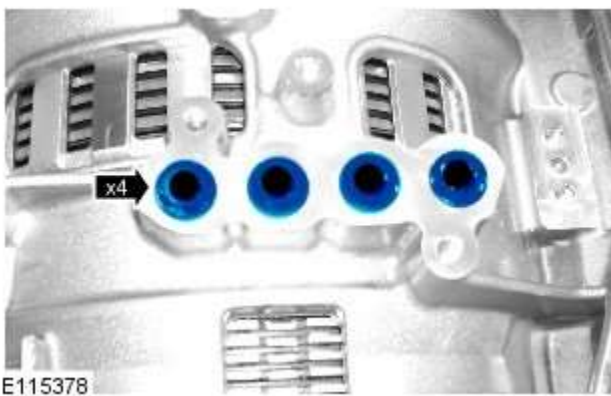


6.  CAUTION: Discard the component.



7.  CAUTION: Be prepared to collect escaping fluids.

 NOTE: Note the position of the manual park brake release.



8.

9.




Installation

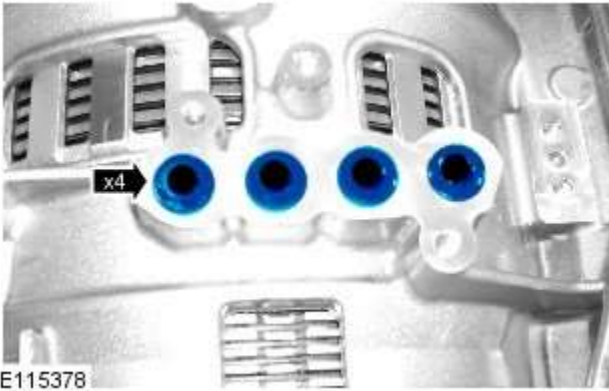


1. CAUTIONS:


 Make sure that when fully fitted, all seals protrude by the same amount.

 Install the new seals.

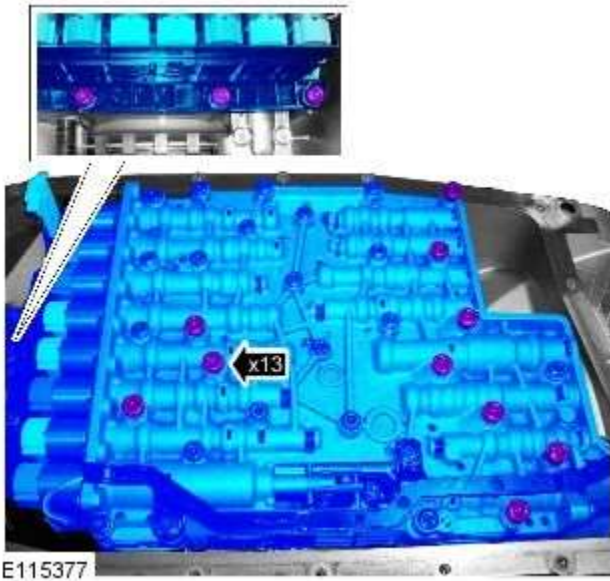
- Install a new seal block.




2. CAUTIONS:

 Install the new seals.

 Make sure that when fully fitted, all seals protrude by the same amount.




E115377

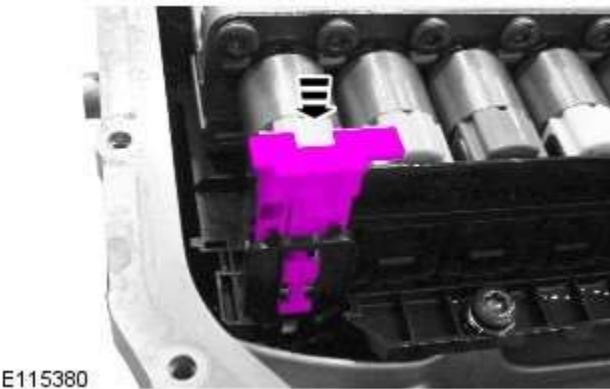
3.  CAUTION: Make sure the manual park release is correctly engaged.

Torque: 8 Nm



E115381

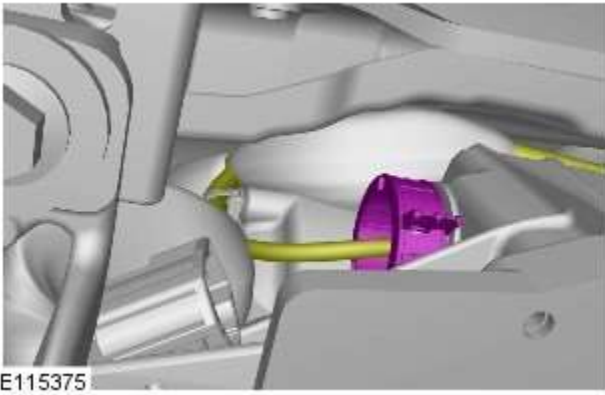
4.  CAUTION: Make sure that a new component is installed.



E115380

- 5.

6.



7. Refer to: [Transmission Fluid Pan, Gasket and Filter](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
8. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
9. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Fluid Pan, Gasket and Filter

Removal and Installation

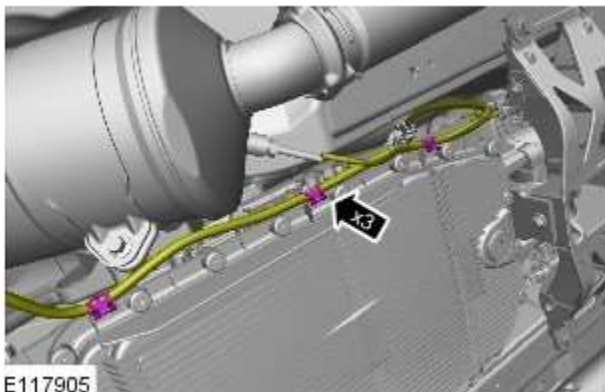
Removal




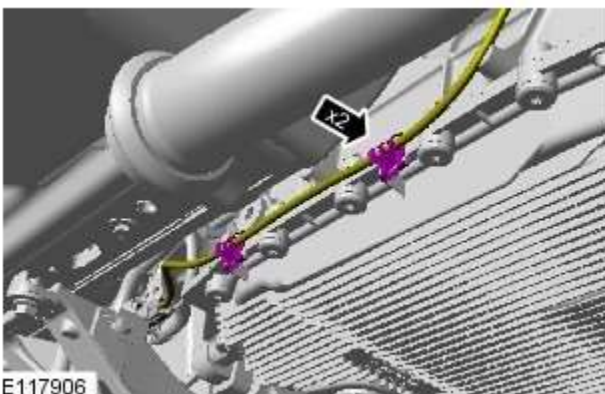
NOTE: Removal steps in this procedure may contain installation details.

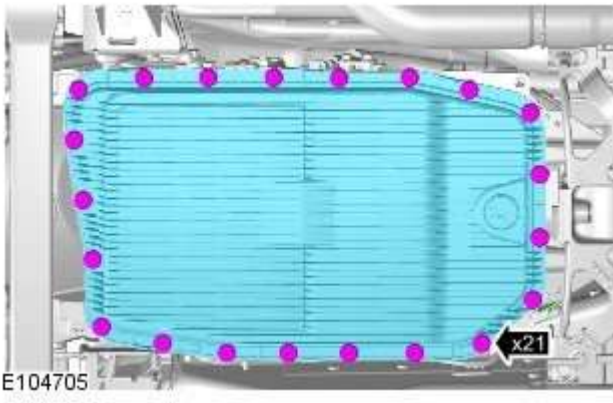
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Raise and support the vehicle.
3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Transmission Fluid Drain and Refill](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

5.



6.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.





7. CAUTIONS:



Make sure that the area around the component is clean and free of foreign material.



Be prepared to collect escaping fluids.

Torque: 8 Nm

Installation

1. To install, reverse the removal procedure.

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Support Insulator V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

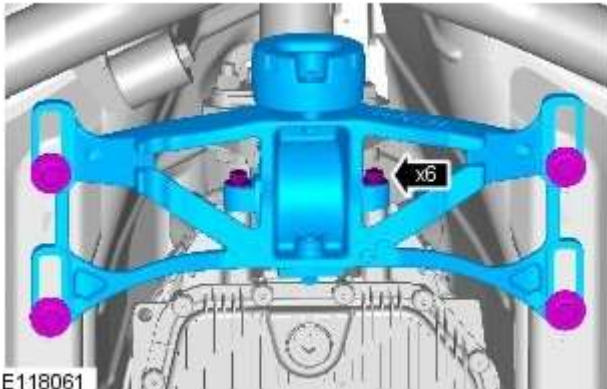
Removal

 NOTE: Removal steps in this procedure may contain installation details.




1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

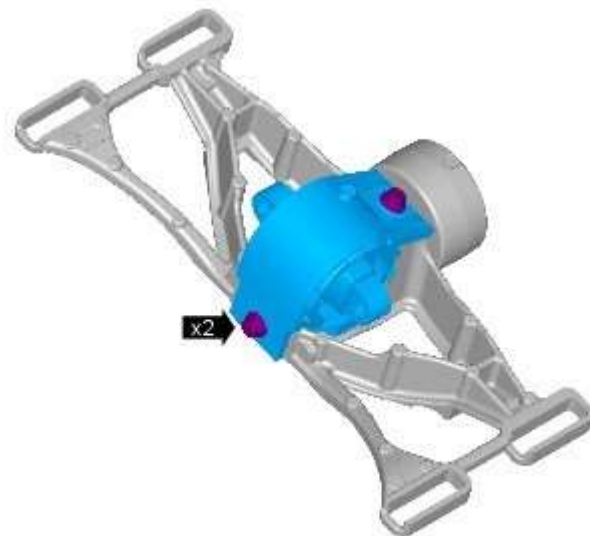
2. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).




E118061

3.  **CAUTION:** During this procedure the transmission crossmember is removed, make sure the transmission is correctly supported to avoid damaging associated components.

Torque: 48 Nm



E118062

4.  NOTE: Do not disassemble further if the component is removed for access only.

Torque: 55 Nm

Installation

1. To install, reverse the removal procedure.

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission, Transmission Fluid Cooler and Transmission Fluid Cooler Tubes V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal



CAUTION: Make sure that all openings are sealed. Use new blanking caps.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



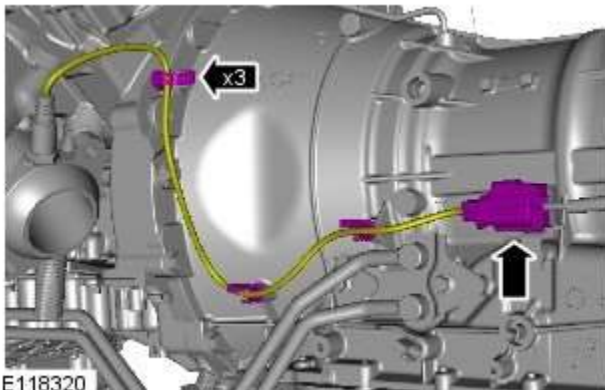
2. **WARNING:** Make sure to support the vehicle with axle stands.

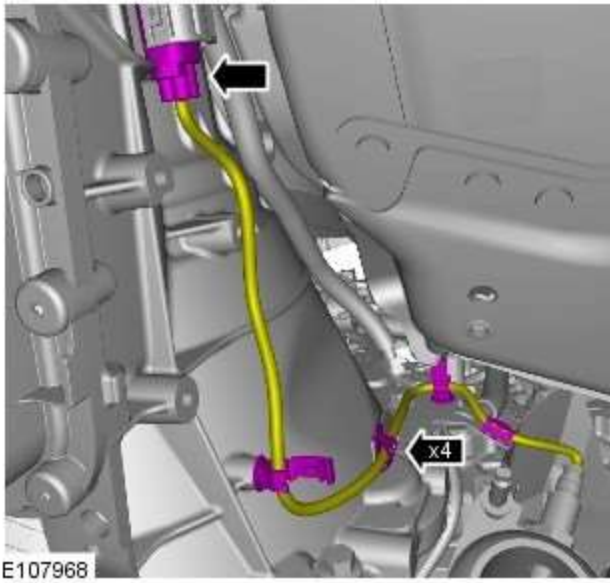
Raise and support the vehicle.

3. Refer to: [Catalytic Converter RH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

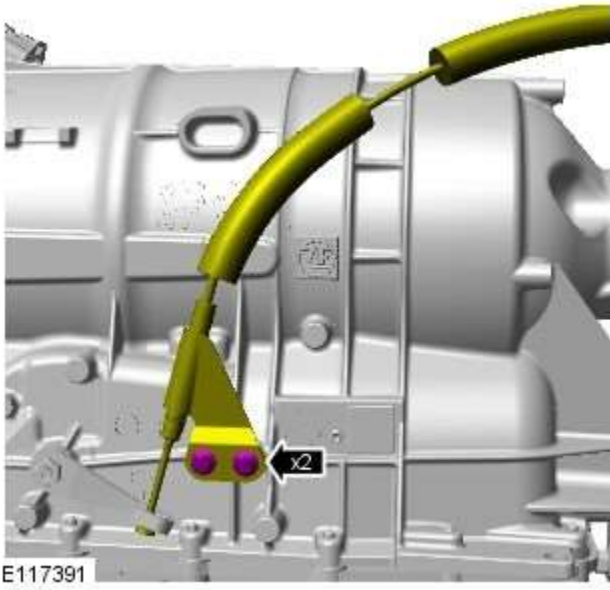
4. Refer to: [Catalytic Converter LH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

5.

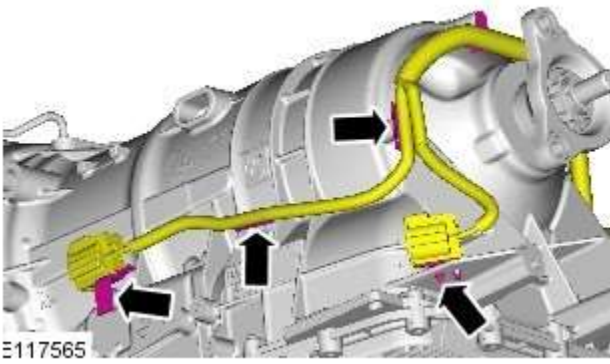




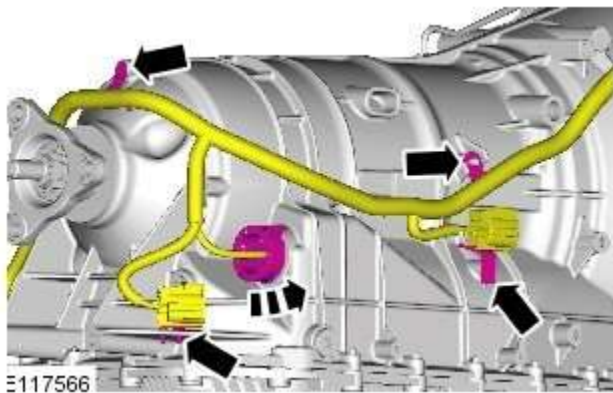
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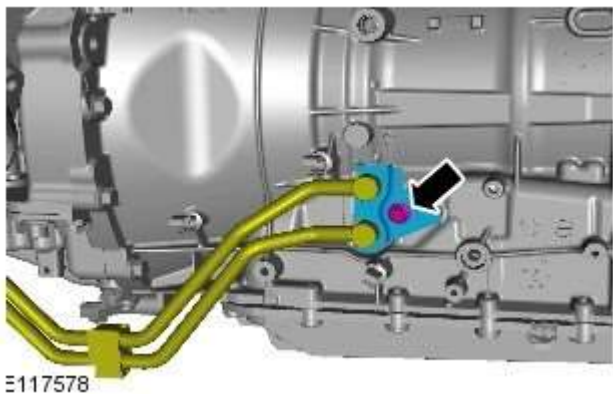
7.



8.



9.



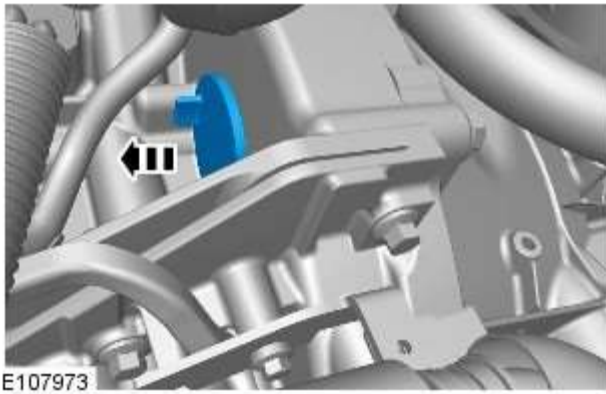
10.  CAUTION: Be prepared to collect escaping fluids.

 NOTE: Remove and discard the O-ring seals.

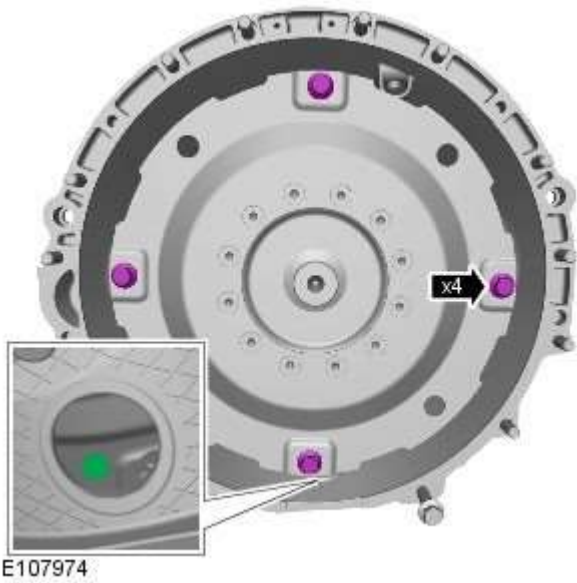
Install blanking caps to the exposed ports.



11.

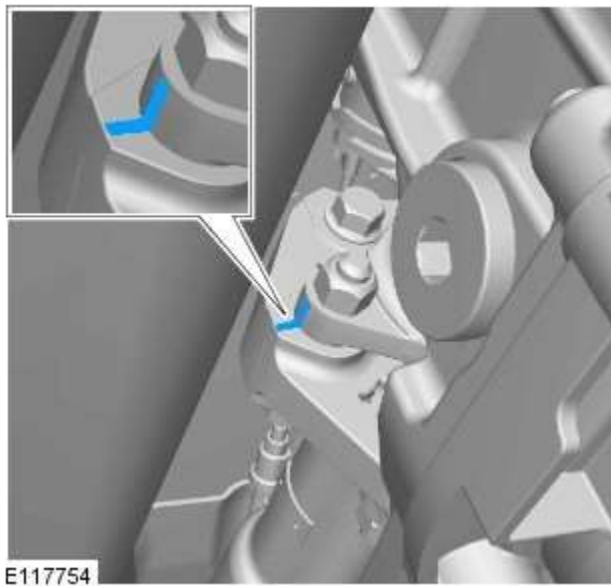


12.

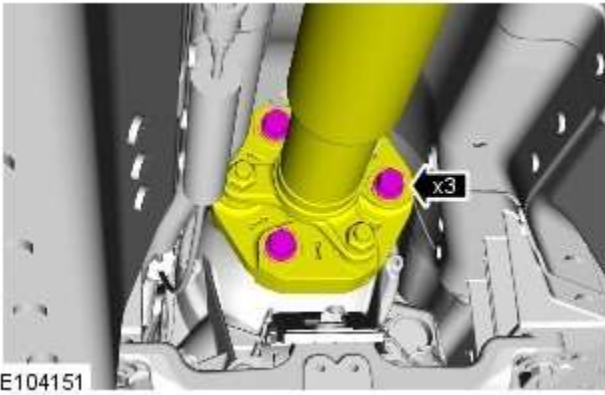


13.


- Make sure that the alignment mark is visible through the inspection hole on removal of the last torque converter bolt.



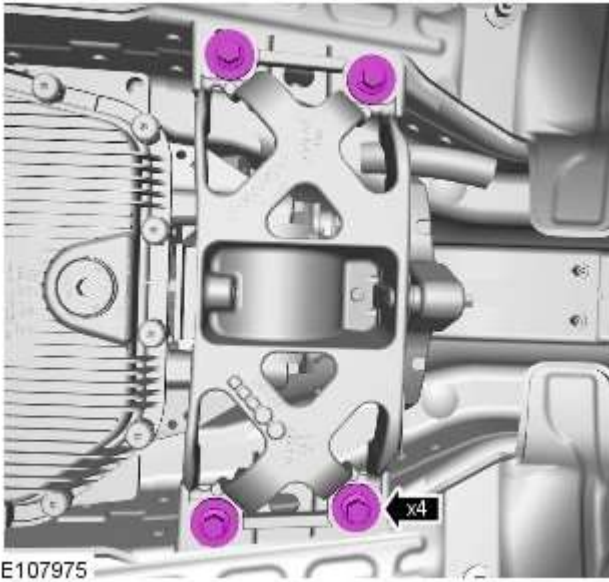
14.  NOTE: Mark the position of the driveshaft on the transmission flange.



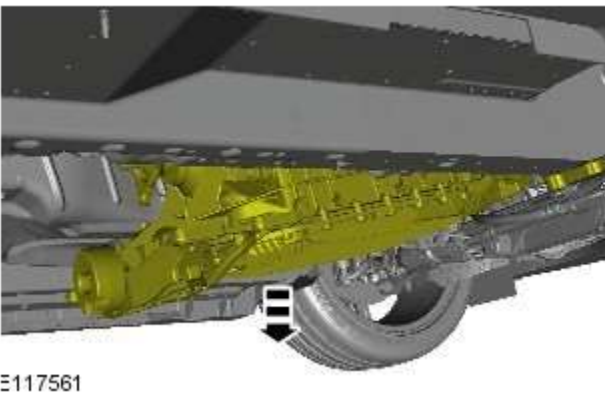
- 15.
- Using a suitable tie strap, secure the driveshaft.


16.  **WARNING:** Make sure that the transmission is secured with suitable retaining straps.

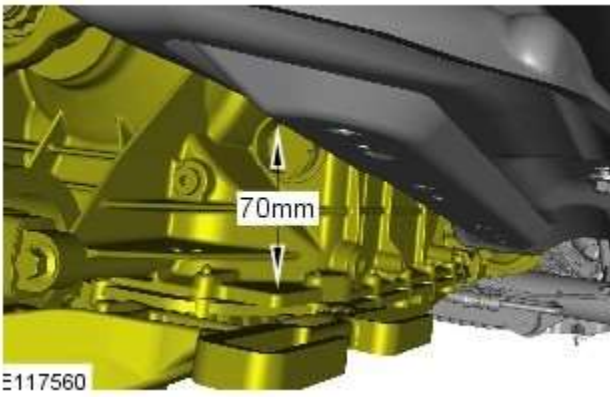
Using a suitable stand, support the transmission.



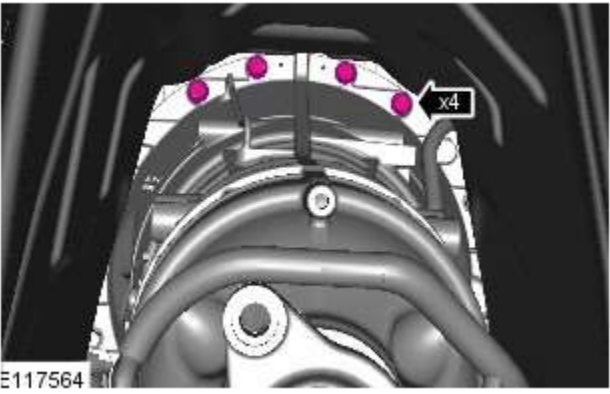
17.



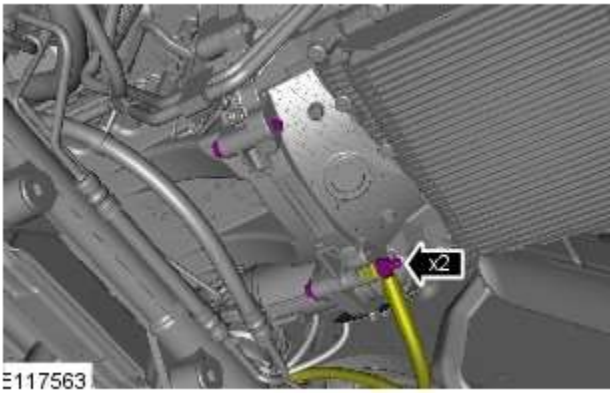
18.  **NOTE:** The transmission is lowered for access.
Lower the rear of the transmission for access.



19.  NOTE: The transmission is lowered for access.

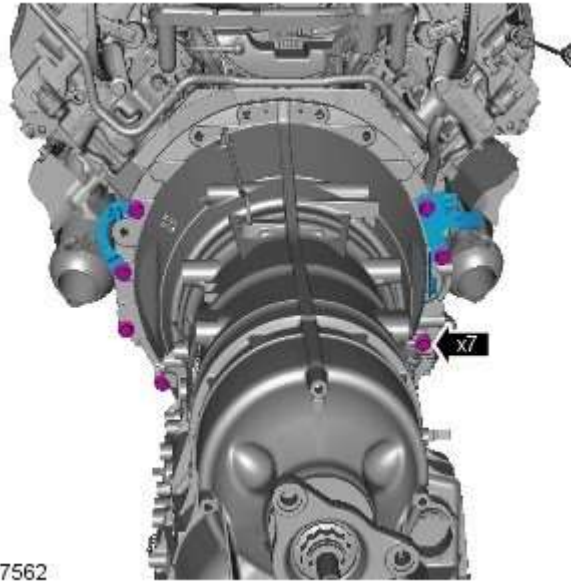


20.



21.

22.

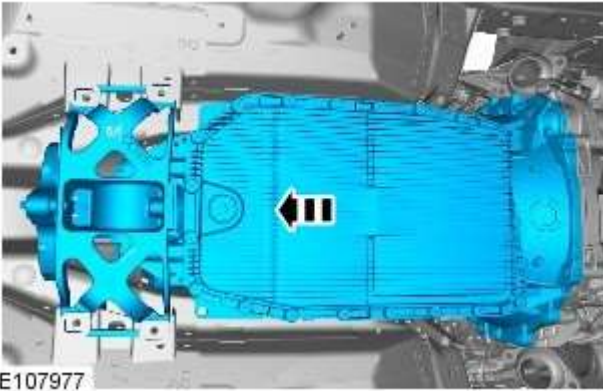


E117562

23.  CAUTION: Make sure that the torque converter remains in the transmission.

 NOTE: This step requires the aid of another technician.

- Install the torque converter retainer.

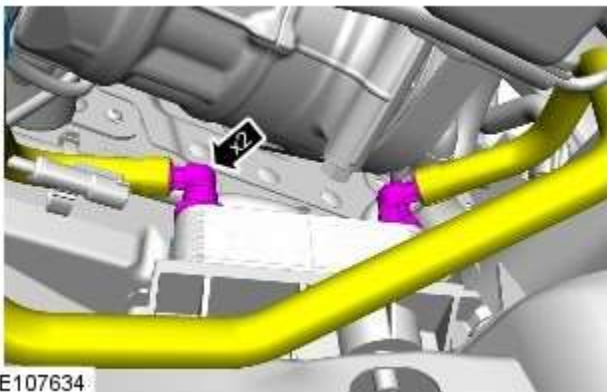


E107977

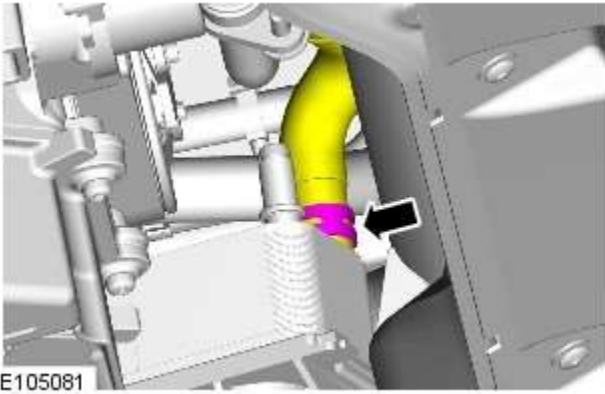
24. CAUTIONS:

 Be prepared to collect escaping fluids.

 Make sure that all openings are sealed. Use new blanking caps.

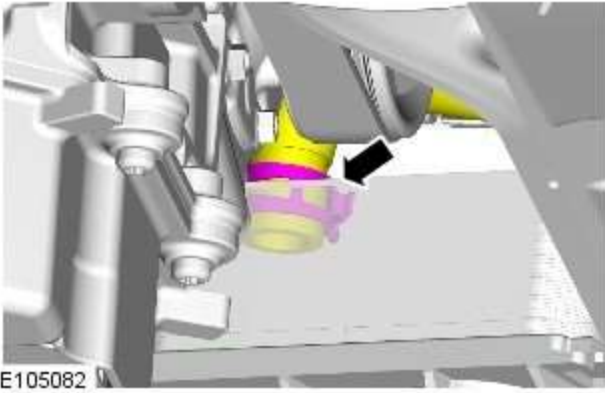


E107634

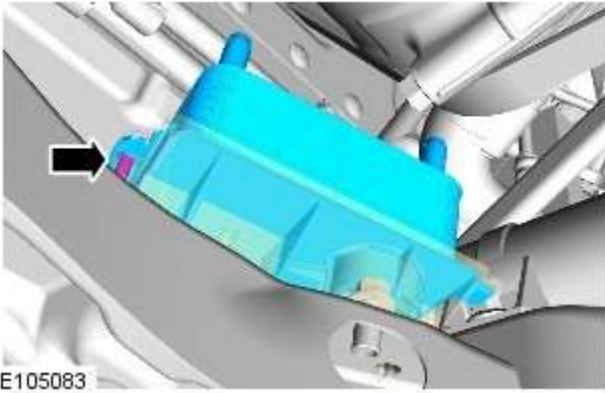


25.

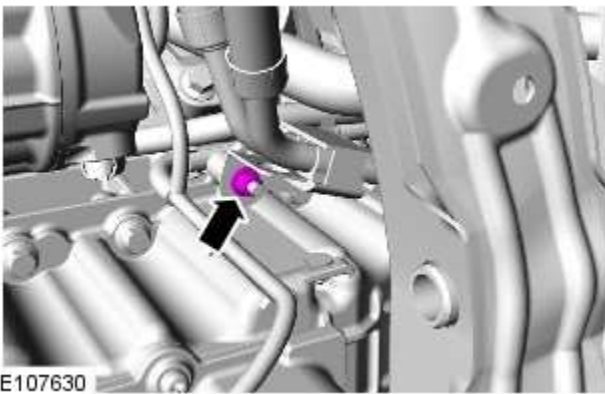
- Clamp the hoses to minimize coolant loss.



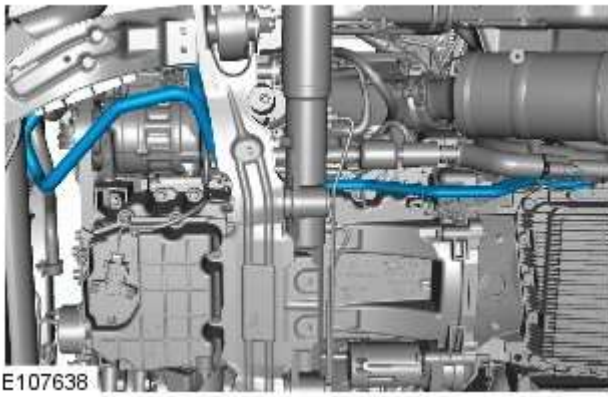
26.




27.

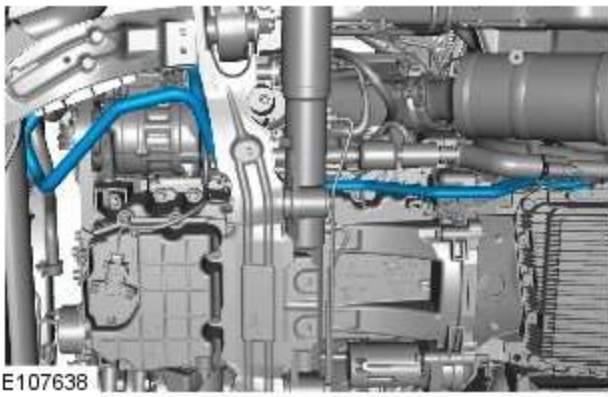


28.

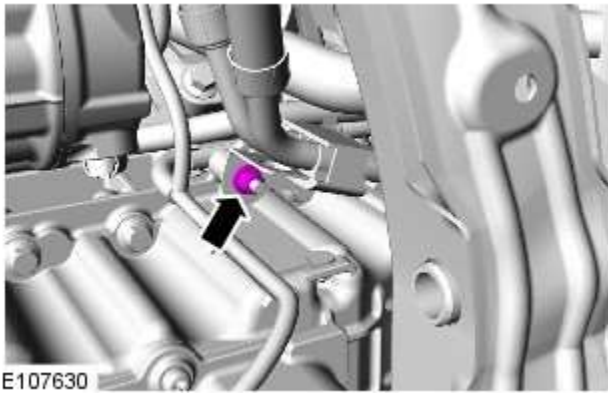


29.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

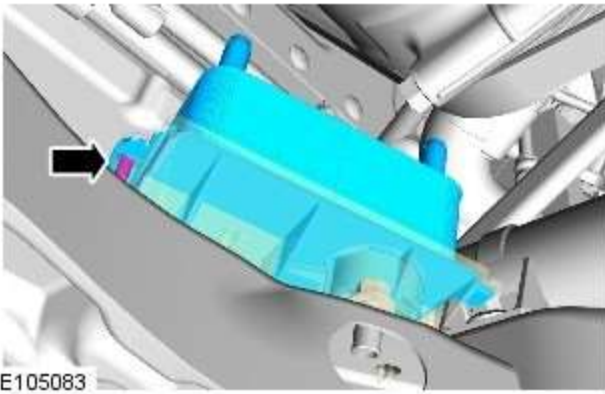
Installation



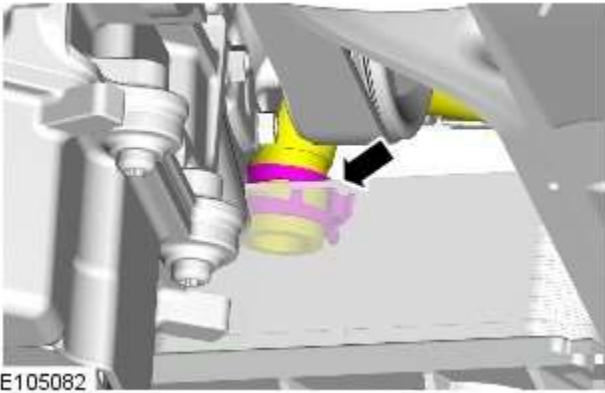
1. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



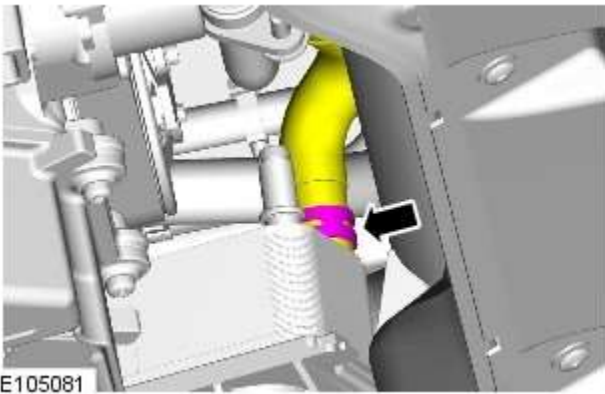
2. Torque: 11 Nm



3. Torque: 5 Nm

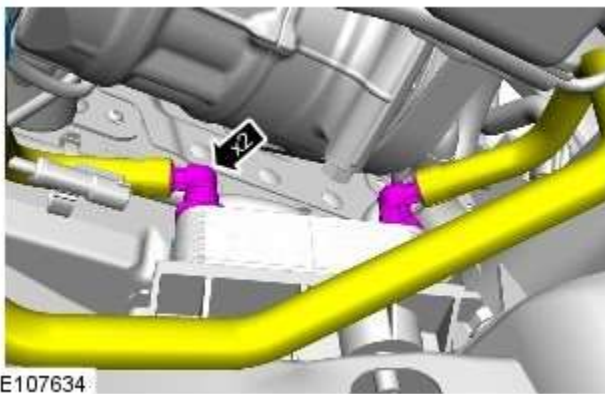


4.



5.

- Clamp the hoses to minimize coolant loss.



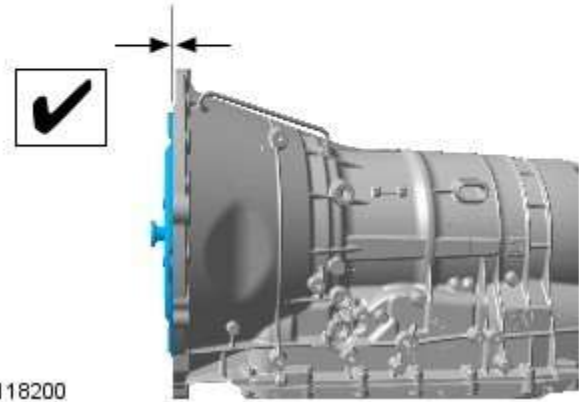
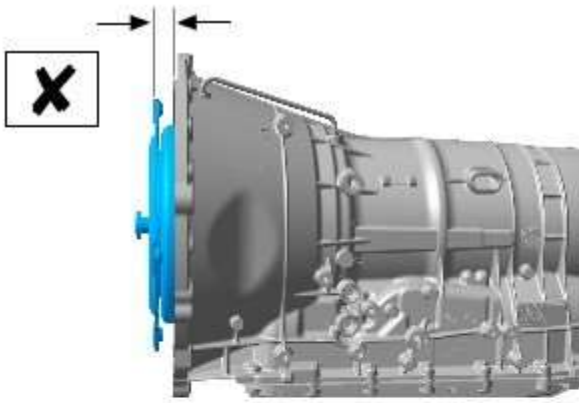
6. CAUTIONS:



Be prepared to collect escaping fluids.



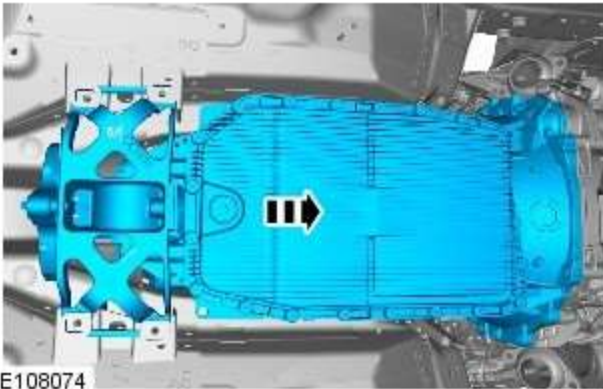
Make sure that all openings are sealed. Use new blanking caps.



E118200



7. CAUTION: Make sure the torque converter is fully located into the oil pump drive.



E108074

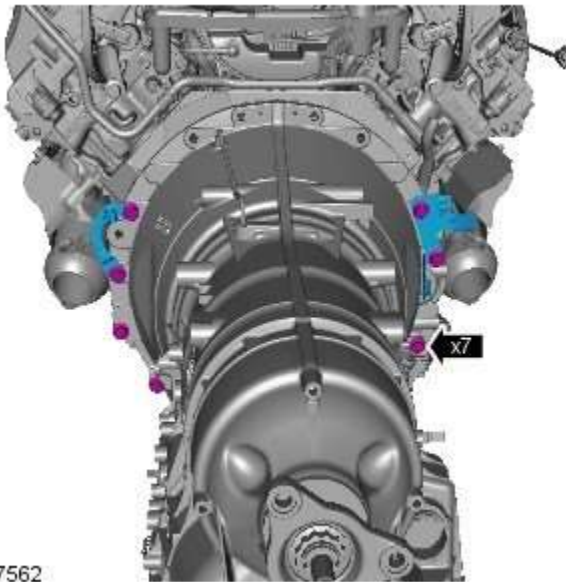


8. CAUTION: Make sure that the torque converter remains in the transmission.



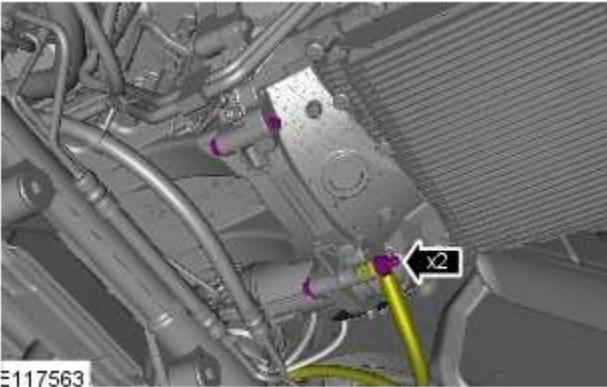
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Raise the powertrain assembly jack and transmission assembly.



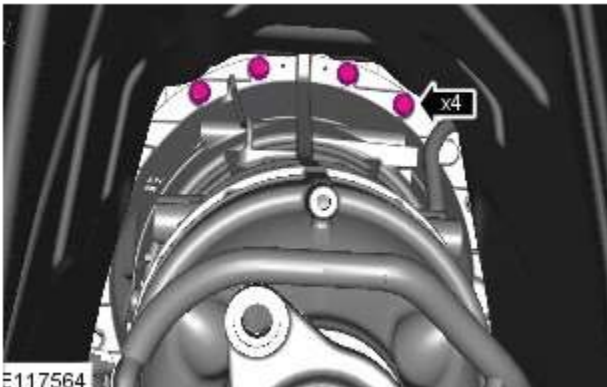
E117562

9.  NOTE: Transmission shown removed for clarity.
Torque: 48 Nm



E117563

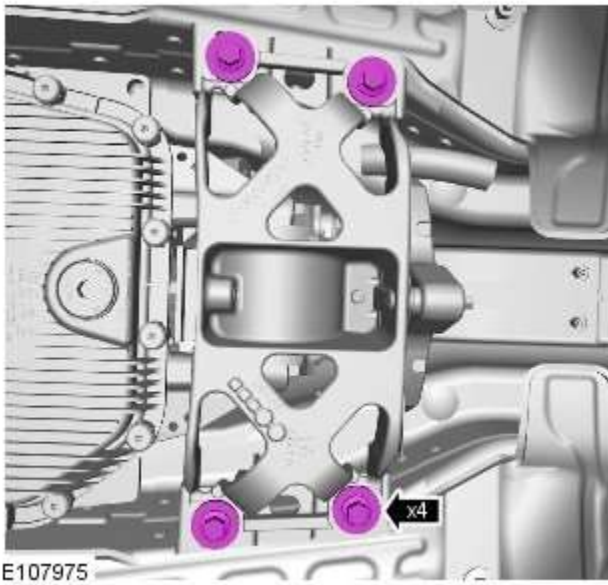
10. Torque: 48 Nm



E117564

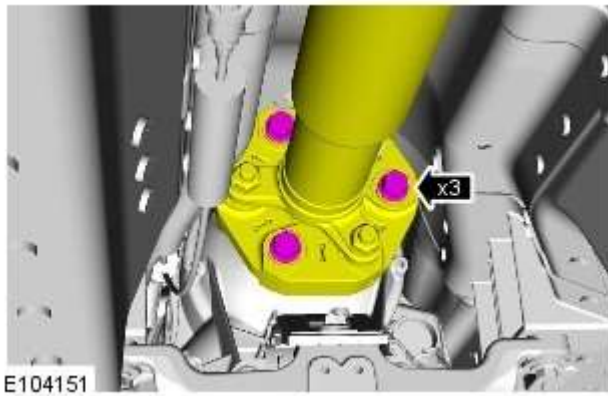
11. Torque: 48 Nm

12. Torque: 45 Nm




13. Remove the support.

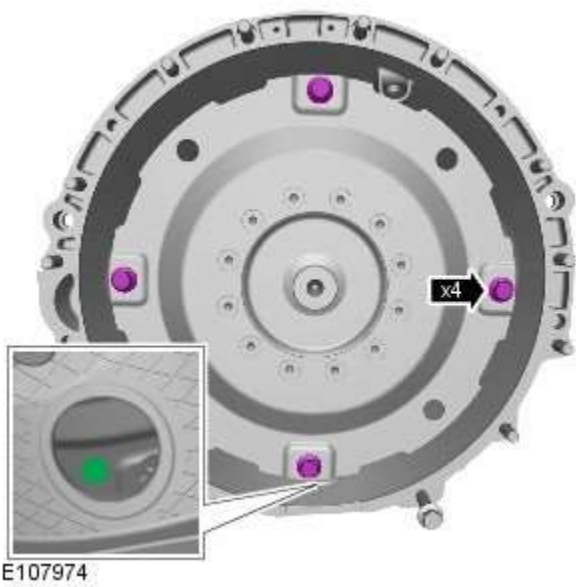
14. Torque: 110 Nm



15.  CAUTION: Only rotate the crankshaft clockwise.

 NOTE: Make sure that the alignment mark is visible through the inspection hole as illustrated.

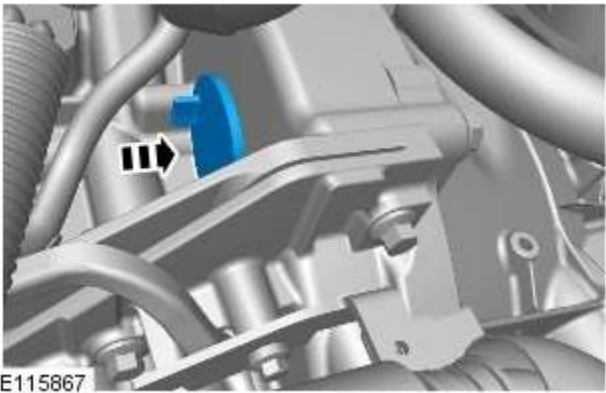
Torque: 63 Nm





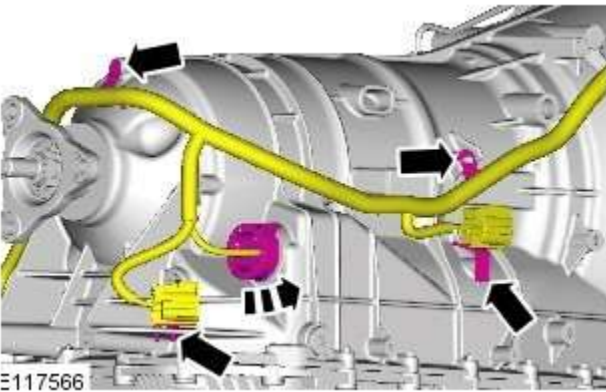
E107972

16.



E115867

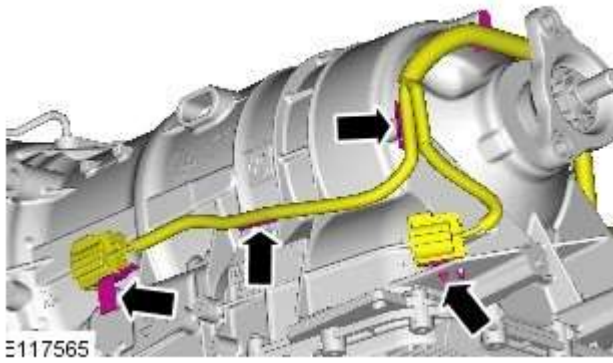
17.



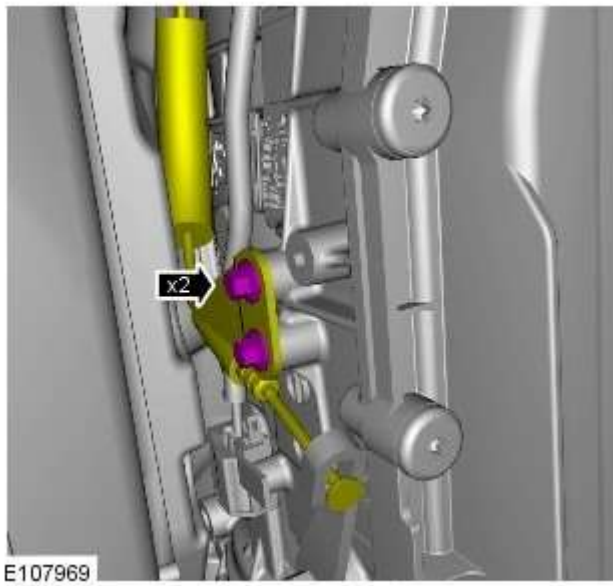
E117566

18.

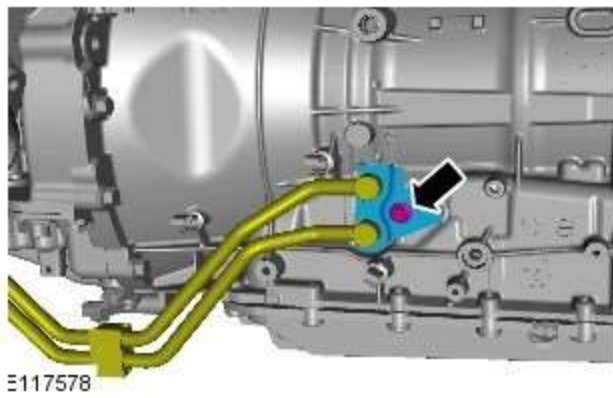
19.



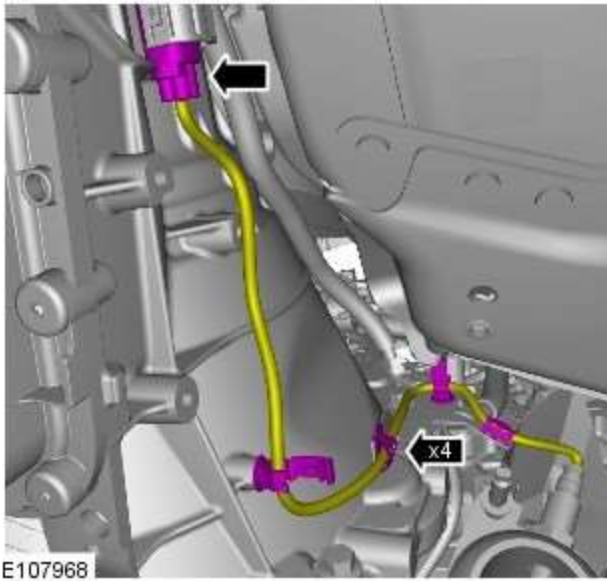
20. Torque: 10 Nm



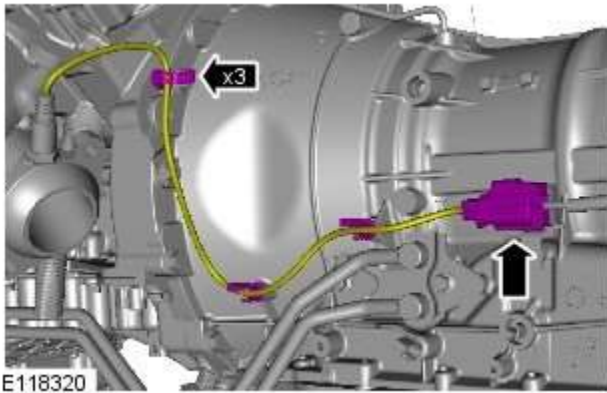
21.  CAUTION: Install new o-ring seals
Torque: 10 Nm





22.



23.



24. Refer to: [Catalytic Converter LH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
25. Refer to: [Catalytic Converter RH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
26. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
27. Check and top up the cooling system as required.
28. Set the heater controls to HOT.
29.  **CAUTION:** Observe the engine temperature warning light. If the warning light is displayed, switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle.
Start the engine and allow to idle until hot air is emitted at the face registers.

30.  CAUTION: Observe the engine temperature warning light. If the warning light is displayed, switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle.

Raise the engine speed to 2000 RPM and maintain at 2000 RPM until the engine cooling fan operates.

31.  CAUTION: Switch off the engine and allow the coolant temperature to go cold.

Switch the engine off and allow to cool.

32. Visually check the engine and cooling system for signs of coolant leakage.

33. WARNINGS:



When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.



Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.

CAUTIONS:



Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.



Anti-freeze concentration must be maintained at 50%.



NOTE: When the cooling system is warm, the coolant will be approximately 10mm above the upper level mark on the expansion tank with the cap removed.

Check and top-up the coolant if required.

34. Refer to: [Transmission Fluid Level Check](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission and Transmission Fluid Cooler V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal



CAUTION: Make sure that all openings are sealed. Use new blanking caps.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



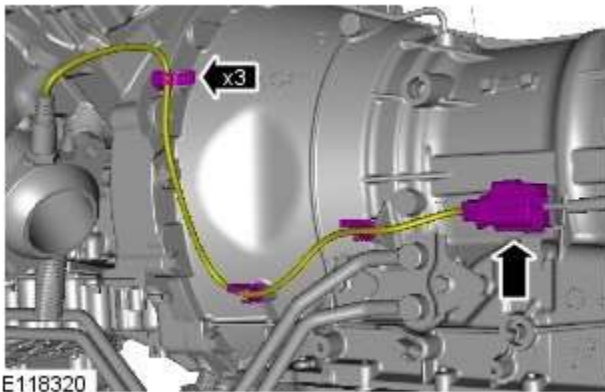
2. **WARNING:** Make sure to support the vehicle with axle stands.

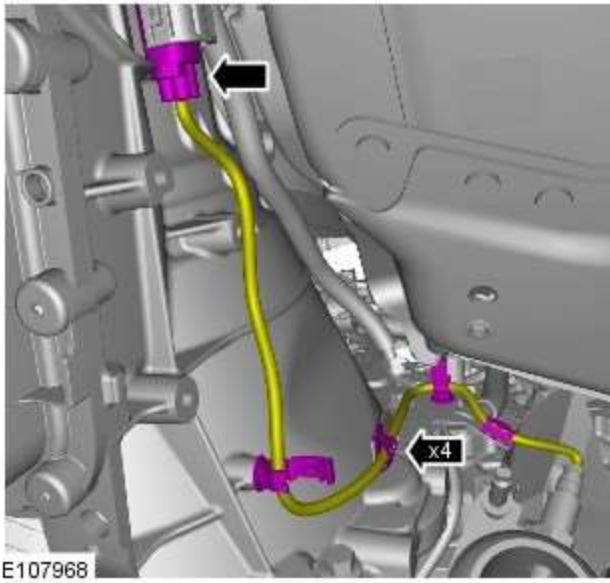
Raise and support the vehicle.

3. Refer to: [Catalytic Converter RH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

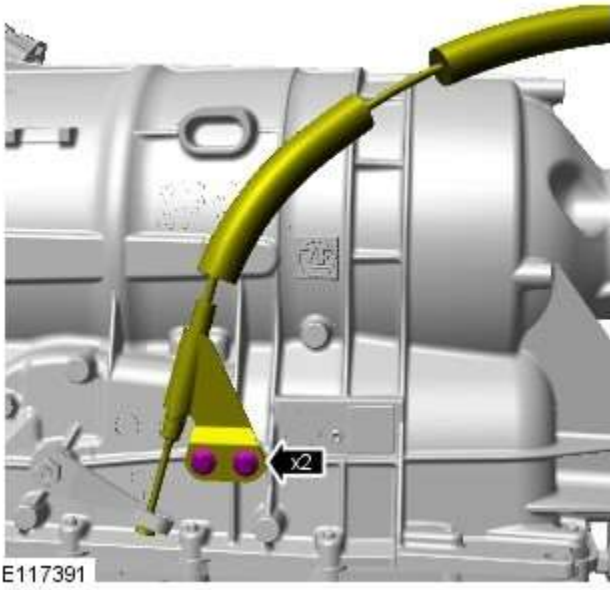
4. Refer to: [Catalytic Converter LH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

5.

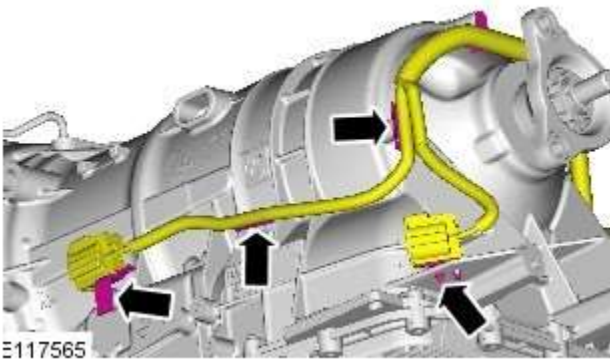




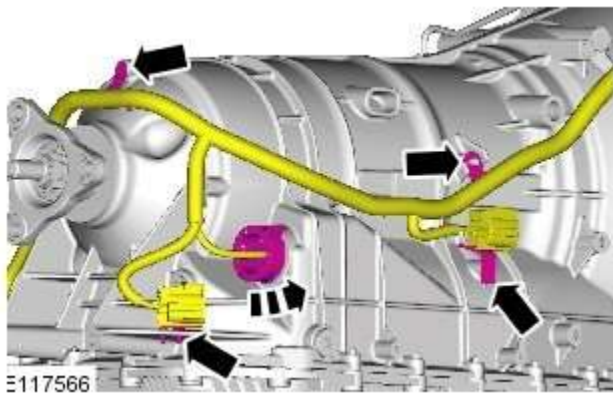
6.



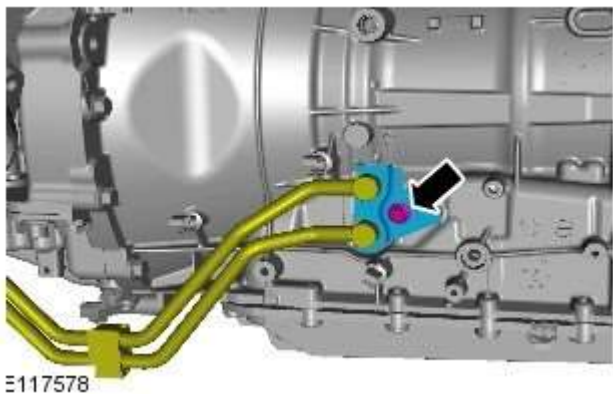
7.



8.



9.



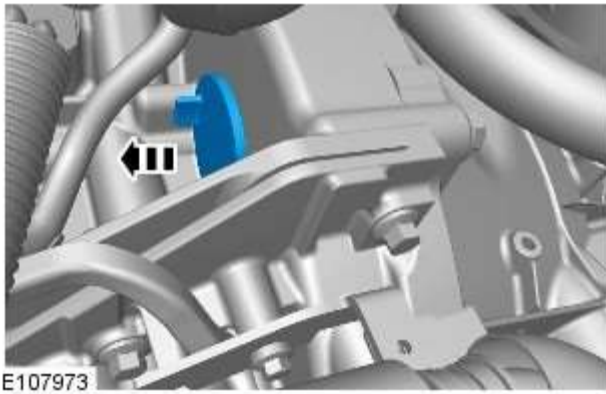
10.  CAUTION: Be prepared to collect escaping fluids.

 NOTE: Remove and discard the O-ring seals.

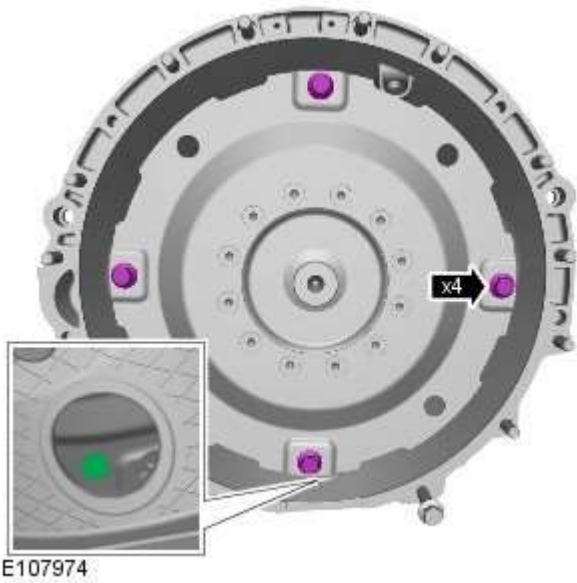
Install blanking caps to the exposed ports.



11.

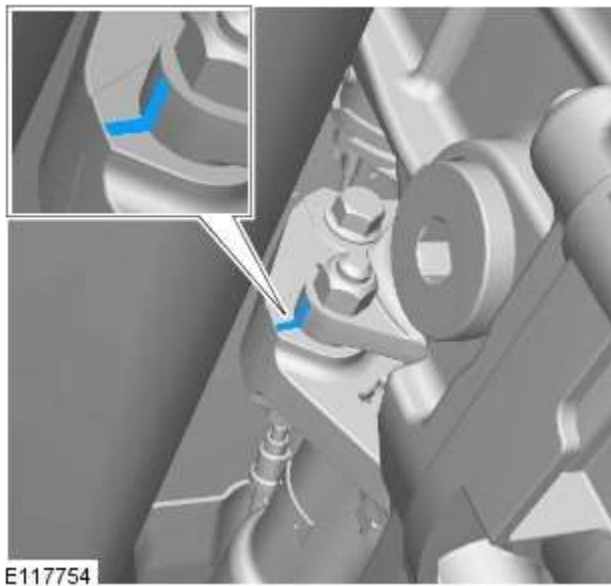


12.

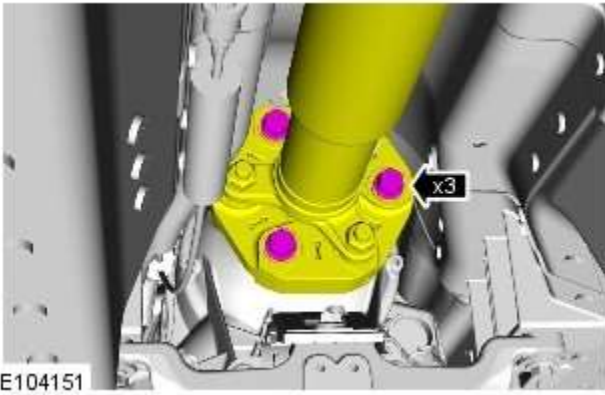


13.


- Make sure that the alignment mark is visible through the inspection hole on removal of the last torque converter bolt.



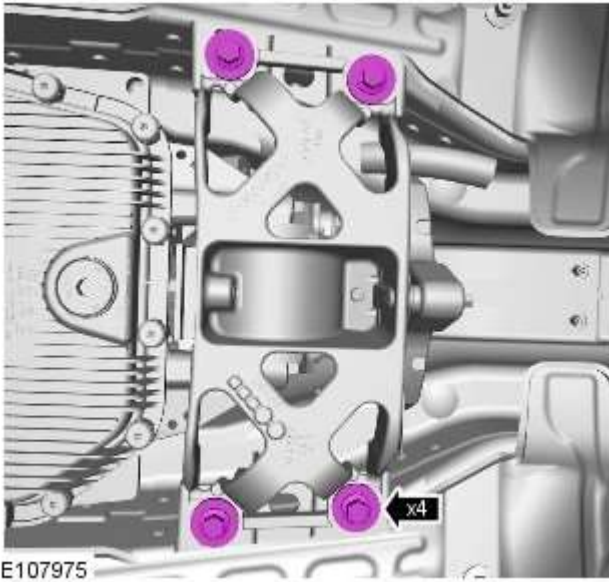
14.  NOTE: Mark the position of the driveshaft on the transmission flange.



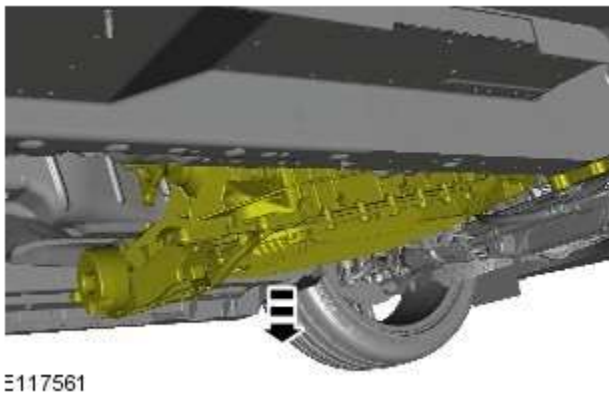
- 15.
- Using a suitable tie strap, secure the driveshaft.


16.  **WARNING:** Make sure that the transmission is secured with suitable retaining straps.

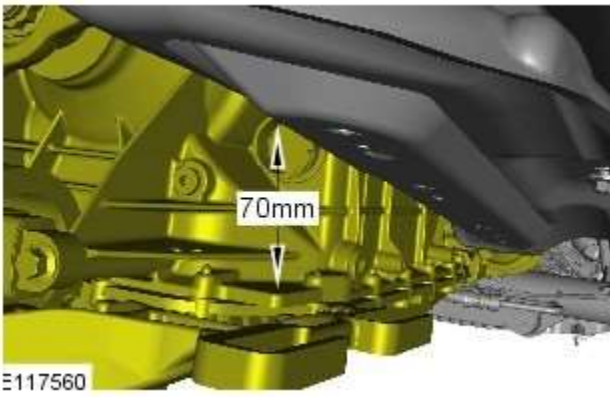
Using a suitable stand, support the transmission.



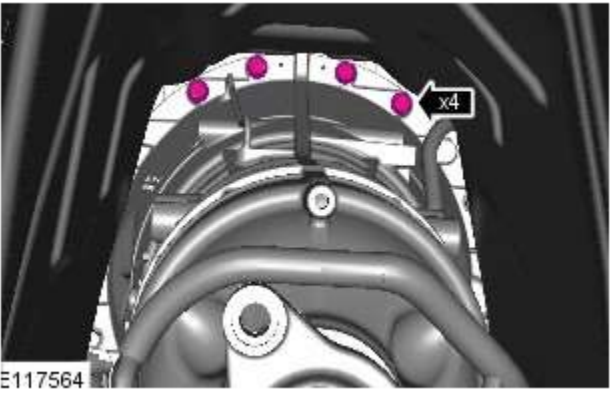
- 17.



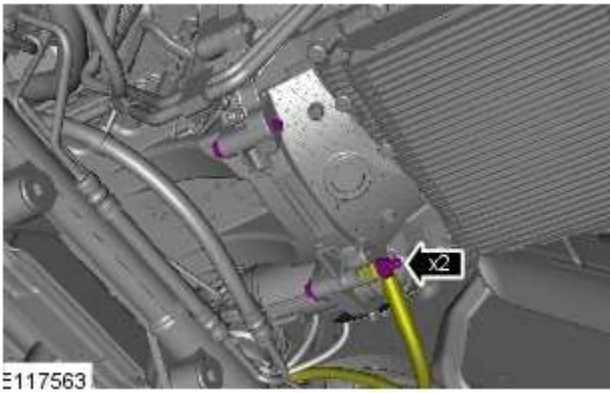
18.  **NOTE:** The transmission is lowered for access.
Lower the rear of the transmission for access.



19.  NOTE: The transmission is lowered for access.

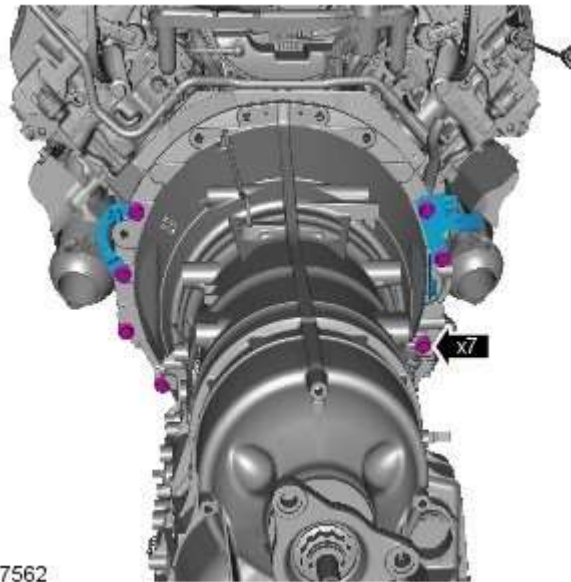


20.



21.

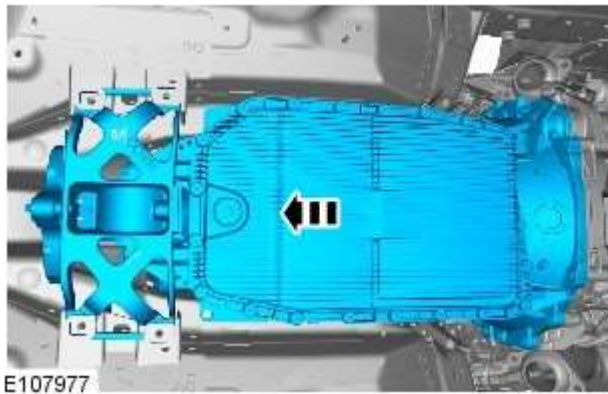
22.



23.  CAUTION: Make sure that the torque converter remains in the transmission.

 NOTE: This step requires the aid of another technician.

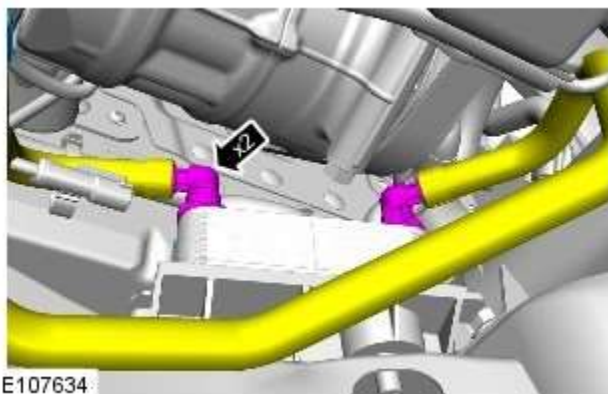
- Install the torque converter retainer.

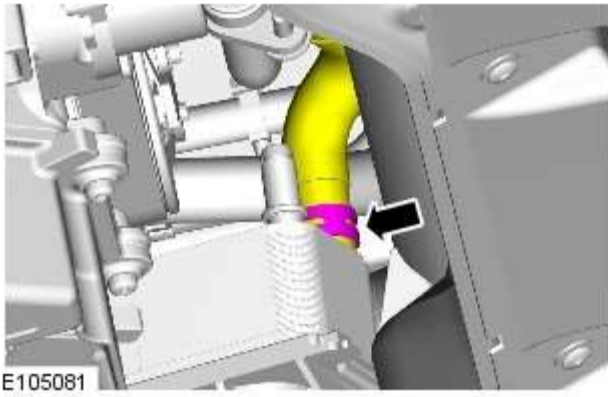


24. CAUTIONS:

 Be prepared to collect escaping fluids.

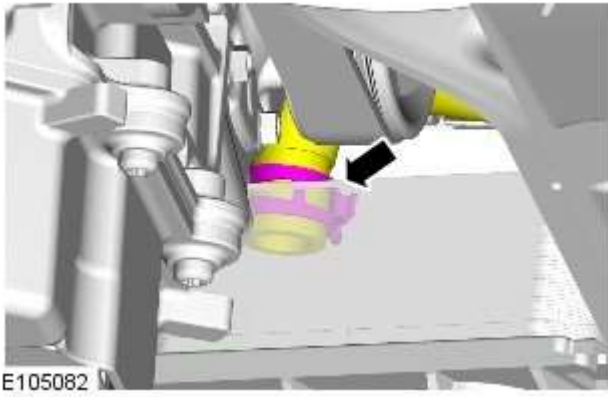
 Make sure that all openings are sealed. Use new blanking caps.



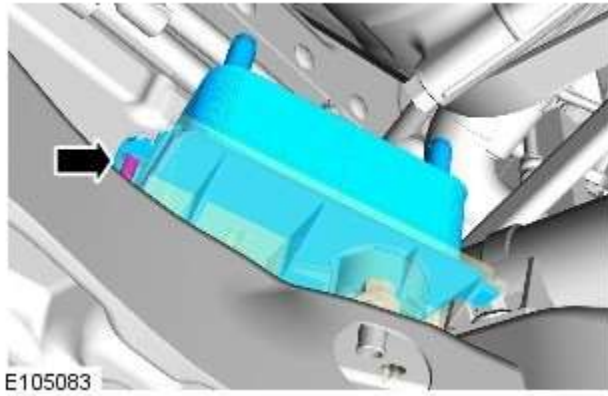


25.

- Clamp the hoses to minimize coolant loss.

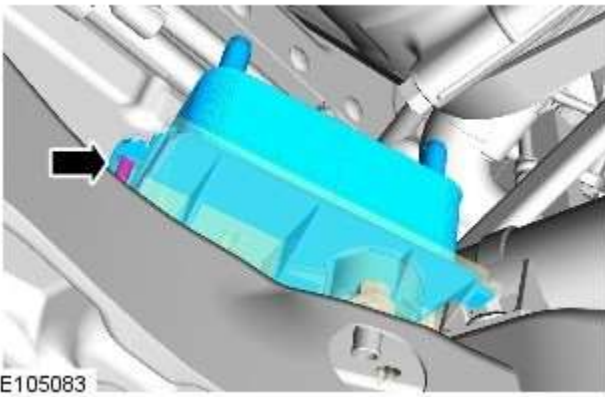


26.

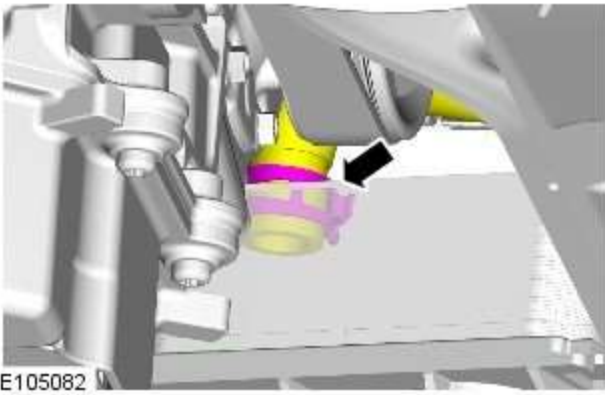


27.

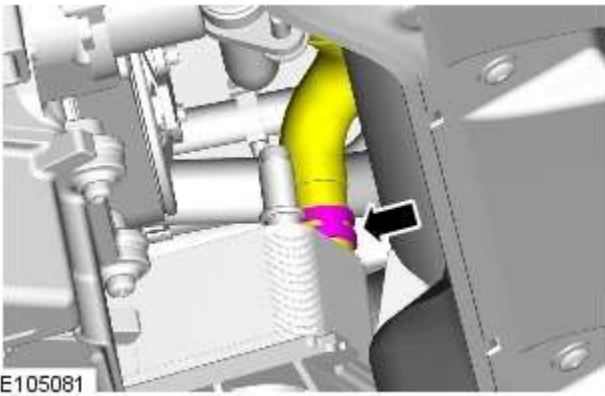
Installation



1. Torque: 5 Nm

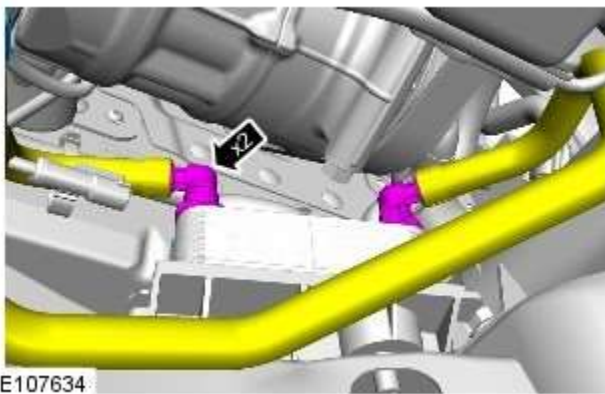


2.



3.

- Clamp the hoses to minimize coolant loss.



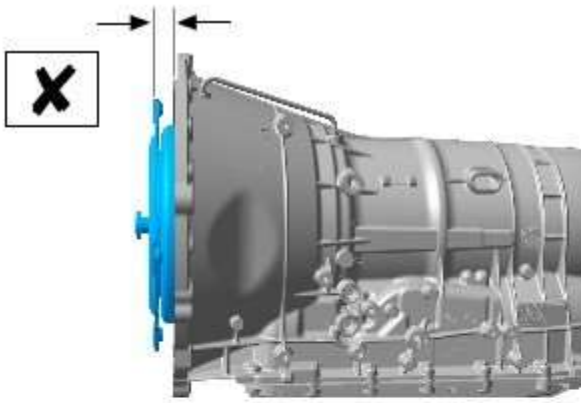
4. CAUTIONS:




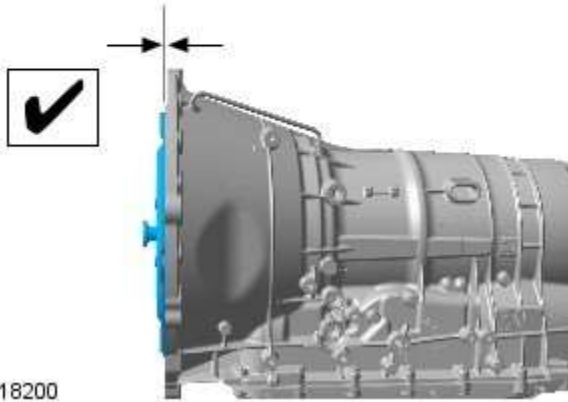
Be prepared to collect escaping fluids.



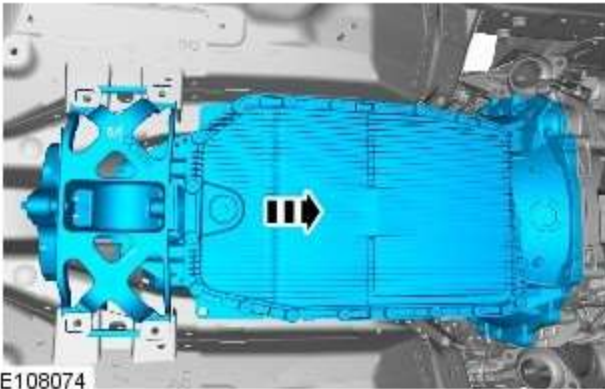
Make sure that all openings are sealed. Use new blanking caps.




5.  CAUTION: Make sure the torque converter is fully located into the oil pump drive.




E118200

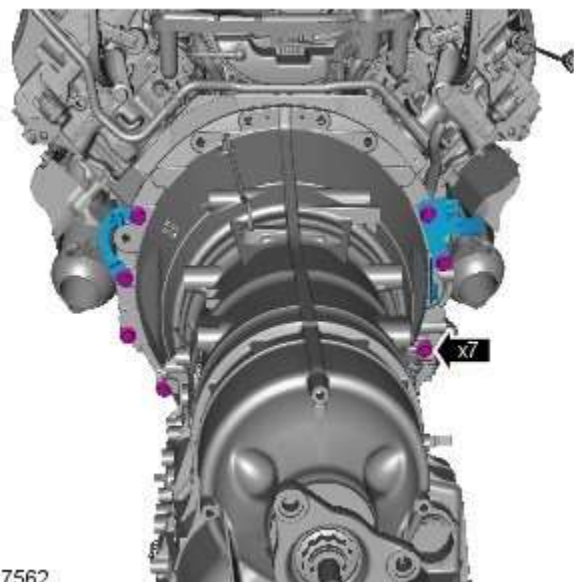


E108074

6.  CAUTION: Make sure that the torque converter remains in the transmission.

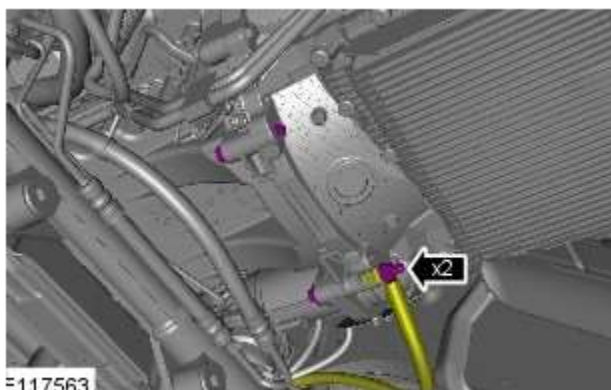
 NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Raise the powertrain assembly jack and transmission assembly.



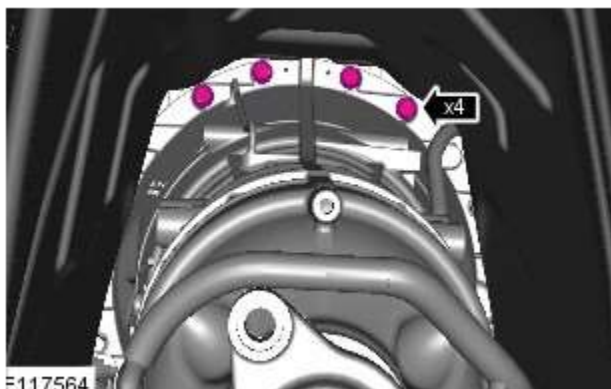
E117562

7.  NOTE: Transmission shown removed for clarity.
Torque: 48 Nm



E117563

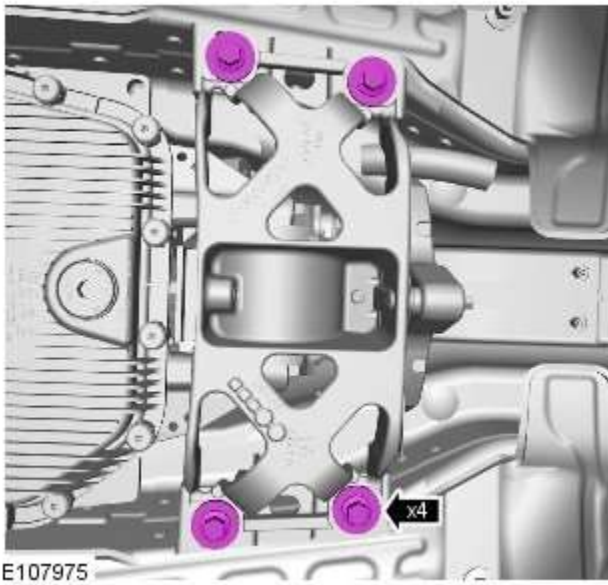
8. Torque: 48 Nm



E117564

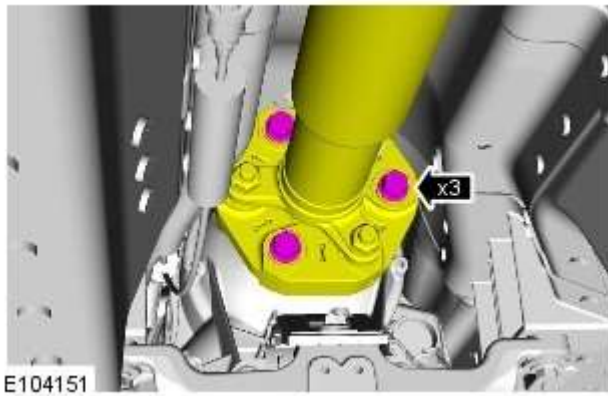
9. Torque: 48 Nm

10. Torque: 45 Nm




11. Remove the support.

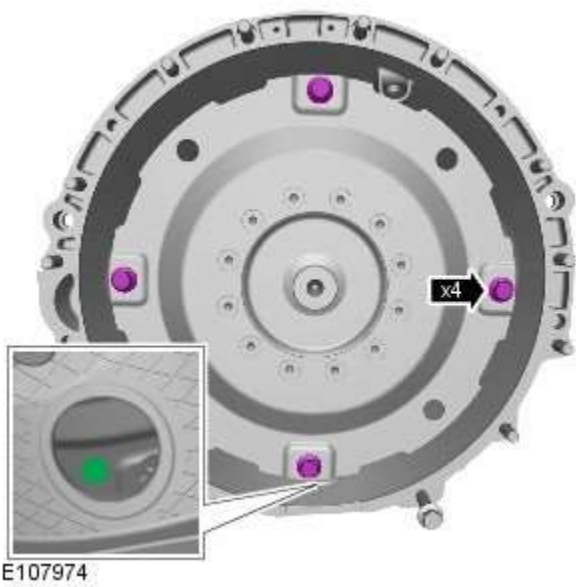
12. Torque: 110 Nm



13.  CAUTION: Only rotate the crankshaft clockwise.

 NOTE: Make sure that the alignment mark is visible through the inspection hole as illustrated.

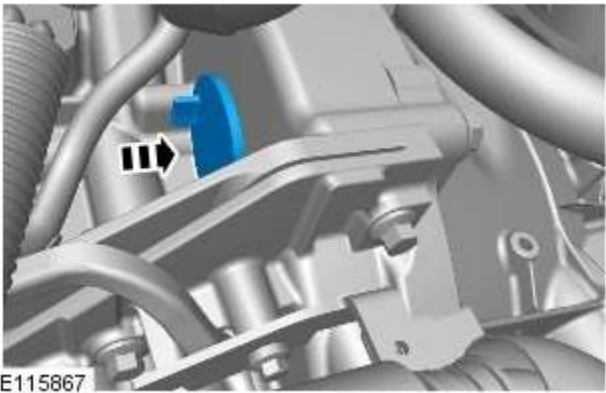
Torque: 63 Nm





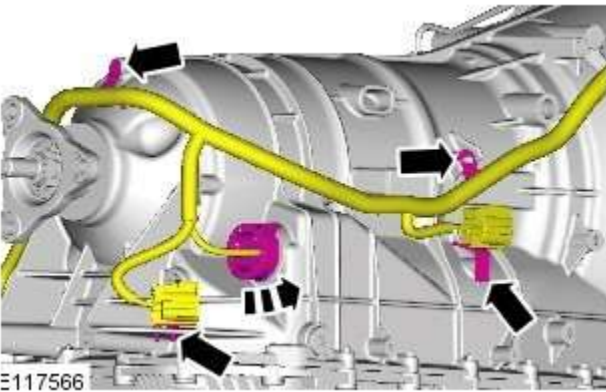
E107972

14.



E115867

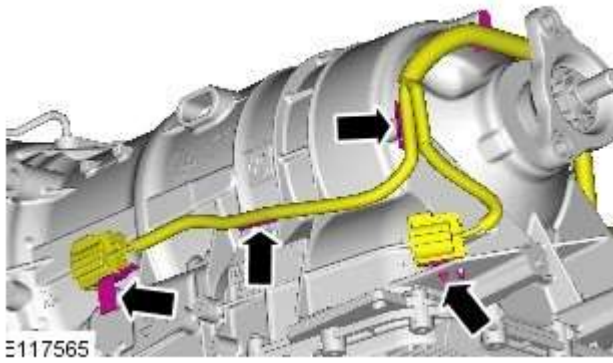
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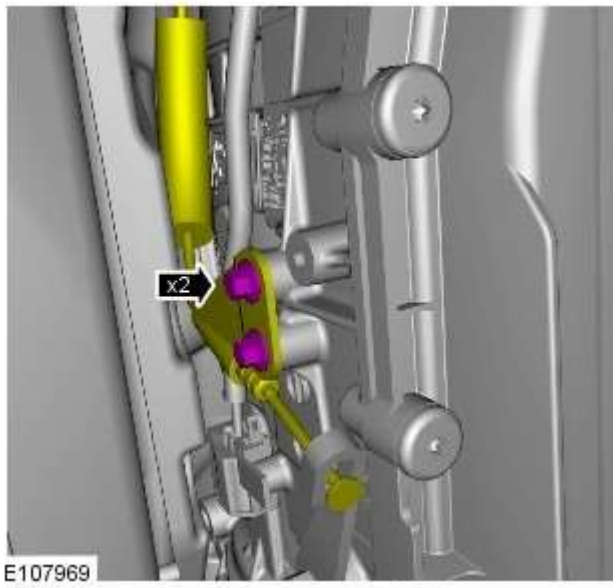
E117566


16.

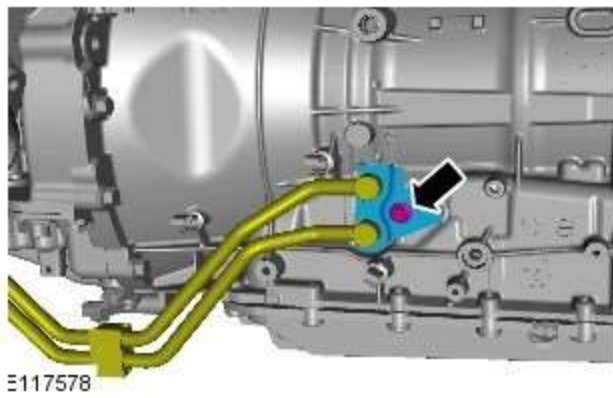
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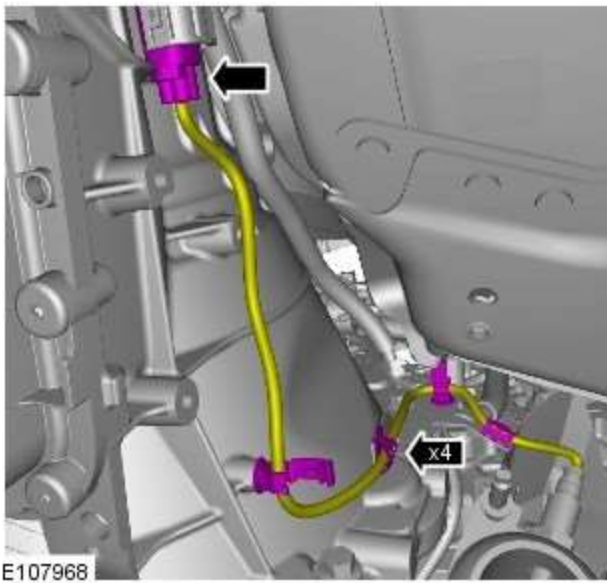
18. Torque: 10 Nm



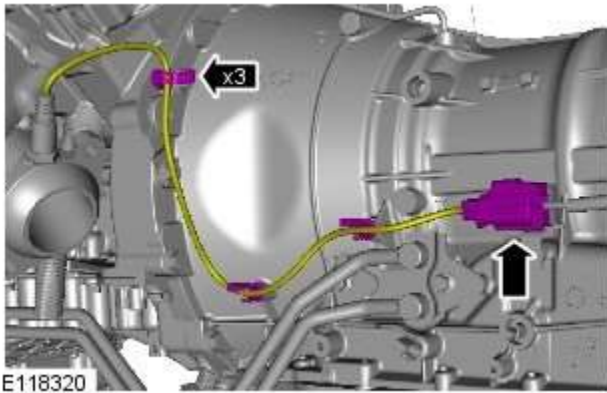
19.  CAUTION: Install new o-ring seals
Torque: 10 Nm





20.



21.



22. Refer to: [Catalytic Converter LH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
23. Refer to: [Catalytic Converter RH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
24. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
25. Check and top up the cooling system as required.
26. Set the heater controls to HOT.
27.  **CAUTION:** Observe the engine temperature warning light. If the warning light is displayed, switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle.
Start the engine and allow to idle until hot air is emitted at the face registers.

28.  CAUTION: Observe the engine temperature warning light. If the warning light is displayed, switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle.

Raise the engine speed to 2000 RPM and maintain at 2000 RPM until the engine cooling fan operates.

29.  CAUTION: Switch off the engine and allow the coolant temperature to go cold.

Switch the engine off and allow to cool.

30. Visually check the engine and cooling system for signs of coolant leakage.

31. WARNINGS:



When releasing the cooling system pressure, cover the coolant expansion tank cap with a thick cloth.



Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.

CAUTIONS:



Make sure the coolant level remains above the "COLD FILL RANGE" lower level mark.



Anti-freeze concentration must be maintained at 50%.



NOTE: When the cooling system is warm, the coolant will be approximately 10mm above the upper level mark on the expansion tank with the cap removed.

Check and top-up the coolant if required.

32. Refer to: [Transmission Fluid Level Check](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



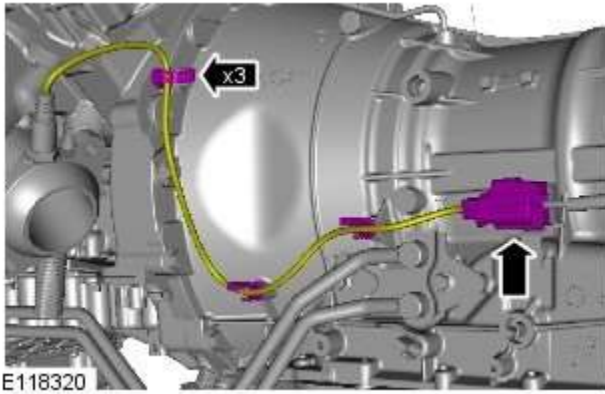
2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

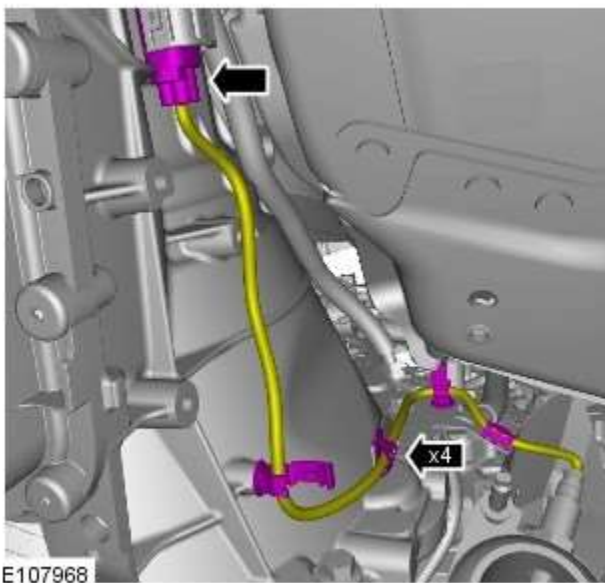
3. Refer to: [Catalytic Converter RH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

4. Refer to: [Catalytic Converter LH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

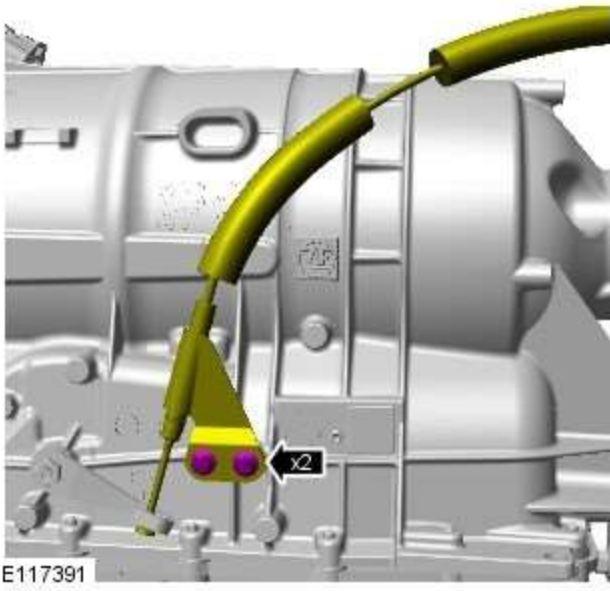
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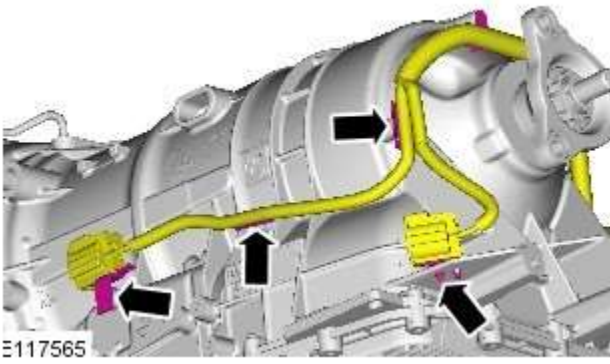
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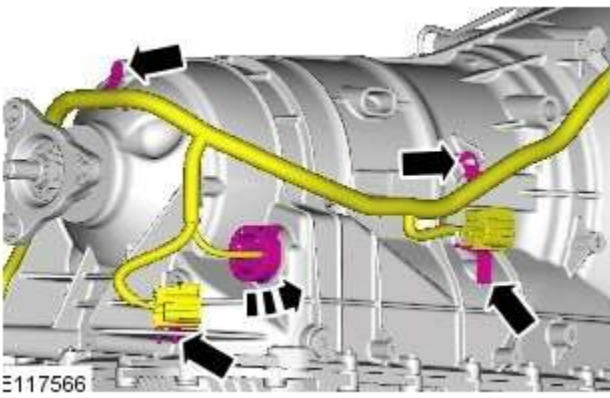
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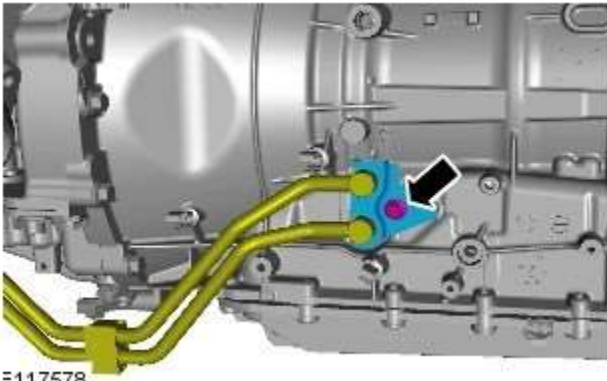


8.



9.





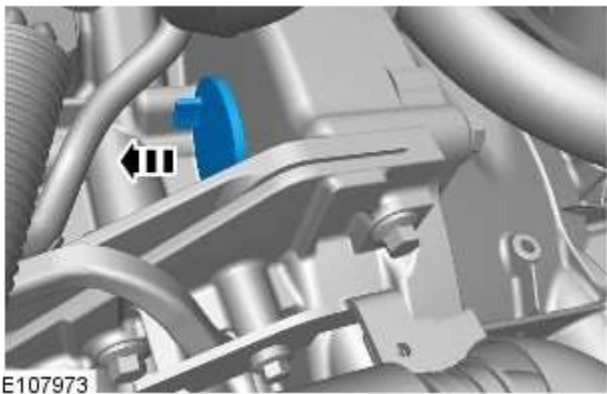
E117578

10.  CAUTION: Be prepared to collect escaping fluids.



E107972

11.

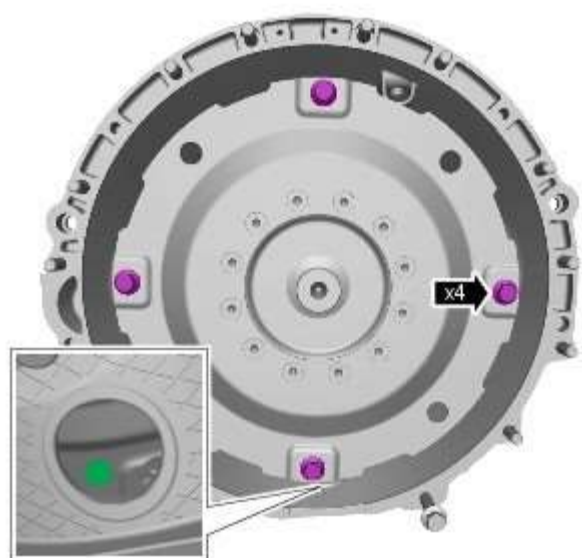


E107973

12.

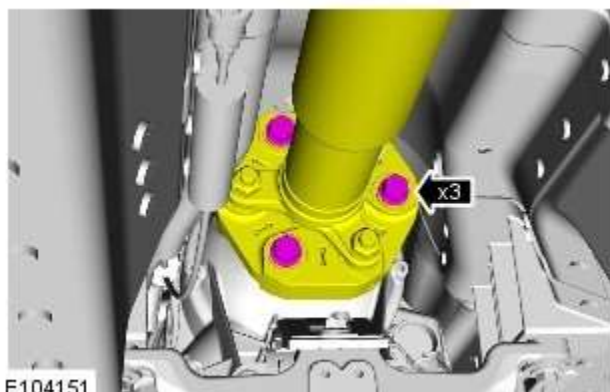
13.

- Make sure that the alignment mark is visible through the inspection hole on removal of the last torque converter bolt.




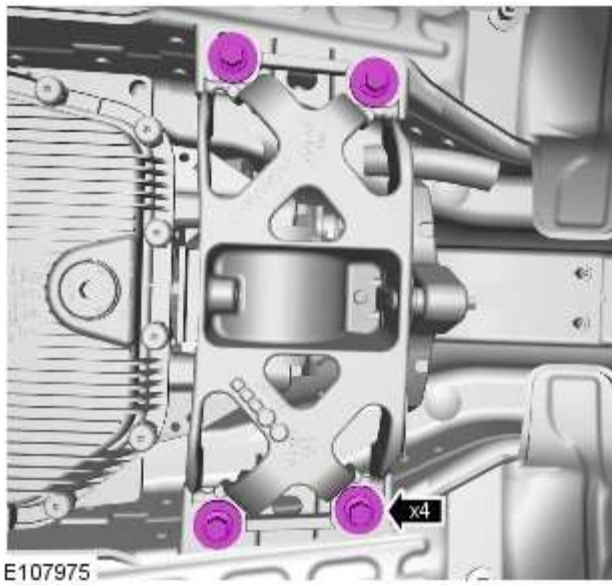
E107974

14.

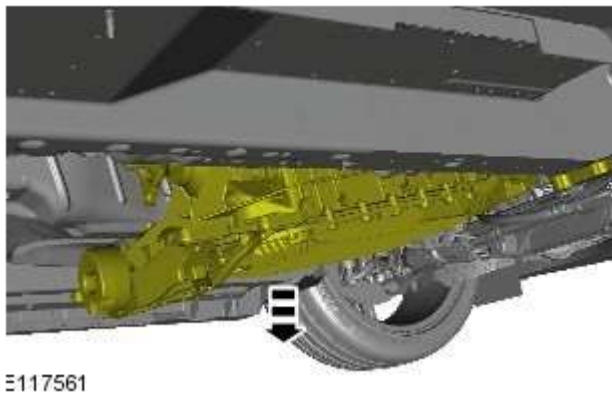



E104151

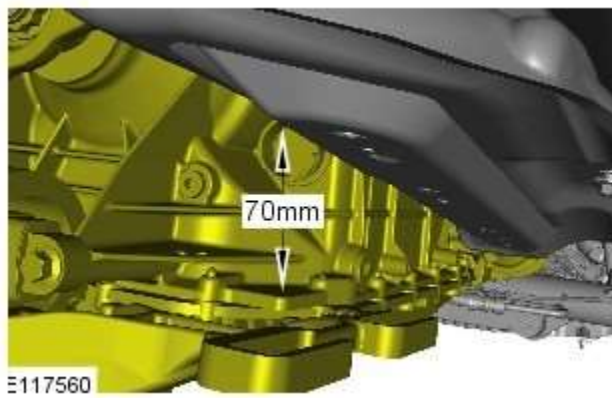
15.  **WARNING:** Make sure that the transmission is secured with suitable retaining straps.
Using a suitable stand, support the transmission.



16.

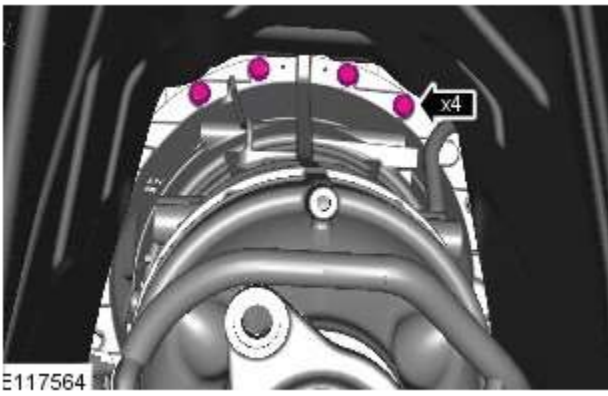


17.  NOTE: The transmission is lowered for access.
Lower the rear of the transmission for access.

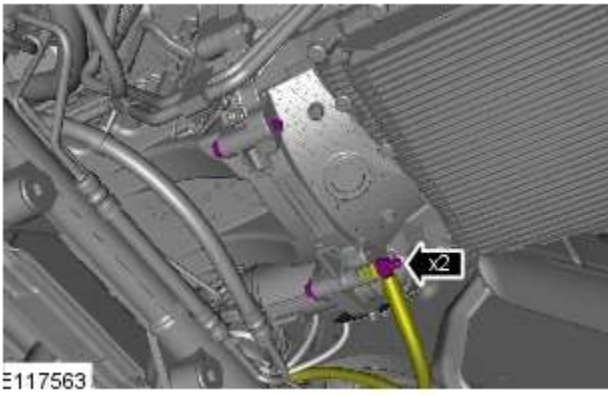


18.  NOTE: The transmission is lowered for access.

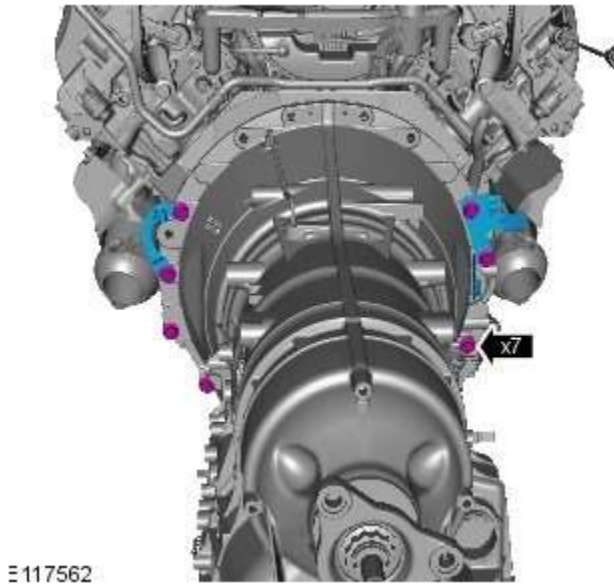
19.

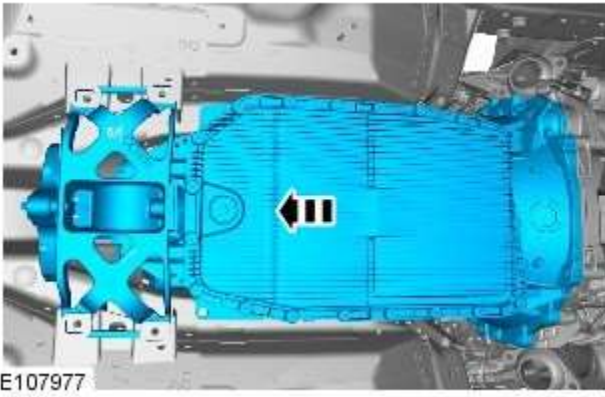


20.



21.





22.  **CAUTION:** Make sure that the torque converter remains in the transmission.

 **NOTE:** This step requires the aid of another technician.

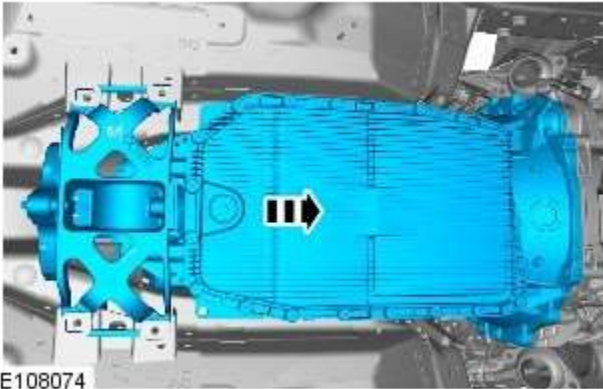
- Install the torque converter retainer.

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission V8 5.0L Petrol/V8 S/C 5.0L Petrol


Installation



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



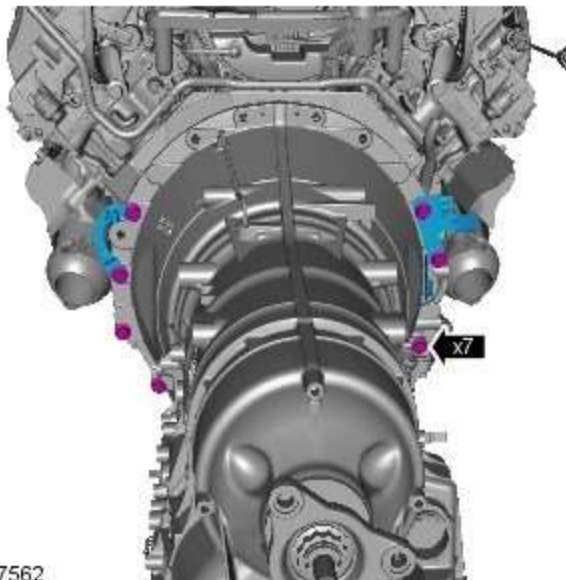
E108074

1.  CAUTION: Make sure that the torque converter remains in the transmission.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

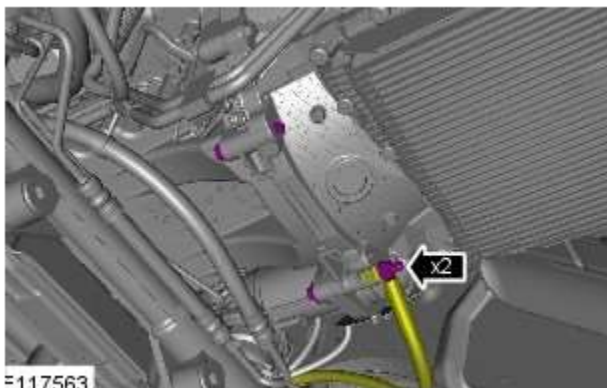
Raise the powertrain assembly jack and transmission assembly.



E117562

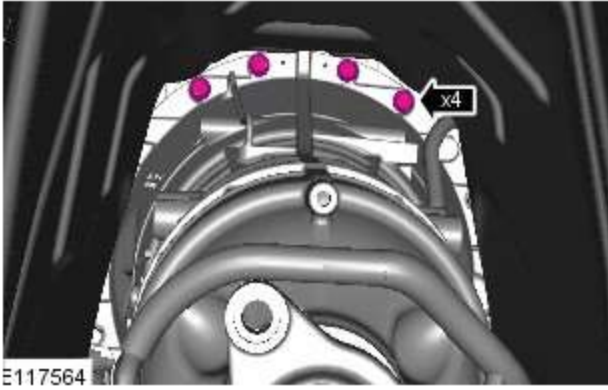
2.  NOTE: Transmission shown removed for clarity.

Torque: 48 Nm

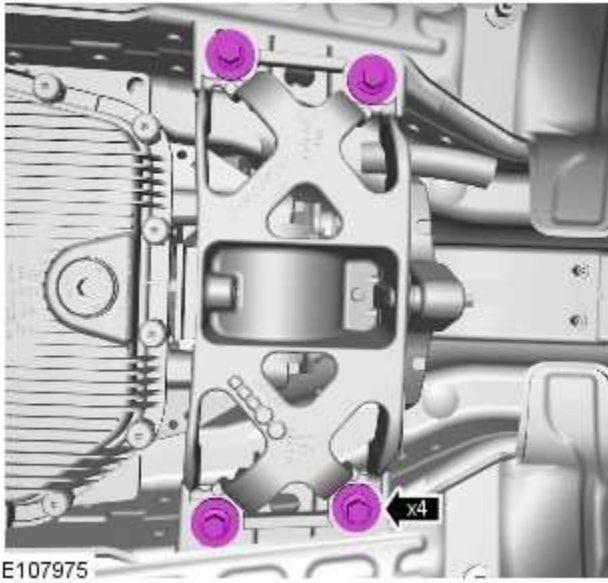


E117563

3. Torque: 48 Nm

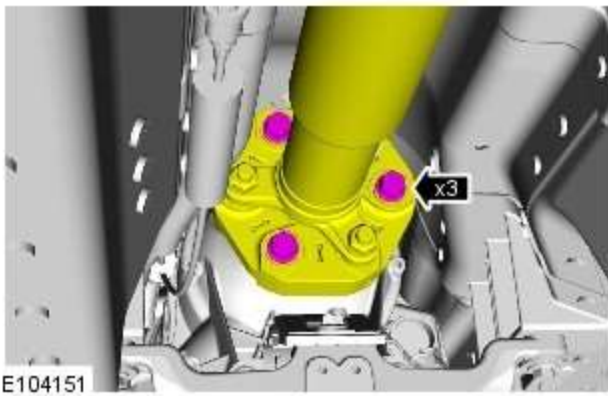


4. Torque: 48 Nm

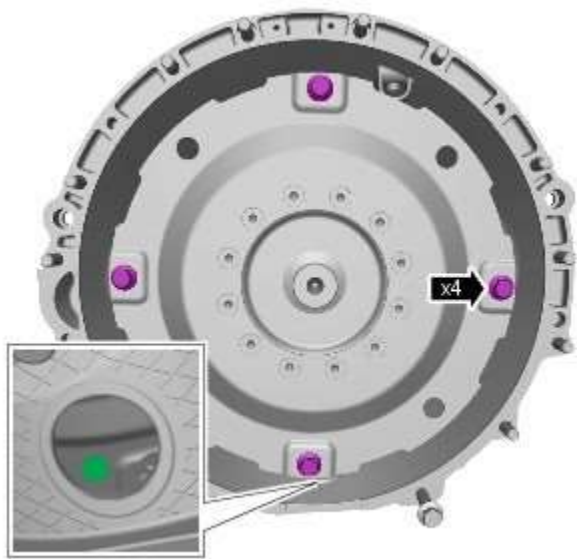


5. Torque: 45 Nm

6. Remove the support.




7. Torque: 110 Nm



E107974

8.  CAUTION: Only rotate the crankshaft clockwise.

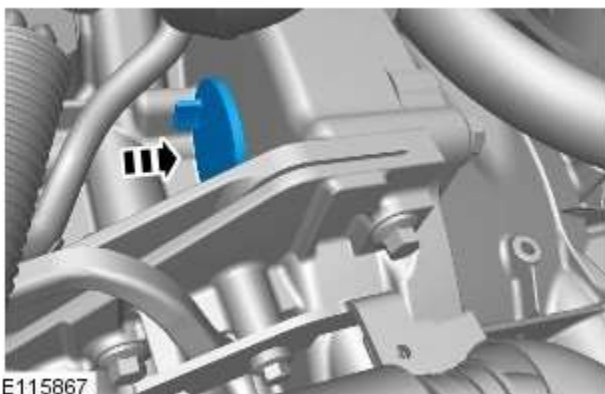
 NOTE: Make sure that the alignment mark is visible through the inspection hole as illustrated.

Torque: 63 Nm



E107972

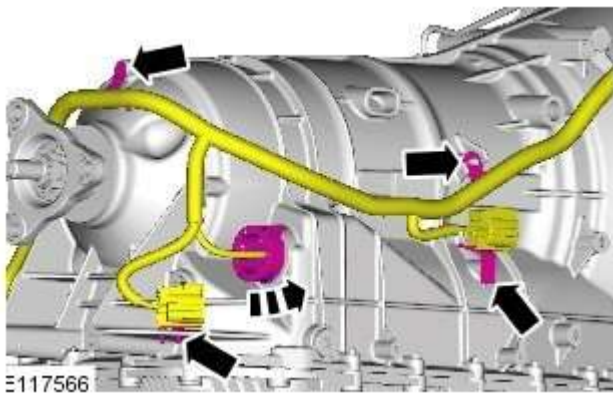
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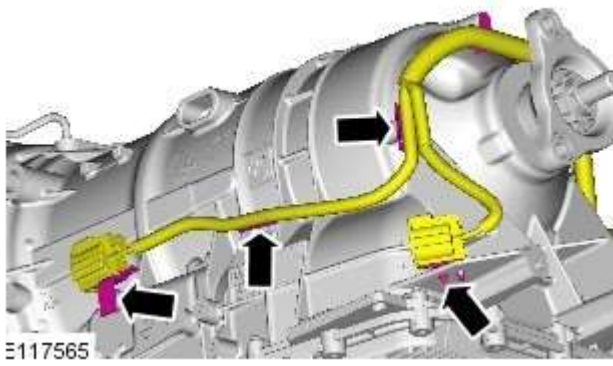
E115867

10.

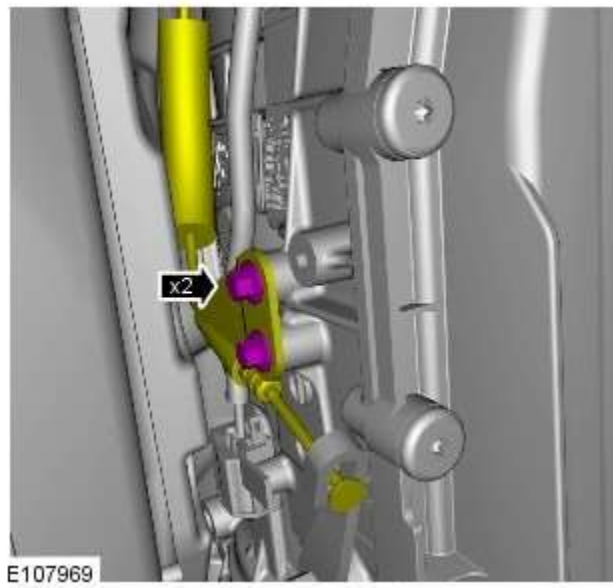
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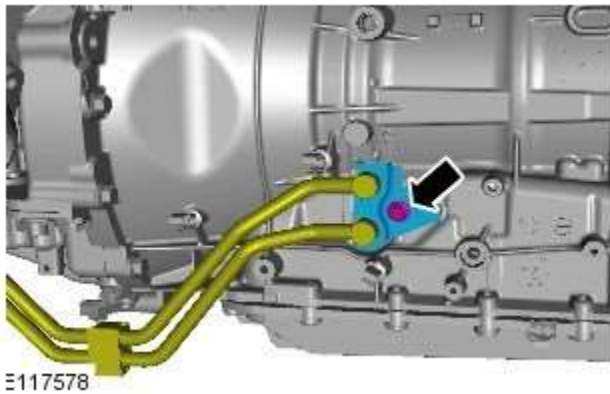


12.

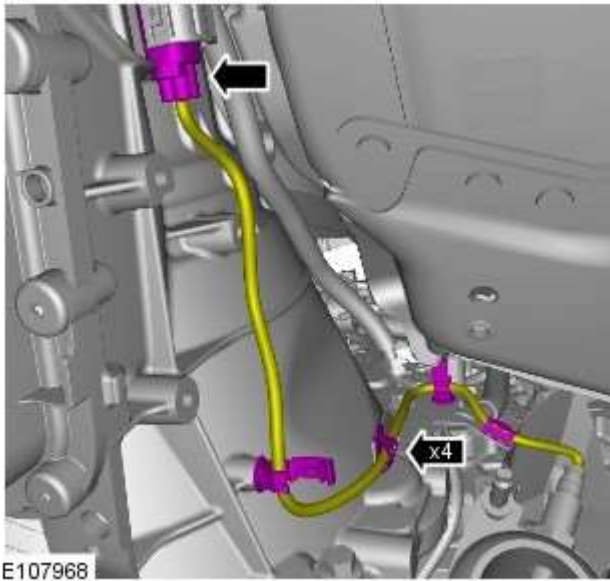


13. Torque: 10 Nm

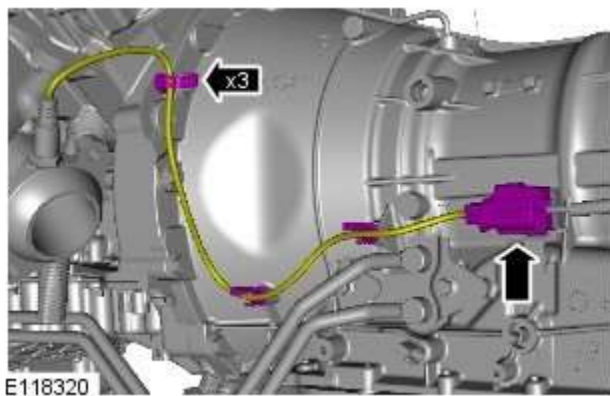




14.  CAUTION: Install new o-ring seals
Torque: 10 Nm



15.



16.

17. Refer to: [Catalytic Converter LH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
18. Refer to: [Catalytic Converter RH](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
19. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

20.  NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Long Drive Cycle Self-Test](#)
(303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures).

Transmission/Transaxle Cooling - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol -

Item	Specification
Transmission fluid	ATF Shell M 1375.4

Vehicles with 3.0L diesel engine

Description	Nm	lb-ft
Transmission fluid cooler tube to transmission housing bolt	23	17
Transmission fluid cooler tube bracket to engine oil pan retaining bolt	23	17

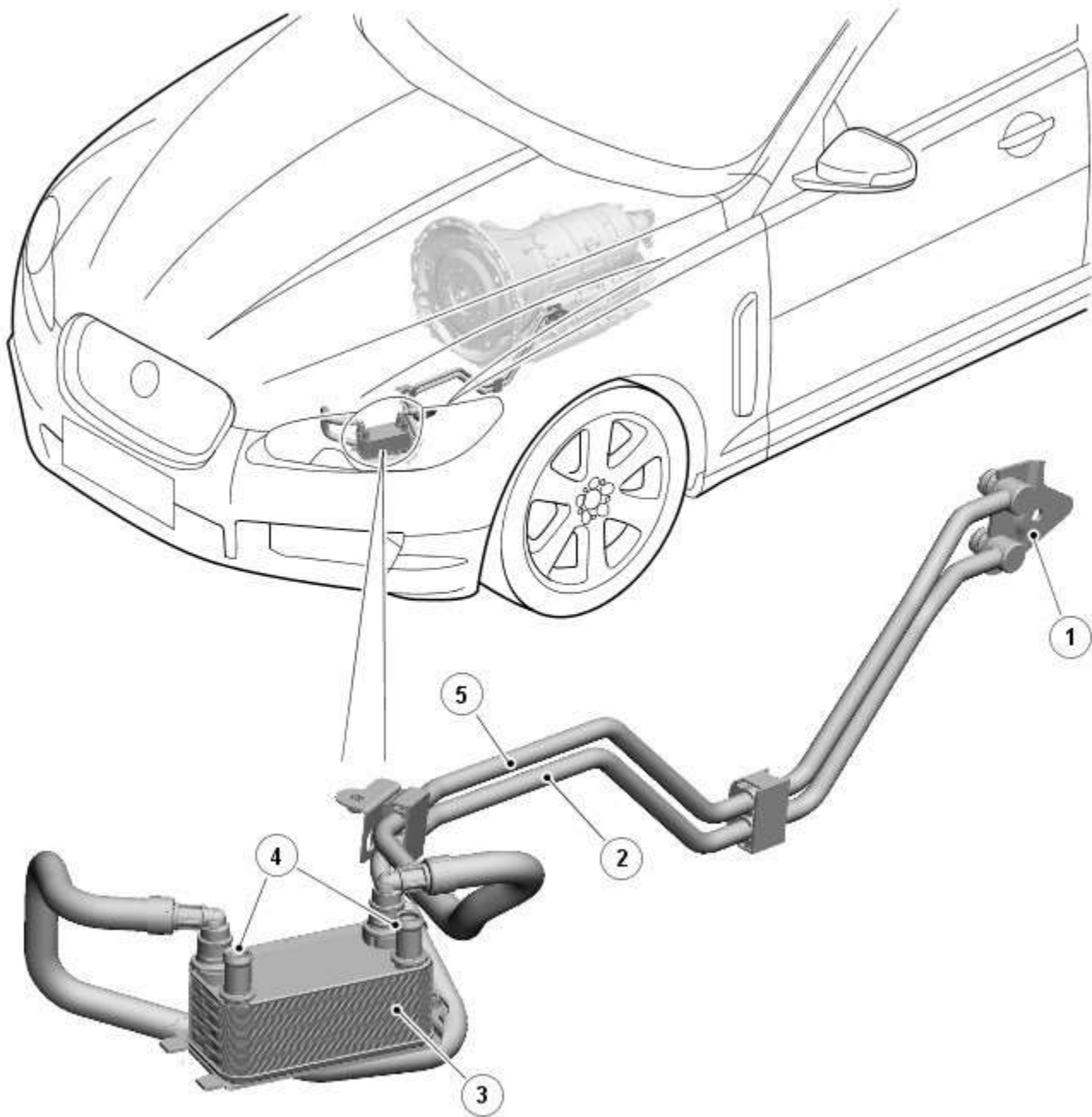
Vehicles with 5.0L engine

Description	Nm	lb-ft
Transmission fluid cooler tube to transmission housing bolt	23	17
Transmission fluid cooler tube bracket to engine oil pan retaining bolt	11	8

Transmission/Transaxle Cooling - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Cooling - Component Location

Description and Operation

COMPONENT LOCATION



E118008

Item	Description
1	Latch-plate
2	Feed hose and pipe (from transmission)
3	Transmission fluid cooler
4	Engine coolant hose connections
5	Return hose and pipe (to transmission)

Transmission/Transaxle Cooling - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Cooling - Overview

Description and Operation

OVERVIEW

Transmission cooling is provided by a transmission fluid cooler, which transfers heat from the transmission to the engine cooling system. The transmission fluid cooler is attached to a mounting bracket on the front subframe, in the front left corner of the engine compartment.

Two hose and pipe assemblies connect the transmission fluid cooler to the automatic transmission. Two engine coolant hose connections are incorporated into the top of the transmission fluid cooler for the supply and return of coolant from the engine cooling system. For additional information, refer to 303-03D Engine Cooling.

Transmission/Transaxle Cooling - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Cooling - System Operation and Component Description

Description and Operation

System Operation

Fluid from the pump in the automatic transmission flows through the feed hose and pipe to the transmission fluid cooler. The fluid then flows through the transmission fluid cooler, and the return hose and pipe, to the sump of the automatic transmission.

Transmission/Transaxle Cooling - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Cooling

Diagnosis and Testing

Principle of Operation

For a detailed description of the automatic transmission cooling system, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (307-02B Transmission/Transaxle Cooling - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol)

[Transmission Cooling](#) (Description and Operation),
[Transmission Cooling](#) (Description and Operation),
[Transmission Cooling](#) (Description and Operation).

Inspection and Verification

1. Verify the customer concern by operating the system.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical
<ul style="list-style-type: none"> • Feed and return tubes • Connections to the automatic transmission and the automatic transmission fluid cooler • Automatic transmission fluid level

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Condition	Possible Causes	Action
Over heating of the automatic transmission	Obstruction in the automatic transmission fluid cooler	Flush out the automatic transmission fluid cooler with new automatic transmission fluid. If the flushing is unsuccessful, install a new transmission fluid cooler.
Over heating of the automatic transmission	Obstruction in the automatic transmission fluid tubes	Flush out the automatic transmission fluid cooler tubes with new automatic transmission fluid. If the flushing is unsuccessful install new automatic transmission fluid cooler tubes.
Loss of automatic transmission fluid	Connections to the automatic transmission and the automatic transmission fluid cooler	Check the integrity of the tubes, connections and seals. Check the torque of the tube fixings.
Loss of automatic transmission fluid	Leak at oil cooler	Check the integrity of tubes, connections and seals. Check the torque of the tube fixings.

Transmission/Transaxle Cooling - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Fluid Cooler V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal

 NOTE: Removal steps in this procedure may contain installation details.



1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Transmission Fluid Drain and Refill](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).
3. Refer to: [Cooling System Draining and Vacuum Filling](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

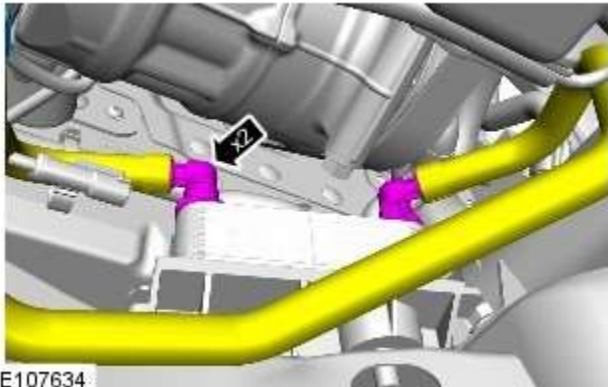
4. CAUTIONS:



Be prepared to collect escaping fluids.

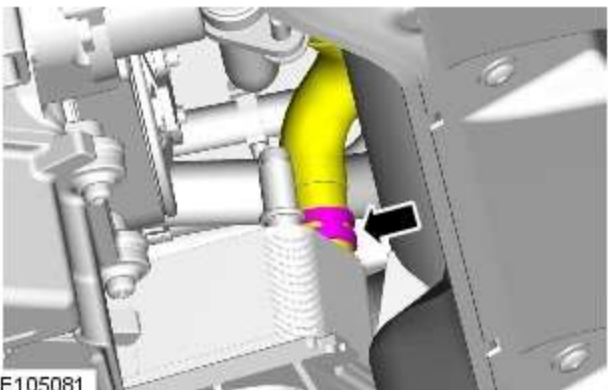


Make sure that all openings are sealed. Use new blanking caps.

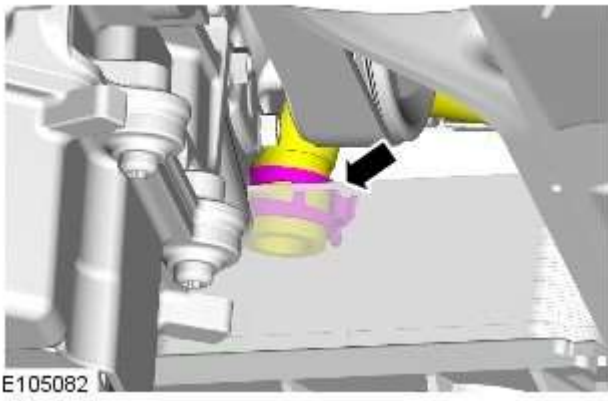


E107634

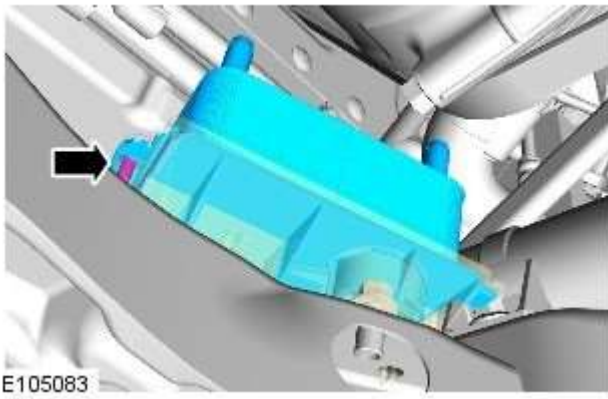
5.



E105081



6.



7. Torque: 5 Nm

Installation

1. To install, reverse the removal procedure.

Transmission/Transaxle Cooling - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - Transmission Fluid Cooler Tubes V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.



1. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

2. Refer to: [Transmission Fluid Drain and Refill](#) (307-01A Automatic Transmission/Transaxle - V6 3.0L Petrol, General Procedures).

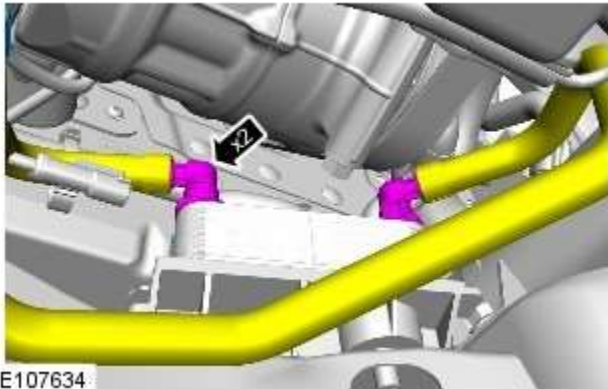
3. **CAUTIONS:**



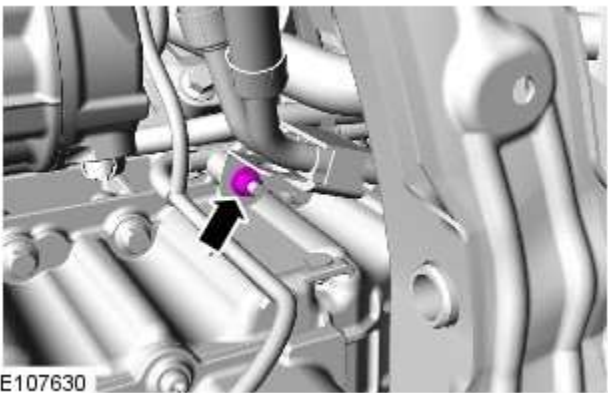
Be prepared to collect escaping fluids.



Make sure that all openings are sealed. Use new blanking caps.

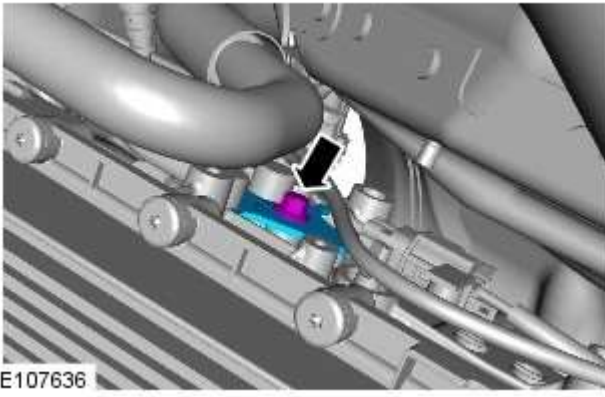


E107634



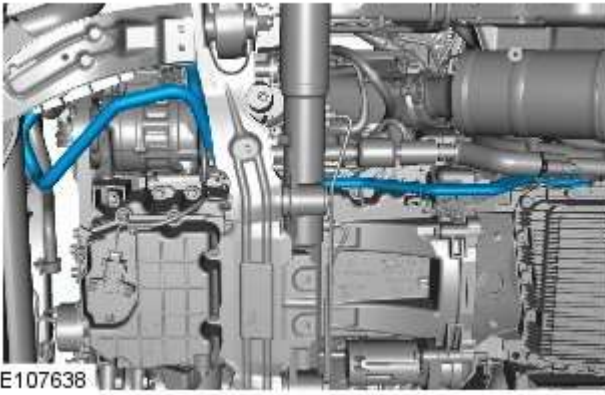
E107630

4. **Torque:** 11 Nm




E107636

5. Torque: 23 Nm



E107638

6.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

Automatic Transmission/Transaxle External Controls - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol -

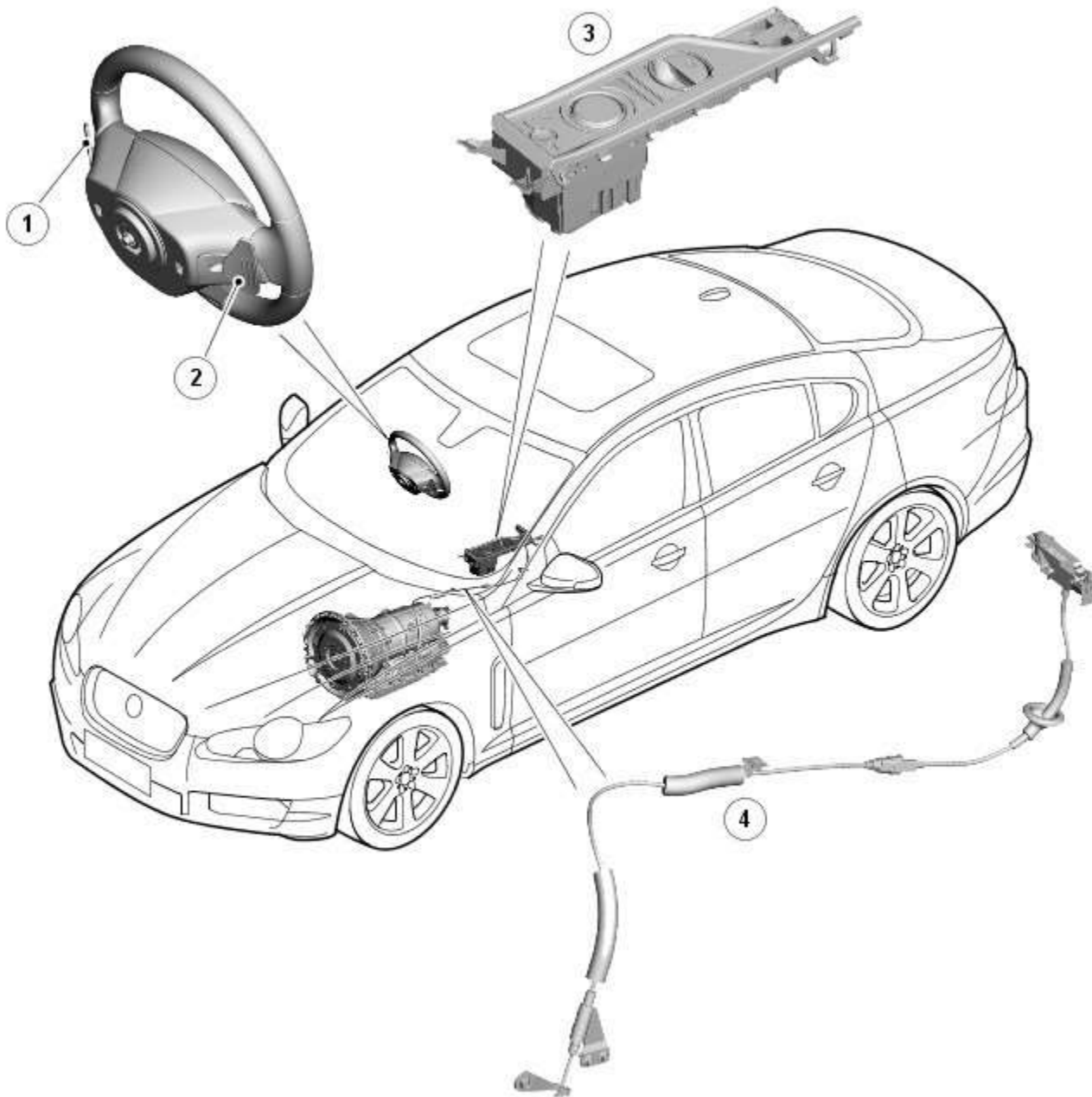
Torque Specifications

Description	Nm	lb-ft	lb-in
Uppshift paddle switch to steering wheel retaining bolt	3	-	27
Downshift paddle switch to steering wheel retaining bolt	3	-	27
Transmission control switch (TCS) to floor console bracket retaining bolts	4	-	35
Emergency park position release lever cable bracket to transmission housing retaining bolts	11	8	-

Automatic Transmission/Transaxle External Controls - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - External Controls - Component Location

Description and Operation

COMPONENT LOCATION



E118501

Item	Description
1	Upshift (+) paddle switch
2	Downshift (-) paddle switch
3	JaguarDrive selector
4	Emergency park release

Automatic Transmission/Transaxle External Controls - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - External Controls - Overview

Description and Operation

OVERVIEW

The external controls for the transmission consist of a JaguarDrive selector, two paddle switches and an emergency park release.

The JaguarDrive selector transmits driver transmission selections to the [TCM \(transmission control module\)](#). The paddle switches allow the driver to initiate gear shifts when the transmission is in the sequential shift manual mode. The emergency park release ensures the transmission is kept in neutral during vehicle recovery operations.

Four additional switches adjacent to the JaguarDrive selector control the JaguarDrive control functions. For additional information, refer to 204-06 Ride and Handling Optimization Description and Operation.

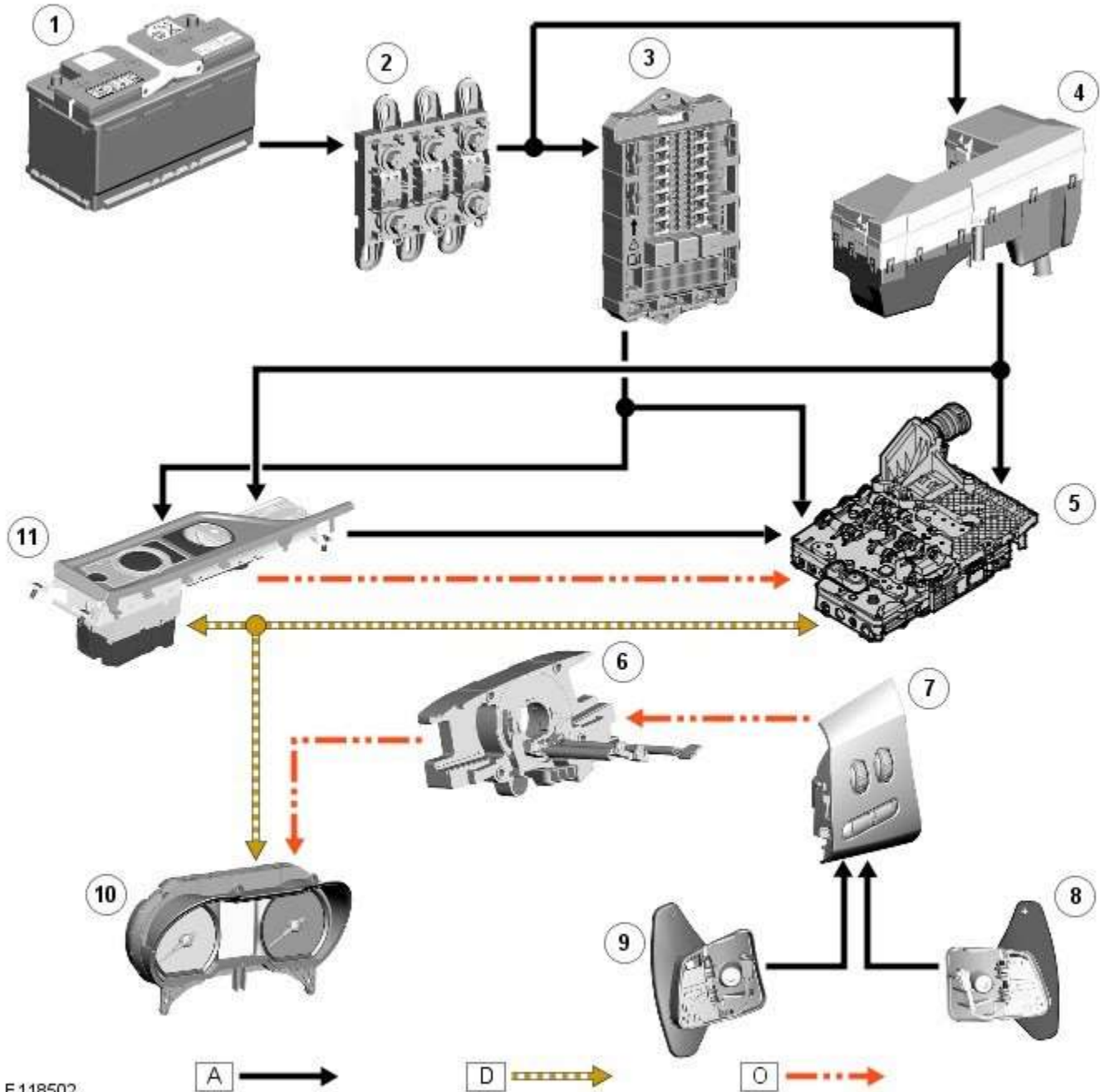
Automatic Transmission/Transaxle External Controls - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - External Controls - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired; D = High speed CAN (controller area network) bus; O = LIN (local interconnect network) bus



E 118502

A →

D →

O →

Item	Description
1	Battery
2	BJB (battery junction box) (250 A megafuse)
3	CJB (central junction box)
4	EJB (engine junction box)
5	TCM (transmission control module)

6	Clockspring
7	Steering wheel audio switches
8	Upshift paddle switch
9	Downshift paddle switch
10	Instrument cluster
11	JaguarDrive selector

System Operation

JAGUARDRIVE SELECTOR

Rotation of the JaguarDrive selector to any of the five positions is sensed by the [TCM \(transmission control module\)](#) via the high speed [CAN](#) bus. A [LIN](#) bus connection is also provided, but is only used in the event of a [CAN](#) bus failure as a back-up. The [TCM](#) then reacts according to the selected position. The JaguarDrive selector is a magnetic system using Hall effect sensors to determine the position of the selector.

The S (sport) position selection allows the [TCM](#) to operate the transmission using the semi-automatic Jaguar sequential shift. Gear selections are sensed by the [TCM](#) when the driver operates the steering wheel paddle switches. Once the JaguarDrive selector position is confirmed, the [TCM](#) outputs appropriate information on the high speed [CAN](#) bus which is received by the instrument cluster to display the gear selection information in the message center. Refer to: [Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

The paddles can also be used on a temporary basis when the JaguarDrive selector is in the D (drive) position to override the automatic gear selection if required.

PARK INTERLOCK AND NEUTRAL LOCK

Neutral lock is a requirement for the JaguarDrive selector. The selector is always locked at ignition on when the engine is not running, except after an engine stall when the selector is not in P (park) or N (neutral).

If, when driving with the JaguarDrive selector in S, D or R (reverse) at a speed of more than 5 km/h (3 mph), the driver selects P or N:

- Without the brake pedal pressed, the JaguarDrive selector will be immediately locked once the vehicle speed falls to below 5 km/h (3 mph).
- With the brake pedal pressed, the JaguarDrive selector will remain locked for as long as the brake pedal remains pressed, regardless of vehicle speed.

The transmission will only engage park once the vehicle speed is less than 2 km/h (1 mph).

If the driver selects N and releases the brake pedal with a vehicle speed of less than 5 km/h (3 mph), the JaguarDrive selector will be locked 2 seconds after N is selected. The selector will remain locked until the driver presses the brake pedal again.

To ensure that a driver request to change from a non-driving range (N for example) to a driving range (D for example), the park interlock and neutral lock features are used in conjunction with the intermediate position.

If the transmission receives a range change request without the brake pedal pressed, the [TCM](#) initiates a soft lock function. The transmission will remain in park or neutral, depending on the starting position.

If a transmission position letter is flashing in the message center and the vehicle has no drive, the driver must:

- Press the brake pedal.
- Reselect N or P on the JaguarDrive selector.
- Select the required driving range, ensuring that the brake pedal is pressed.

Rocking Function

The rocking function compliments the neutral lock function. For all changes from a non-driving range to a driving range, it is necessary to press the brake pedal (to release either the park interlock or neutral lock).

In situations where the driver will require to change the gear selection from R to D, or from D to R, without brake pedal input (car park maneuvering, 3 point turns or 'rocking' the vehicle from a slippery surface for example), the rocking function gives a 2 second lock delay when N is selected on the JaguarDrive selector and the brake pedal is not pressed.

Intermediate Position

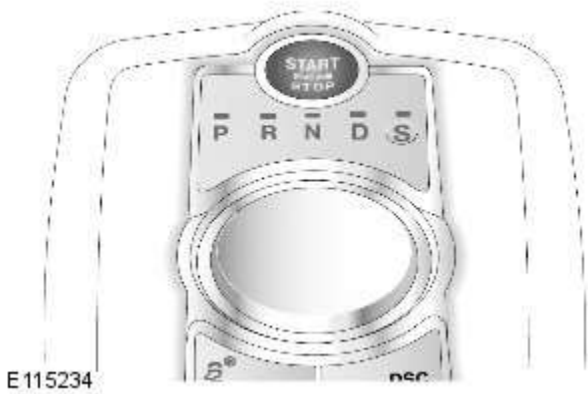
If the JaguarDrive selector is rotated slowly from P to S and back to position P with the brake pedal pressed, the R or D position display letter in the message center will flash and the transmission will remain in park or neutral depending on the previous starting position of the selector.

If the brake pedal is released when R or D is flashing in the message center and the JaguarDrive selector is rotated to the R or D position, the required range will not be selected and the transmission will remain in park or neutral, depending on the previous starting position. This feature is known as soft lock.

If the driving range letter in the message center is flashing and the vehicle has no drive, the driver should depress the brake pedal to reselect N or P, and then select the required driving range while the brake pedal remains pressed.

Component Description

JAGUARDRIVE SELECTOR



The Jaguardrive selector is a rotary selector installed in the top of the JaguarDrive selector module. The JaguarDrive selector module is located in the floor console and controls the vehicle optimization functions on the vehicle. For additional information, refer to: Ride and Handling Optimization (204-06 Ride and Handling Optimization, Description and Operation).

The [TCM](#) allows the transmission to be operated as a conventional automatic unit by selecting P, R, N, D on the JaguarDrive selector.

Rotation of the JaguarDrive selector allows the selection of P, R, N and D. By depressing the JaguarDrive selector and rotating clockwise from the D position, S mode can be selected. The JaguarDrive selector is fully electronic rotary transmission selector with no mechanical connection to the transmission.

The JaguarDrive selector rises from the JaguarDrive selector module once the engine is running. When the engine is stopped with the JaguarDrive selector in any position other than N, it retracts into the JaguarDrive selector module again. If the selector is in position N when the engine is stopped, it remains in the raised position for up to 10 minutes, for use in a drive through car wash for example. After 10 minutes the selector automatically retracts into the JaguarDrive selector module. The selector also retracts if P is selected within the 10 minute period.

If the JaguarDrive selector does not rise from the console when the engine is started, but electrical power is supplied to the selector, the retracted selector can still be rotated to make selections. If electrical power to the JaguarDrive selector is lost, the selector will not rise from the console when the engine is started and the retracted selector will not rotate.

The JaguarDrive selector contains an internal interlock solenoid to prevent the selector from being rotated when the engine is not running.

The engine can be stopped with the JaguarDrive selector in any position. Once the engine is stopped the selector will automatically reset to the P position and the transmission park lock will be engaged, except if the selector is moved to the N position when the engine is stopped.

PADDLE SWITCHES



E115235

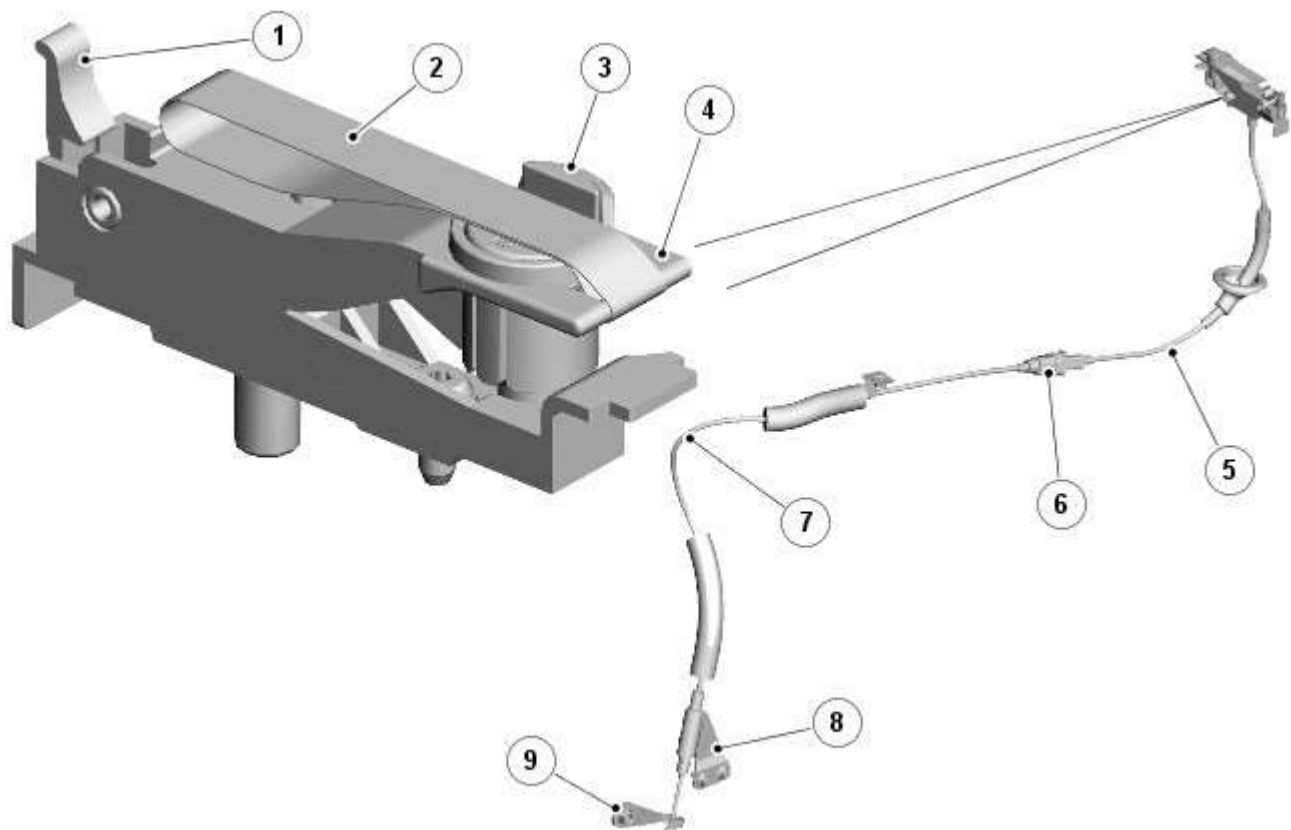
Two gear change 'paddle' switches are fitted at the rear of the steering wheel and allow the driver to operate the transmission as a semi-automatic manual gearbox using the Jaguar sequential shift feature.

Each paddle switch has three connections; ground, illumination [PWM \(pulse width modulation\)](#) supply and ground switch signal. The paddle switches are hardwired to the steering wheel audio switches. Operation of the paddle switch completes a ground path to the audio switch assembly. The audio switch assembly converts the completed ground signal into a [LIN](#) bus signal which is passed via the clockspring to the instrument cluster. The instrument cluster converts the signal into a high speed [CAN](#) bus signal to the [TCM](#).

Pulling the [LH \(left-hand\)](#) downshift - paddle provides down changes and pulling the [RH \(right-hand\)](#) upshift (+) paddle provides up changes. The first operation of either paddle, after sport mode is selected, puts the transmission into permanent manual Jaguar sequential shift mode. Rotation of the JaguarDrive selector back to the D position, returns the transmission to conventional automatic operation.

Temporary operation of manual Jaguar sequential shift mode can also be operated with the JaguarDrive selector in the D position. Operation of either the upshift or downshift paddles activates the manual mode operation. If the JaguarDrive selector is in D, Jaguar sequential shift will cancel after a time period or can be cancelled by pressing and holding the + paddle for approximately 2 seconds.

EMERGENCY PARK RELEASE



E118503

Item	Description
1	Latch
2	Strap
3	Locking cylinder
4	Operating lever
5	Upper cable
6	Cable joint
7	Lower cable
8	Cable bracket
9	Park interlock lever

If a vehicle requires recovery/transportation, the emergency park release mechanism is used to manually disengage the park lock and engage the transmission in neutral.

The emergency park release mechanism consists of an operating lever that is connected to a park interlock lever on the transmission by an upper and lower cable assembly.

The operating lever is installed in the floor console, under the trim panel between the drinks holder and the cubby box. The park interlock lever is attached to the transmission selector shaft.

One end of the operating lever is attached to a base by a hinge pin. A locking cylinder is installed in the other end of the operating lever, to secure the operating lever to the base. The operating lever is raised by pulling on a strap.

When operated, the emergency park release mechanism turns the transmission selector shaft.

To disengage the park lock:

- Open the cubby box lid and the drinks holder lid.
- Remove the trim panel from between the drinks holder and the cubby box.
- Rotate the locking mechanism of the emergency park release lever 90 degrees counterclockwise.
- Apply the footbrake, pull the operating lever upwards and ensure it locks in the vertical position.

Raising the operating lever causes the emergency park release cable to rotate the park interlock lever on the transmission, which disengages the parking pawl and engages neutral. This allows the vehicle to freewheel.

To re-engage the park lock:

- Hold the strap on the operating lever, release the latch and lower the operating lever to the horizontal position.
- Lock the operating lever by turning the locking mechanism 90 degrees clockwise.
- Install the trim panel.
- Close the cubby box lid and the drinks holder lid.

Automatic Transmission/Transaxle External Controls - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol - External Controls

Diagnosis and Testing

Principles of Operation

For a detailed description of the transmission external controls, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (307-05)

External Controls (Description and Operation),
External Controls (Description and Operation),
External Controls (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Check for stuck/jammed switches and buttons • Visibly damaged or worn components • Loose or missing fasteners 	<ul style="list-style-type: none"> • Fuse(s) • Loose or corroded electrical connector(s) • Transmission control module • Transmission control switch

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index

For a list of DTCs that could be logged on this vehicle, please refer to Section 100-00.

REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Transmission Control Module (TCM) (100-00, Description and Operation)

/
Diagnostic Trouble Code (DTC) Index - DTC: Transmission Control Switch (TCS) (100-00, Description and Operation).

Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol - Transmission Control Switch (TCS)

Removal and Installation

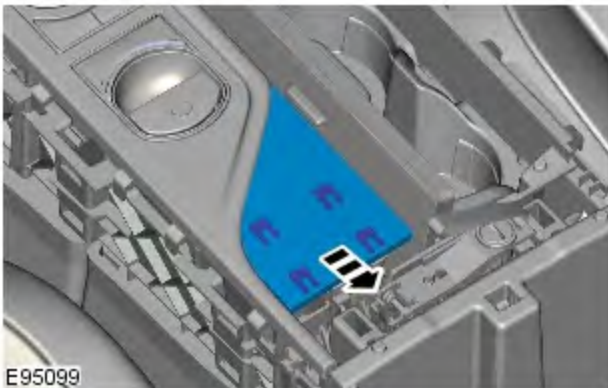
Removal



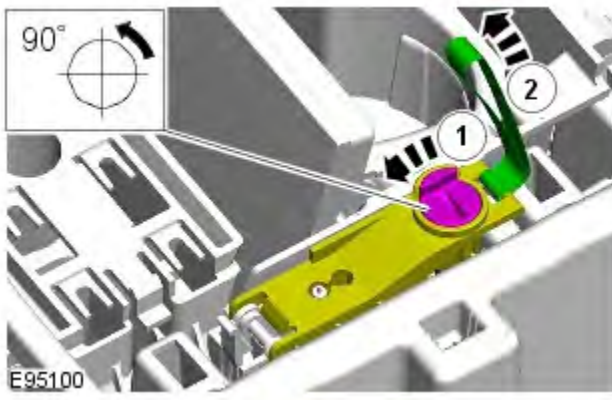
NOTE: Removal steps in this procedure may contain installation details.

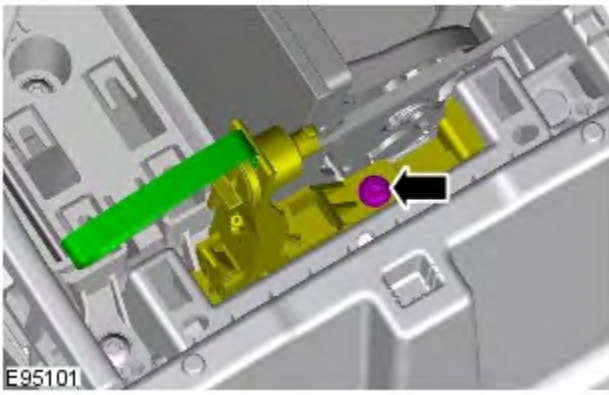
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Audio and Climate Control Assembly](#) (415-01A Information and Entertainment System, Removal and Installation).

3.

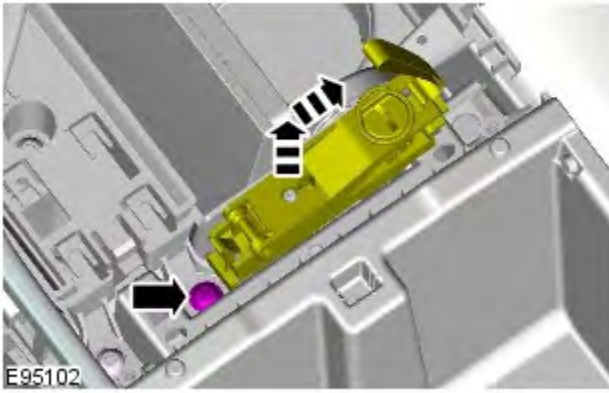


4.

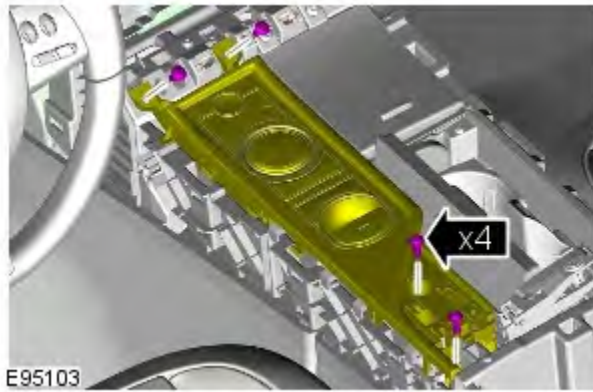




5. Torque: 4 Nm

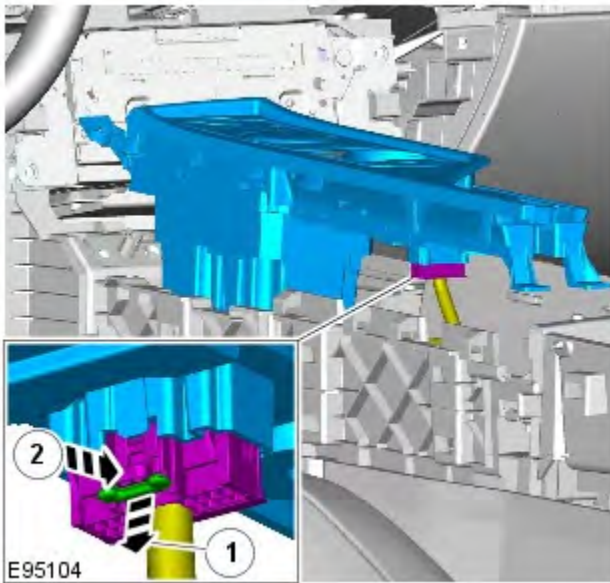


6. Torque: 4 Nm




7. Torque: 4 Nm

8.



Installation

1.  CAUTION: Make sure that all diagnostic trouble codes (DTCs) have been removed after the road test.

To install, reverse the removal procedure.

Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol - Transmission Control Switch (TCS) Knob

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.



1.
 - Start the engine and make sure that 'P' is selected.



2. Torque: 2 Nm

Installation

1. To install, reverse the removal procedure.

Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol - Emergency Park Position Release Lever

Removal and Installation

Removal

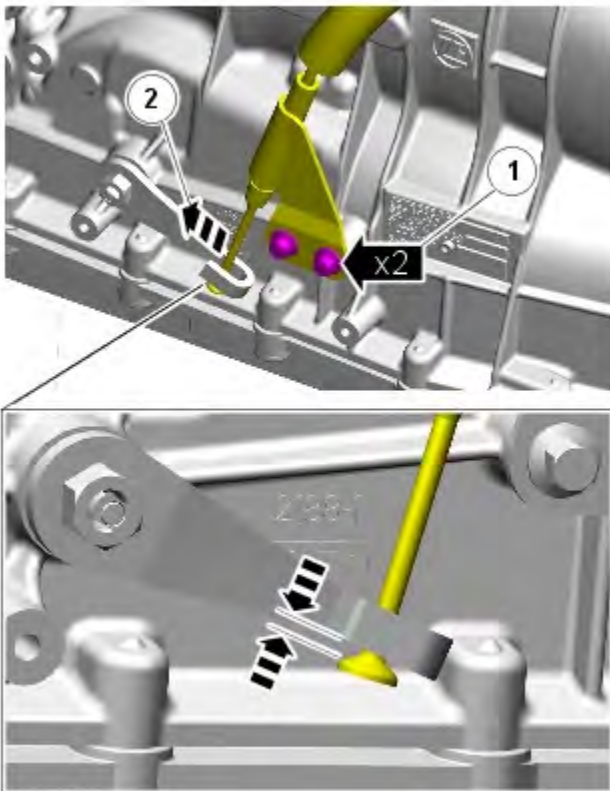


NOTE: Removal steps in this procedure may contain installation details.

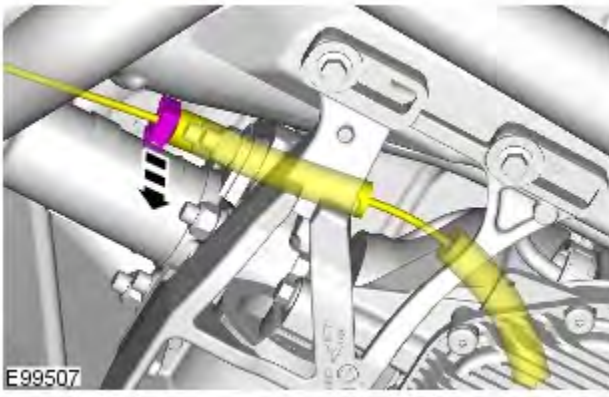
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Air Deflector](#) (501-02, Removal and Installation).
3. Refer to: [Engine Rear Undershield](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Floor Console Side Trim Panel](#) (501-12 Instrument Panel and Console, Removal and Installation).

5.  **WARNING:** Make sure to support the vehicle with axle stands.

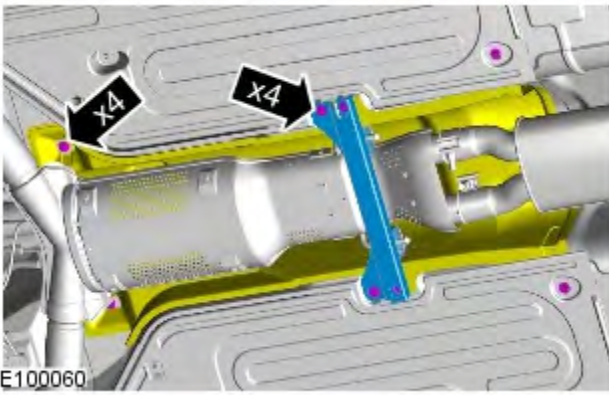
Torque: 11 Nm



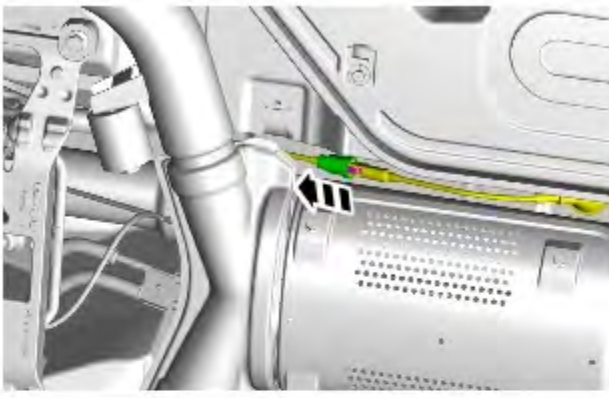
E100350



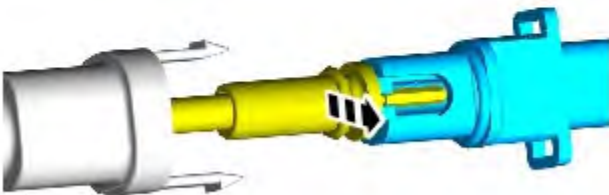
6.



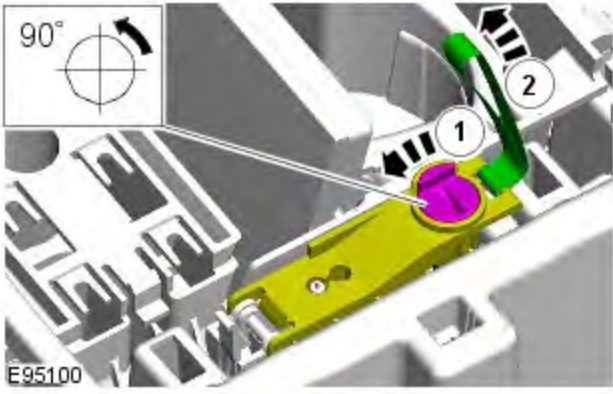
7. Torque: 7 Nm



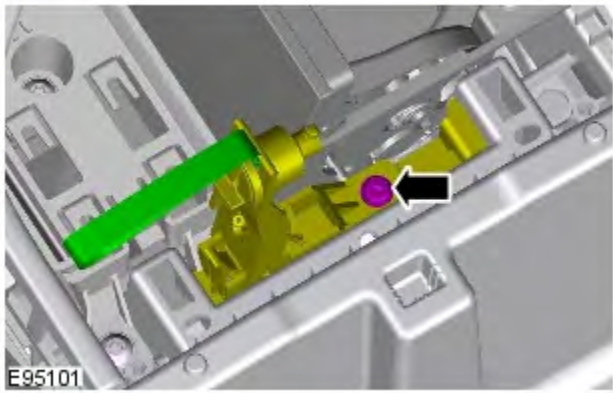
8.



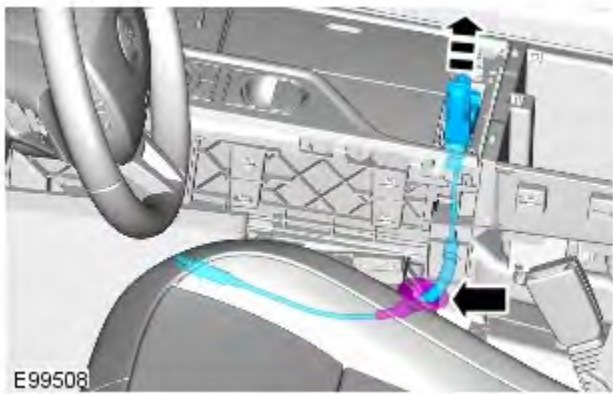
E100061



9.

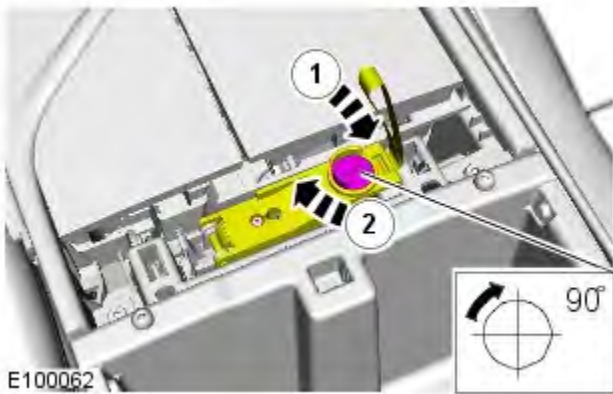


10. Torque: 3 Nm



11.

Installation



1. To install, reverse the removal procedure.

Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol - Upshift Paddle Switch

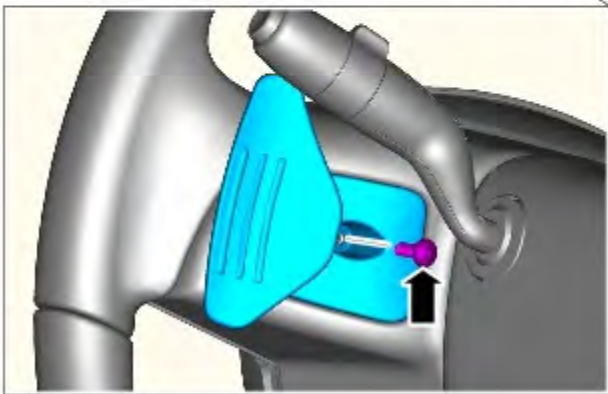
Removal and Installation

Removal



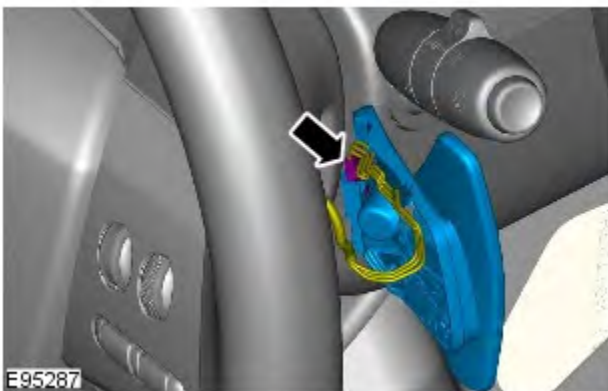
NOTE: Removal steps in this procedure may contain installation details.

1. Torque: 3 Nm



E95286

- 2.



E95287

Installation



1. NOTE: Make sure the wiring harness is routed correctly. To install, reverse the removal procedure.

Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol - Downshift Paddle Switch

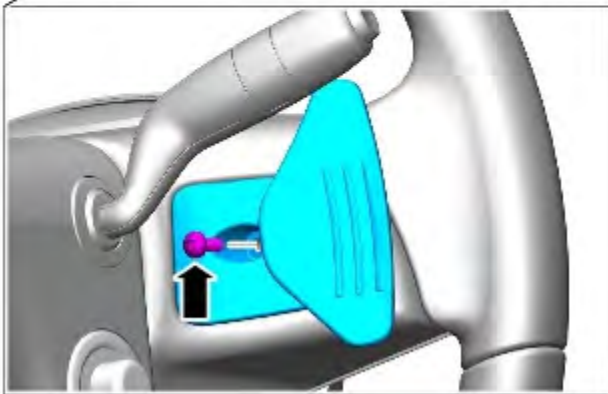
Removal and Installation

Removal



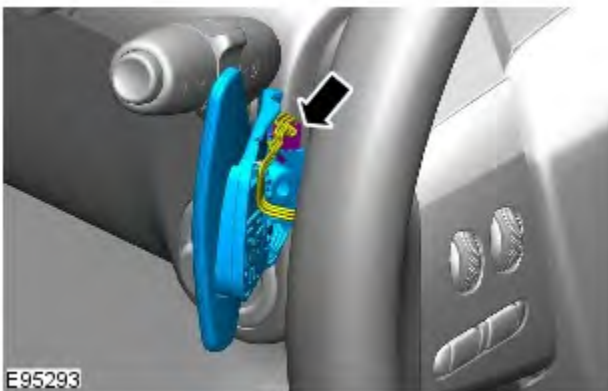
NOTE: Removal steps in this procedure may contain installation details.

1. Torque: 3 Nm



E95292

- 2.



E95293

Installation



1. **NOTE:** Make sure the wiring harness is routed correctly.
To install, reverse the removal procedure.

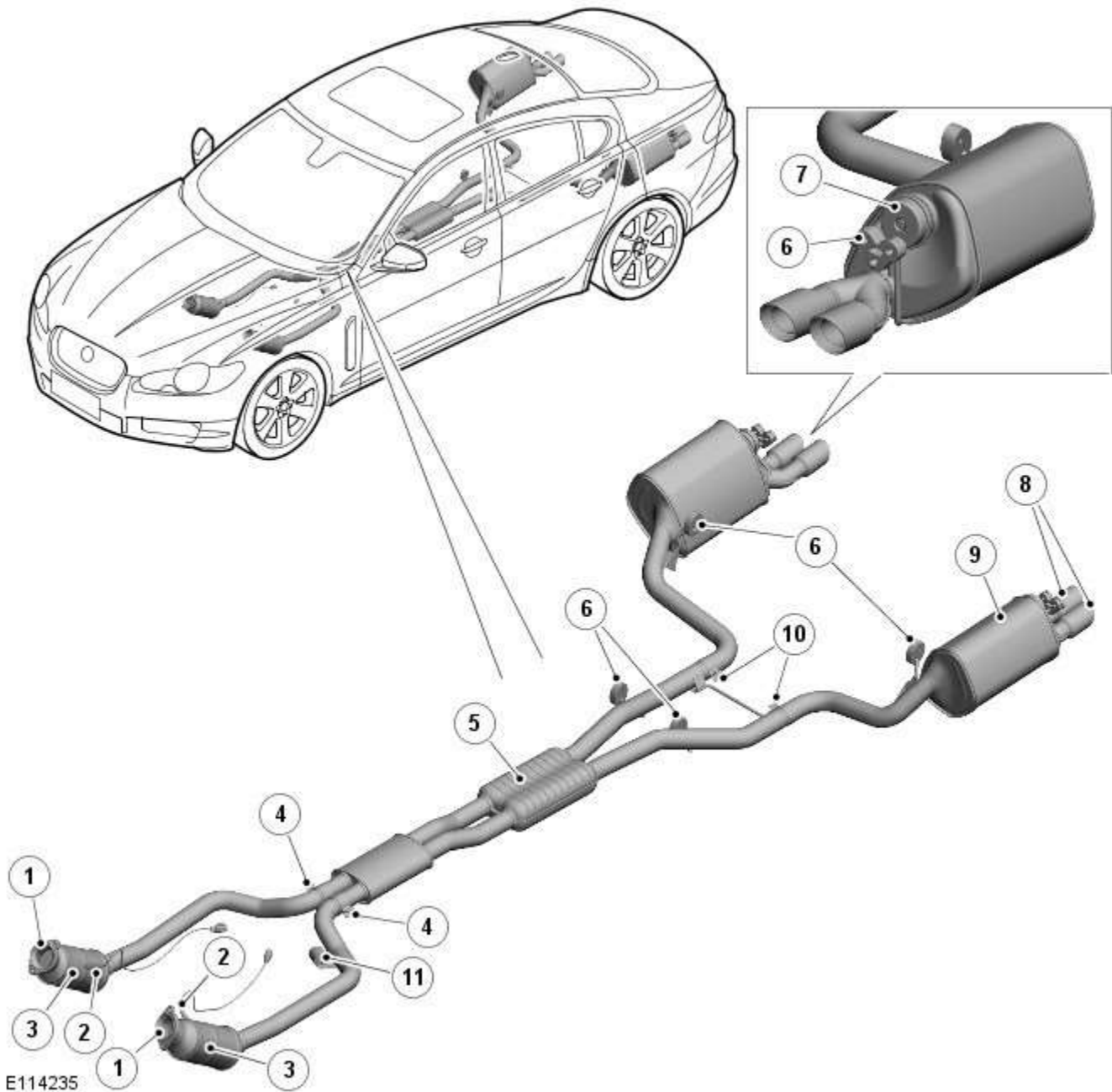
Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol -**Torque Specifications**

Description	Nm	lb-ft	lb-in
Catalytic converter retaining bolts	40	30	-
Rear muffler support retaining bolts	25	18	-
Exhaust securing strap nuts	55	40	-
Exhaust support retaining bolts	25	18	-

Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Exhaust System - Component Location

Description and Operation

COMPONENT LOCATION - 5.0L V8 SUPERCHARGER - FROM 2010MY - UP TO 2013MY



Item	Description
1	Manifold flange (2 off)
2	Mid catalyst HO2S (2 off)
3	Catalytic converter (2 off)
4	Clamp (2 off)
5	Center resonator silencer (2 off)
6	Mounting rubber (6 off)
7	Semi-active muffler valve
8	Exhaust trim (2 off)
9	Rear silencer (2 off)
10	Clamp (2 off)
11	Mass damper

Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Exhaust System -

Overview

Description and Operation

OVERVIEW

5.0L V8 NATURALLY ASPIRATED AND SUPERCHARGER - FROM 2010MY

The exhaust system fitted to models with the 5.0L V8 engines are fabricated from stainless steel. 5 separate assemblies make up the complete system.

The front section comprises 2 separate assemblies ([LH \(left-hand\)](#) and [RH \(right-hand\)](#)) incorporating a catalytic converter for each bank of cylinders. The rear section comprises 3 separate sections; a center section and two rear sections. The center section assembly incorporates a rear silencer which is connected to a center resonator silencer. On supercharger models, the center resonator is a one piece assembly with two inlet pipes from the center silencer and two outlet pipes to the rear silencers. On naturally aspirated models, each outlet pipe from the center silencer connects into an individual center resonator.

The system is attached to the underside of the body with mounting rubbers which are located on steel hanger bars that are welded to the system. The mounting rubbers locate on corresponding hangers which are welded or bolted to the underside of the vehicle body.

Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Exhaust System - System Operation and Component Description

Description and Operation

System Operation

CATALYTIC CONVERTERS

In the catalytic converters, the exhaust gases are passed through honeycombed ceramic elements coated with a special surface treatment called 'washcoat'. The washcoat increases the surface area of the ceramic elements by a factor of approximately 7000. On top of the washcoat is a coating containing palladium and rhodium, which are the active constituents for converting harmful emissions into inert by-products. The palladium and rhodium add oxygen to the carbon monoxide and the hydrocarbons in the exhaust gases, to convert them into carbon dioxide and water respectively.

SEMI-ACTIVE MUFFLER VALVE (5.0L SUPERCHARGER VEHICLES ONLY)

The semi-active muffler valve is operated by the pressure in the exhaust system. At low engine speeds the valve head is closed or partially closed to provide a more refined noise quality. At higher engine speeds the increased pressure within the exhaust system opens the valve head to provide a more sporting noise. This is achieved by the valve, which once open, allows the exhaust gasses to by-pass the baffle tubes and plates in the rear silencer.

Component Description

FRONT SECTION - 4.2L NATURALLY ASPIRATED (NAS ONLY) - From 2010MY

The front section comprises two separate pipes, each incorporating a catalytic converter. Each catalytic converter has a welded inlet pipe with a flange. The inlet pipe is flared into a cone which mates with the exhaust manifold. The flange has two holes which locate on studs in the exhaust manifold and is secured with flanged nuts. Each catalytic converter is fitted with a pre and post catalyst [HO2S \(heated oxygen sensor\)](#).

Each catalytic converter has a curved outlet pipe which mates with the respective inlet pipe for the applicable resonator on the center section. The joint on each pipe is secured with a clamp.

FRONT SECTION - 5.0L NATURALLY ASPIRATED AND SUPERCHARGER - From 2010MY

The front section is common to both the naturally aspirated and supercharger vehicles. The front section comprises two separate pipes each incorporating a catalytic converter. Each catalytic converter has a welded pipe with a flange, which is flared into a cone which mates with the exhaust manifold. Each flange has two holes which locate on studs in the exhaust manifold and are secured with nuts. Each catalytic converter is fitted with a mid catalyst [HO2S](#). The mid catalyst [HO2S](#) is located in the catalytic converter.



NOTE: The pre catalyst [HO2S](#) is located in the exhaust manifold.

On vehicles from 2013MY, a post catalyst [HO2S](#) is located in the curved pipe from each catalytic converter.

A curved pipe from each catalytic converter locates into the resonator inlet pipes of the center section. The [LH \(left-hand\)](#) pipe is fitted with a mass damper which absorbs resonance from the system.

REAR SECTION - 4.2L NATURALLY ASPIRATED (NAS ONLY) - From 2010MY

The 2 inlet pipes each connect into a separate resonator silencer. Each resonator silencer is cylindrical in shape and houses 2 perforated tubes separated by 2 baffle plates. Exhaust gasses exit each resonator silencer via an outlet pipe. The 2 outlet pipes are joined together behind the resonators with a cross over pipe. Each pipe also has a welded hanger bracket which allow the rear section to be supported on mounting rubbers. A further bracket is welded to each pipe which braces the 2 pipes together.

The 2 rear silencers each have a welded inlet pipe which mate with the outlet pipes from the resonator silencers and are each secured with a clamp. The inlet pipes each have a welded hanger bracket which support each rear silencer at the rear of the vehicle on mounting rubbers. The fabricated rear silencers have 2 perforated tubes which are supported on 2 perforated baffle plates. The exhaust gasses are expelled from the rear silencer via a single outlet pipe. The outlet pipe from each silencer has a welded hanger bar which support the rear silencer on mounting rubbers. The outlet pipe is fitted with a welded outlet which is covered with a polished stainless steel finisher which is part welded to the silencer.

REAR SECTION - 5.0L NATURALLY ASPIRATED - From 2010MY

The 2 pipes from the front section each connect into 2 short pipes on the center resonator box and are secured with clamps. Two pipes from the resonator box split the system into 2 sections which each connect into another resonator. Each resonator silencer houses perforated tubes separated by baffle plates. Exhaust gasses exit each resonator silencer via an outlet pipe. The 2 outlet pipes are joined together behind the resonators with a cross over pipe. Each pipe also has a welded hanger bracket which allow the rear section to be supported on mounting rubbers. A further bracket is welded to each pipe which braces the 2 pipes together.

The 2 rear silencers each have a welded inlet pipe which mate with the outlet pipes from the cylindrical resonator silencers and

are each secured with a clamp. The inlet pipes each have a welded hanger bracket which support each rear silencer at the rear of the vehicle on mounting rubbers. The fabricated rear silencers have 2 perforated tubes which are supported on 2 perforated baffle plates. The exhaust gasses are expelled from the rear silencer via a single outlet pipe. The outlet pipe from each silencer has a welded hanger bar which support the rear silencer on mounting rubbers. The outlet pipe is fitted with a welded outlet which is covered with a polished stainless steel finisher which is part welded to the silencer.

REAR SECTION - 5.0L SUPERCHARGER - From 2010MY

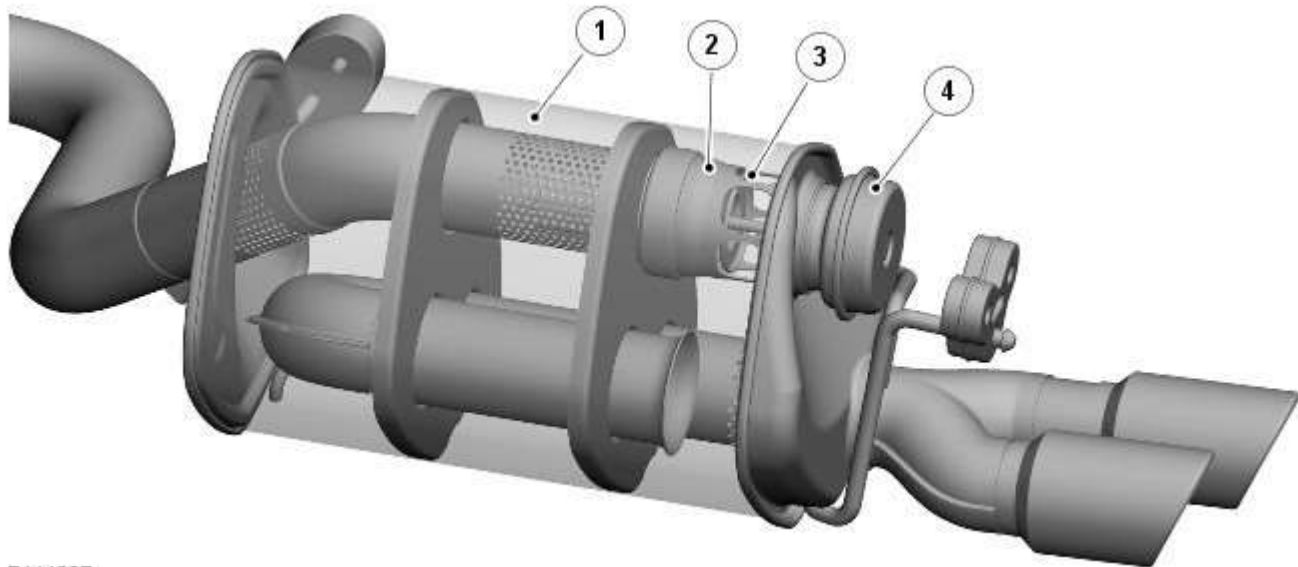
The 2 pipes from the front section each connect into 2 short pipes on the center resonator box and are secured with clamps. Two pipes from the center resonator box each connect into a second resonator silencer. The resonator silencer comprises perforated tubes separated by 2 baffle plates. Exhaust gasses exit the resonator silencer via 2 outlet pipes. Each pipe has a welded hanger bracket which allows the rear section to be supported on mounting rubbers. A further bracket is welded to each pipe which braces the 2 pipes together.

The 2 rear silencers each have a welded inlet pipe which mate with the outlet pipes from the cylindrical resonator silencers and are each secured with a clamp. The inlet pipes each have a welded hanger bracket which support each rear silencer at the rear of the vehicle on mounting rubbers. The fabricated rear silencers have a perforated inlet tube which is supported on 2 baffle plates. Each rear silencer has a welded hanger bar which supports the rear silencer on mounting rubbers. The outlet pipe is fitted with a welded twin outlet which is covered with 2 polished stainless steel finishers which are part welded to the silencer.

Semi-Active Muffler Valve



NOTE: [LH silencer](#) shown, RH (right-hand) silencer similar



E114237

Item	Description
1	Outer case
2	Overpipe
3	Valve cage
4	Semi-active muffler valve assembly

A semi-active muffler valve is located in the rear of each rear silencer. The valve comprises a valve head, a valve shaft, a shaft guide, a housing shell, a membrane and a spring. The valve head is connected to the membrane by the valve shaft which is located within the shaft guide. The valve shaft is attached to the membrane with a pin. The membrane is located inside the housing shell and is held in position by the spring.

The valve head is located in and seals against the over pipe. When the exhaust gas pressure increases and overcomes the spring pressure, the valve head is lifted and the gasses by-pass the valve and are expelled through slots in the valve cage into the rear chamber and into the outlet pipe.

When the semi-active muffler valve is closed the exhaust gasses are expelled from the inlet tube through the perforations. The exhaust gasses then pass through perforations in the outlet pipe and are expelled from the silencer via the single outlet pipe and 2 polished stainless steel finishers.

When the semi-active muffler valve is open, the exhaust gasses are released into the rear chamber. The exhaust gasses then pass directly into the open end of the outlet pipe and are expelled from the silencer via the outlet pipe and the 2 polished stainless steel finishers. With the valve open, the gasses reduce through the baffle plates and tube perforations giving the exhaust note a more 'sporty' sound.

Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Exhaust System

Diagnosis and Testing

Principle of Operation

For a detailed description of the exhaust system, refer to the relevant Description and Operation section of the workshop manual. REFER to: (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol)

[Exhaust System](#) (Description and Operation),
[Exhaust System](#) (Description and Operation),
[Exhaust System](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.



NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical
<ul style="list-style-type: none"> • Leaks • Metal fatigue • Pipes • Catalytic converter • Muffler(s) • Joints • Mountings • Clearance around components

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Excessively noisy/leaking exhaust	<ul style="list-style-type: none"> • Exhaust system/components 	Inspect exhaust system. Rectify leaks and install new components as required. Refer to Removal and Installation instructions in this section
Loss of power	<ul style="list-style-type: none"> • Restricted exhaust system • Exhaust sound enhancement valve stuck closed • Fuel system • Ignition system • Electronic engine control 	Inspect exhaust system. Install new exhaust components as required. Refer to Removal and Installation instructions in this section. Check for fuel, ignition and electronic engine control system DTCs and refer to the relevant DTC Index

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged in the Engine Control Module (ECM), please refer to Section 303-14. REFER to:

[Electronic Engine Controls](#) (303-14C Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing),
[Electronic Engine Controls](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).

Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Catalytic Converter LH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNINGS:



Make sure to support the vehicle with axle stands.



Observe due care when working near a hot exhaust system.

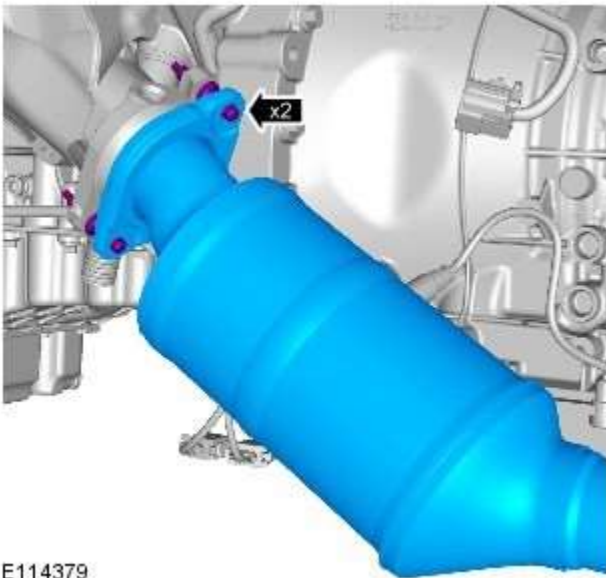
Raise and support the vehicle.

3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).


4. Refer to: [Engine Rear Undershield](#) (501-02 Front End Body Panels, Removal and Installation).

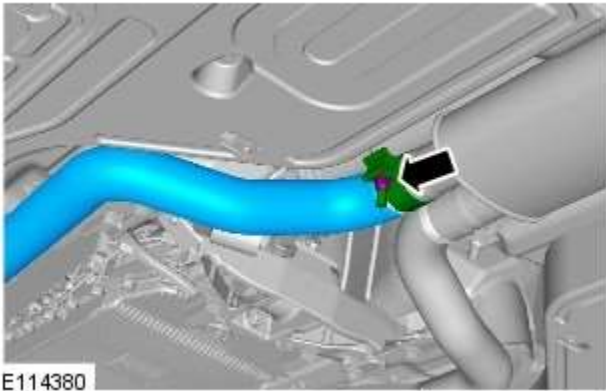


5. CAUTION: Make sure the catalyst monitor sensor wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.




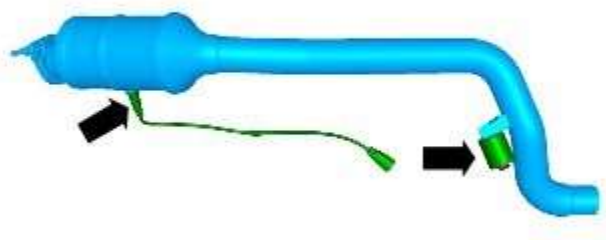
E114379

6.  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.
- Tighten the top retaining nut first.
 - *Torque:*
 Top nut 40 Nm
 Bottom nut 40 Nm




E114380

7.  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.
- Torque:* 55 Nm




E114381


8. CAUTIONS:

 Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

 If accidentally dropped or knocked install a new sensor.

NOTES:

 Do not disassemble further if the component is removed for access only.

 If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

Torque: 48 Nm

Installation

1. To install, reverse the removal procedure.

2.  NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Long Drive Cycle Self-Test](#)
(303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures).

Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Catalytic Converter RH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNINGS:



Make sure to support the vehicle with axle stands.

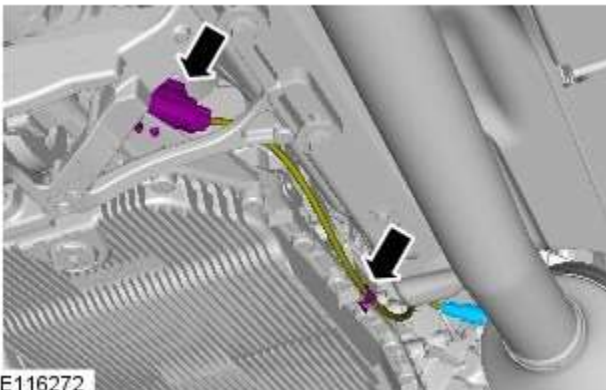


Observe due care when working near a hot exhaust system.

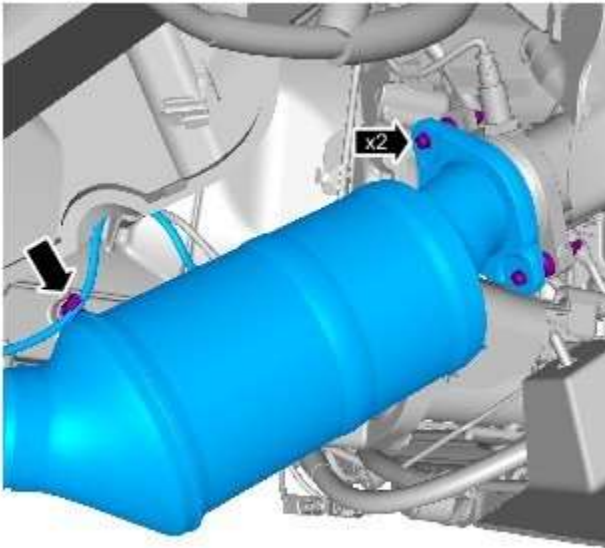
Raise and support the vehicle.

3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).


4. Refer to: [Engine Rear Undershield](#) (501-02 Front End Body Panels, Removal and Installation).

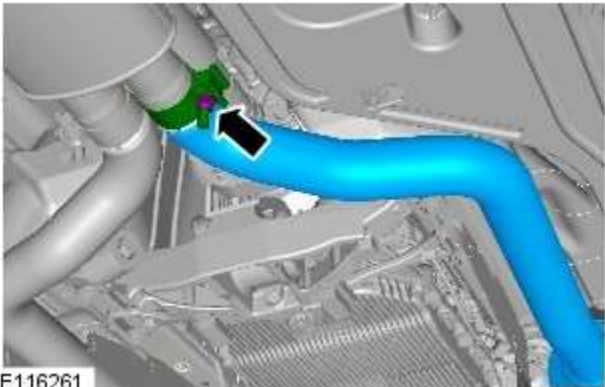


5. CAUTION: Make sure the catalyst monitor sensor wiring harness is not twisted more than 180 degrees and is not in contact with either the exhaust or driveshaft.




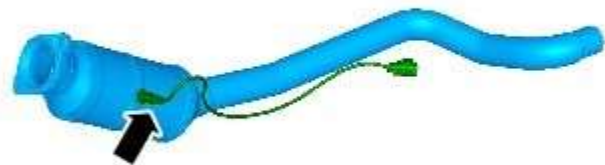
E116260

6.  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.
- Tighten the top retaining nut first.
 - Torque:
 - Top nut 40 Nm
 - Bottom nut 40 Nm




E116261

7.  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.
- Torque: 55 Nm





E116262

8. CAUTIONS:
-  Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

-  If accidentally dropped or knocked install a new sensor.

NOTES:

-  Do not disassemble further if the component is removed for access only.

-  If the original sensor is to be installed, apply lubricant meeting specification ESE-M12A4-A to the thread of the sensor.

Torque: 48 Nm

Installation

1. To install, reverse the removal procedure.

2.  NOTE: For NAS vehicles only.

If required, carry out a long drive cycle.

Refer to: [Powertrain Control Module \(PCM\) Long Drive Cycle Self-Test](#)
(303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, General Procedures).

Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Exhaust Sound Enhancement Valve

Removal and Installation

Removal



WARNING: Observe due care when working near a hot exhaust system.

NOTES:



The exhaust sound enhancement valve is an integral part of the muffler and cannot be serviced separately.



Removal steps in this procedure may contain installation details.



- WARNING:** Make sure to support the vehicle with axle stands. Raise and support the vehicle.

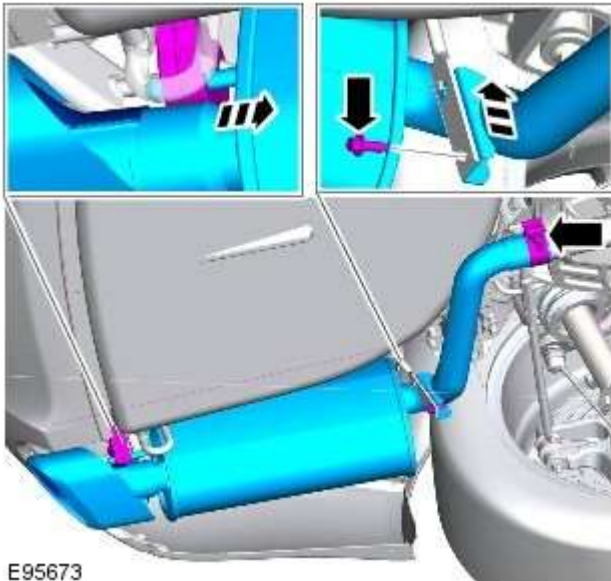


- CAUTION:** Make sure that these components are installed to the noted removal position.

Torque:

M8 25 Nm

M10 55 Nm



E95673

Installation

- To install, reverse the removal procedure.

Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Exhaust System

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNINGS:



Make sure to support the vehicle with axle stands.

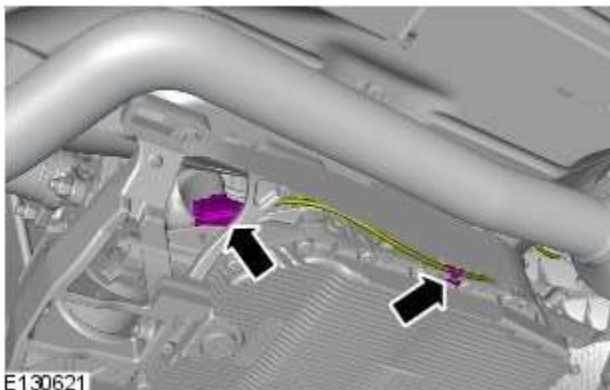


Observe due care when working near a hot exhaust system.

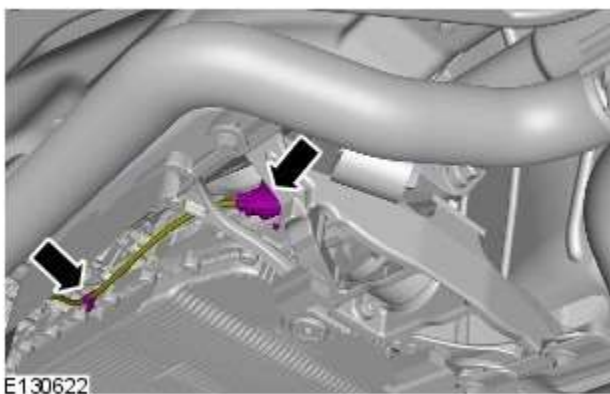
Raise and support the vehicle.

3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

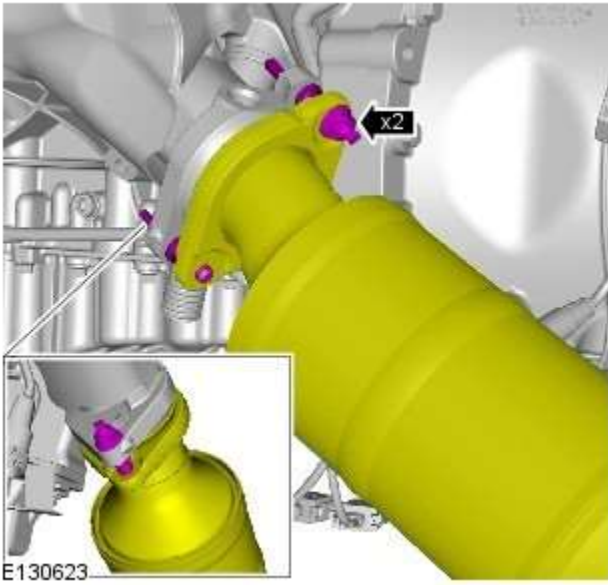
4. Refer to: [Engine Rear Undershield](#) (501-02 Front End Body Panels, Removal and Installation).



- 5.

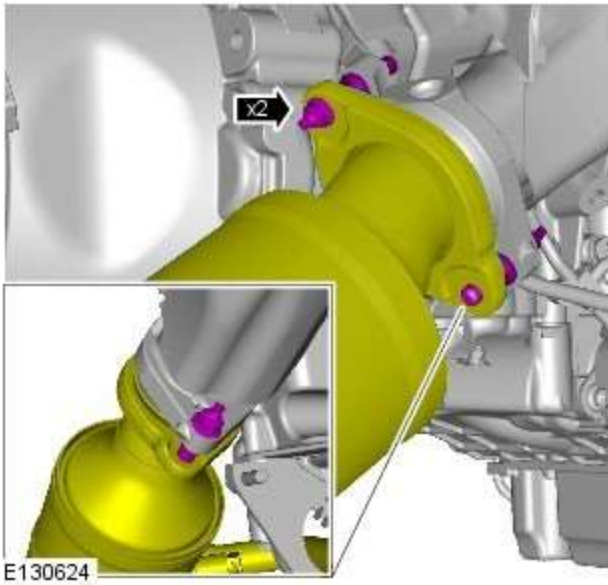


- 6.

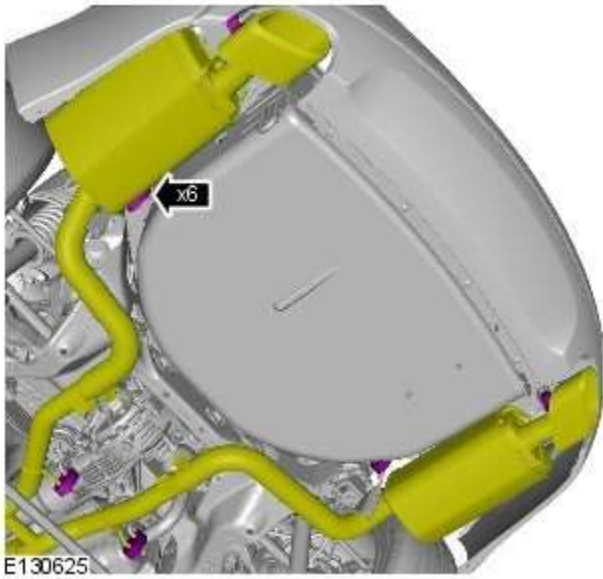



7. CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.

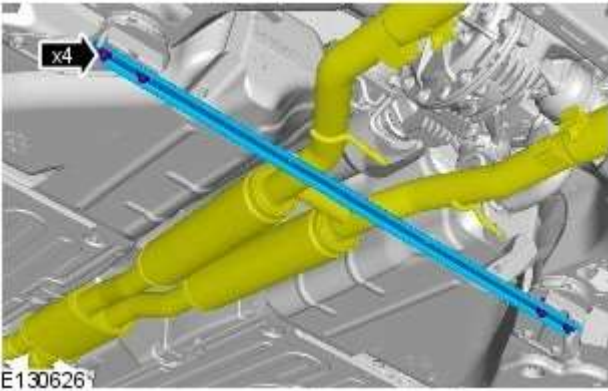
Torque: 40 Nm




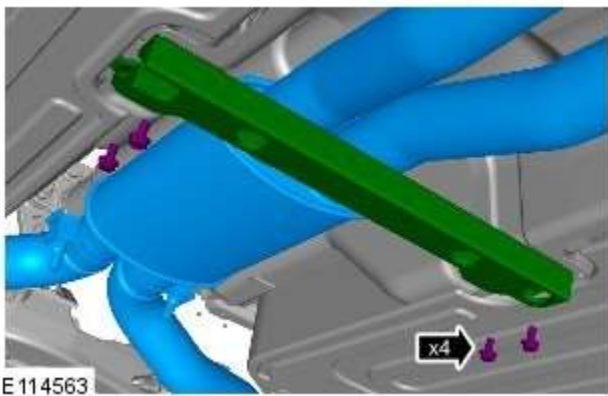
8. Torque: 40 Nm




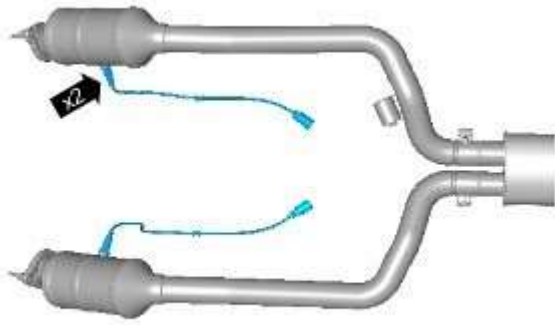
9.  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.




10.  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.
Torque: 30 Nm



11.  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.
Torque: 6 Nm



E 114565

12.  NOTE: Do not disassemble further if the component is removed for access only.

Torque: 48 Nm

Installation

1. To install, reverse the removal procedure.

Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Front Muffler

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. WARNINGS:



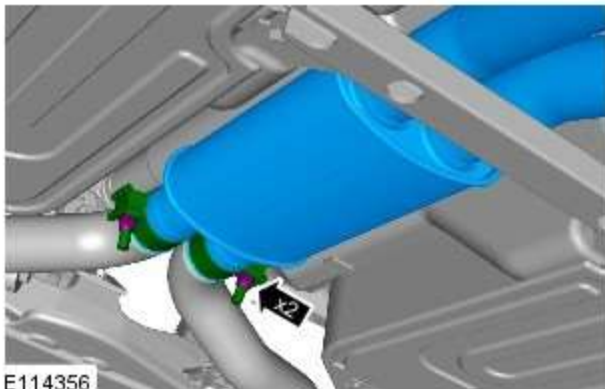
Make sure to support the vehicle with axle stands.



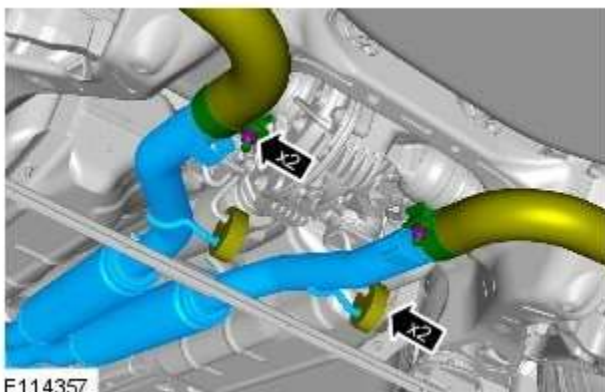
Observe due care when working near a hot exhaust system.

Raise and support the vehicle.

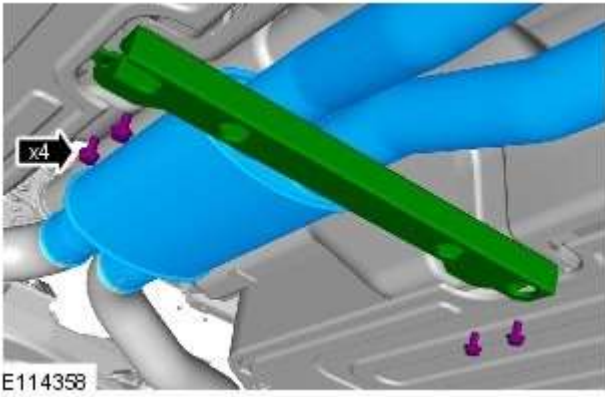
2. Refer to: [Engine Rear Undershield](#) (501-02 Front End Body Panels, Removal and Installation).




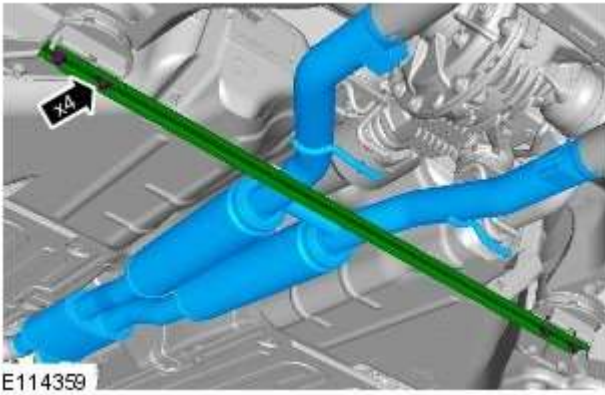
3. Torque: 55 Nm




4. Torque: 55 Nm



5.  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.



6.  CAUTION: Make sure that the exhaust system is supported with suitable retaining straps.

Installation

1. To install, reverse the removal procedure.

Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Rear Muffler

Removal and Installation

Removal



WARNING: Observe due care when working near a hot exhaust system.



NOTE: Removal steps in this procedure may contain installation details.



1. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

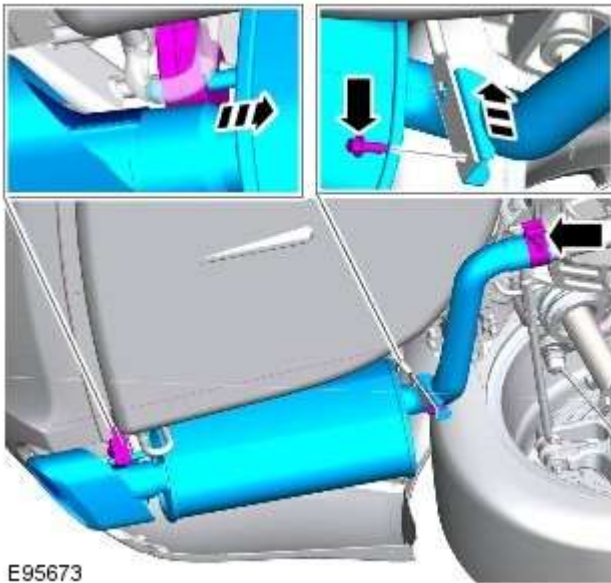


2. **CAUTION:** Make sure that these components are installed to the noted removal position.

Torque:

M8 25 Nm

M10 55 Nm



Installation

1. To install, reverse the removal procedure.

Fuel System - General Information -

General Specifications

Item	Specification
Fuel tank gross capacity - all vehicles	77 liters
Fuel tank capacity - vehicles with 3.0L, 4.2L, 2.7L Diesel	69.5 (total) / 64 (usable) liters
Fuel tank capacity - vehicles with 3.0L Diesel	71.1 (total) / 68.1 (usable) liters
Fuel tank capacity - vehicles with 5.0L	71.1 (total) / 69.5 (useable) liters
Fuel tank capacity - when fuel gauge indicates empty - vehicles with 3.0L Diesel	64 liters
Reserve capacity - when fuel gauge indicates empty - vehicles with 3.0L, 4.2L, 2.7L Diesel	5.5 liters
Reserve capacity - when fuel gauge indicates empty - vehicles with 5.0L, 3.0L Diesel	7 liters

Fuel System - General Information - Fuel System Pressure Release V8 5.0L

Petrol/V8 S/C 5.0L Petrol

General Procedures

Draining

1. Remove the fuel pump fuse.
2. Remove the fuel filler cap.



3. **CAUTION:** When depressurising the fuel system, make sure that there is no throttle input. Failure to follow this instruction may cause damage to the vehicle.

Start the engine and allow it to idle until the engine stalls.

4. Crank the engine for approximately five seconds to make sure that the fuel rail pressure is released.

Filling

1. **NOTE:** Make sure all repairs have been carried out before proceeding to the following steps.

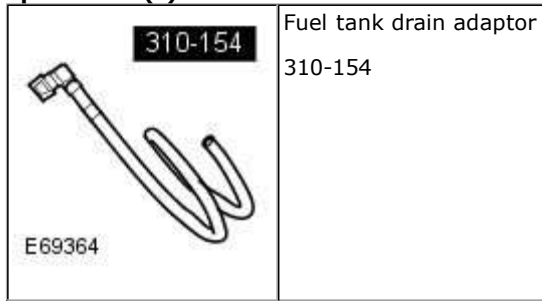
Install the fuel pump fuse.

2. Install the fuel filler cap.
3. Read and clear stored DTC fault codes.

Fuel System - General Information - Fuel Tank Draining

General Procedures

Special Tool(s)



Vehicles with diesel engine

1. For additional information, refer to: [Diesel Fuel System Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

All except vehicles with diesel engine

2. For additional information, refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

Vehicles with 3.0L or 4.2L engine

3. Release the pressure in the fuel system.
For additional information, refer to: [Fuel System Pressure Release - V6 3.0L Petrol](#) (310-00 Fuel System - General Information, General Procedures).

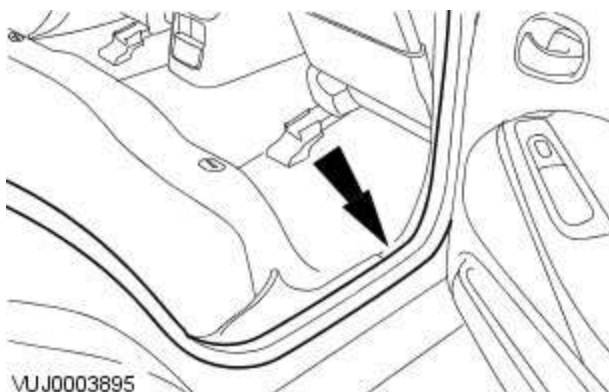
Vehicles with 5.0L engine

4. Release the pressure in the fuel system.
For additional information, refer to: [Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (310-00 Fuel System - General Information, General Procedures).

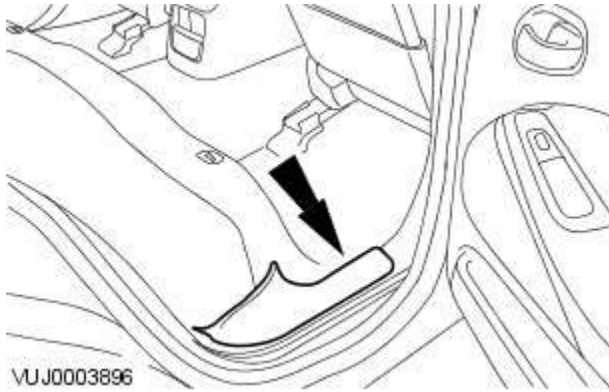
All vehicles

5. Remove the rear seat cushion.
For additional information, refer to: [Rear Seat Cushion](#) (501-10 Seating, Removal and Installation).

6. Detach and reposition the door opening weatherstrip.



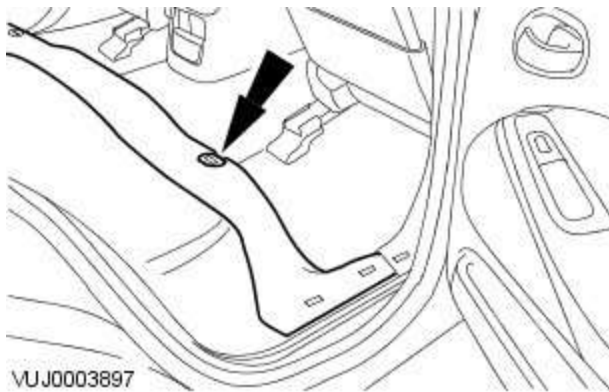
VUJ0003895



Remove the scuff plate trim panel.

VUJ0003896

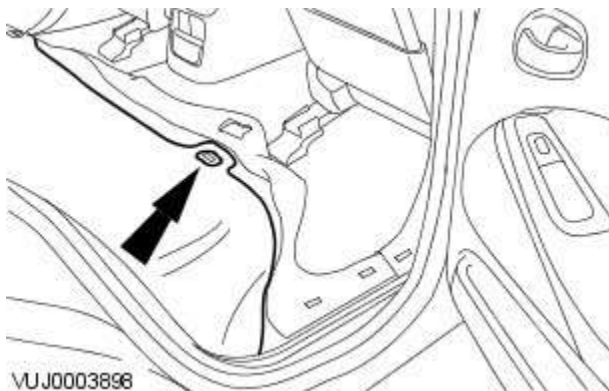
7.



Detach and reposition the floor covering.

VUJ0003897

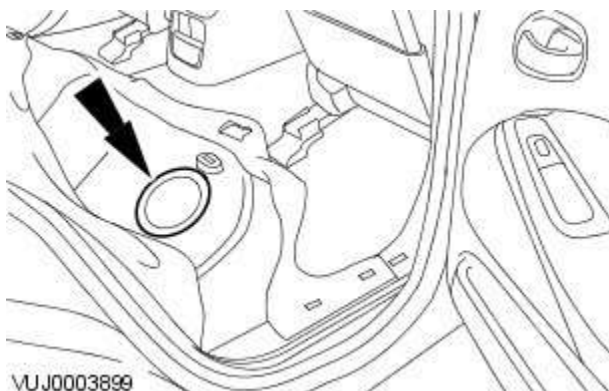
8.



Detach and reposition the rear seat cushion insulation.

VUJ0003898

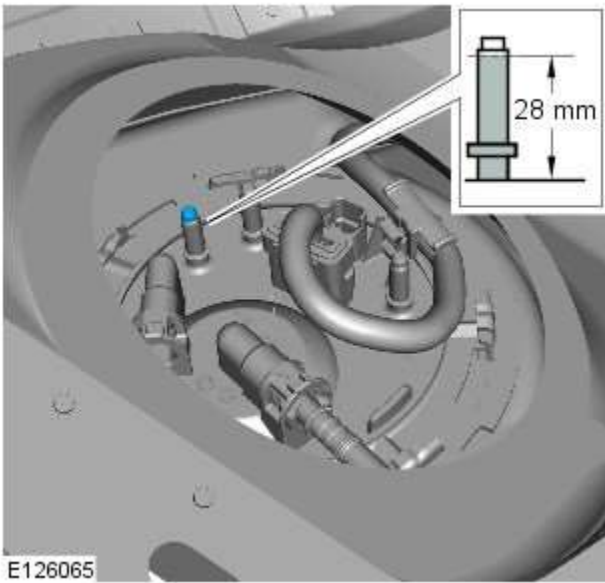
9.




Remove the floor aperture cover.

VUJ0003899

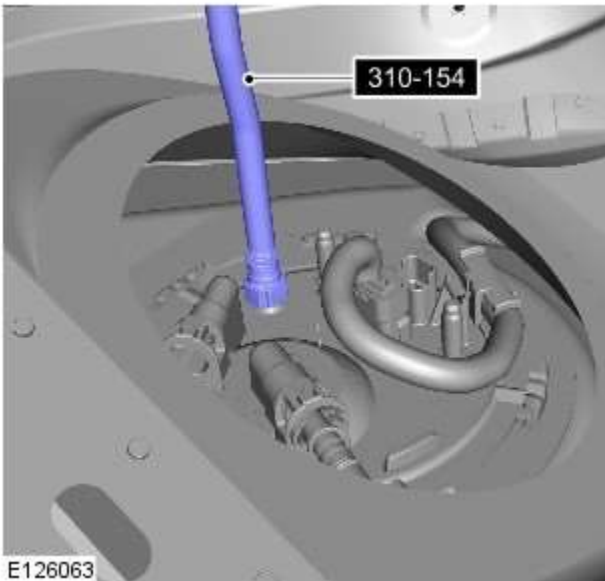
10.




11.  **CAUTION:** The correct measurement must be used to remove the fuel tank drain port top. Failure to follow this instruction may result in damage to the vehicle.

 **NOTE:** Vehicles without Diesel engine shown, vehicles with Diesel engine similar.

Using a suitable tool, remove the top of the fuel tank drain port.

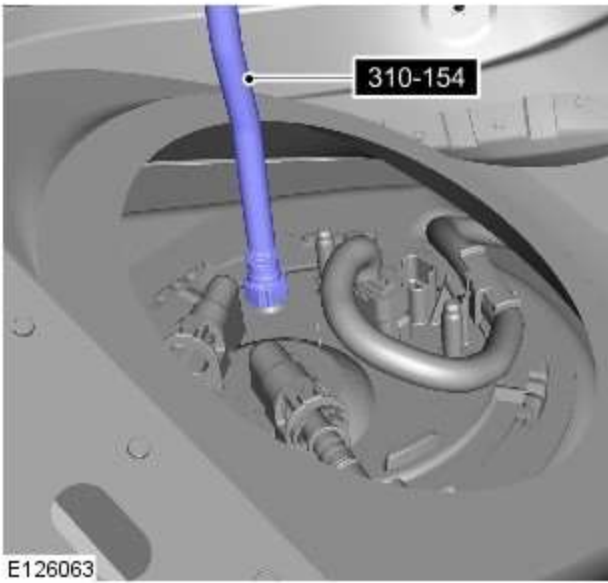



12. **NOTES:**

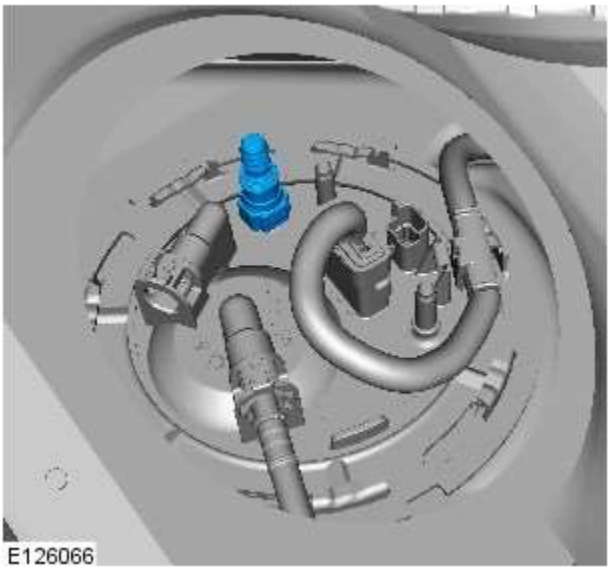
 A fuel vacuum drain unit must be attached to the special tool to achieve full fuel tank drain.


 Vehicles without Diesel engine shown, vehicles with Diesel engine similar.

Using the special tool, drain the right-hand side of the fuel tank.



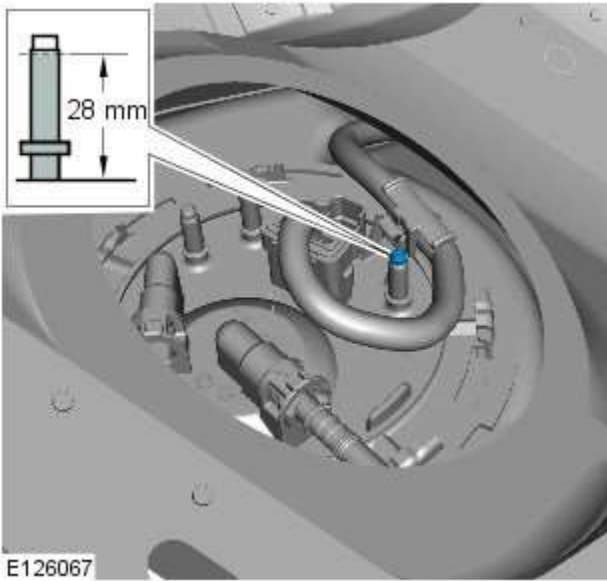
13.  NOTE: Vehicles without Diesel engine shown, vehicles with Diesel engine similar.
Remove the special tool.




14.  CAUTION: Make sure the new fuel tank drain port sealing cap is correctly installed. Failure to follow this instruction may result in damage to the vehicle.

 NOTE: Vehicles without Diesel engine shown, vehicles with Diesel engine similar.

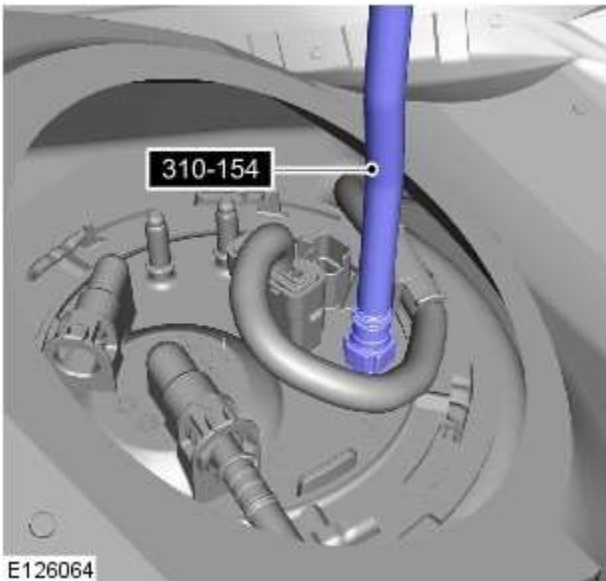
Install a new fuel tank drain port sealing cap.




15.  **CAUTION:** The correct measurement must be used to remove the fuel tank drain port top. Failure to follow this instruction may result in damage to the vehicle.

 **NOTE:** Vehicles without Diesel engine shown, vehicles with Diesel engine similar.

Using a suitable tool, remove the top of the fuel tank drain port.

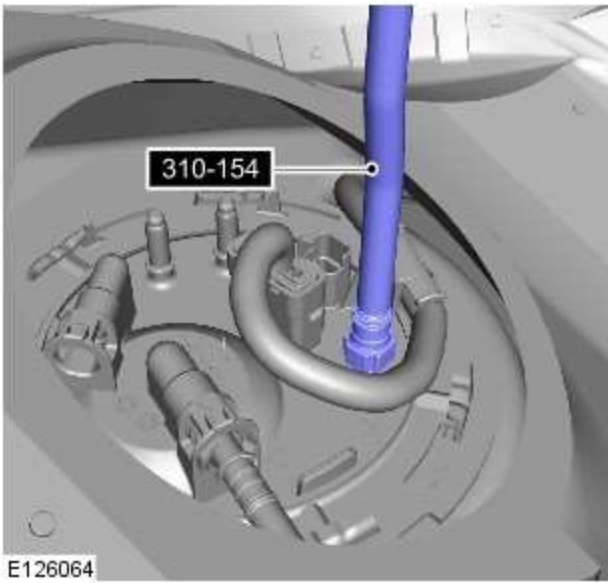



16. **NOTES:**

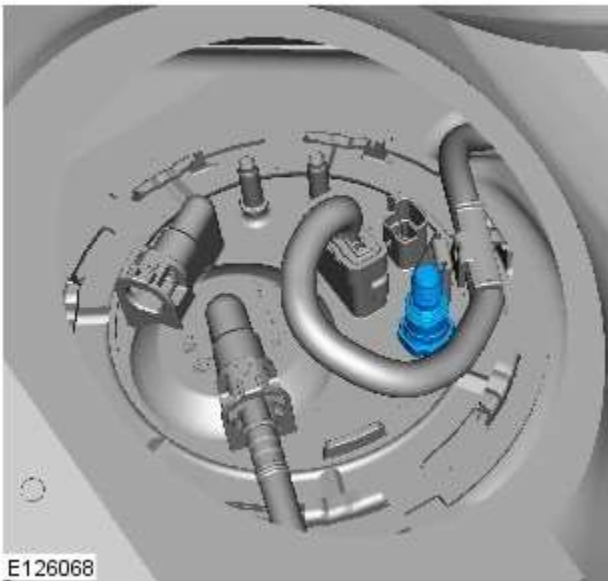
 A fuel vacuum drain unit must be attached to the special tool to achieve full fuel tank drain.


 Vehicles without Diesel engine shown, vehicles with Diesel engine similar.

Using the special tool, drain the left-hand side of the fuel tank.



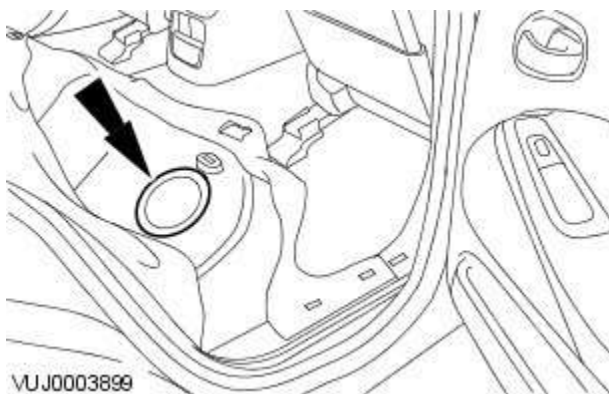
17.  NOTE: Vehicles without Diesel engine shown, vehicles with Diesel engine similar.
- Remove the special tool.



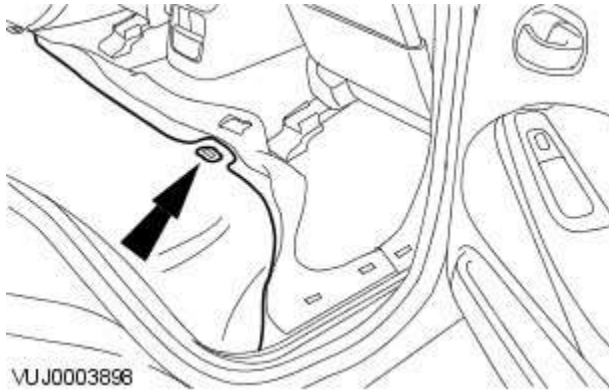
18.  CAUTION: Make sure the new fuel tank drain port sealing cap is correctly installed. Failure to follow this instruction may result in damage to the vehicle.

 NOTE: Vehicles without Diesel engine shown, vehicles with Diesel engine similar.

Install a new fuel tank drain port sealing cap.



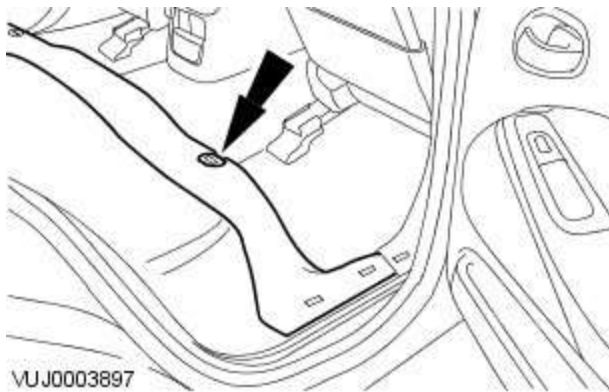
19. Install the floor aperture cover.



VUJ0003898

20.

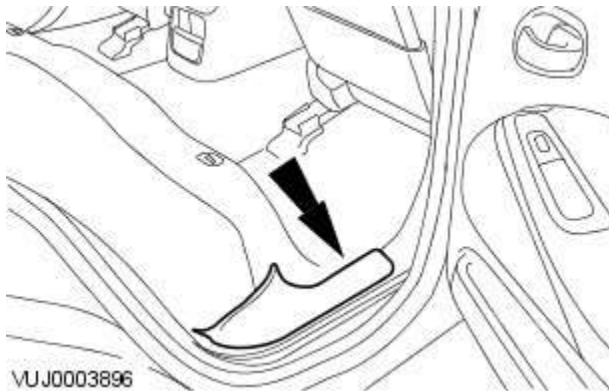
Attach the rear seat cushion insulation.



VUJ0003897

21.

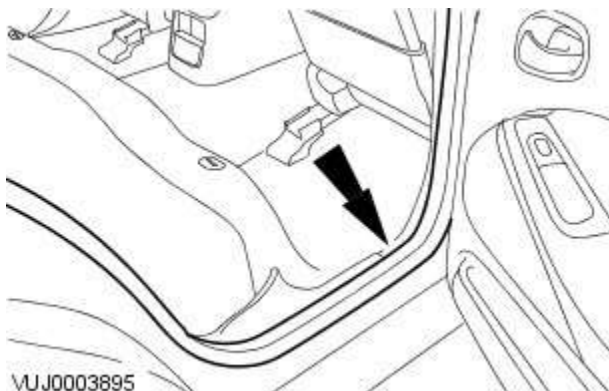
Attach the floor covering.



VUJ0003896

22.

Install the scuff plate trim panel.



VUJ0003895

23.


Attach the door opening weatherstrip.

24. Install the rear seat cushion.
For additional information, refer to: [Rear Seat Cushion](#) (501-10 Seating, Removal and Installation).
www.JagDocs.com

Fuel System - General Information - Spring Lock Couplings

General Procedures

Special Tool(s)

 <p>310D005</p>	<p>Spring Lock Coupling Tool or Equivalent 310-D005 (23-040)</p>
--	--

Disconnect

1. WARNINGS:



Place the vehicle in a quarantined area and arrange "No Smoking/Petrol Fumes" signs about the vehicle.



Before any work is carried out on the fuel system, ground the vehicle to earth and maintain the ground connection until the work is complete.



Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.



The fuel system remains pressurized for a long time after the ignition is switched off. The fuel pressure must be relieved before attempting any repairs. Failure to follow these instructions may result in personal injury.



After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow these instructions may result in personal injury.



This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.



If taken internally do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

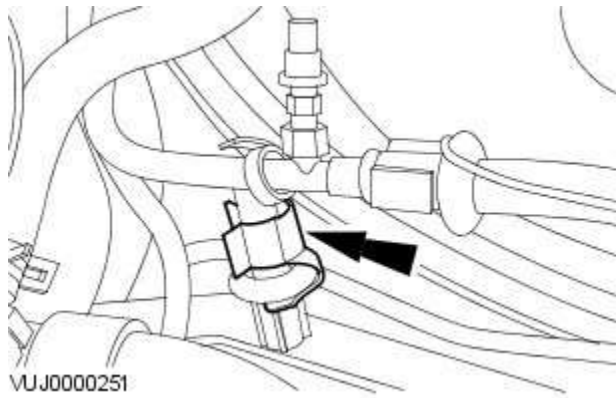


If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention.

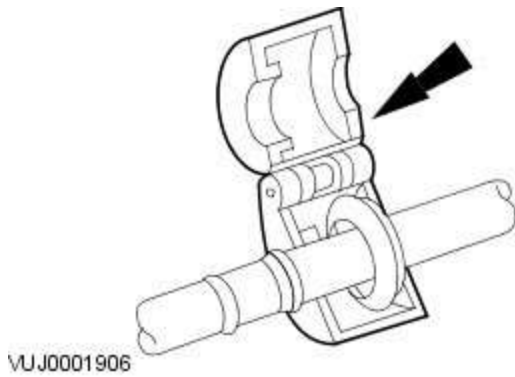


Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

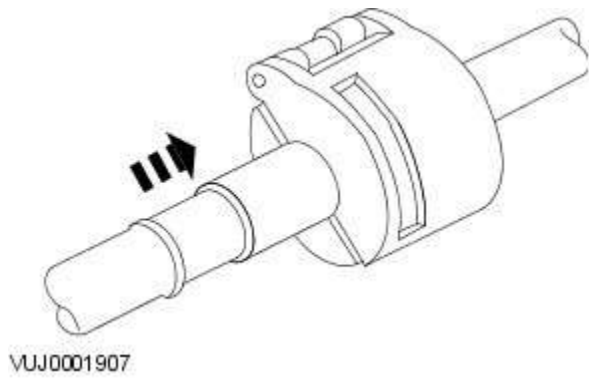
Relieve the fuel system pressure. For additional information, refer to the procedure in this section: [Pressure Relief](#).



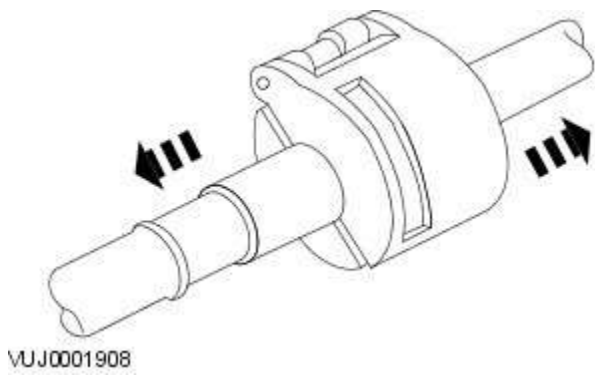
2. Remove the safety clip from the spring lock coupling.



3. Install the special tool.

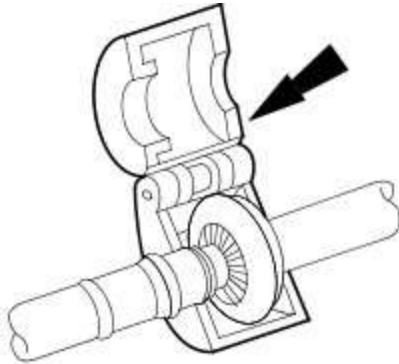


4. Close the special tool and push it into the female end of the spring lock coupling.



5. Disconnect the spring lock coupling.

6. Remove the special tool.



VUJ0001909

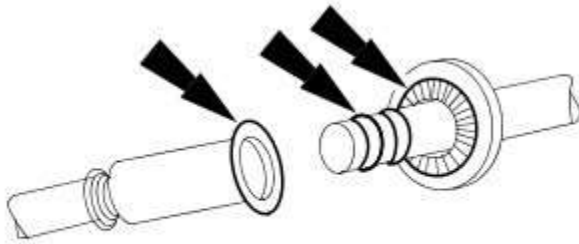
Connect

1. NOTES:


 Install new O-ring seals.

 Install a new garter spring.

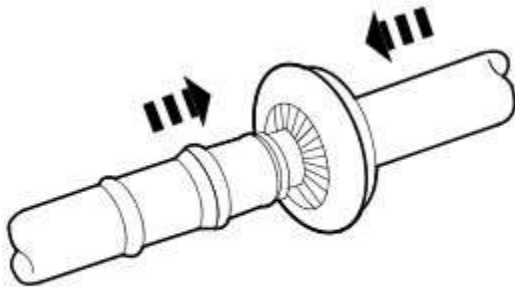
Clean and inspect the male and female ends of the spring lock coupling.



VUJ0001910

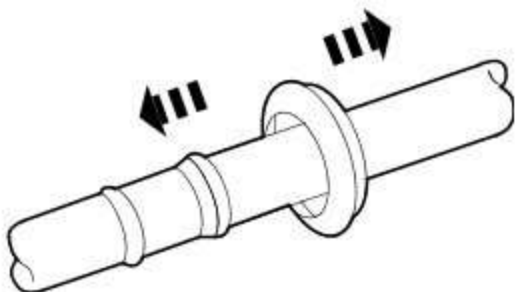
2.  **WARNING:** Make sure the garter spring snaps over the male end of the spring lock coupling.

Connect the spring lock coupling.

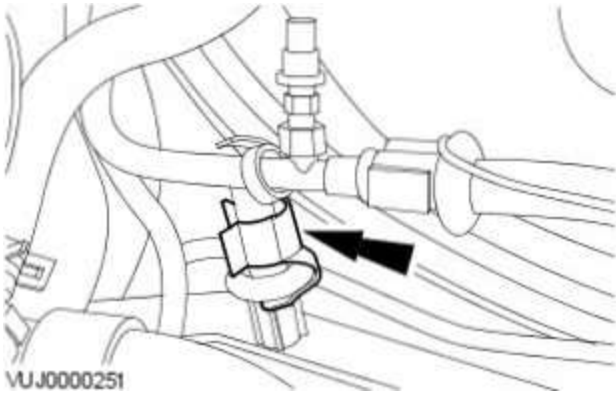


E31439

3. Check the spring lock coupling to make sure it is correctly connected.



E31440



4. Install the safety dip to the sprino lock coupling.

Fuel System - General Information - Quick Release Coupling

General Procedures

Disconnect

1. WARNINGS:



Place the vehicle in a quarantined area and arrange "No Smoking/Petrol Fumes" signs about the vehicle.



Before any work is carried out on the fuel system, ground the vehicle to earth and maintain the ground connection until the work is complete.



Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.



The fuel system remains pressurized for a long time after the ignition is switched off. The fuel pressure must be relieved before attempting any repairs. Failure to follow these instructions may result in personal injury.



After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow these instructions may result in personal injury.



This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.



If taken internally do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.

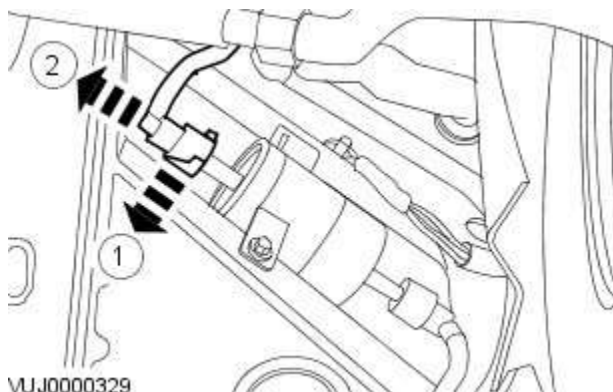


If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention.



Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

Relieve the fuel system pressure. For additional information, refer to the procedure in this section: [Pressure Relief](#).



VJJ0000329

2. Disconnect the quick release fitting.
 1. Release the retaining clip.
 2. Disconnect the quick release fitting.

Connect

1. To connect, reverse the disconnect procedure.

Fuel System - General Information - Quick Release Coupling - Push Connect

General Procedures

Disconnect

1. WARNINGS:



Place the vehicle in a quarantined area and arrange "No Smoking/Petrol Fumes" signs about the vehicle.



Before any work is carried out on the fuel system, ground the vehicle to earth and maintain the ground connection until the work is complete.



Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.



The fuel system remains pressurized for a long time after the ignition is switched off. The fuel pressure must be relieved before attempting any repairs. Failure to follow these instructions may result in personal injury.



After carrying out repairs, the fuel system must be checked visually for leaks. Failure to follow these instructions may result in personal injury.



This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow these instructions may result in personal injury.



If taken internally do not induce vomiting, seek immediate medical attention. Failure to follow these instructions may result in personal injury.



If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention.

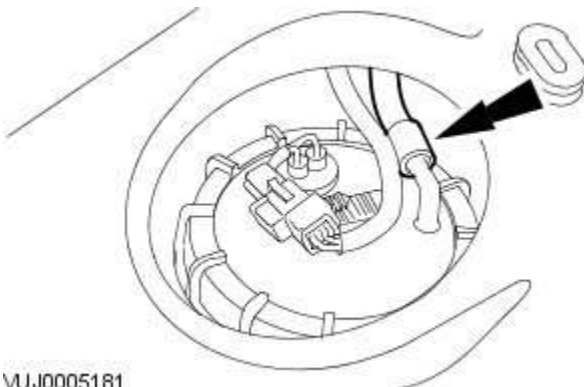


Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention.

Relieve the fuel system pressure. For additional information, refer to the procedure in this section:

For additional information, refer to: Fuel System Pressure Release (310-00 Fuel System - General Information, General Procedures).

2. Disconnect the push connect fitting.
 1. Press the tang.
 2. Disconnect the push connect fitting.

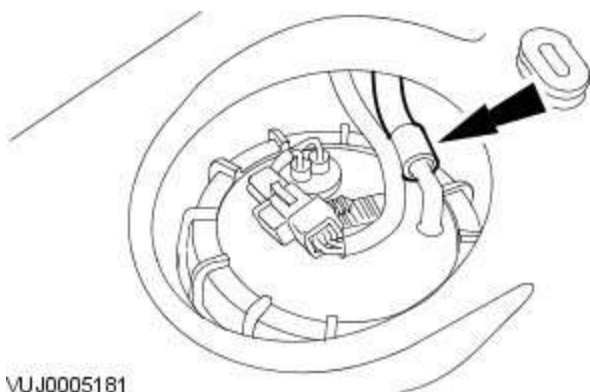


VUJ0005181

Connect

1. To connect.

- Support the male stub.
- Push the connector fitting onto the stub until an audible click can be heard.
- Check the connection by a gentle tug test.



VUJ0005181

Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol -**General Specifications**

Item	Specifications
Fuel system	Electronic returnless fuel system (ERFS)
Fuel tank	Multi layer plastic
Fuel tank sender unit	Mounted on the body of the fuel pump
Fuel filter	Located in the fuel tank
Fuel pump	Electric, located in the fuel tank
System pressure	4.5 bar - 65 lbf/in ²

Capacities

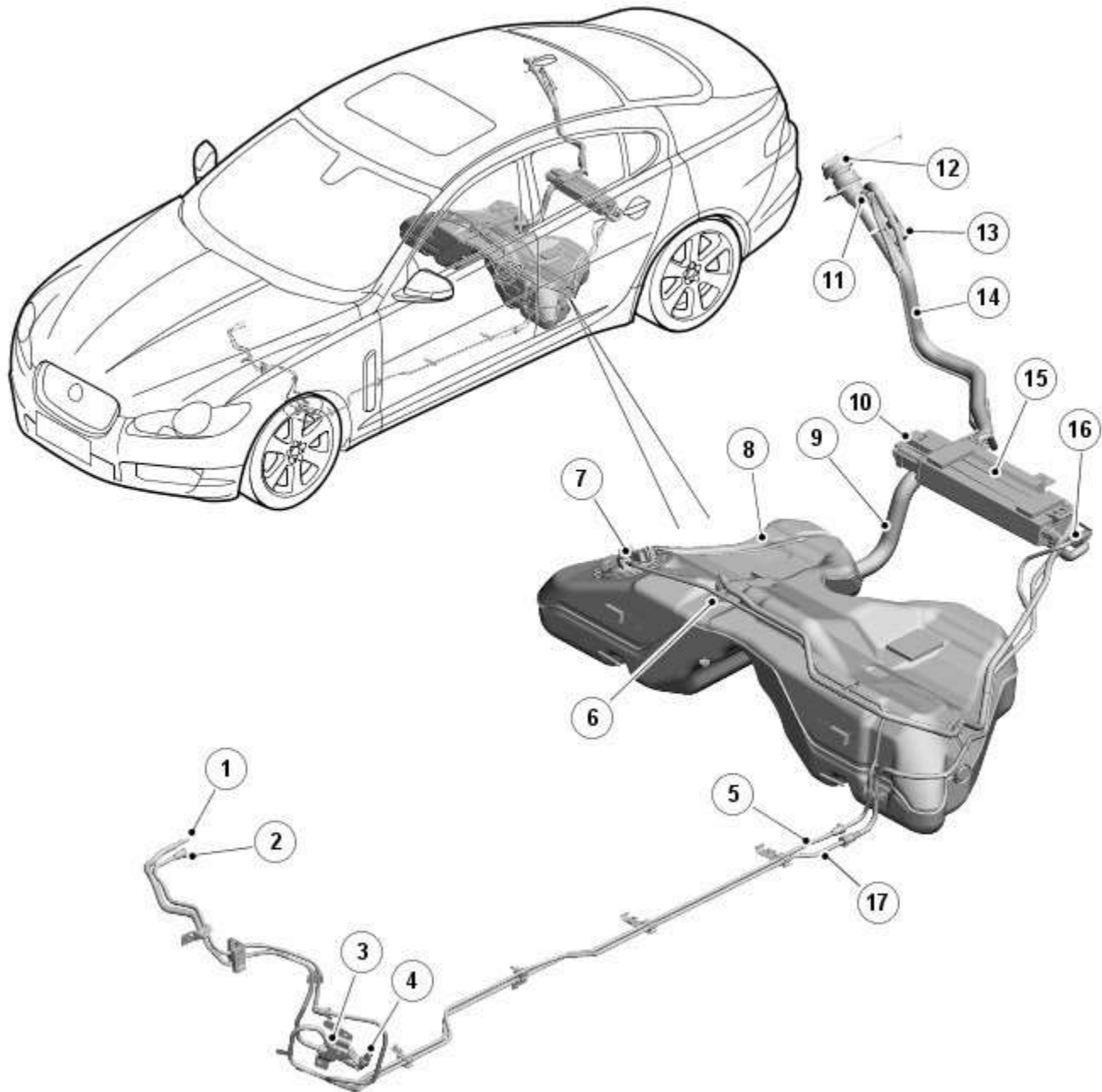
	Liters
Fuel tank capacity	71.1 (total) / 69.5 (useable)

Torque Specifications

Item	Nm	lb-ft	lb-in
Fuel tank filler pipe bracket retaining nut	9	-	80
Fuel tank filler pipe bracket retaining bolt	9	-	80
Fuel tank support strap retaining bolts	35	26	-
Fuel / vapor tube bracket retaining bolt in engine compartment	5	-	44
Fuel / vapor tube bracket to underbody retaining bolts	7	-	62
Fuel pump and sender unit locking ring	250	184	-

9	Fuel filler hose
10	FPDM (fuel pump driver module)
11	Fuel filler pipe
12	Fuel filler cap and lanyard
13	Charcoal canister
14	Pipe - EVAP charcoal canister to purge valve

COMPONENT LOCATION - NORTH AMERICAN SPECIFICATION (NAS)



E118268

Item	Description
1	Fuel feed pipe connection
2	EVAP pipe connection
3	Manifold
4	LP sensor
5	Fuel feed pipe
6	Fuel vapor vent valve

7	Fuel pump module assembly
8	Fuel tank
9	Fuel filler hose
10	FPDM
11	Anti-trickle valve
12	Fuel filler cap and lanyard
13	DMTL filter
14	Fuel filler pipe
15	Charcoal canister
16	DMTL pump
17	Pipe - EVAP charcoal canister to purge valve

Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Fuel Tank and Lines - Overview

Description and Operation

OVERVIEW

The fuel system uses an electronic returnless system. The system comprises a pump module mounted in the fuel tank to deliver Low Pressure (LP) fuel at variable flow to the fuel charging and control system on the engine. Fuel pump operation is regulated by a [FPDM \(fuel pump driver module\)](#) which is controlled by the [ECM \(engine control module\)](#). The [FPDM](#) regulates the flow and pressure supplied by controlling the operation of the fuel pump using a [PWM \(pulse width modulation\)](#) output. A LP sensor is located in the fuel feed supply line to the engine and is monitored by the [ECM](#) for fuel pump control.

Two fuel level sensors are installed in either side of the saddle tank. The sensors are a MAPPS (magnetic passive position sensor) which provide a variable resistance to ground for the output from the fuel gage.

The fuel system also incorporates an [EVAP \(evaporative emission\)](#) system which is part of the on-board refueling and vapor recovery feature. The function and operation of the system is designed to meet [EVAP](#) requirements to minimize fuel vapor losses.

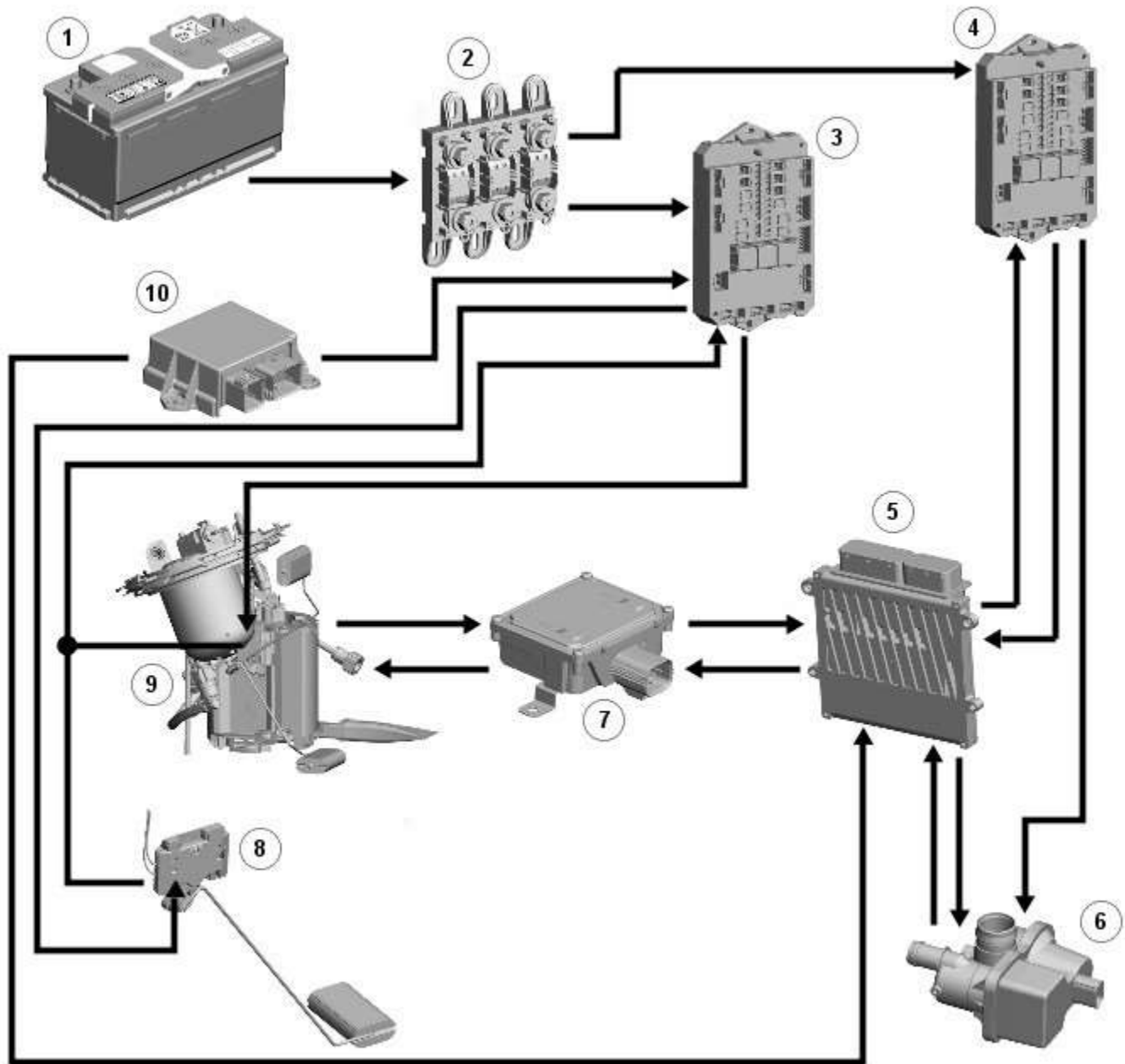
Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Fuel Tank and Lines - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired



E117963



Item	Description
1	Battery
2	Megafuse (250A)
3	RJB (rear junction box)
4	CJB (central junction box).
5	ECM (engine control module)
6	DMTL Pump

7	FPDM (fuel pump driver module)
8	LH (left-hand) fuel level sensor
9	RH (right-hand) fuel level sensor and fuel pump module
10	RCM (restraints control module)

System Operation

OPERATION

The fuel pump is a variable-speed rotary-vane type, which operates in a fuel pump module located in the **RH** side of the fuel tank. A venturi transfer pump is located in the **RH** side of the tank. The fuel pump module is secured in the fuel tank with a bayonet style locking ring that is welded into the tank structure. The fuel pump module has an integral top plate for the external pipe work and electrical connectors.

Fuel level is biased towards the **RH** compartment in the fuel tank by drawing fuel through the internal cross over pipe via the jet pump, which serves to deliver a constant supply of fuel to the transfer pump and swirl pot assembly. High pressure fuel from the fuel pump is directed through the jet pump's orifice, creating a low pressure area to be formed in the cross over pipe. The fuel is drawn into this low pressure area in the cross over pipe and directed into the swirl pot delivery pipes.

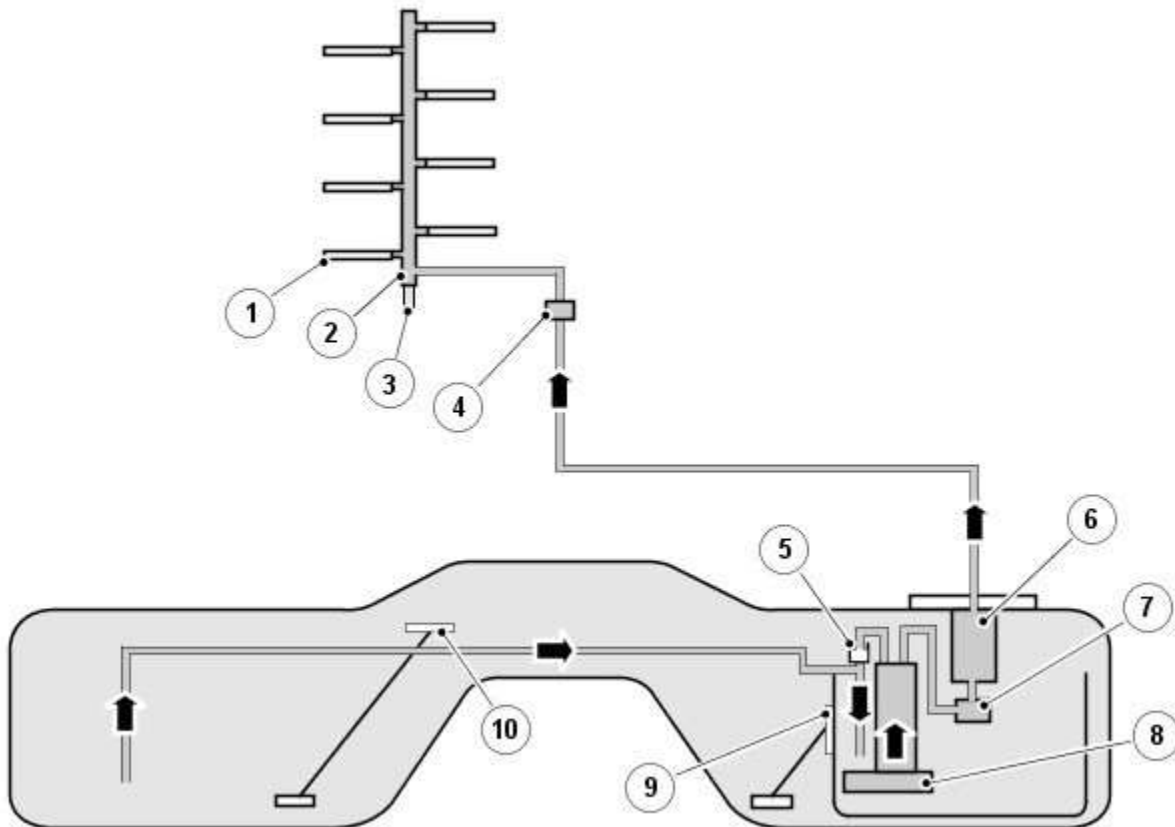
Fuel is pumped from the fuel pump to the fuel rail via the integral filter and pressure relief valve.

The pressure relief valve assists engine starting by retaining a pre-set fuel pressure in the supply pipe and fuel rail. The pressure relief valve also limits fuel rail pressure due to temporary vapor increase in hot conditions and pressure caused by sudden load changes, for example, a fully open to closed throttle transition.

To meet **ORVR (on-board refueling vapor recovery)** requirements, the fuel tank and associated components are designed to minimize fuel vapor loss during refueling. This is achieved by preventing fuel vapor from the fuel tank venting directly to the atmosphere. Instead fuel vapor is directed into the **EVAP (evaporative emission)** charcoal canister where it is stored before being purged at intervals to the engine's intake manifold.

North American Specification (NAS) vehicles feature additional connections and pipes at the rear of the filler head and also incorporates a Diagnostic Monitoring Tank Leakage (DMTL) pump for leak detection requirements.

Fuel System Schematic Diagram



E118269

Item	Description
1	Fuel injector (8 off)
2	Fuel rail

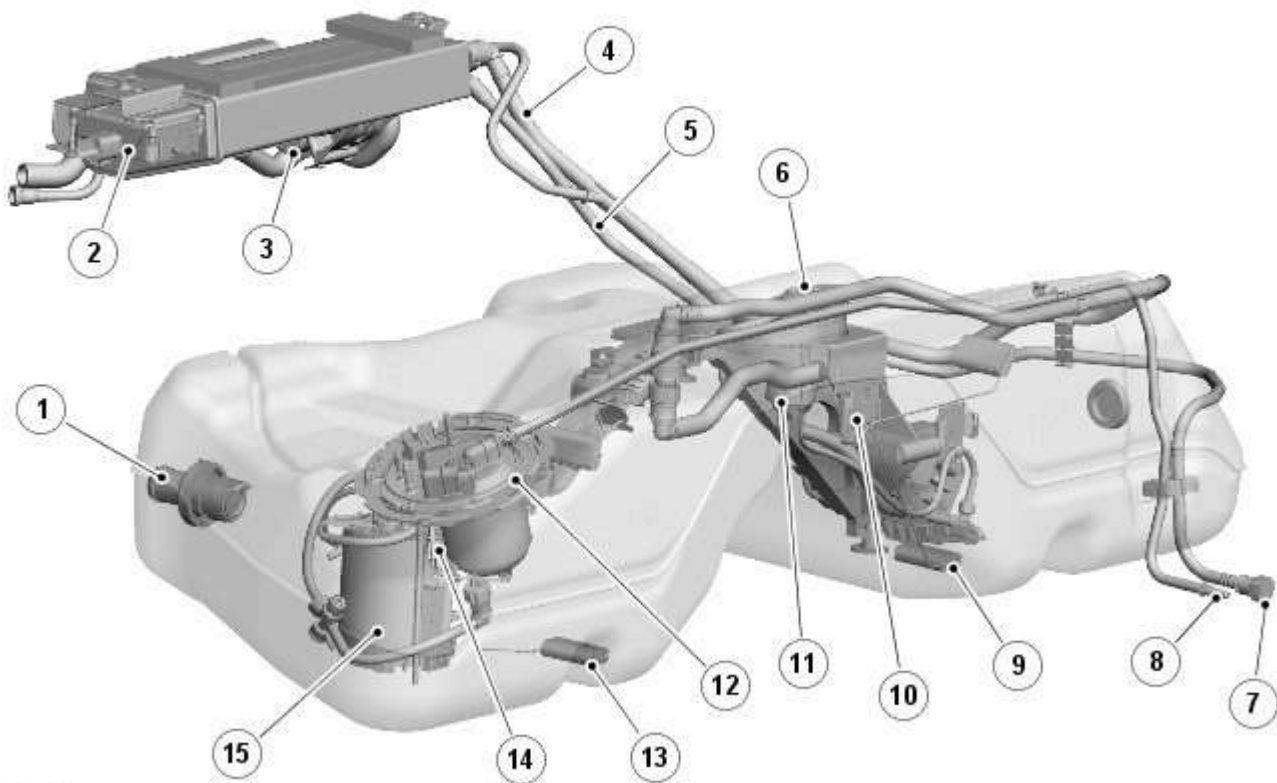
3	Fuel High Pressure (HP) sensor
4	Fuel LP sensor
5	Jet pump
6	Fuel filter
7	Pressure relief valve
8	Fuel pump module assembly
9	RH fuel level sensor
10	LH fuel level sensor

Component Description

FUEL TANK



NOTE: NAS fuel system shown



E117961

Item	Description
1	Fuel filler pipe connection and spit back flap
2	FPDM
3	DMTL Pump (NAS only)
4	EVAP hose
5	Hose - EVAP charcoal canister to purge valve
6	Vapor pressure control valve
7	Hose connection - EVAP charcoal canister to purge valve
8	Fuel supply to engine
9	LH fuel level sensor float
10	LH fuel level sensor
11	Liquid Vapor Separator (LVS)
12	Fuel delivery pump outlet connection
13	RH fuel level sensor float

14	RH fuel level sensor
15	Fuel pump module

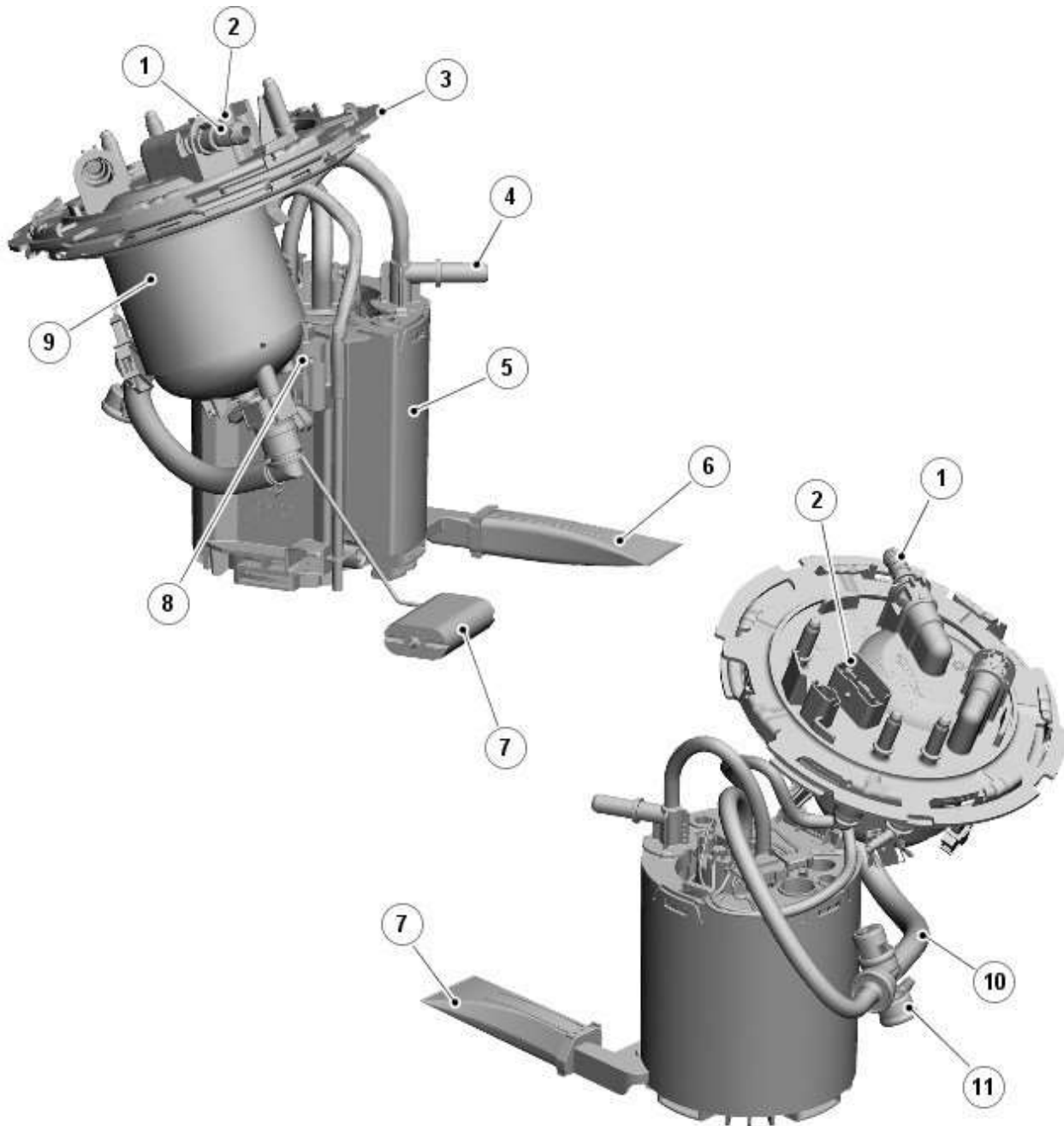
The fuel tank is a saddle type tank, blow moulded from HDPE (high density polyethylene). The tank is located forward of the rear suspension and is mounted using two metal straps. The tank is a sealed unit with the only internal access being through the fuel pump module aperture on the top of the tank.

The fuel pump module flange has a six pin external connector which provides the electrical connections for the fuel pump and both fuel level sensors. A quick release connector provides for the connection of the fuel feed pipe.

The flange is fitted with a locking ring and seal. The seal locates in a groove on the tank. The locking ring locates and clamps on the encapsulated ring that is moulded into the fuel tank. The flange has a tag which locates in the top of the tank to ensure correct orientation.

A carrier within the tank provides for the mounting of the passive side jet pump tube, vent valve, ROV and liquid vapor separator (LVS), level sensors and passive side drain.

FUEL PUMP MODULE



Item	Description
1	Fuel supply connection
2	Electrical connector
3	Flange locking ring and seal
4	Sucking jet connector
5	Fuel pump module
6	Fuel pick up filter
7	Level sensor float
8	RH level sensor
9	Fuel filter
10	Pressure relief valve
11	Pump supply to flange connection

12 The fuel pump is a variable speed rotary vane type. The pump is energized by the fuel pump relay which is located in the [RJB](#) and the [FPDM](#), which is located under the [RH](#) floor pan above the rear suspension stabilizer bar. The relay and [FPDM](#) are controlled by the [ECM](#).

A fine mesh filter is located in the lower section of the pump module. This provides filtration to the fuel as it is drawn into the module. There is a winged filter on the fuel pump that gives additional protection and a life time fuel filter integrated into the flange which eliminates the need for an additional filter further downstream in the fuel system.

The [RH](#) fuel level sensor is mounted into the pump module housing.

FUEL PUMP DRIVER MODULE (FPDM)



E117838

The [FPDM](#) is located on a bracket which is integral with the charcoal canister. The module is attached to one end of the canister with a bracket.

The fuel pump operation is regulated by a [FPDM](#), which is controlled by the [ECM](#). The [FPDM](#) regulates the flow and pressure supplied by controlling the operation of the fuel pump using a [PWM \(pulse width modulation\)](#) output.

The [FPDM](#) is powered by a supply from the fuel pump relay in the [RJB](#). The fuel pump relay is energized on opening the driver's door, pressing the start button only or pressing the start button and the footbrake (which initiates engine cranking). The [FPDM](#) supplies power to the fuel pump, and adjusts the power to control the speed of the fuel pump and thus the pressure and flow in the fuel delivery line.

A [PWM](#) signal from the [ECM](#) tells the [FPDM](#) the required speed for the fuel pump. The on time of the [PWM](#) signal represents half the fuel pump speed, e.g. if the [PWM](#) signal has an on time of 50%, the [FPDM](#) drives the pump at 100%.

The [FPDM](#) will only energize the fuel pump if it receives a valid [PWM](#) signal, with an on time of between 4% and 50%. To switch the fuel pump off, the [ECM](#) transmits a [PWM](#) signal with an on time of 75%.

The output pressure from the fuel pump will change with changes of engine demand and fuel temperature. The [ECM](#) monitors the input from the fuel rail LP sensor and adjusts the speed of the fuel pump as necessary to maintain a nominal output pressure of 450 kPa (4.5 bar; 65.3 lbf/in.²), except during engine start-up. At engine start-up the target pressure for the fuel delivery line is 630 kPa (6.3 bar; 91.4 lbf/in.²).

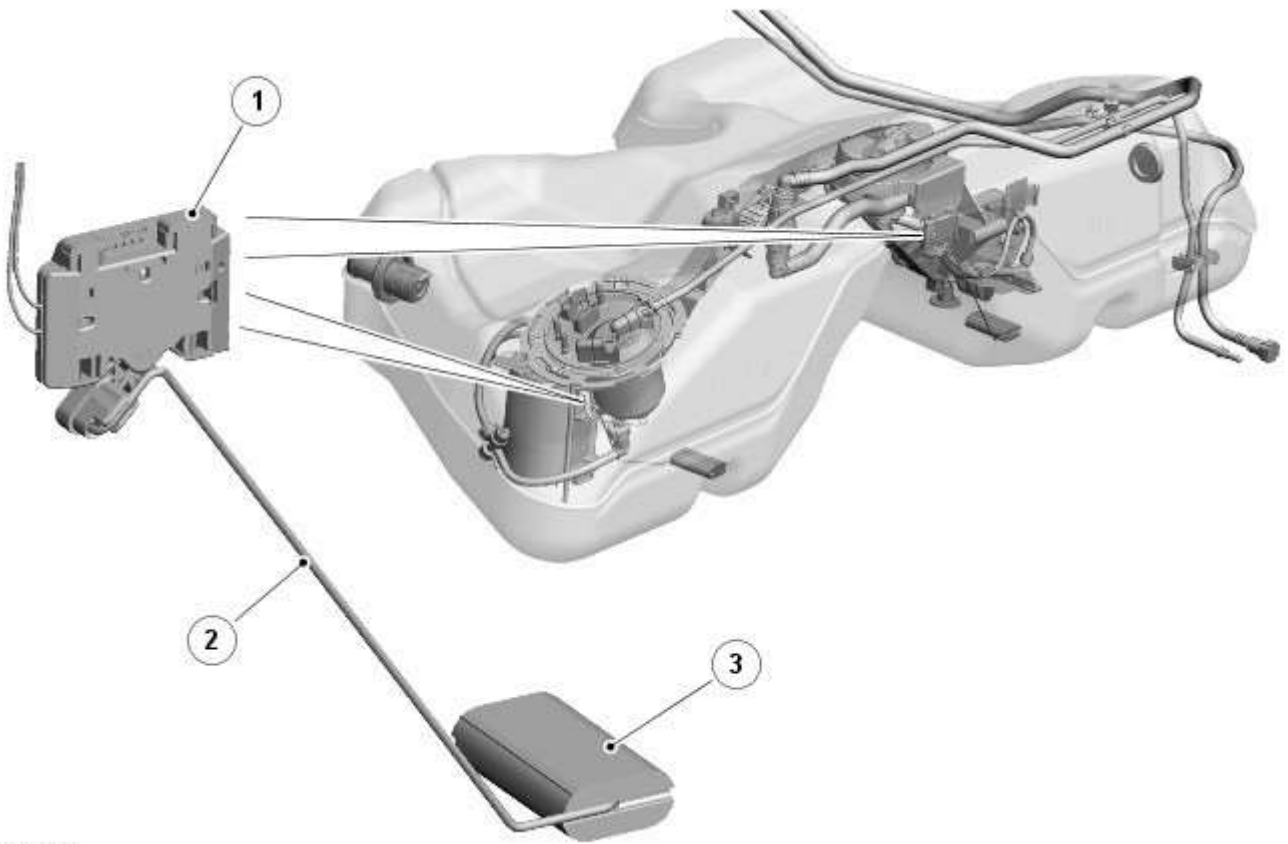
If the [SRS \(supplemental restraint system\)](#) outputs a crash signal on the high speed [CAN \(controller area network\)](#), the [ECM](#) de-energizes the fuel pump relay to prevent any further fuel being pumped to the engine.

If the [ECM](#) does not detect pressure in the fuel delivery line, it stops, or refuses to start the engine and stores the appropriate [DTC \(diagnostic trouble code\)](#).

The [ECM](#) receives a monitoring signal from the [FPDM](#). Any [DTC](#)'s produced by the [FPDM](#) are stored by the [ECM](#).

[DTC](#)'s can be retrieved from the [ECM](#) using an approved Jaguar diagnostic system. The [FPDM](#) itself cannot be interrogated by the approved Jaguar diagnostic system.

FUEL LEVEL SENSORS

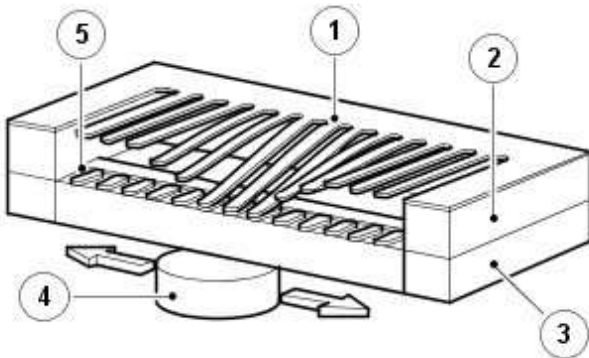


E117813

Item	Description
1	Fuel level sensor
2	Fuel level sensor float arm
3	Fuel level sensor float

Two fuel level sensors are installed in either side of the saddle tank. One is mounted on the fuel pump module, the other is mounted on the carrier in the LH side of the fuel tank. The sensors are a float operated MAPPS (magnetic passive position sensor) which provide a variable resistance to ground for the output from the fuel gauge. The sensor is sealed from the fuel preventing contamination of the contacts, increasing reliability. The fuel level sensors are connected to the external electrical connector on the flange via the connector on the underside of the fuel pump module flange.

The sensor comprises a series of 51 film resistors mounted in an arc on a ceramic surface. The resistors are wired in series with individual contacts. A soft magnetic foil with 51 flexible contacts is mounted a small distance above the film resistors. A magnet, located below the ceramic surface, is attached to the sender unit float arm. As the float arm moves, the magnet follows the same arc as the film resistors. The magnet pulls the flexible contacts onto the opposite film resistor contacts forming an electrical circuit.



E44504

Item	Description
1	Magnetic foil
2	Spacer
3	Ceramic surface
4	Magnet
5	Resistance film

The film resistors are arranged in a linear arc with resistance ranging from 51.2 to 992.11 Ohms. The electrical output signal is proportional to the amount of fuel in the tank and the position of the float arm. The measured resistance is processed by the instrument cluster to implement an anti-slosh function. This monitors the signal and updates the fuel gauge pointer position at regular intervals, preventing constant pointer movement caused by fuel movement in the tank due to cornering or braking.

A warning lamp is incorporated in the instrument cluster and illuminates when the fuel level is low.

The fuel level sender signal is converted into a [CAN](#) message by the instrument cluster as a direct interpretation of the fuel tank contents in liters. The [ECM](#) uses the [CAN](#) message to store additional [OBD \(on-board diagnostic\)](#) 'P' Codes for misfire detection when the fuel level is below a predetermined capacity.

JET PUMP

The fuel system incorporates two jet pumps. One jet pump is integrated into the fuel pump and draws fuel from the [RH](#) side of the fuel tank. The other jet pump is located on the fuel delivery module on the [RH](#) side of the tank. There is a pipe that is located in the [LH](#) side of the tank that allows fuel to be drawn over from the [LH](#) side of the tank, delivering fuel into the swirl pot. The jet pumps operate on a venturi effect created by the fuel at pump output pressure passing through the jet pump. This draws additional fuel from the [LH](#) side of the tank through ports in the jet pump body, delivering additional fuel to the swirl pot.

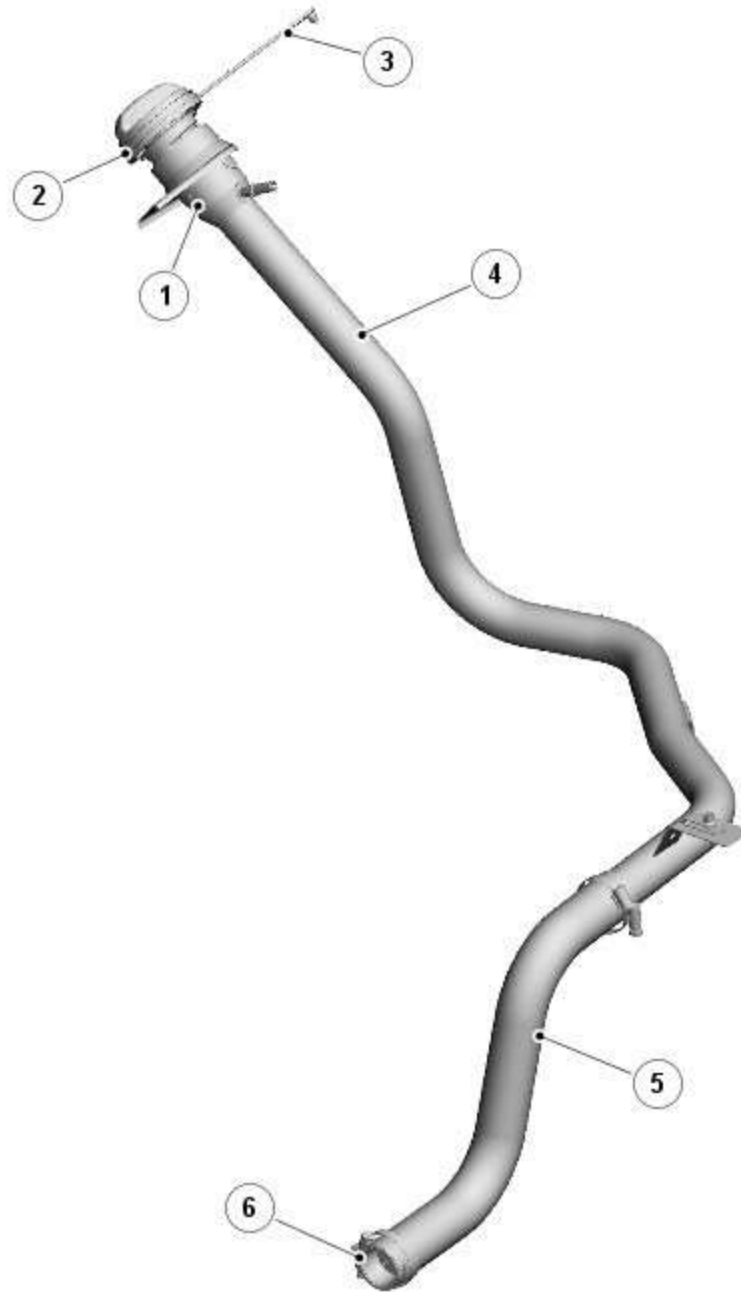
FUEL VENT VALVE

The fuel level vent valve is located in the upper half of the tank and is connected into a separator which is connected to the Roll Over Valve (ROV) tank breather. The main purpose of the fuel level vent valve is to control the fill volume of the tank. During filling, air trapped inside the tank and a small amount of vapor is passed via the fuel level vent valve to the tank breather. The air and vapor mix then vents to atmosphere through the breather. During filling, when the tank reaches its full level, the fuel level vent valve closes and prevents air/vapor passing through to the tank breather. The resulting back pressure causes refueling to stop automatically.

The fuel level vent valve is always open when the fuel tank is below full, providing an unrestricted air/vapor outlet to the tank breather.

FUEL FILLER PIPE

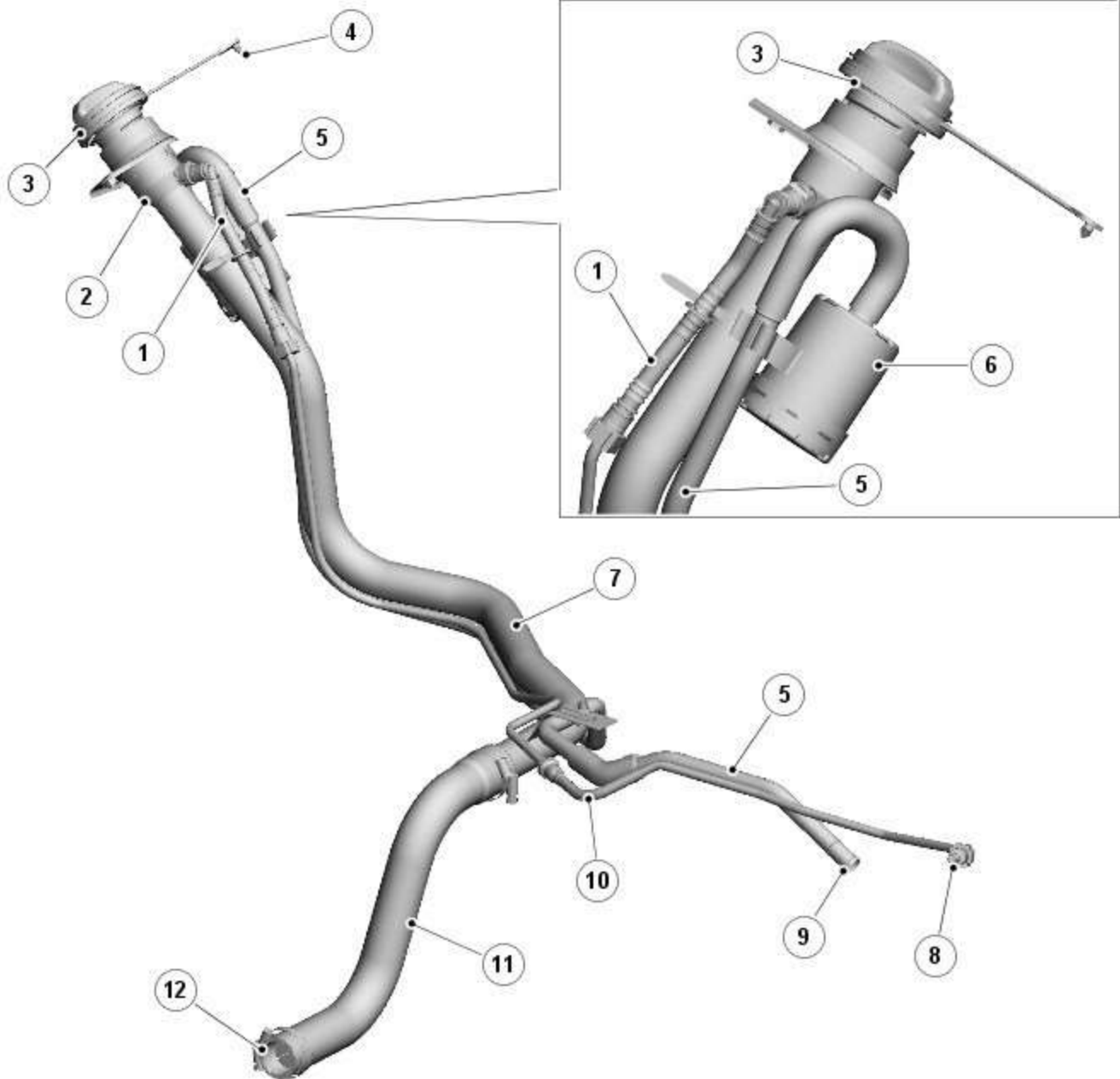
Fuel Filler Pipe (ROW)



E117814

Item	Description
1	Wide bore filler neck
2	Fuel cap
3	Fuel cap lanyard
4	Fuel filler pipe
5	Fuel filler hose
6	Hose connection with fuel tank inlet check valve

Fuel Filler Pipe (NAS)



E117962

Item	Description
1	Anti-trickle valve assembly
2	Wide bore filler neck
3	Fuel cap
4	Fuel cap lanyard
5	DMTL breather hose
6	DMTL breather filter
7	Fuel filler pipe
8	Connection of leak pipe to tank vapor line
9	Connection to charcoal canister
10	DMTL vapor leak pipe
11	Fuel filler hose
12	Hose connection with fuel tank inlet check valve

The fuel filler head is positioned at the rear of the vehicle, above the right hand rear wheel. The filler head is covered by a molded plastic cover which is electrically locked when the vehicle is locked. The filler cap is a conventional screw in type which is secured to the vehicle with a lanyard.

The filler head is stainless steel fabrication which is secured to the vehicle body with 2 brackets and a location lug on the filler bowl. The formed pipe locates in a short flexible hose attached to the tank which is secured with worm drive clamps at each end.

FUEL LP SENSOR



E112870

The fuel LP sensor supplies a pressure signal to the [ECM](#) to enable closed loop control of the fuel pump. The fuel LP sensor is installed in a manifold in the fuel delivery line. The manifold is located in the rear of the front [LH](#) wheelarch, behind the splash shield.

Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Fuel Tank and Lines

Diagnosis and Testing

Principle of Operation

For a detailed description of the fuel tank and lines system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: (310-01C Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol)

[Fuel Tank and Lines](#) (Description and Operation),
[Fuel Tank and Lines](#) (Description and Operation),
[Fuel Tank and Lines](#) (Description and Operation).

Inspection and Verification

WARNINGS:



Eye protection must be worn at all times when working on or near any fuel related components. Failure to follow this instruction may result in personal injury.



This procedure involves fuel handling. Be prepared for fuel spillage at all times and always observe fuel handling precautions. Failure to follow this instruction may result in personal injury.



After carrying out repairs, the fuel system must be checked visually for leaks. This should be done after the engine has been run, but with the engine switched **OFF**. Failure to follow this instruction may result in personal injury.



If taken internally, **DO NOT** induce vomiting. Seek immediate medical attention. Failure to follow this instruction may result in personal injury.



If fuel contacts the eyes, flush the eyes with cold water or eyewash solution and seek medical attention. Failure to follow this instruction may result in personal injury.



Wash hands thoroughly after handling, as prolonged contact may cause irritation. Should irritation develop, seek medical attention. Failure to follow this instruction may result in personal injury.

CAUTIONS:



Before disconnecting any part of the system, it is imperative that all dust, dirt and debris is removed from around components to prevent ingress of foreign matter into the fuel system. Failure to follow this instruction may result in damage to the vehicle.



It is essential that absolute cleanliness is observed when working with these components. Always install blanking plugs to any open orifices or lines. Failure to follow this instruction may result in damage to the vehicle.



Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



When measuring fuel sender resistance values with a multimeter, it is critical to use the correct multimeter setting. The multimeter should **not** be on the 'Auto' setting and **must** be set to 'Manual'. This will help prevent incorrect diagnosis and unnecessary replacement of fuel senders. If the multimeter range is set at 'Auto' then, during a sweep of the sender from 50 Ohms to 998 Ohms, the multimeter has to change its measurement range. For approximately 1 second, during the range switch over point, the multimeter display indicates an open circuit. This can lead to a mis-diagnosis of a fuel sender fault.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Low/contaminated fuel • Fuel supply/return line(s) • Fuel tank and filler pipe • Fuel leak(s) • Fuel filler cap • Fuel filter • Push connect fittings • Fuel pump 	<ul style="list-style-type: none"> • Fuses • Links • Relays • Fuel Pump Driver Module (FPDM) • Fuel pump module • Sensor(s) • Engine control module (ECM) • Rear Junction Box (RJB) • Restraints Control Module (RCM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and proceed to the DTC Index

Symptom Chart

Symptom	Possible Causes	Action
Engine cranks, but does not fire	<ul style="list-style-type: none"> • Engine breather system disconnected/restricted • Ignition system • Fuel system • Electronic engine control 	<ul style="list-style-type: none"> • Ensure the engine breather system is free from restriction and is correctly installed • Check for ignition system, fuel system and electronic engine control DTCs and refer to the relevant DTC Index
Engine cranks and fires, but will not start	<ul style="list-style-type: none"> • Evaporative emissions purge valve • Fuel pump • Spark plugs • HT short to ground (tracking) check rubber boots for cracks/damage • Ignition system 	<ul style="list-style-type: none"> • Check for evaporative emissions, fuel system and ignition system related DTCs and refer to the relevant DTC Index
Difficult cold start	<ul style="list-style-type: none"> • Engine coolant level/anti-freeze content • Battery • Electronic engine controls • Fuel pump • Purge valve 	<ul style="list-style-type: none"> • Check the engine coolant level and condition • Ensure the battery is in a fully charged and serviceable condition • Check for electronic engine controls, engine emissions, fuel system and evaporative emissions system related DTCs and refer to the relevant DTC Index
Difficult hot start	<ul style="list-style-type: none"> • Injector leak • Electronic engine control • Purge valve • Fuel pump • Ignition system 	<ul style="list-style-type: none"> • Check for injector leak, install new injector as required • Check for electronic engine controls, evaporative emissions, fuel system, ignition system and engine emission system related DTCs and refer to the relevant DTC Index
Difficult to start after hot soak (vehicle standing, engine off, after engine has reached operating temperature)	<ul style="list-style-type: none"> • Injector leak • Electronic engine control • Purge valve • Fuel pump • Ignition system 	<ul style="list-style-type: none"> • Check for injector leak, install new injector as required • Check for electronic engine controls, evaporative emissions, fuel system, ignition system and engine emission system related DTCs and refer to the relevant DTC Index
Engine stalls soon after start	<ul style="list-style-type: none"> • Breather system disconnected/restricted • ECM relay • Electronic engine control • Ignition system • Air intake system restricted • Air leakage • Fuel lines 	<ul style="list-style-type: none"> • Ensure the engine breather system is free from restriction and is correctly installed • Check for electronic engine control, ignition system and fuel system related DTCs and refer to the relevant DTC Index • Check for blockage in air filter element and air intake system • Check for air leakage in air intake system
Engine hesitates/poor acceleration	<ul style="list-style-type: none"> • Fuel pressure, fuel pump, fuel lines • Injector leak • Air leakage 	<ul style="list-style-type: none"> • Check for fuel system related DTCs and refer to the relevant DTC Index • Check for injector leak, install new injector as required

Symptom	Possible Causes	Action
	<ul style="list-style-type: none"> Electronic engine control Throttle motor Restricted accelerator pedal travel (carpet, etc) Ignition system Transmission malfunction 	<ul style="list-style-type: none"> Check for air leakage in air intake system Ensure accelerator pedal is free from restriction Check for electronic engine controls, ignition, engine emission system and transmission related DTCs and refer to the relevant DTC Index
Engine backfires	<ul style="list-style-type: none"> Fuel pump/lines Air leakage Electronic engine controls Ignition system Sticking variable camshaft timing (VCT) hub 	<ul style="list-style-type: none"> Check for fuel system failures Check for air leakage in intake air system Check for electronic engine controls, ignition system and VCT system related DTCs and refer to the relevant DTC Index
Engine surges	<ul style="list-style-type: none"> Fuel pump/lines Electronic engine controls Throttle motor Ignition system 	<ul style="list-style-type: none"> Check for fuel system failures Check for electronic engine controls, throttle system and ignition system related DTCs and refer to the relevant DTC Index
Engine detonates/knocks	<ul style="list-style-type: none"> Fuel pump/lines Air leakage Electronic engine controls Sticking VCT hub 	<ul style="list-style-type: none"> Check for fuel system failures Check for air leakage in intake air system Check for electronic engine controls and VCT system related DTCs and refer to the relevant DTC Index
No throttle response	<ul style="list-style-type: none"> Electronic engine controls Throttle motor 	<ul style="list-style-type: none"> Check for electronic engine controls and throttle system related DTCs and refer to the relevant DTC Index
Poor throttle response	<ul style="list-style-type: none"> Breather system disconnected/restricted Electronic engine controls Transmission malfunction Traction control event Air leakage 	<ul style="list-style-type: none"> Ensure the engine breather system is free from restriction and is correctly installed Check for electronic engine controls, transmission and traction control related DTCs and refer to the related DTC Index Check for air leakage in intake air system
Fuel gauge reading empty with fuel in the fuel tank	<ul style="list-style-type: none"> Active fuel level sensor circuit open circuit Passive fuel level sensor circuit open circuit Instrument cluster internal failure 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, perform the guided diagnostic routine - Fuel Level Sensor Test
Fuel gauge not reading empty with no fuel in the fuel tank	<ul style="list-style-type: none"> Jet pump fault Fuel crossover tube blocked or leaking 	<ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, check datalogger signals - Fuel Sender 2 (0x61B8) - Fuel Sender 1 (0x61B7). Refer to the table below. If the right sensor reads empty when the left sensor reads more than empty, check that the jet pump is transferring fuel from the left side to the right side

Fuel Gauge, Resistance, Voltage And Fuel Tank Level Comparison Chart

Use the chart to determine fuel tank fuel volume versus fuel gauge reading to determine the fuel level symptom and fault.

NOTES:



The vehicle must be parked on a level surface to obtain an accurate fuel level gauge reading.



The actual values may vary, according to the quantity of fuel in the left and right sides of the fuel tank.



An accurate fuel level gauge reading requires 3 to 5 minutes for levels to stabilise.

Volume, Resistance and Voltage Values

Gauge Reading	Fill Volume (L)	Fuel Sender 2 (0x61B8) - Right side		Fuel Sender 1 (0x61B7) - Left side	
		Resistance (Ω)	CAN Count (Tolerance ± 10)	Resistance (Ω)	CAN Count (Tolerance ± 10)
0		52	75	51	74
2		60	86	51	74
4		76	107	51	74

Gauge Reading	Fill Volume (L)	Fuel Sender 2 (0x61B8) - Right side		Fuel Sender 1 (0x61B7) - Left side	
		Resistance (Ω)	CAN Count (Tolerance ± 10)	Resistance (Ω)	CAN Count (Tolerance ± 10)
	6	86	119	51	74
	8	121	160	51	74
	10	151	191	51	74
Empty	12	183	223	51	74
	14	205	244	51	74
	16	242	276	51	74
	18	283	308	51	74
	20	327	340	51	74
1/4	22	358	361	51	74
	24	408	392	51	74
	26	445	414	51	74
	28	446	436	51	74
	30	446	436	51	74
	32	446	436	59	85
	34	446	436	75	106
	36	445	425	101	148
	38	486	436	170	159
	40	486	446	140	170
1/2	42	486	446	160	201
	44	460	425	192	223
	46	486	446	204	243
	48	552	457	204	243
	50	626	489	204	243
	52	654	521	228	254
	54	654	521	241	275
	56	654	521	254	286
3/4	58	654	521	281	307
	60	684	531	296	318
	62	707	531	326	339
	64	727	541	357	350
	66	737	562	373	370
Full	67	803	563	407	391
Maximum Fill	Maximum Fill	911	594	425	402

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged in the Engine Control Module (ECM), please refer to Section 303-14. REFER to:

[Electronic Engine Controls](#) (303-14C Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing),
[Electronic Engine Controls](#) (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Diagnosis and Testing).

Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Fuel Level Sender

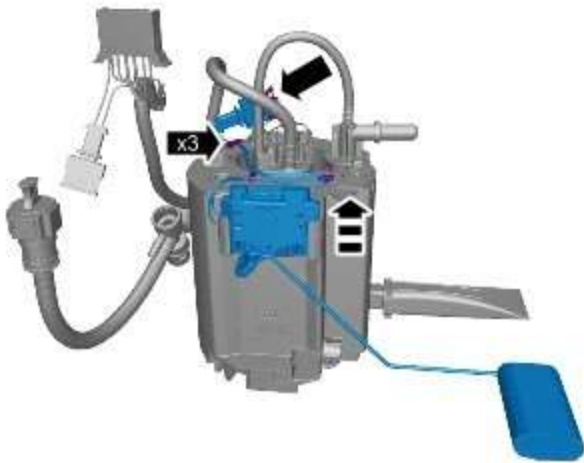
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Fuel Pump and Sender Unit](#) (310-01C Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
- 3.



E114483

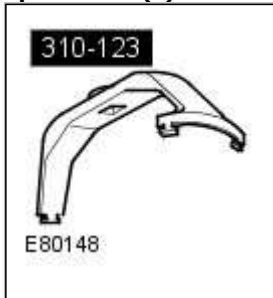
Installation

1. To install, reverse the removal procedure.

Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Fuel Pump and Sender Unit

Removal and Installation

Special Tool(s)

	310-123 Locking Ring, Fuel Tank
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Removal



NOTE: Removal steps in this procedure may contain installation details.

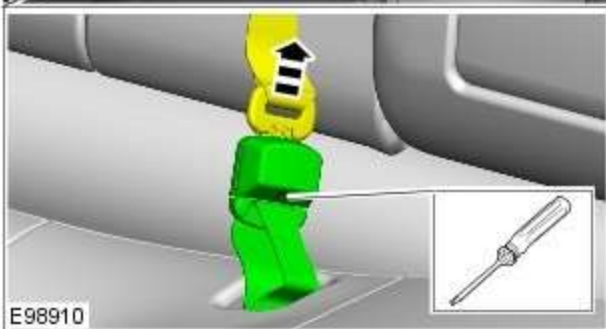
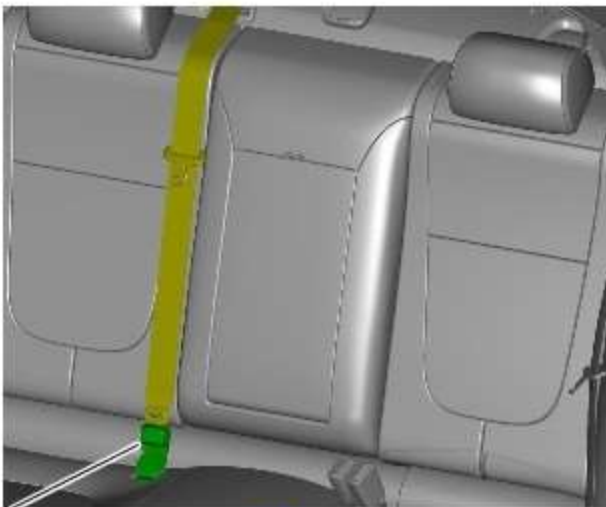


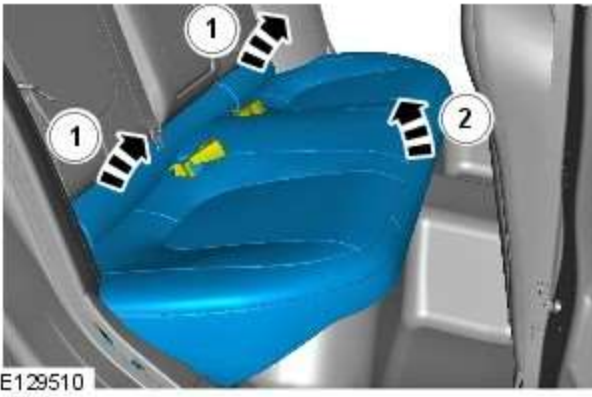
1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

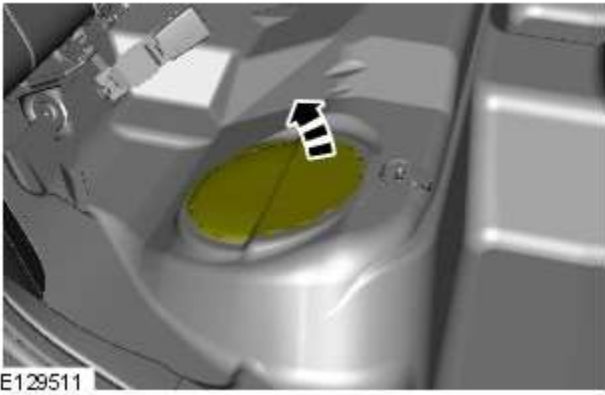
2. Refer to: [Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (310-00 Fuel System - General Information, General Procedures).

3.

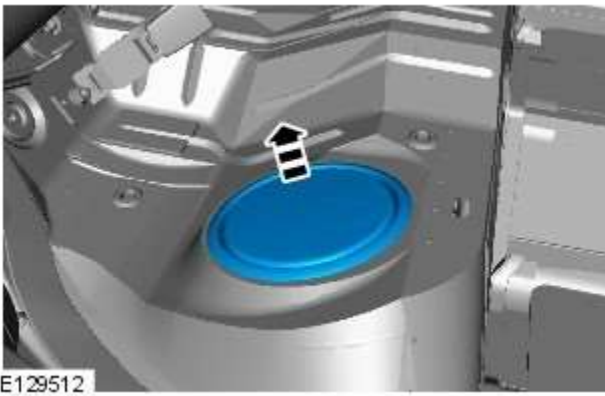




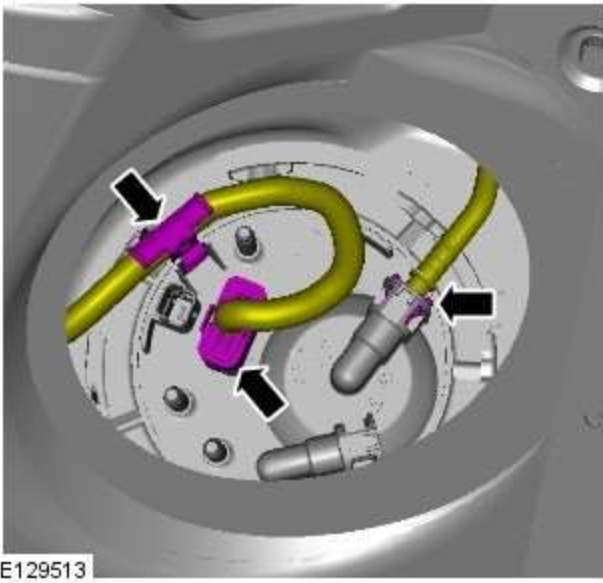
4.



5.

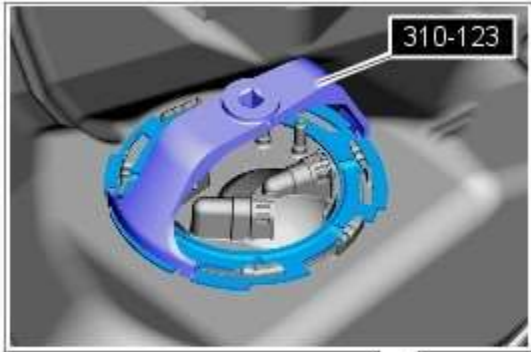


6.



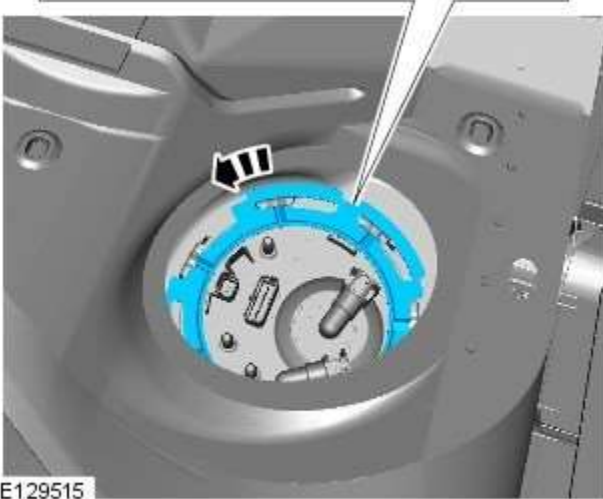
E129513

7.

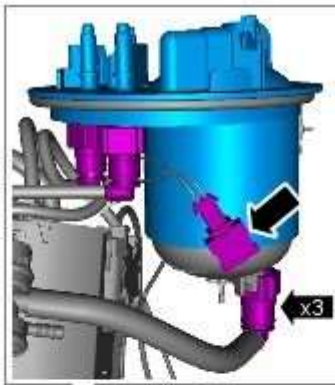


8.

- *Special Tool(s):* [310-123](#)



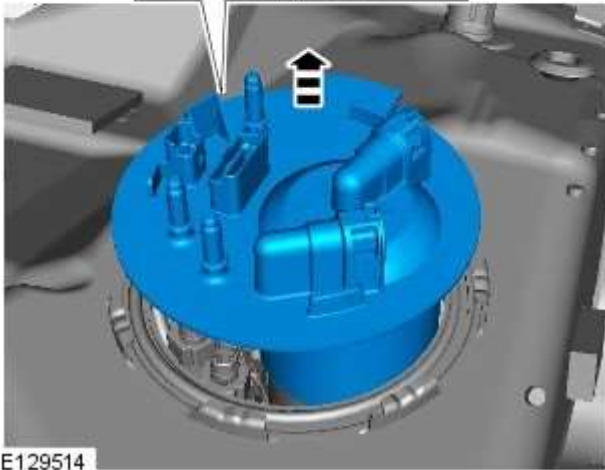
E129515



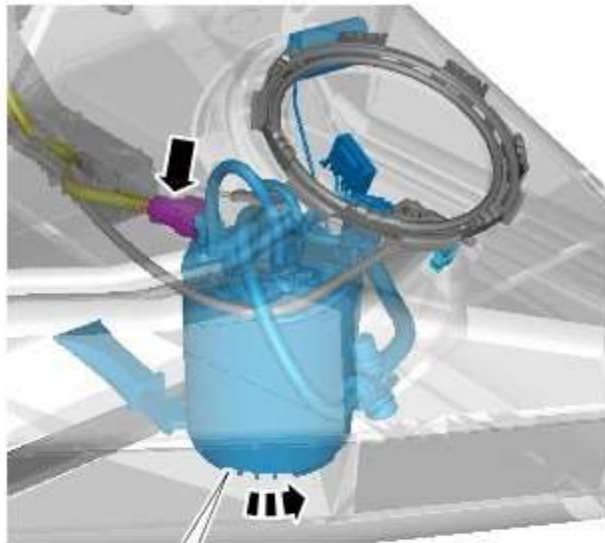
9. NOTES:


 Note the position of the locating tang.

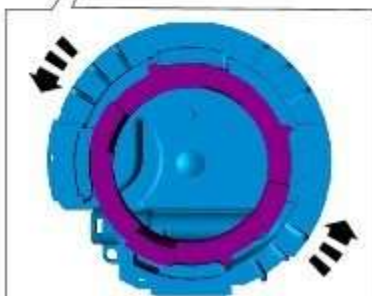
 Remove and discard the O-ring seal.



E129514



10.  CAUTION: Take extra care not to damage the fuel tank level sensor float and arm.



E129516

Installation

1. CAUTIONS:



Take extra care not to damage the fuel tank level sensor float and arm.



Make sure the fuel pump and sender unit is correctly installed in to the retaining bracket in the fuel tank.



NOTE: Make sure the locating tang is installed in the correct position.

To install, reverse the removal procedure.

Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Fuel Tank

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

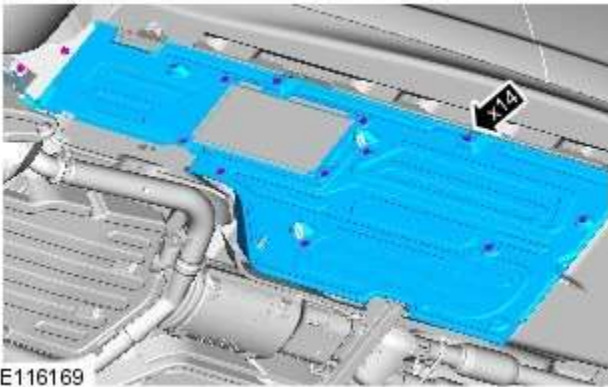
1. Refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: [Fuel Tank Draining](#) (310-00 Fuel System - General Information, General Procedures).



4. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

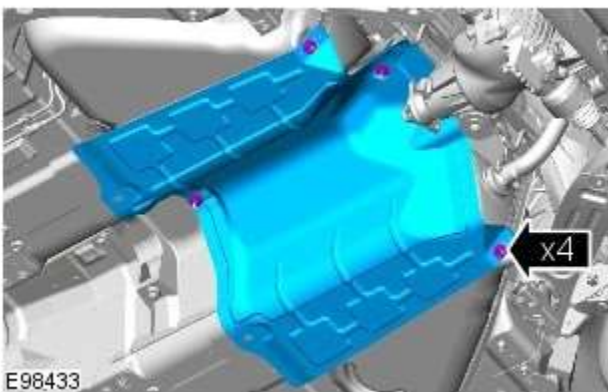
Raise and support the vehicle.

5. Refer to: [Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-01 Driveshaft, Removal and Installation).

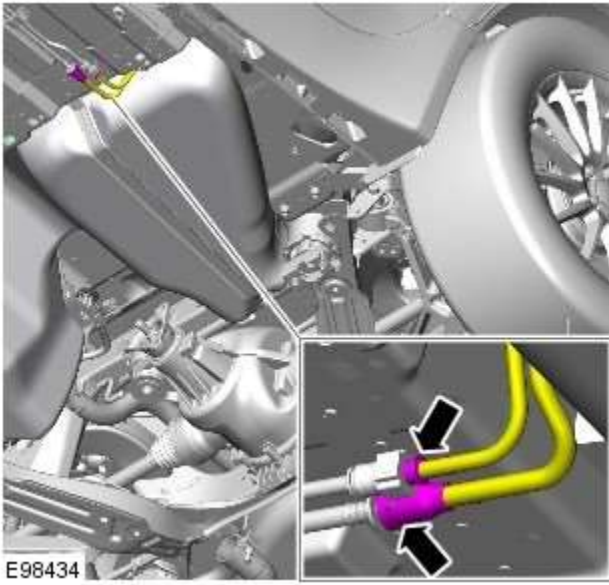



6. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

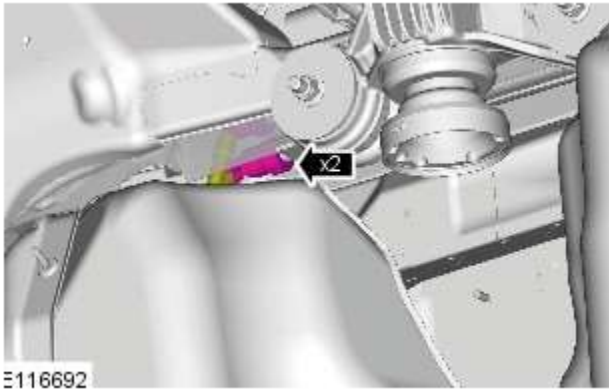
Torque: 10 Nm



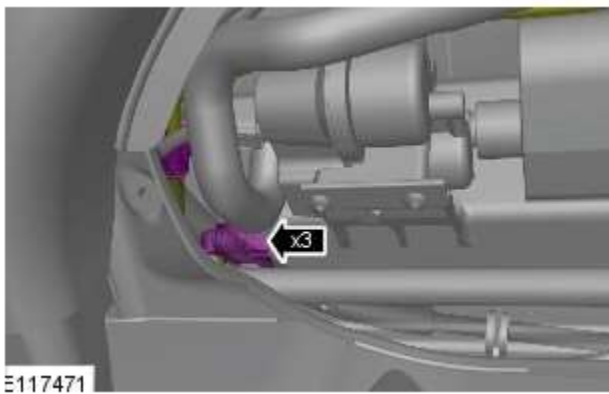
7. Torque: 4.8 Nm



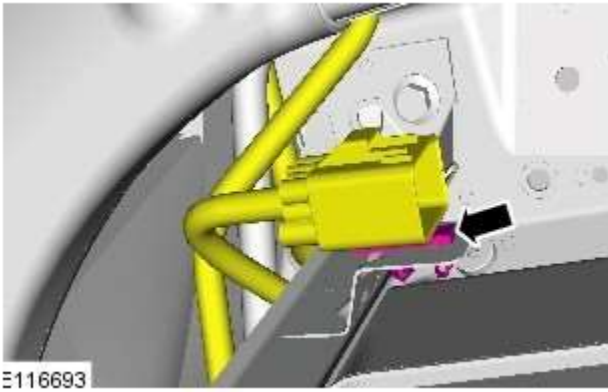
8.  **WARNING:** The spilling of fuel is unavoidable during this operation. Make sure that all necessary precautions are taken to prevent fire and explosion.




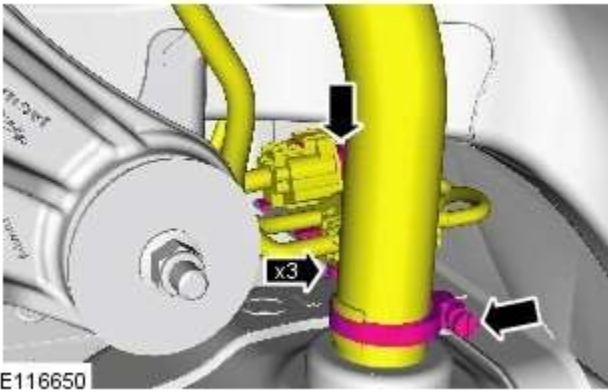
9.  **NOTE:** Non federal market vehicles only.



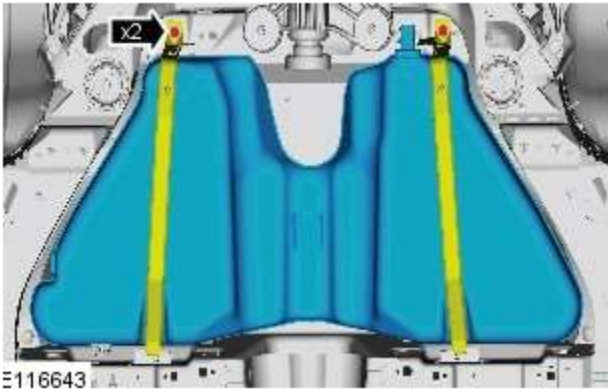
10.  **NOTE:** Federal market vehicles only.



11.  NOTE: On vehicles with supercharger, detach the lower electric connector from the retaining bracket as well as the electrical connector indicated.



12.

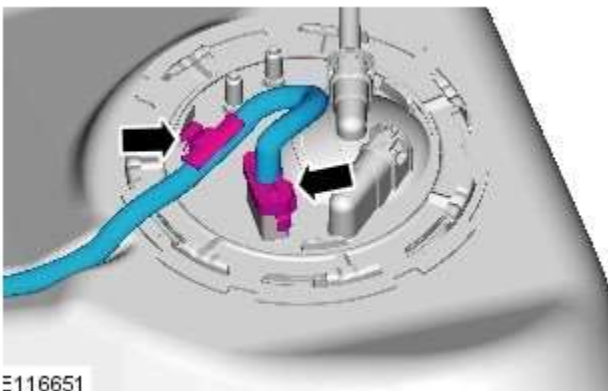



13.  WARNING: Secure the component to the transmission jack.



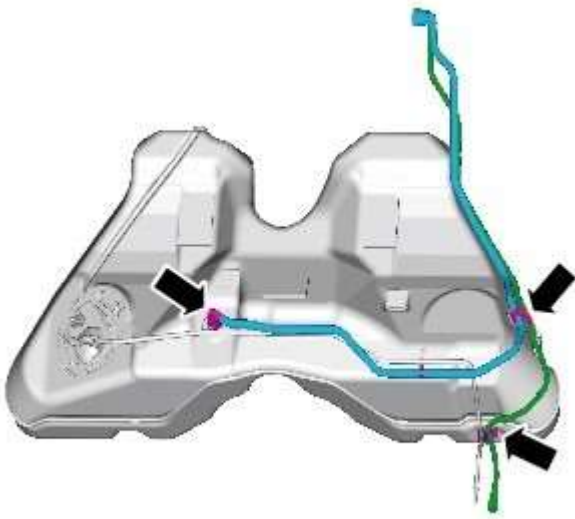
CAUTION: Use suitable packing material to prevent damage to the component.

Torque: 35 Nm



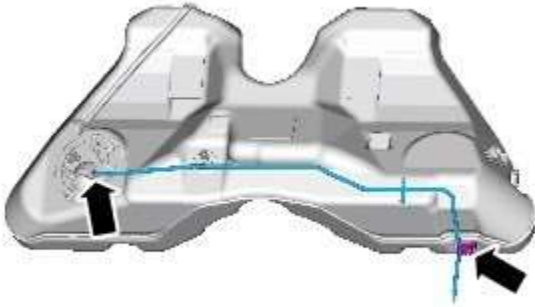
14.  NOTE: Do not disassemble further if the component is removed for access only.

15.



E116694

16.



E116695

Installation

1. To install, reverse the removal procedure.

Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Fuel Tank Filler

Pipe

Removal and Installation

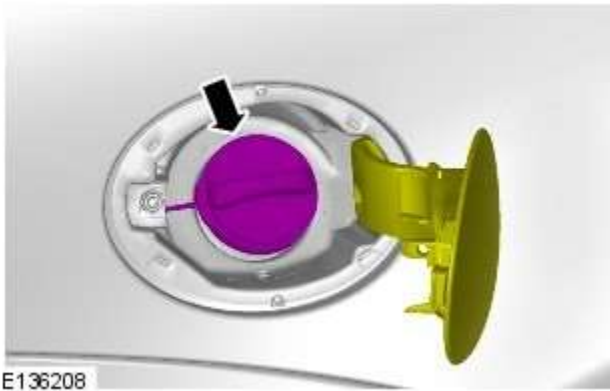
Removal




NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Diesel Fuel System Health and Safety Precautions](#) (100-00 General Information, Description and Operation).
Refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

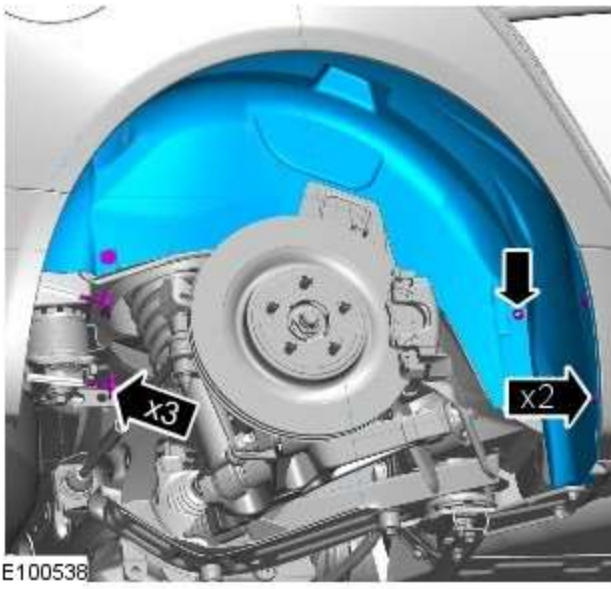
2. Open the fuel filler door and remove the cap.



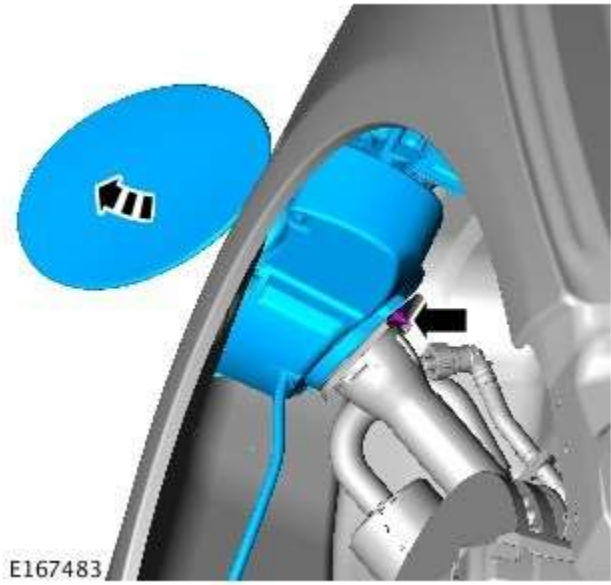
3.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.
Raise and support the vehicle.
4. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
5. Remove the right-hand wheel and tire.

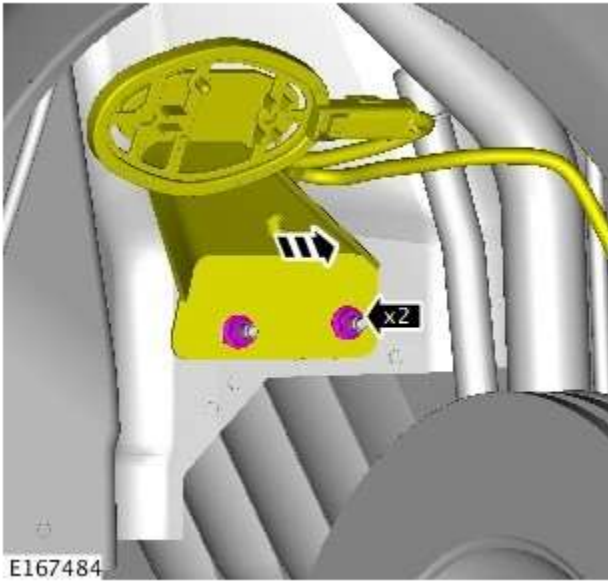
Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).


6. Remove the right-hand wheel arch liner.



7.

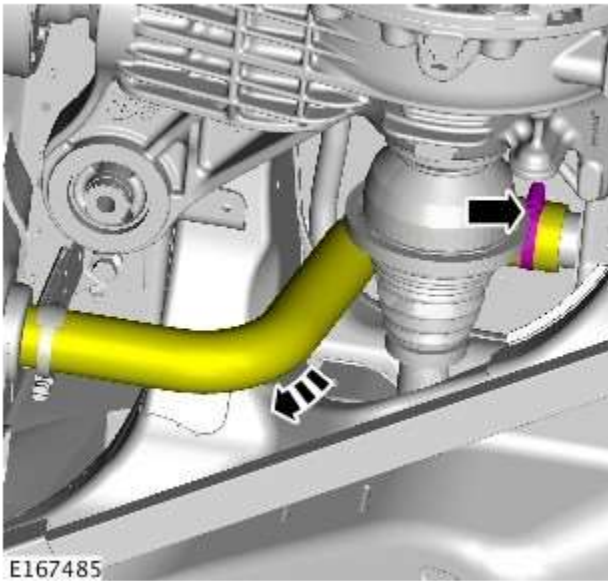




8.  NOTE: If equipped.

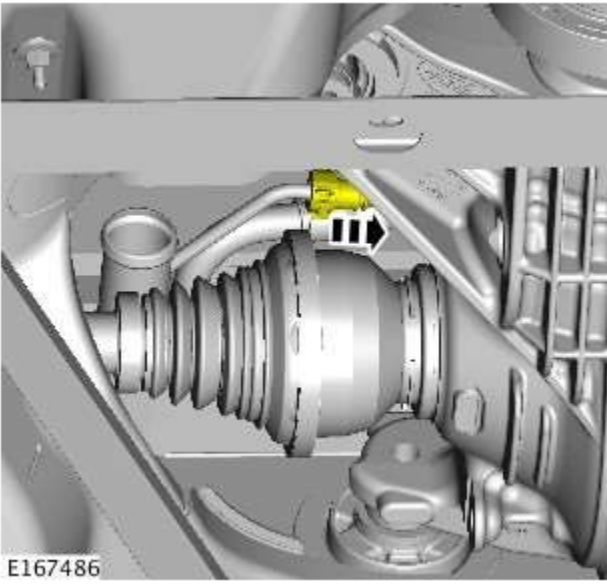
Torque: 9 Nm


9. Refer to: [Rear Muffler](#) (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).
Refer to: [Rear Muffler](#) (309-00A Exhaust System - TDV6 3.0L Diesel, Removal and Installation).
Refer to: [Rear Muffler](#) (309-00D, Removal and Installation).
Refer to: [Rear Muffler](#) (309-00E, Removal and Installation).

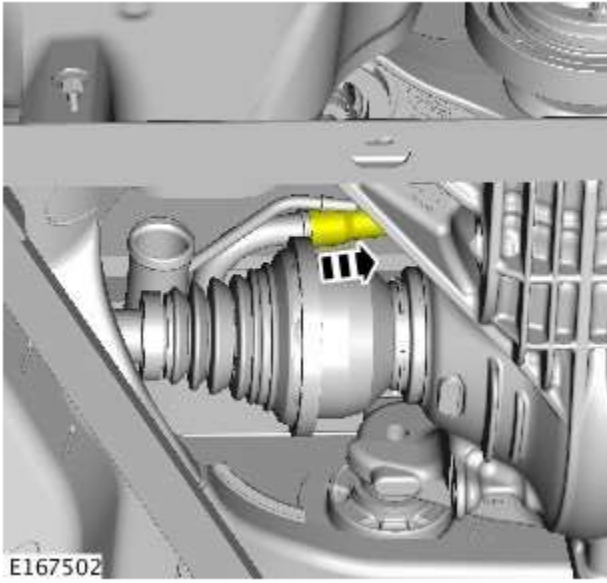


- 10.

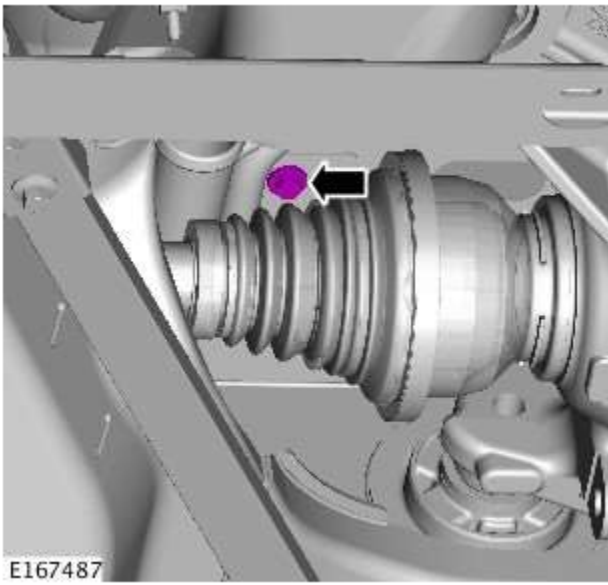
11.



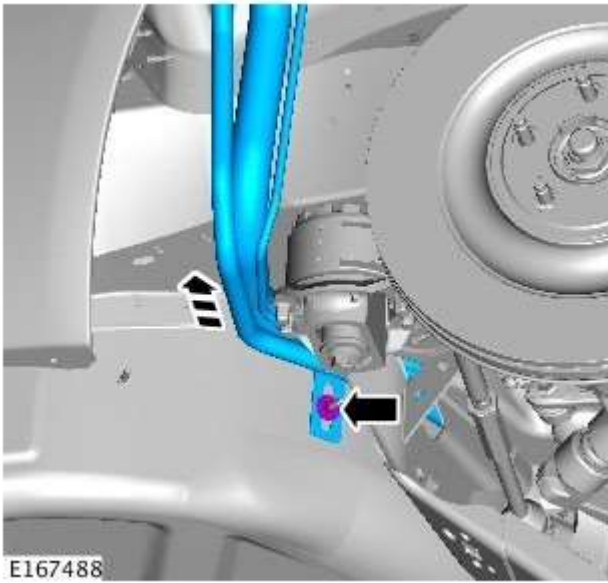
12.  NOTE: If equipped.



13. Torque: 9 Nm



14. Torque: Bolt: 9 Nm



Installation

1. To install, reverse the removal procedure.

Fuel Tank and Lines - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Fuel Rail High-Pressure Fuel Pump Supply Line

Removal and Installation

Removal

NOTES:



Some variation in the illustrations may occur, but the essential information is always correct.

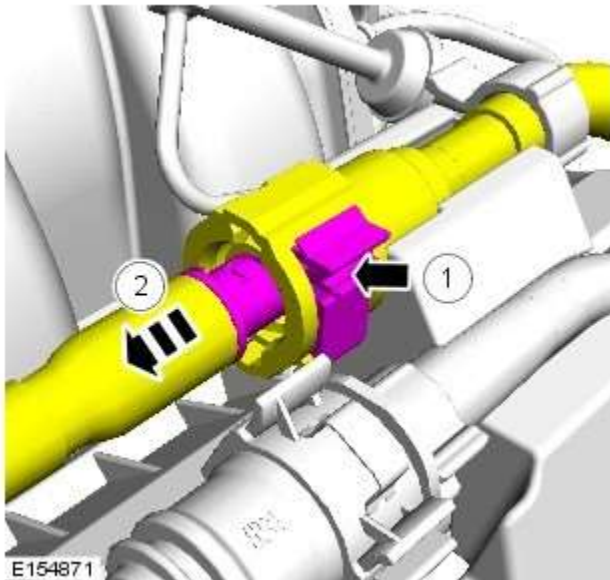


Some illustrations may show the engine removed for clarity.

1. Depressurize the fuel system.

Refer to: [Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (310-00 Fuel System - General Information, General Procedures).

2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



3. **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable mixtures are always present and may ignite. Failure to follow these instructions may result in personal injury.

CAUTIONS:

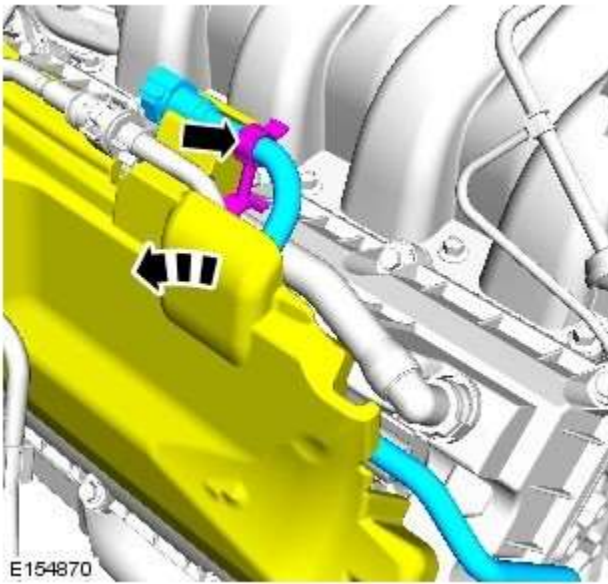



Be prepared to collect escaping fuel.



Make sure that all openings are sealed. Use new blanking caps.

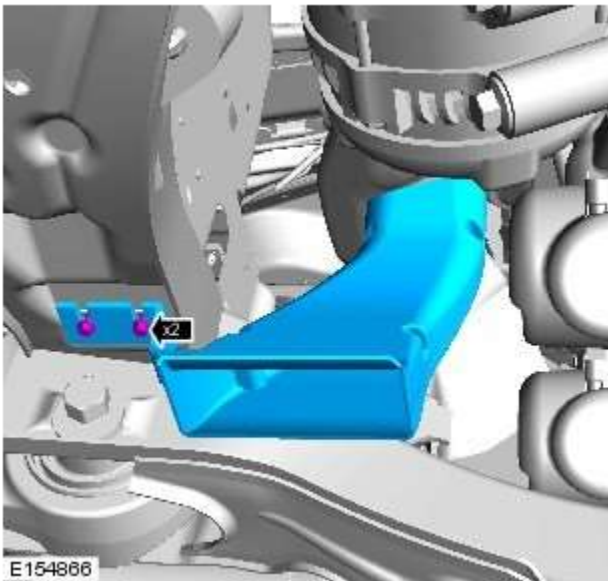
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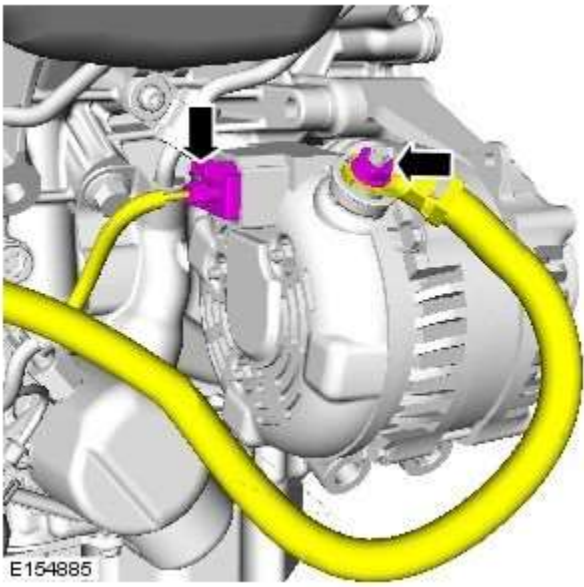
5.  **WARNING:** Make sure to support the vehicle with axle stands. Raise and support the vehicle.

6. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

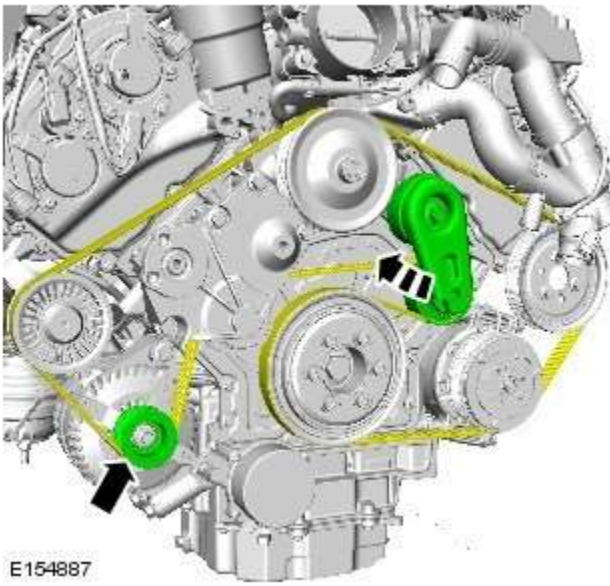
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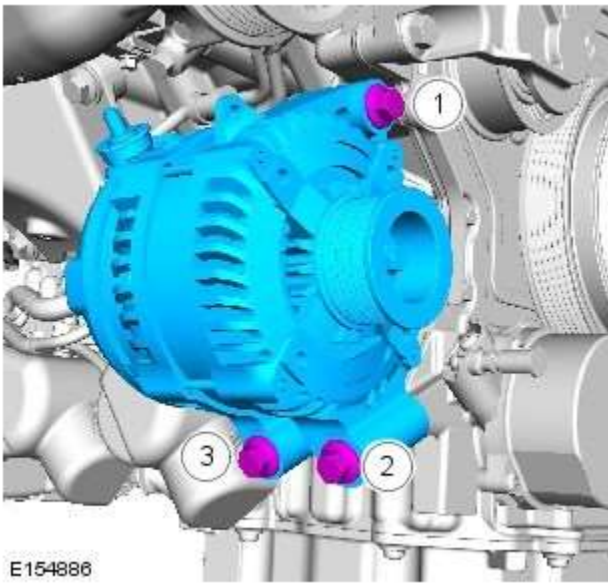
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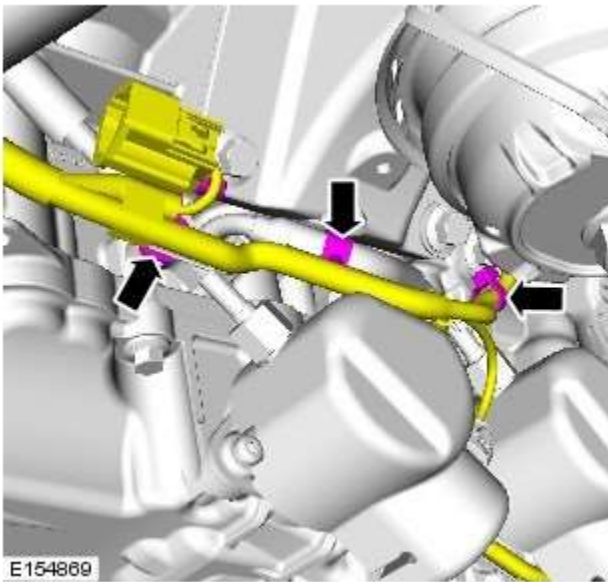


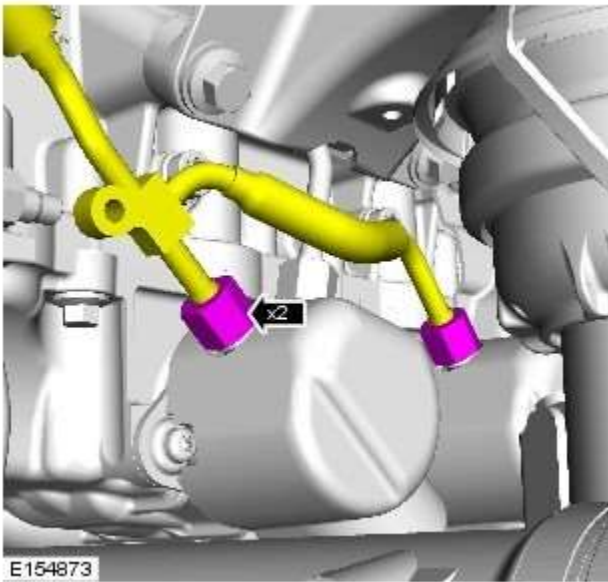
10.




11. Refer to: [Starter Motor](#) (303-06C Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

12.



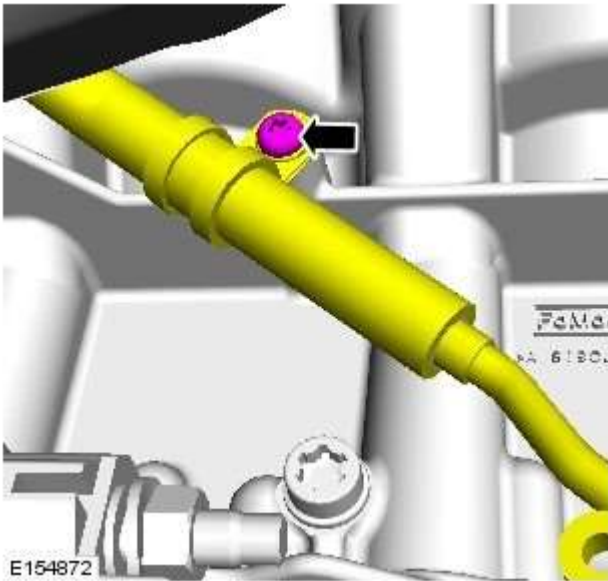


13.  **WARNING:** Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable mixtures are always present and may ignite. Failure to follow these instructions may result in personal injury.

CAUTIONS:

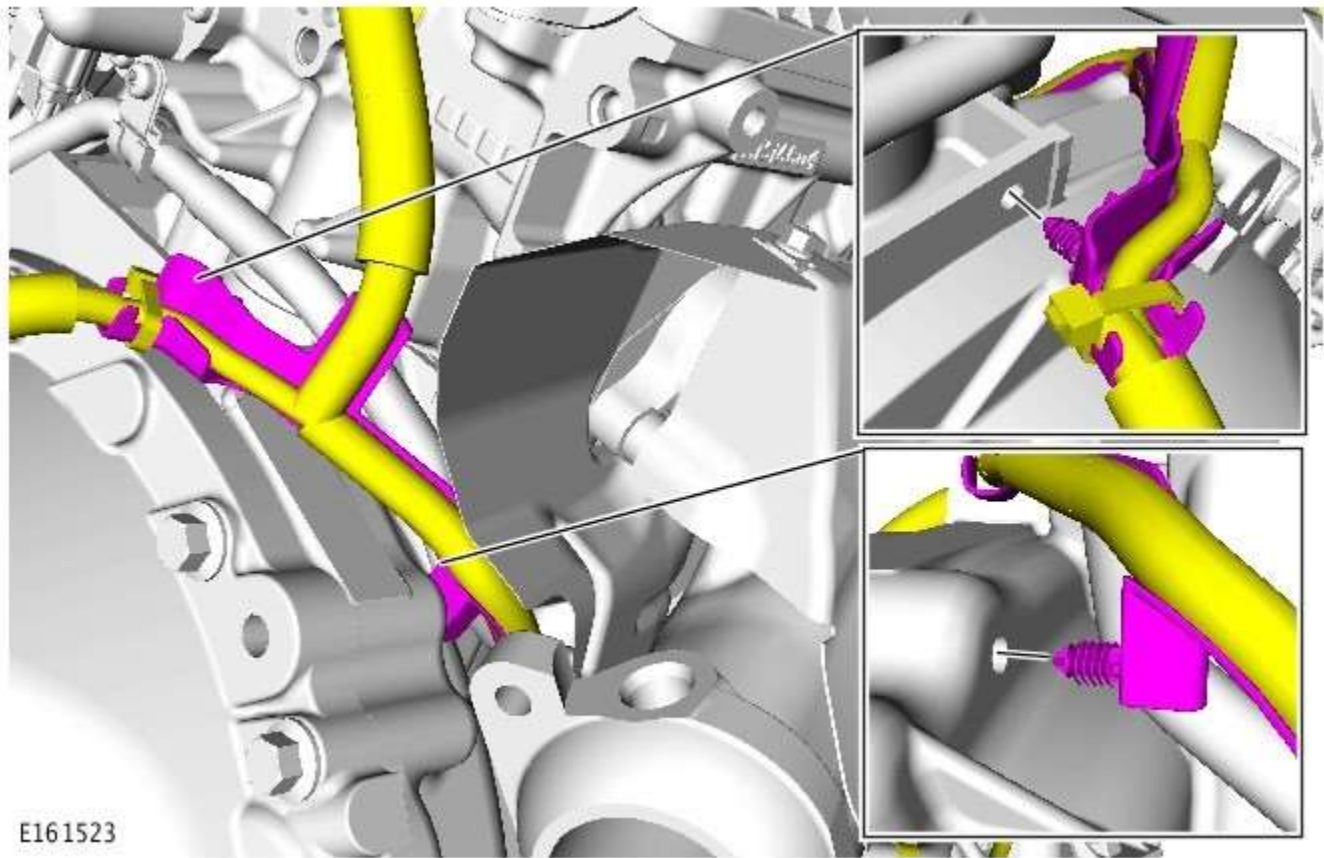
 Be prepared to collect escaping fuel.

 Make sure that all openings are sealed. Use new blanking caps.



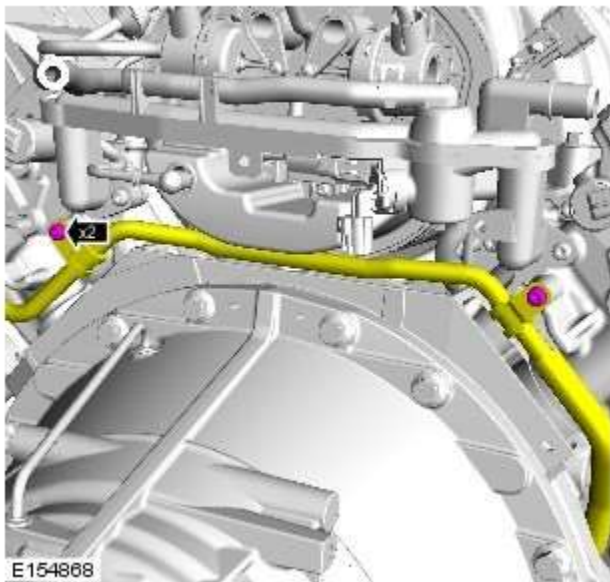
- 14.

- 15.

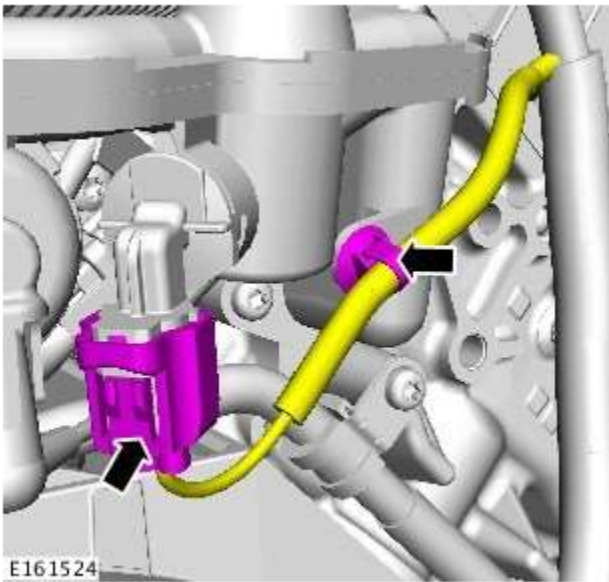


16. Lower the vehicle.

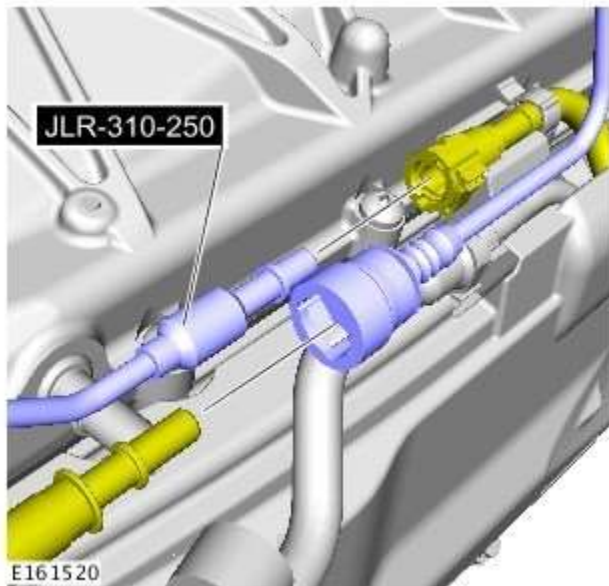
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18.



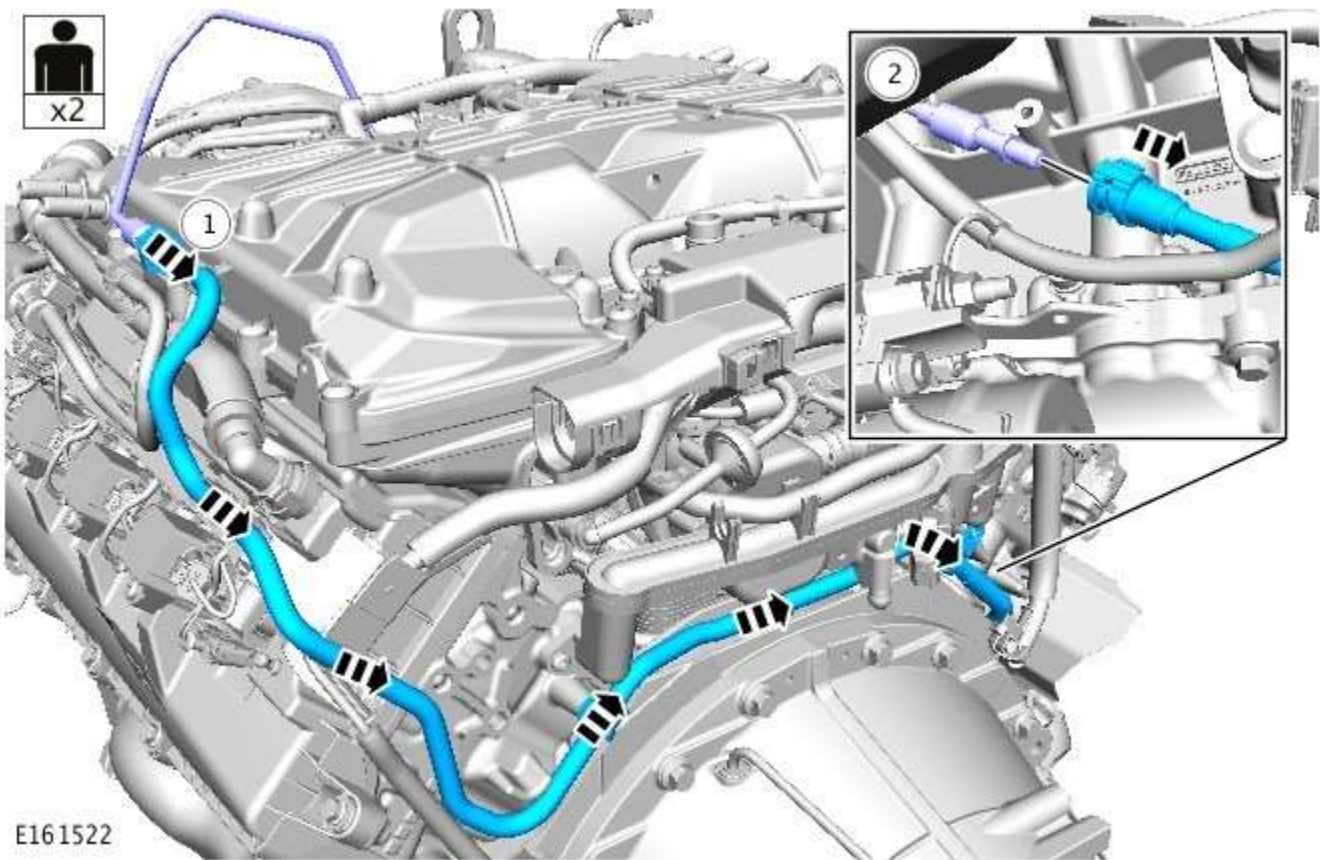
19. Install the special tool.



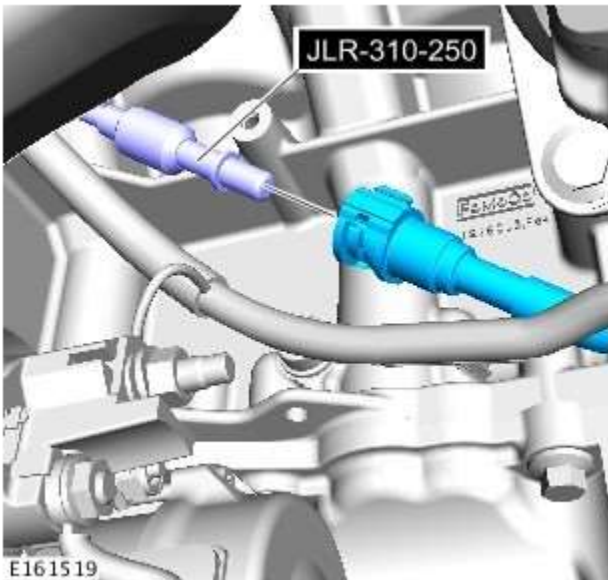
20.  CAUTION: Discard the fuel pipe.

 NOTE: This step requires the aid of another technician.

With the aid of another technician remove the low pressure fuel pipe as indicated.



Installation



1. Connect the new fuel pipe to end of the special tool as indicated.

2. CAUTIONS:



Install a new fuel pipe.



Care must be taken not to damage the component.

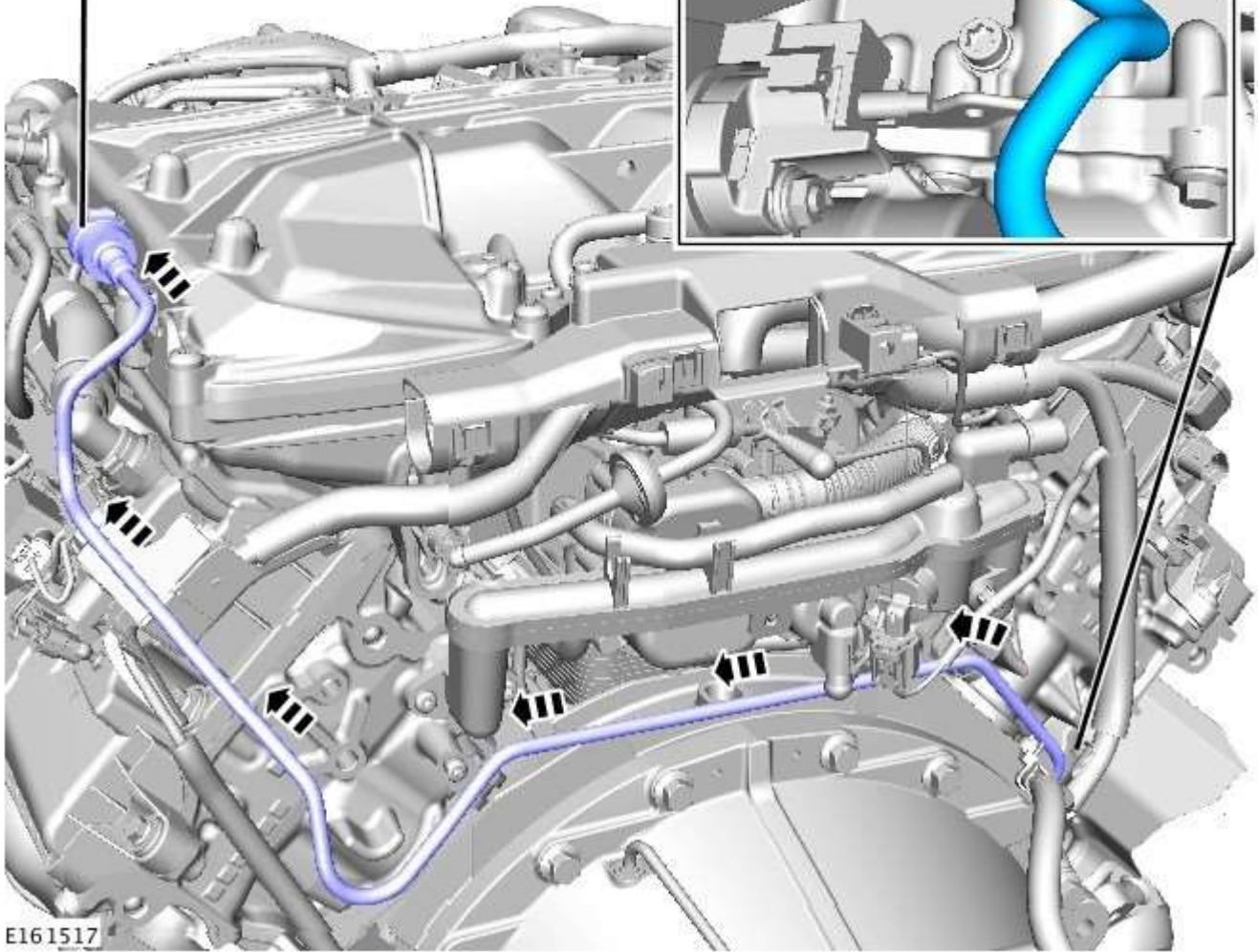
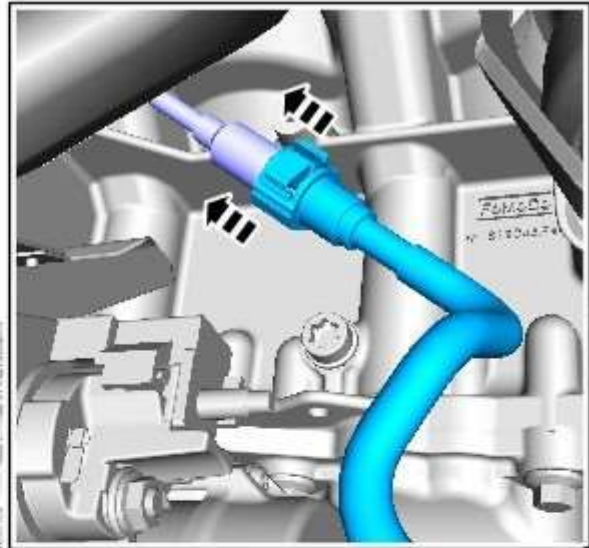


NOTE: This step requires the aid of another technician.

With the aid of another technician, install a new low pressure fuel pipe using the special tool as indicated.

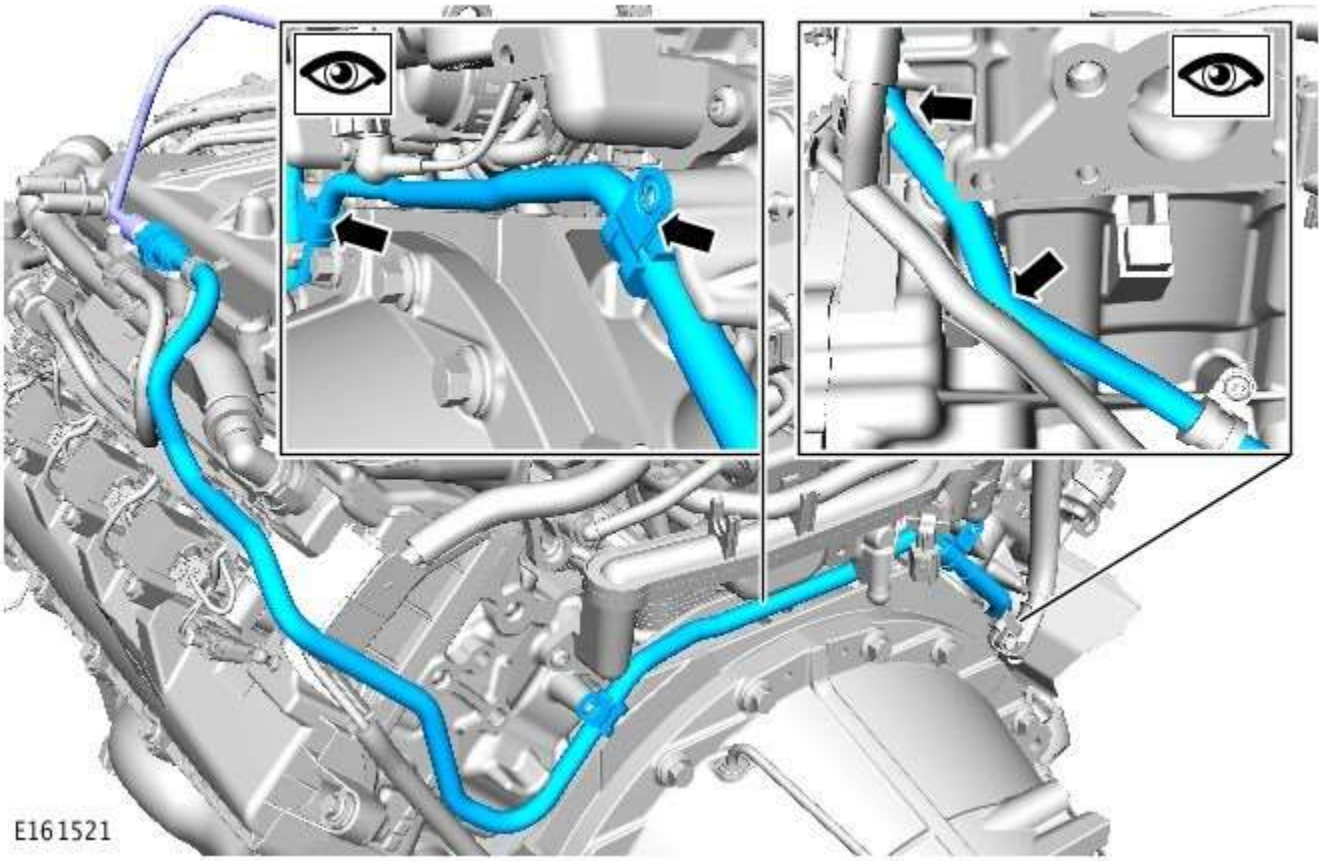


JLR-310-250



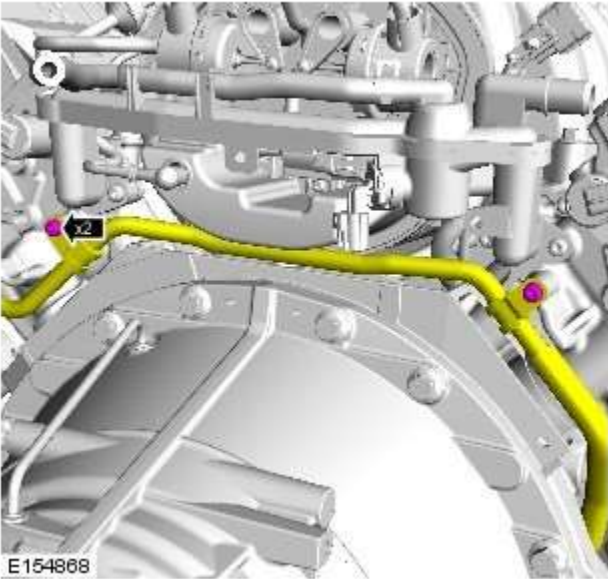
E161517

3. Inspect the low pressure fuel line for correct fitment and routing as indicated.

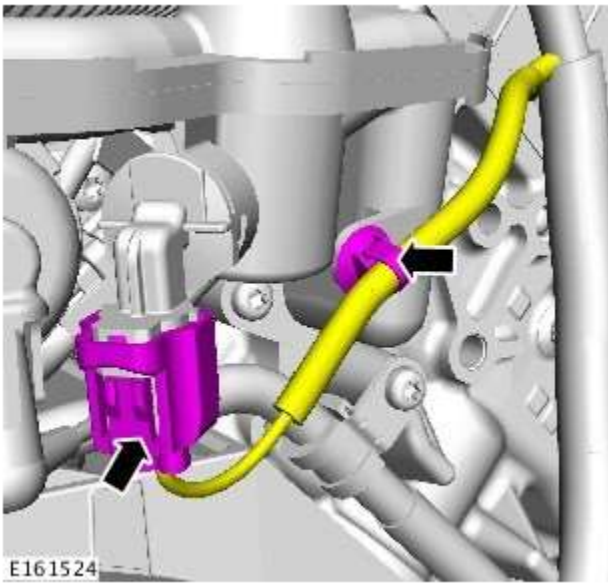


E161521

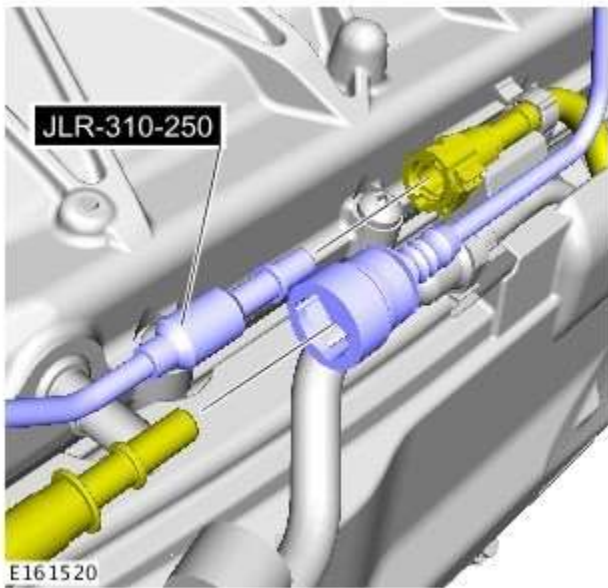
4. Torque: 10 Nm



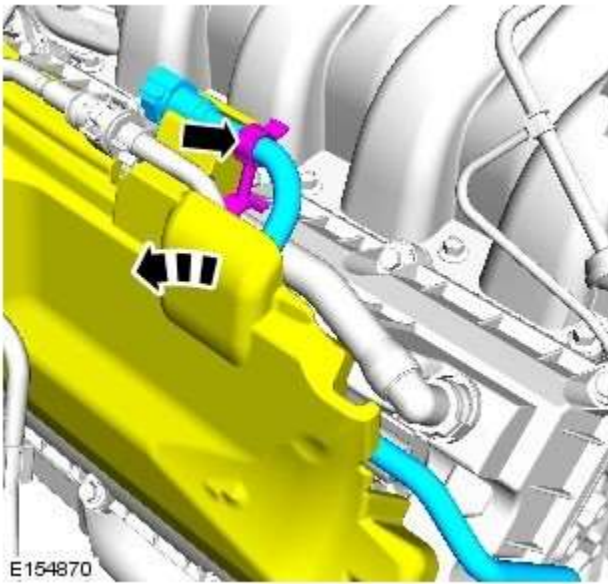
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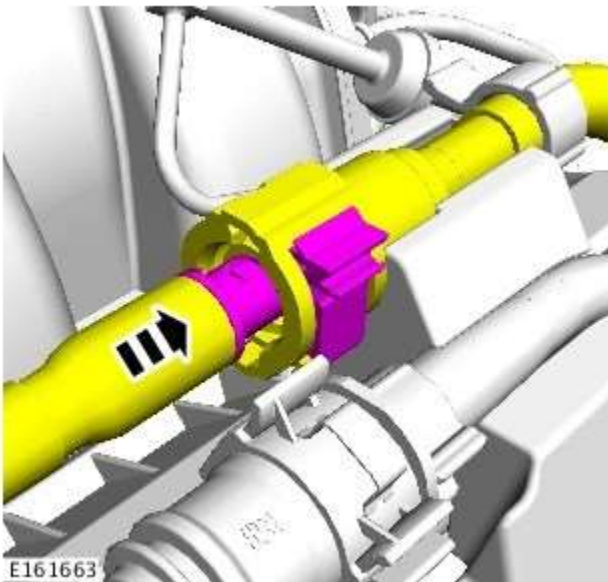
5.




6. Remove the special tool.



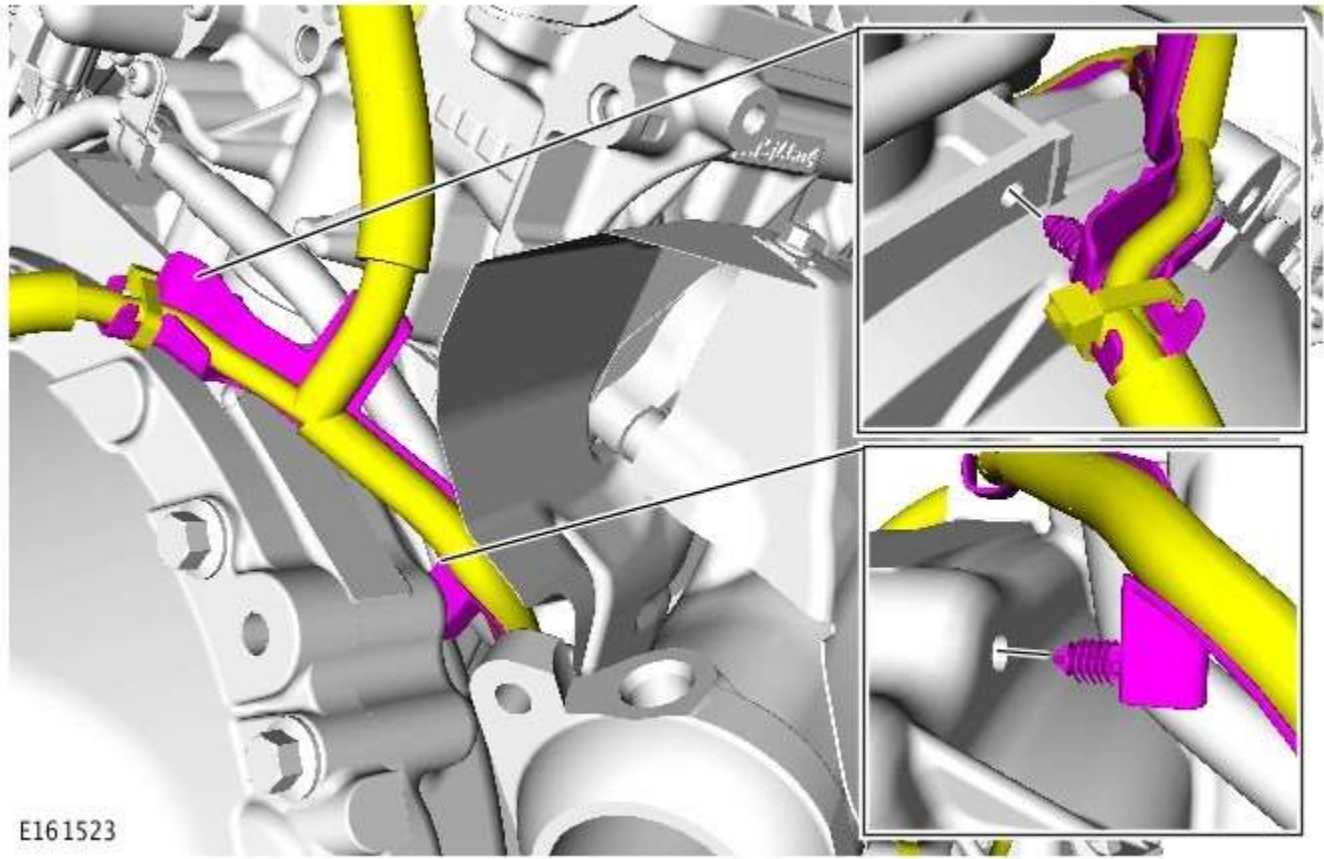
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8.

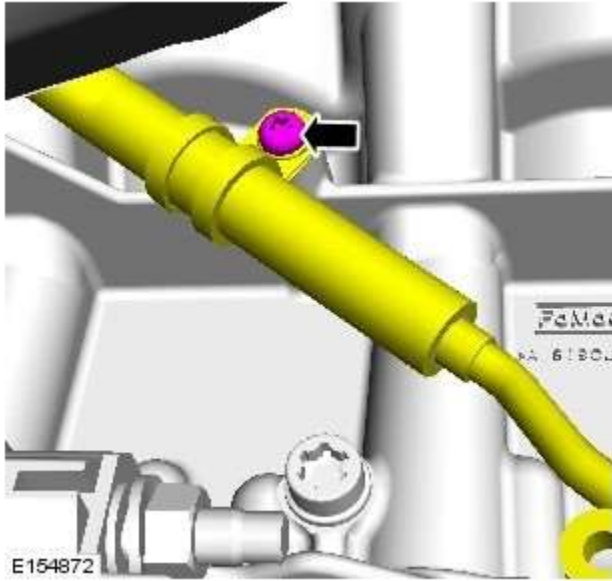
9.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

10.



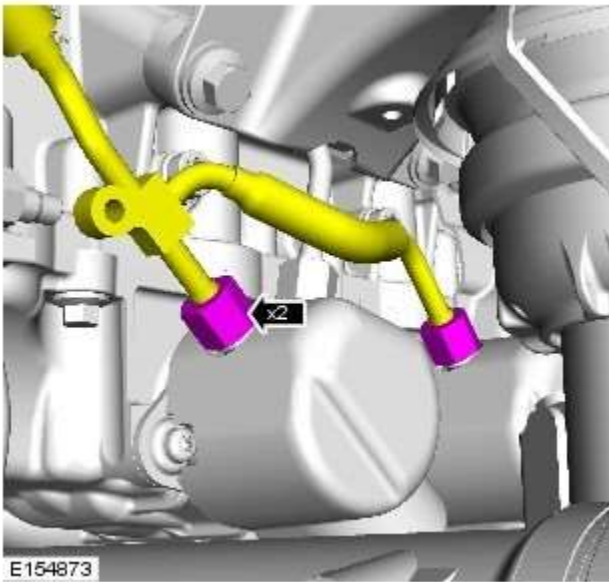
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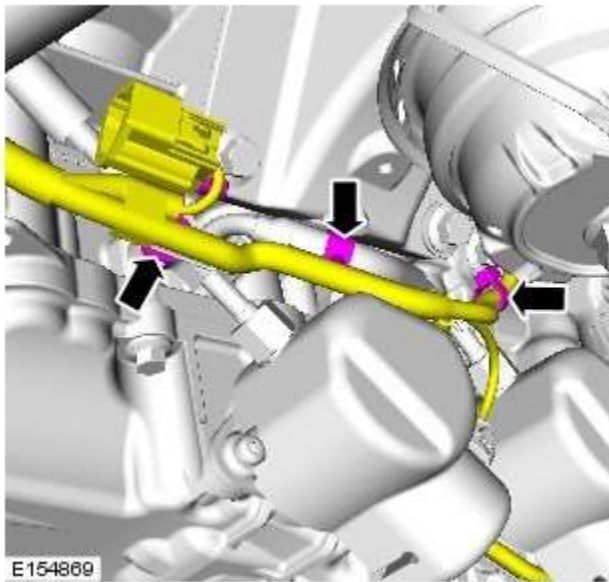


E154872

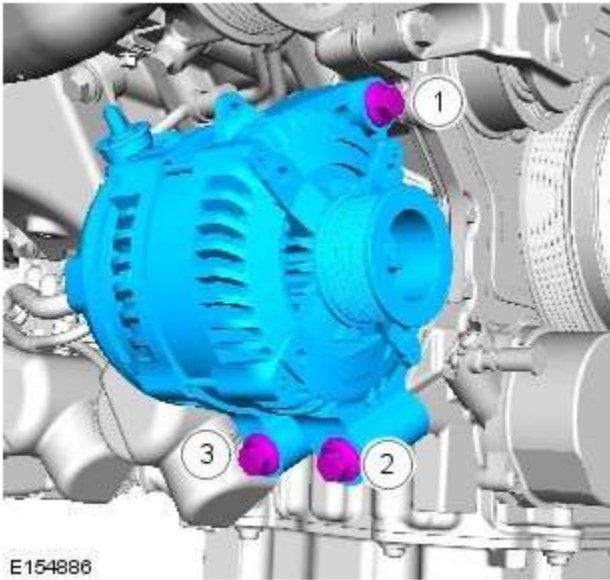
12. Torque: 21 Nm



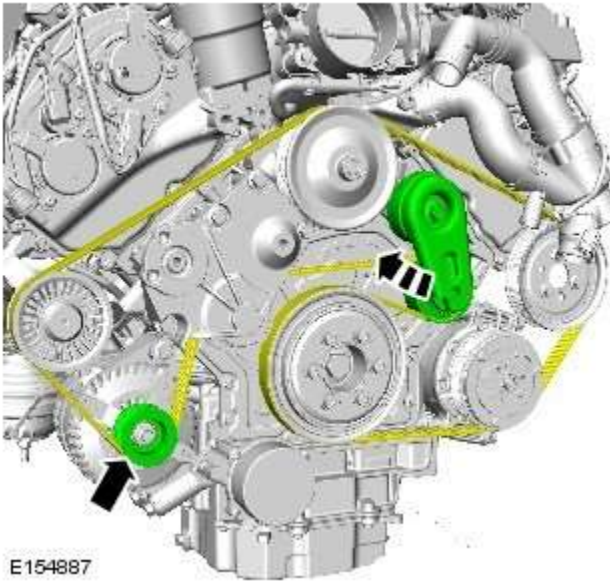
13.



14. Refer to: [Starter Motor](#) (303-06C Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

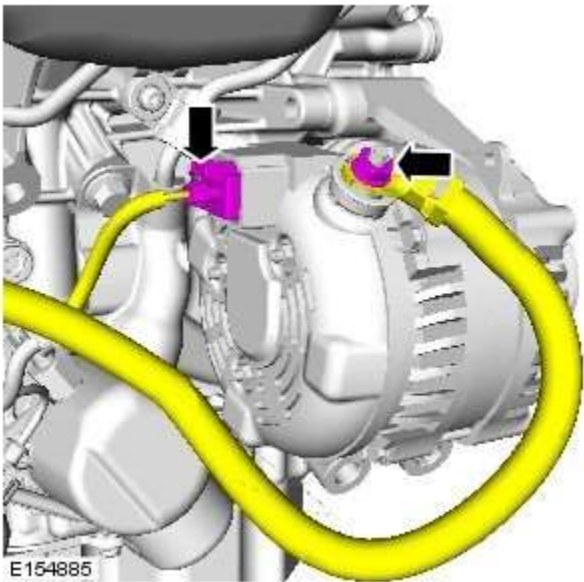


15.  NOTE: Tighten the bolts in the indicated sequence.
Torque: 48 Nm

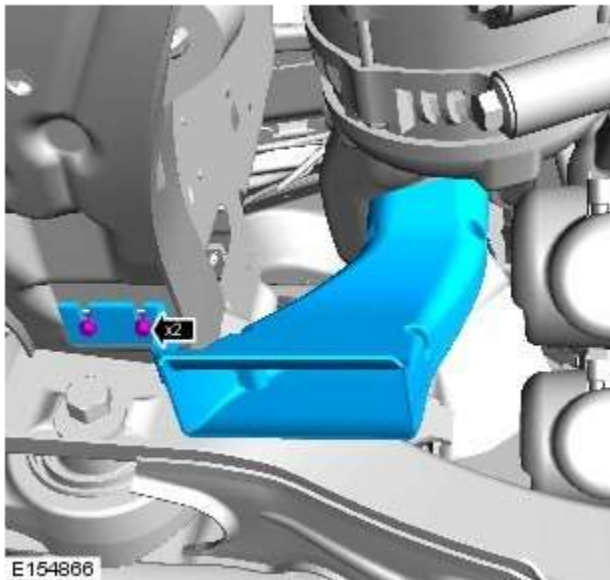


- 16.

17. Torque: 12 Nm



18.  NOTE: If equipped.



19. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

20. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Acceleration Control -

Torque Specifications

Description	Nm	lb-ft	lb-in
Accelerator pedal	10	7	89

Acceleration Control - Acceleration Control

Diagnosis and Testing

Principles of Operation

For a detailed description of the acceleration controls, refer to the relevant Description and Operation sections in the workshop manual. REFER to: Acceleration Control (310-02, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Accelerator pedal • Throttle body 	<ul style="list-style-type: none"> • Fuses • Wiring harness • Electrical connector(s) • Sensor(s) • Engine control module (ECM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the module or a component is suspect and the vehicle remains under the Manufacturers warranty, refer to the Warranty Policy and Procedure manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer-approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
P012100	Throttle/Pedal Position Sensor A Circuit Range/Performance	<ul style="list-style-type: none"> • TP sensor sensing circuits TP 1 and TP 2 - short to power, high resistance • TP sensor failure 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check TP sensor sensing circuits TP 1 and TP 2 for short to power, high resistance. Check and install a new throttle body as required

DTC	Description	Possible Cause	Action
P012200	Throttle/Pedal Position Sensor A Circuit Low	<ul style="list-style-type: none"> TP sensor sensing circuit TP 1 - short to ground, high resistance TP sensor failure 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check TP sensor sensing circuit TP 1 for short to ground, high resistance. Check and install a new throttle body as required
P012300	Throttle/Pedal Position Sensor A Circuit High	<ul style="list-style-type: none"> TP sensor sensing circuit TP1 - short to power TP sensor failure 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check TP sensor sensing circuit TP 1 for short to power. Check and install a new throttle body as required
P022200	Throttle/Pedal Position Sensor/Switch B Circuit Low	<ul style="list-style-type: none"> TP sensor sensing circuit TP 2 - short to ground, high resistance TP sensor failure 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check TP sensor sensing circuit TP 2 for short to ground, high resistance. Check and install a new throttle body as required
P022300	Throttle/Pedal Position Sensor/Switch B Circuit High	<ul style="list-style-type: none"> TP sensor sensing circuit TP 2- short to power TP sensor failure 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check TP sensor sensing circuit TP 2 for short to power. Check and install a new throttle body as required
P022700	Throttle/Pedal Position Sensor/Switch C Circuit Low	<ul style="list-style-type: none"> APP sensor circuit APP 1 - short to ground, high resistance 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check APP sensor circuit APP 1 for short to ground, high resistance
P022800	Throttle/Pedal Position Sensor/Switch C Circuit High	<ul style="list-style-type: none"> APP sensor circuit APP 1 - short to power 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check APP sensor circuit APP 1 for short to power
P210129	Throttle Actuator Control Motor Circuit Range/Performance	<ul style="list-style-type: none"> Signal invalid Jammed throttle blade, gearing or motor 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test throttle actuator control motor circuit for short to ground, power, high resistance. Suspect the throttle body, check and install a new throttle body as required, refer to the new module/component installation note at the top of the DTC Index
P210162	Throttle Actuator Control Motor Circuit Range/Performance	<ul style="list-style-type: none"> Signal compare failure Jammed throttle blade, gearing or motor 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test throttle actuator control motor circuit for short to ground, power, high resistance. Suspect the throttle body, check and install a new throttle body as required, refer to the new module/component installation note at the top of the DTC Index
P210164	Throttle Actuator Control Motor Circuit Range/Performance	<ul style="list-style-type: none"> Signal plausibility failure Jammed throttle blade, gearing or motor 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test throttle actuator control motor circuit for short to ground, power, high resistance. Suspect the throttle body, check and install a new throttle body as required, refer to the new module/component installation note at the top of the DTC Index
P210177	Throttle Actuator Control Motor Circuit Range/Performance	<ul style="list-style-type: none"> Commanded position not achievable Throttle blade stuck open Intake air system leak 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test throttle actuator control motor circuit for short to ground, power, high resistance. Suspect the throttle body, check and install a new throttle body as required, refer to the new module/component installation note at the top of the DTC Index
P210329	Throttle Actuator Control Motor Circuit High	<ul style="list-style-type: none"> Signal invalid Throttle motor control circuit - short to power ECM fault 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check throttle motor control circuit for short to power. If ECM is suspect, check and install a new module as required, refer to new module/component installation note at top of DTC Index
P210364	Throttle Actuator Control Motor Circuit High	<ul style="list-style-type: none"> Signal plausibility failure Throttle motor control circuit - short to power 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check throttle motor control circuit for short to power. If ECM is suspect, check and install a new module as required, refer to new module/component installation note at top of DTC Index

DTC	Description	Possible Cause	Action
		<ul style="list-style-type: none"> ECM fault 	
P210500	Throttle Actuator Control System - Forced Engine Shutdown	<ul style="list-style-type: none"> Throttle MIL request due to fuel cut 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
P211800	Throttle Actuator Control Motor Current Range/Performance	<ul style="list-style-type: none"> Throttle motor control circuit - short to ground, power, high resistance 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check throttle motor control circuit for short to ground, power, high resistance
P211900	Throttle Actuator Control Throttle Body Range/Performance	<ul style="list-style-type: none"> Throttle spring faulty 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Suspect throttle body faulty. Check and install a new throttle body as required, refer to the new module/component installation note at top of DTC Index
P212200	Throttle/Pedal Position Sensor/Switch D Circuit Low	<ul style="list-style-type: none"> APP sensor circuit 2 - low input 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check APP sensor circuit 2 for short to ground, open circuit
P212216	Throttle/Pedal Position Sensor/Switch D Circuit Low Input	<ul style="list-style-type: none"> Accelerator pedal position (APP) sensor circuit 1 - short to ground, power Accelerator pedal position (APP) sensor failure 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check accelerator pedal position (APP) sensor circuit 1 for short to ground, power. Set ignition status to 'ON' engine 'OFF' check and record ' Pedal value sensor 1 ' datalogger signal. With pedal in idle position, value of signal should be approximately 0%, if not suspect the pedal position sensor, check and install a new sensor as required
P212300	Throttle/Pedal Position Sensor/Switch D Circuit High	<ul style="list-style-type: none"> APP sensor circuit 2 - high input 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check APP sensor circuit 2 for short to power
P212317	Throttle/Pedal Position Sensor/Switch D Circuit High Input	<ul style="list-style-type: none"> Accelerator pedal position (APP) sensor circuit 1 - short to power Accelerator pedal position (APP) sensor failure 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check accelerator pedal position (APP) sensor circuit 1 for short to ground, power. Set ignition status to 'ON' engine 'OFF' check and record ' Pedal value sensor 1 ' datalogger signal. With pedal in fully depressed position, value of signal should be approximately 99%, if not suspect the pedal position sensor, check and install a new sensor as required
P212716	Throttle/Pedal Position Sensor/Switch E Circuit Low Input	<ul style="list-style-type: none"> Accelerator pedal position (APP) sensor circuit 2 - short to ground, high resistance Accelerator pedal position (APP) sensor failure 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check accelerator pedal position (APP) sensor circuit 2 for short to ground, power. Set ignition status to 'ON' engine 'OFF' check and record ' Pedal value sensor 2 ' datalogger signal. With pedal in idle position, value of signal should be approximately 0%, if not suspect the pedal position sensor, check and install a new sensor as required
P212817	Throttle/Pedal Position Sensor/Switch E Circuit High Input	<ul style="list-style-type: none"> Accelerator pedal position (APP) sensor circuit 2 - short to power Accelerator pedal position (APP) sensor failure 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check accelerator pedal position (APP) sensor circuit 2 for short to ground, power. Set ignition status to 'ON' engine 'OFF' check and record ' Pedal value sensor 2 ' datalogger signal. With pedal in fully depressed position, value of signal should be approximately 99%, if not suspect the pedal position sensor, check and install a new sensor as required
P213528	Throttle/Pedal Position Sensor/Switch A/B Voltage Correlation	<ul style="list-style-type: none"> APP sensor circuit 1 and 2 range performance - sub-processor 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check APP sensor circuits 1 and 2 for short to ground, power and high resistance. Clear the DTCs and retest. If the code remains, replace the APP sensor
P213529	Throttle/Pedal Position Sensor/Switch A/B Voltage Correlation	<ul style="list-style-type: none"> APP sensor - excessive difference between raw values of circuit 1 and 2 - sub-processor 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check APP sensor circuits 1 and 2 for short, open circuit

DTC	Description	Possible Cause	Action
P213562	Throttle/Pedal Position Sensor/Switch A/B Voltage Correlation	<ul style="list-style-type: none"> • APP sensor circuit 1 and 2 range performance - sub-processor 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check APP sensor circuits 1 and 2 for short to ground, power and high resistance. Clear the DTCs and retest. If the code remains, replace the APP sensor
P213564	Throttle/Pedal Position Sensor/Switch A/B Voltage Correlation	<ul style="list-style-type: none"> • APP sensor circuit 1 and 2 range performance 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check APP sensor circuits 1 and 2 for short, open circuit
P213862	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	<ul style="list-style-type: none"> • Pedal value difference between channel 1 and channel 2 greater than a threshold 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check accelerator pedal position (APP) sensor circuit 1 and 2 for short to ground, power. Set ignition status to 'ON' engine 'OFF' check and record ' Pedal value sensor 1 ' and ' Pedal value sensor 2 ' datalogger signal. With pedal in fully depressed position, value of signals should be approximately 99%, with pedal in idle position, value of signals should be approximately 0%, if not suspect the pedal position sensor, check and install a new sensor as required
P213864	Throttle/Pedal Position Sensor/Switch D/E Voltage Correlation	<ul style="list-style-type: none"> • Gradient on one channel without gradient on the other 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check accelerator pedal position (APP) sensor circuit 1 and 2 for short to ground, power. Set ignition status to 'ON' engine 'OFF' check and record ' Pedal value sensor 1 ' and ' Pedal value sensor 2 ' datalogger signal. With pedal in fully depressed position, value of signals should be approximately 99%, with pedal in idle position, value of signals should be approximately 0%, if not suspect the pedal position sensor, check and install a new sensor as required

Acceleration Control - Accelerator Pedal

Removal and Installation

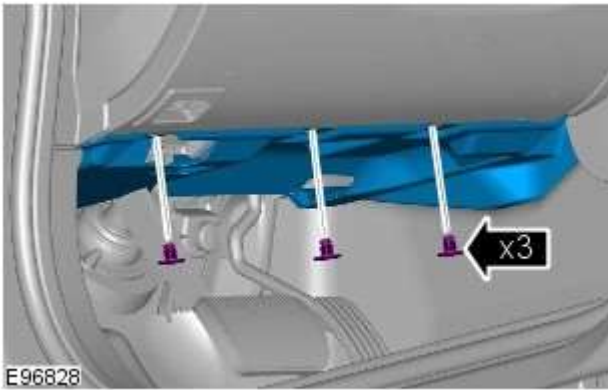
Removal



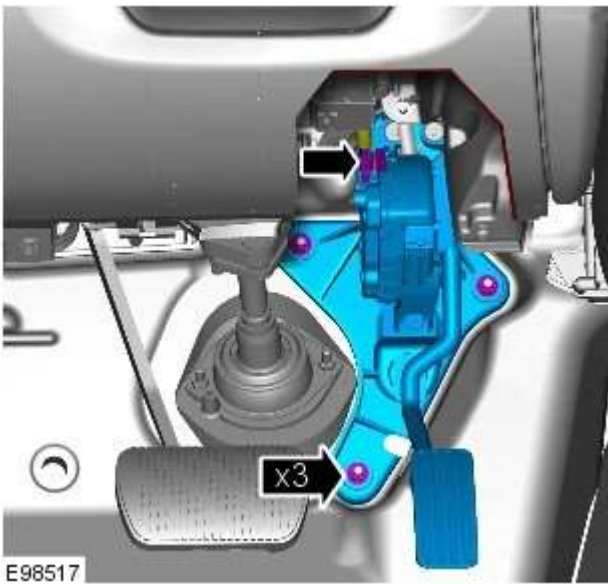
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2.



3. Torque: 9 Nm



Installation

1. To install, reverse the removal procedure.

Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol -

Item	Specification
Speed control module vertical alignment	90° ± 0.75°

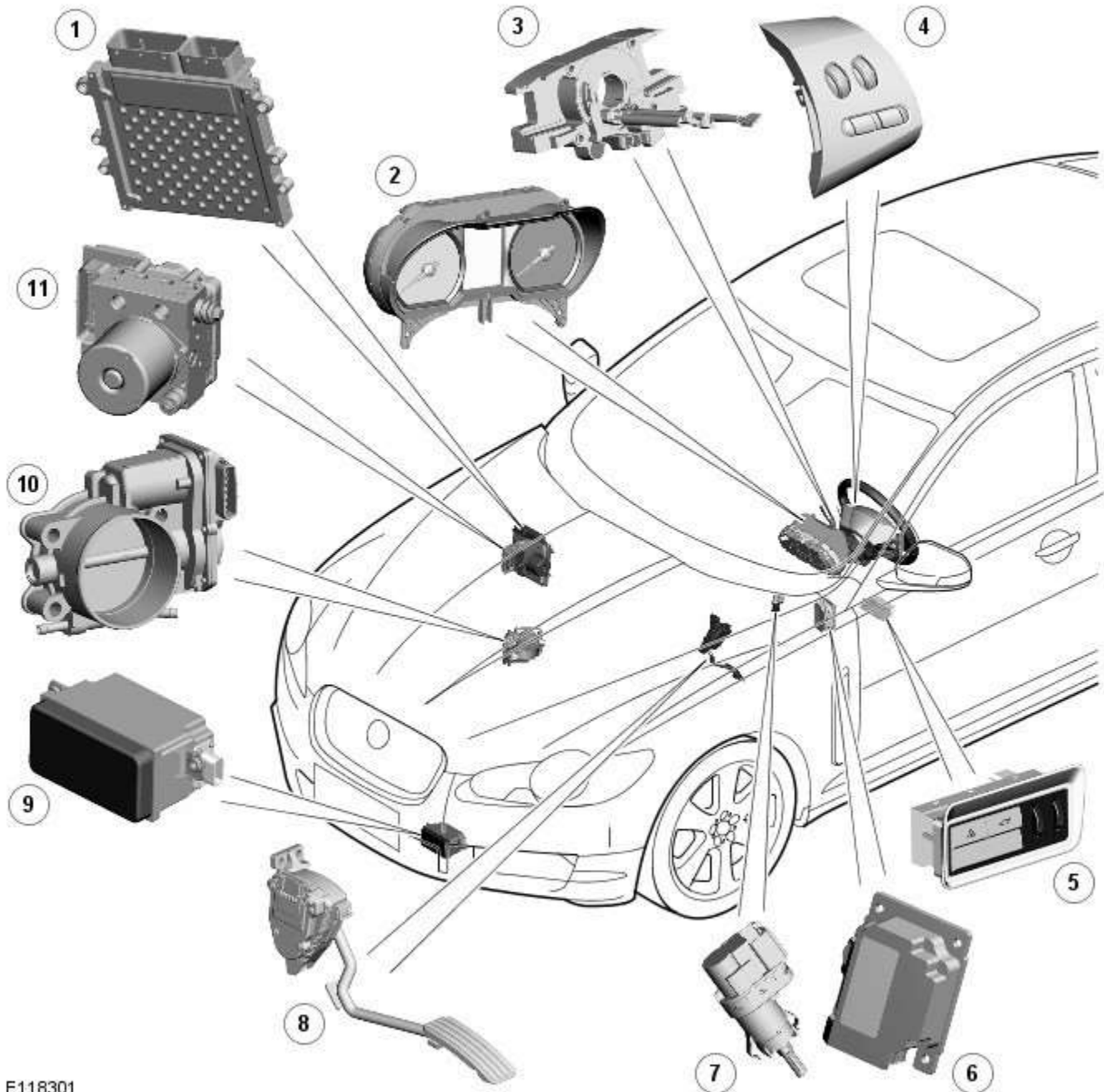
Description	Nm	lb-ft	lb-in
Speed control module retaining nuts	5	-	44
Speed control module alignment bolt lock nut	5	-	44

Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Speed Control -

Component Location

Description and Operation

COMPONENT LOCATION 5.0L V8



E118301

Item	Description
1	ECM (engine control module)
2	Instrument cluster
3	Clock spring
4	Speed control switches
5	Forward alert switch
6	Adaptive speed control module
7	Brake lamp/brake test switch
8	APP (accelerator pedal position) sensor

9	Adaptive speed control radar sensor
10	Electric throttle actuator
11	ABS (anti-lock brake system) module

Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Speed Control -

Overview

Description and Operation

OVERVIEW

Speed Control

The speed control system is integrated with the engine management system and uses fueling intervention to automatically maintain a set vehicle speed. Once engaged, the system can also be used to accelerate the vehicle without using the accelerator pedal.

The speed control system comprises the following components:

- On/Off/Suspend switch
- '+' and '-' (set/accelerate and decelerate) steering wheel switches
- Resume switch
- Clock spring
- Speed control warning indicator.

Adaptive Speed Control

The adaptive speed control system uses a forward looking radar sensor to scan the road ahead, looking for objects that are moving at a different rate to itself. When a target is identified the adaptive speed control system will monitor the time gap between it and the target vehicle. When that gap falls below a set driver selected level the adaptive speed control system will intervene slowing the vehicle by backing off the throttle and/ or applying the brakes, until the correct gap is attained.

The adaptive speed control system comprises the following components:

- Adaptive speed control sensor
- Adaptive speed control module
- Steering wheel control switches
- [ECM \(engine control module\)](#)
- Electric throttle actuator
- [ABS \(anti-lock brake system\)](#) module and pump
- Adaptive speed control warning indicator (in the instrument cluster).

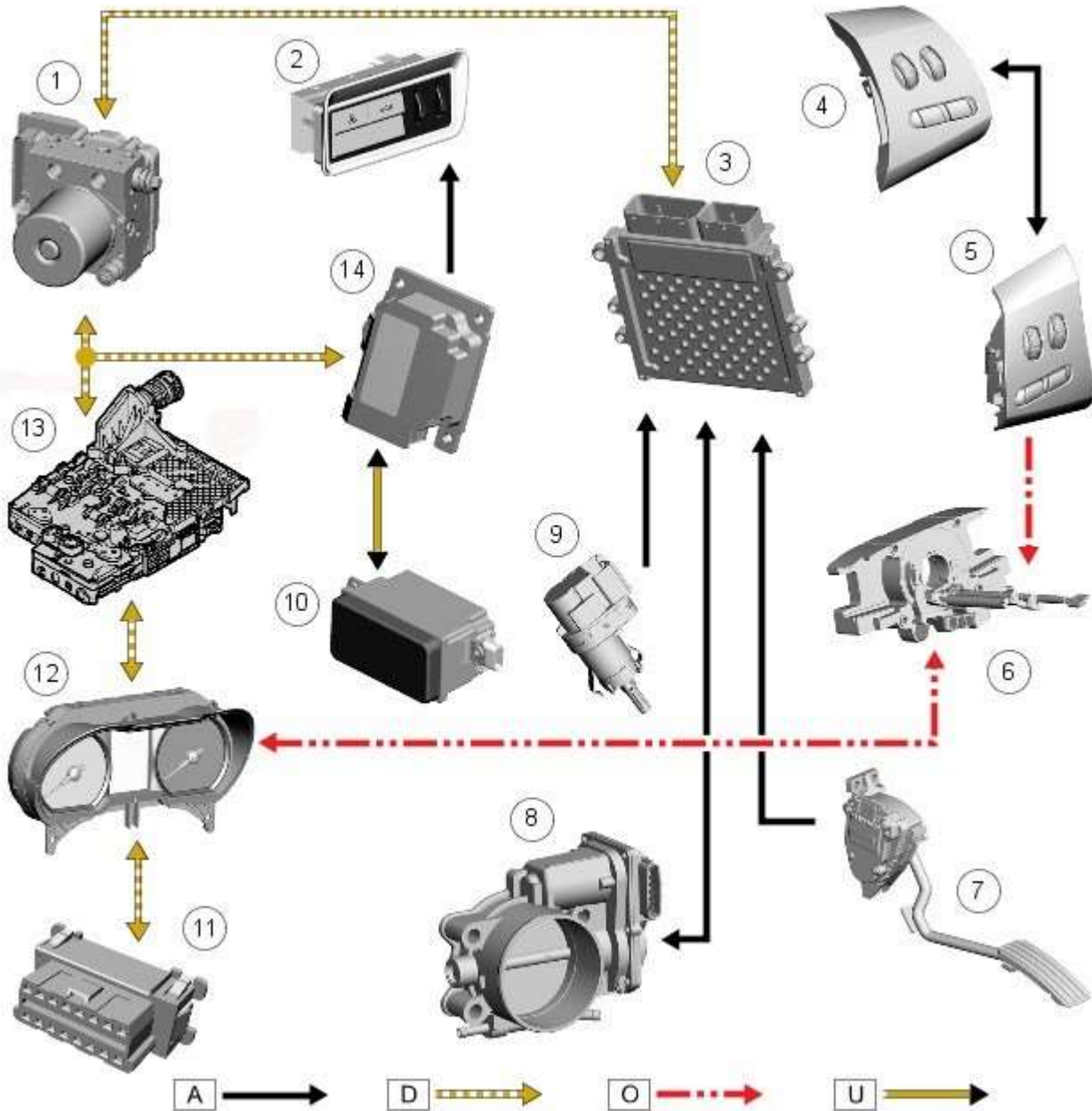
Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Speed Control - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus; **O** = LIN (local interconnect network) bus; **U** = Private CAN_{bus}



E139730

Item	Description
1	ABS (anti-lock brake system) modul
2	Forward alert switch
3	ECM (engine control module)
4	Speed control switches
5	Audio system control switches

6	Clockspring
7	APP (accelerator pedal position) sensor
8	Electric throttle actuator
9	Brake lamp/brake test switch
10	Adaptive speed control radar sensor
11	Diagnostic socket
12	Instrument cluster
13	TCM (transmission control module)
14	Adaptive speed control module

System Operation

SPEED CONTROL

The speed control system uses inputs from the brake lamp/brake test switch, the [APP](#) sensor, the [ECM](#) and the [ABS](#) module.

Speed control is operated by the driver using only the steering wheel switches. When speed control is active, the [ECM](#) regulates the [PWM \(pulse width modulation\)](#) signals to the fuel injectors to adjust the fuel supply as required to maintain the set speed.

During speed control operation, the [ECM](#) controls vehicle speed by adjusting fuel injection duration and timing. When the accelerator pedal is pressed with speed control active, the [ECM](#) outputs a calculated throttle angle signal in place of the actual throttle angle signals produced by the [APP](#) sensor. The calculated throttle angle is derived from fuel demand.

The minimum set speed for speed control is 18 mph (30 (km/h)). Speed control is automatically suspended if the following conditions apply:

- Vehicle speed falls below 18 mph (30 km/h)
- The brake pedal is pressed
- The cancel button is pressed
- Neutral, park or reverse gear is selected
- The difference between actual speed and the set speed is too great
- If the engine speed becomes near to the red line (maximum engine speed)
- If the accelerator pedal is used to accelerate beyond the set speed for too long.

ADAPTIVE SPEED CONTROL

The adaptive speed control system comprises the following components:

- Adaptive speed control sensor
- Adaptive speed control module
- Steering wheel control switches
- [ECM](#)
- Electric throttle actuator
- [ABS](#) module and pump
- Adaptive speed control warning indicator.

The adaptive speed control system uses a forward looking radar sensor to scan the road ahead, looking for objects that are moving at a different rate to itself. When a target is identified the adaptive speed control system will monitor the time gap between it and the target vehicle. When that gap falls below a set driver selected level the adaptive speed control system will intervene slowing the vehicle by backing off the throttle and/ or applying the brakes, until the correct gap is attained. The driver can chose between four gap settings, 1, 1.4, 1.8 and 2.2 seconds.

The system will detect but not react to the following:

- Vehicles in the oncoming lane
- Stationary vehicles
- Pedestrians
- Vehicles not in the same lane.

Adaptive speed control is active when the vehicle is moving. Adaptive Speed Control only functions when a set speed is entered in normal speed control mode. The adaptive speed control system only intervenes with the set speed when it detects a target vehicle, and then only if the minimum time gap is breached.

It is important to note that the system is intended for use in limited driving situations, does not remove control and responsibility from the driver, and at all times can be quickly overridden. The adaptive speed control system is not a collision warning system and will not react to stationary objects. The system does not operate below a minimum speed of approximately 30 km/h (20 mph) since it is unsuitable for use in cities or congested traffic. The system is best suited to main roads/ highways with gradual bends.

The [ECM](#), throttle body and throttle control are unchanged from those used for non adaptive speed control variants.

The adaptive speed control system is based on the use of a front mounted radar sensor. The sensor transmits a 1.5° wide beam forward of the vehicle and detects the returning signals reflected off other vehicles and objects ahead.

The 1.5° wide radar beam is mechanically scanned at a rate of 10 sweeps/second across a total arc of 15° centered on the

longitudinal axis of the vehicle. The radar operates at millimetric wavelengths (76 - 77 GHz) and transmits a frequency modulated continuous wave signal at a relatively low power level (no high power pulses).

With the ignition ON, the adaptive speed control module is powered up but no radar transmissions are emitted until the vehicle is in motion.

In follow mode a set speed is selected in the normal speed control manner and this speed is maintained until a slower vehicle is encountered in the lane ahead. When the vehicle ahead comes within the effective range of the radar sensor, the system identifies it as a target vehicle and an icon is illuminated on the instrument cluster to indicate that the system is in "follow mode". When the distance between the two vehicles closes to a set time gap, the adaptive speed control system closes the throttle and if necessary applies the brakes to maintain the set time gap. Follow mode is effectively a closed loop system. If several vehicles are ahead, the closest vehicle is chosen as the target to follow. If the target vehicle moves out of radar range, or if either vehicle changes lane or drops below the minimum operating speed, the system exits follow mode and the follow mode icon is extinguished. The adaptive speed control system will only raise its speed to the originally set speed, it will not accelerate past this speed to maintain a time gap.

Driver operation of the foot brake or control switches will immediately cancel adaptive speed control.

When the vehicle is in follow mode the follow mode warning indicator is illuminated in the instrument cluster and the current gap setting will be displayed in the message center.



E98452

Item	Description
1	Forward Alert warning indicator
2	Follow mode warning indicator

The radar sensor detects three primary parameters of objects within the scanned arc. These are:

- Range
- Relative velocity
- Angle.

Range: The radar sensor detects the presence and ranges of different vehicles and objects within the scanned arc up to a distance of approximately 130 meters. The transmitted signal frequency changes continuously in a cyclic pattern (modulation). This means that, in the time taken for the signal wave front, to travel to and from a target vehicle (or other object), the transmission frequency will have changed. The difference between the received signal frequency and the new transmission frequency is proportional to the distance between the transmitting vehicle and the target vehicle.

Relative velocity: When the signal is reflected off a vehicle moving at a different speed (opening or closing gap) an effect known as the Doppler shift causes an extra frequency modulation to be imposed on the signal. This Doppler frequency varies with the relative speed of the vehicle being followed, enabling the system to differentiate between vehicles traveling at different speeds and also between moving vehicles and stationary objects.

Angle: Using a narrow angle beam to scan horizontally enables the system to distinguish between vehicles in different lanes and between vehicles and roadside objects.

System Restrictions

The adaptive speed control system is only intended to provide enhanced speed control as described above in certain restricted conditions. The following points should be noted:

- Automatic braking is limited to approximately 30% of full pressure (0.3G deceleration) and is intended to provide a smooth, gradual deceleration in follow mode conditions. Harsh braking by the target vehicle or following the target vehicle down to very low speeds or to a halt will require driver override of the brakes.
- While the radar sensor detects moving and stationary targets for assessment of the environment ahead, the system does not react to or provide any control in situations other than follow mode conditions. Stationary or slow moving vehicles (below 10 km/h), pedestrians, objects on the road and oncoming vehicles in the same lane are not recognized.



WARNING: The adaptive speed control system is not a collision warning or avoidance system and that, other than the limited conditions of follow mode, driver intervention will be necessary to control the vehicle speed.

In follow mode, some situations may cause target ambiguities for the detection system. These situations include:

- The nearby presence of a third vehicle when driving on a line slightly offset to the target vehicle.
- Vehicles edging into the lane ahead which are not detected by the system until they have moved into the radar beam.

On the approach to, or exit from a bend, a target vehicle may be lost or a new target acquired as vehicles ahead change their angular position with respect to the radar sensor. On a straight road, if the sensing vehicle is in follow mode below its selected set speed, losing the target vehicle will cause the sensing vehicle to accelerate to this set speed. This acceleration is undesirable either on, or entering a bend when the target is suddenly lost, and in this situation the system inhibits the resumption of the set speed.

The speed control system compares vehicle speed data from the ABS system with the relative speed of an external object as detected by the radar sensor to ascertain whether the object is stationary or not.



NOTE: If tires are fitted which are different in diameter from those specified for the vehicle, the vehicle speed calculated by the ABS will not be the true road speed. This situation may cause stationary objects to be falsely identified as moving vehicles and result in automatic deceleration on a clear road.

Component Description

SPEED CONTROL SWITCHES



E98448

Item	Description
1	Set speed adjustment switch
2	Time gap switch (only on vehicles with adaptive speed control fitted)
3	Cancel switch
4	Resume switch

The speed control switches are located on the **RH (right-hand)** side of the steering wheel. The switches are connected via fly leads to the clock spring. The speed control switches are resistive ladder type switches which vary the resistance of a 5 volt signal sent to them. The signal is returned along a **LIN** bus to the instrument cluster. The instrument cluster routes the control signals to the **ECM** on the medium speed **CAN**.

Speed control is engaged by rotating the speed adjustment switch to the + or - positions. Once engaged the speed can be varied by the speed adjustment switches. Each press of the speed adjustment switch will increase or decrease the set speed in steps of 1 mph (2 kph).

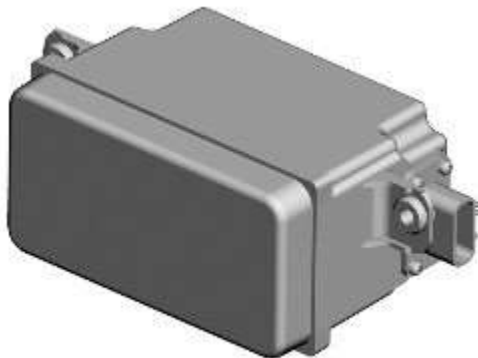
ADAPTIVE SPEED CONTROL MODULE



E98450

The adaptive speed control module, located on the drivers side at the bottom of the 'A' post. The control module is connected to the other vehicle systems via the high speed **CAN** bus. Signals from the adaptive speed control forward looking radar sensor are received on a dedicated **CAN** bus between the two modules.

ADAPTIVE SPEED CONTROL RADAR SENSOR



E98451

The adaptive speed control radar sensor is located in the front bumper, on the **RH** side above the radiator grill behind the bumper cover. The sensor is connected to the adaptive speed control, module via a private **CAN** bus. If the unit is replaced in service the unit must be re-aligned vertically. Horizontal alignment is achieved by putting the sensor in service mode using an approved Jaguar diagnostic system.

FORWARD ALERT SWITCHES



E98449

Item	Description
1	Forward alert switch

The forward alert system utilizes the adaptive speed control system components. Forward alert is turned on and off independently of adaptive speed control, via a switch mounted in the lower outboard knee bolster switchpack. Forward alert will notify the driver by means of a chime, a warning indicator in the instrument cluster and an indication in the message center, when a target vehicle comes into range. The system will NOT use throttle or brake intervention to slow the vehicle.

The forward alert switch is connected to the instrument cluster in a resistive ladder with the luggage compartment opening switch and the fuel filler flap switch. The instrument cluster sends the forward alert information to the Adaptive speed control module on the [CAN](#) bus.



WARNING: The system is intended as a driver aid and should be used as such. The system is NOT a collision warning or avoidance device.

The system sensitivity can be adjusted in the same manner as the adaptive speed control, via the steering wheel mounted switches. Each adjustment is accompanied by a message in the message center.

Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Speed Control

Diagnosis and Testing

Principles of Operation

For a detailed description of the speed control system, refer to the relevant Description and Operation sections in the workshop manual.

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Speed control sensor • Ensure the speed control sensor is free from obstructions • Speed control module • Brake switch 	<ul style="list-style-type: none"> • Fuses • Wiring harness • Electrical connector(s) • Steering wheel switches • Brake switch • Speed control sensor • Speed control module • Engine Control Module (ECM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Speed Control Sensor Adjustment (vehicles with adaptive system installed)

An incorrectly aligned speed control sensor can cause incorrect system operation. Before starting any repair work on the speed control system, on vehicles with the adaptive system installed, check speed control sensor for correct vertical alignment, and carry out speed control sensor alignment procedure using manufacturer approved diagnostic system.

Symptom Chart

Symptom	Possible Causes	Action
Speed control inhibited or disabled	<ul style="list-style-type: none"> • Power or ground supply to speed control module or speed control sensor • Steering wheel speed control switch/circuits • Throttle sensors • Brake switch • Anti-Lock Brake System fault 	<ul style="list-style-type: none"> • Check for DTCs that could be caused by power or ground failure to the module or sensor and refer to DTC Index • Check for sticking, jammed and broken speed control switches. Refer to the electrical circuit diagrams and check speed control switch circuits for short, open circuit • For throttle position sensor tests. REFER to: Electronic Engine Controls - 3.0L Diesel (303-14 Electronic Engine Controls - 3.0L Diesel, Diagnosis and Testing), Electronic Engine Controls - 3.0L (303-14B Electronic Engine Controls - V6 3.0L Petrol, Diagnosis and Testing), Electronic Engine Controls (303-14 Electronic Engine Controls - V8 4.2L Petrol/V8 S/C 4.2L Petrol, Diagnosis and Testing). • Check for correct installation and adjustment of brake switch. Refer to the electrical circuit diagrams and check brake switch circuits for short, open circuit • Check ABS system for related DTCs and refer to the relevant DTC Index
Unable to regulate/adjust vehicle speed	<ul style="list-style-type: none"> • Steering wheel switch malfunction 	<ul style="list-style-type: none"> • Check for sticking, jammed and broken speed control switches. Refer to the electrical circuit diagrams and check speed control switch circuits for short, open circuit

DTC Index

Vehicles WITH Adaptive System Installed



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If a module or component is suspect, and the vehicle remains under the Manufacturers warranty, refer to the Warranty Policy and Procedure manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Causes	Action
B1A84-81	Car Configuration Data - Invalid serial data received	<ul style="list-style-type: none"> RJB reporting invalid data 	<ul style="list-style-type: none"> Re-configure the RJB using manufacturer approved diagnostic system
C1A67-54	Forward Looking Sensor - Missing calibration	<ul style="list-style-type: none"> Speed control sensor out of alignment 	<ul style="list-style-type: none"> Check speed control sensor for correct vertical alignment, and carry out speed control sensor alignment procedure using manufacturer approved diagnostic system
C1A67-81	Forward Looking Sensor - Invalid serial data received	<ul style="list-style-type: none"> Yaw voltage unreasonable for 0.5 seconds or unchanged for 1.2 seconds. Note: Yaw sensor internal to speed control sensor 	<ul style="list-style-type: none"> Clear DTC and re-test, if DTC remains suspect speed control sensor. Check and install a new sensor as required, refer to the new module/component installation note at the top of the DTC Index
C1A67-87	Forward Looking Sensor - Missing Message	Incorrect or missing data from speed control sensor	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check power and ground supplies for short, open circuit. Check private CAN network between speed control sensor and speed control module for failure, clear DTC and re-test. If DTC remains suspect the speed control sensor, check and install a new sensor as required, refer to the new module/component installation note at the top of the DTC Index
C1A67-96	Forward Looking Sensor - Component internal Failure	<ul style="list-style-type: none"> Internal hardware failure 	<ul style="list-style-type: none"> Suspect the speed control sensor. Check and install a new sensor as required, refer to the new module/component installation note at the top of the DTC Index
C1A67-97	Forward Looking Sensor - Component or system operation obstructed or blocked	<ul style="list-style-type: none"> Sensor reduced visibility 	<ul style="list-style-type: none"> Check for blockage in front of radar. Note: This DTC will be cleared automatically when environmental conditions allow

DTC	Description	Possible Causes	Action
C1A67-98	Forward Looking Sensor - Component or system over temperature	<ul style="list-style-type: none"> Speed control sensor internal temperature exceeded threshold 	<ul style="list-style-type: none"> Allow system to cool. Note: This DTC will be cleared automatically when environmental conditions allow
P174E-81	Output Shaft Speed/ABS Wheel Speed Correlation - Invalid serial data received	<ul style="list-style-type: none"> Follow speed is mis-calculated to too high a value 	<ul style="list-style-type: none"> Clear DTC and re-test
U0001-88	High Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> Vehicle CAN Bus off condition 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
U0100-00	Lost Communications With ECM/PCM "A" - No sub type information	<ul style="list-style-type: none"> ECM missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check ECM for related DTCs and refer to the relevant DTC Index
U0101-00	Lost Communications With TCM - No sub type information	<ul style="list-style-type: none"> TCM missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check TCM for related DTCs and refer to the relevant DTC Index
U0103-00	Lost Communication With Gear Shift Control Module A - No sub type information	<ul style="list-style-type: none"> No sub type information 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the Transmission Shift Module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the Transmission Shift Module and Speed Control Module
U0103-87	Lost Communication With Gear Shift Module - Missing Message	<ul style="list-style-type: none"> Transmission shift module missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check transmission shift module for related DTCs and refer to the relevant DTC Index
U0121-00	Lost Communication With Anti-lock Brake System (ABS) Control Module - No sub type information	<ul style="list-style-type: none"> ABS missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check ABS for related DTCs and refer to the relevant DTC Index
U0128-00	Lost Communications With Park Brake Module - No sub type information	<ul style="list-style-type: none"> Parking brake missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check parking brake module for related DTCs and refer to the relevant DTC Index
U0155-00	Lost Communications With Instrument Panel Cluster (IPC) Control Module - No sub type information	<ul style="list-style-type: none"> Instrument cluster missing message 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check instrument cluster for related DTCs and refer to the relevant DTC Index
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> Invalid configuration message is received 	<ul style="list-style-type: none"> Re-configure the speed control module using the manufacturer approved diagnostic system. Clear DTCs and re-test. If DTC still logged, suspect incorrect speed control module installed. Check and install a new module as required, refer to new module/component installation note at top of DTC Index
U0300-55	Internal Control Module Software Incompatibility - Not configured	<ul style="list-style-type: none"> RJB - at least one of the car configuration parameters is not configured 	<ul style="list-style-type: none"> Re-configure the RJB using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
U0401-00	Invalid Data Received From ECM/PCM A - No sub type information	<ul style="list-style-type: none"> ECM did not respond properly to speed control cancel or auto brake cancel request 	<ul style="list-style-type: none"> Check ECM for related DTCs and refer to relevant DTC Index
U0401-67	Invalid Data Received From ECM/PCM A - Signal incorrect after event	<ul style="list-style-type: none"> ECM did not respond properly to speed control resume request 	<ul style="list-style-type: none"> Check ECM for related DTCs and refer to relevant DTC Index
U0401-81	Invalid Data Received From ECM/PCM A - Invalid serial data received	<ul style="list-style-type: none"> Invalid data received from engine control module Bus signal/message failure Speed control inhibited by ECM 	<ul style="list-style-type: none"> Check the Engine Control Module for related DTCs and refer to relevant DTC Index. If U040181 is logged as historic but no other DTCs have logged in the engine control module at the same time and distance, it may be caused by cranking with low voltage conditions. Check battery and charging system according to instructions in the battery care manual. Install the latest Engine Control Module software using the manufacturer approved diagnostic system, contact Dealer Technical Support before replacing components
U0415-53	Invalid Data Received From Anti-Lock Braking System (ABS) Control Module - De-activated	<ul style="list-style-type: none"> Event information Deactivated 	<ul style="list-style-type: none"> Check the Anti-Lock Braking System Module for related DTCs and refer to the relevant DTC index
U0415-81	Invalid Data Received From Anti-lock Brake System (ABS) Control Module - Invalid serial data received	<ul style="list-style-type: none"> Stability assist fault 	<ul style="list-style-type: none"> Check ABS module for related DTCs and refer to relevant DTC Index
U0417-67	Invalid Data Received From Park Brake Control Module - Signal incorrect after event	<ul style="list-style-type: none"> Parking brake module did not respond properly to apply request 	<ul style="list-style-type: none"> Check parking brake module for related DTCs and refer to relevant DTC Index
U0417-81	Invalid Data Received From Park Brake Control Module - Invalid serial data received	<ul style="list-style-type: none"> Speed control inhibited by parking brake module 	<ul style="list-style-type: none"> Check parking brake module for related DTCs and refer to relevant DTC Index
U0418-68	Invalid Data Received From Brake System Control Module - Event information	<ul style="list-style-type: none"> Event information 	<ul style="list-style-type: none"> Check the Anti-Lock Braking System Module for related DTCs and refer to the relevant DTC index
U0421-81	Invalid Data Received From Suspension Control Module 'A' - Invalid serial data received	<ul style="list-style-type: none"> Invalid serial data received 	<ul style="list-style-type: none"> Check the Suspension Control Module for related DTCs and refer to the relevant DTC index
U0423-81	Invalid Data Received From Instrument Panel Control Module - Invalid serial data received	<ul style="list-style-type: none"> Speed control inhibited by instrument cluster 	<ul style="list-style-type: none"> Check instrument cluster, CJB and RJB for related DTCs and refer to relevant DTC Index
U1A00-88	Private Communication Network - Bus off	<ul style="list-style-type: none"> Bus off 	<ul style="list-style-type: none"> The module setting this code has disabled CAN transmission. Check for other bus off codes. Check the module and circuits. Refer to the electrical circuit diagrams. Clear all DTCs and road test the vehicle. If the concern reoccurs contact Dealer Technical Support for further advice. Under no circumstance should any parts be replaced to overcome this issue
U1A14-49	CAN Initialisation Failure - Internal electronic failure	<ul style="list-style-type: none"> Internal electronic failure 	<ul style="list-style-type: none"> Suspect the speed control module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U2101-00	Control Module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> Data sent from RJB is invalid 	<ul style="list-style-type: none"> Check/amend Car Configuration File using the manufacturer approved diagnostic system, clear DTC and re-test. If DTC remains, re-configure RJB using manufacturer approved diagnostic system, clear DTC and re-test. If DTC remains check RJB for DTCs and

DTC	Description	Possible Causes	Action
			refer to DTC Index
U3000-41	Control Module - General checksum failure	<ul style="list-style-type: none"> Internal micro controller error Checksum fault 	<ul style="list-style-type: none"> Suspect the speed control module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-42	Control Module - General memory failure	<ul style="list-style-type: none"> Internal RAM test fault 	<ul style="list-style-type: none"> Suspect the speed control module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> Internal control module failure 	<ul style="list-style-type: none"> Suspect the speed control module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U3000-63	Control Module - Circuit/component protection time-out	<ul style="list-style-type: none"> Circuit/component protection time-out 	<ul style="list-style-type: none"> The Control module internal protection has been activated. Check for other related DTCs that could lead to this event. Clear the DTC and retest. If the problem persists, renew the module. Refer to the warranty policy and procedures manual if a module is suspect
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> Signal compare failure Battery supply voltage below a recognized value 	<ul style="list-style-type: none"> Check vehicle battery and charging system. Refer to the relevant section in the workshop manual. Refer to the electrical circuit diagrams and check the power and ground supply circuits to the modules

Vehicles WITHOUT Adaptive System Installed



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If a module or component is suspect, and the vehicle remains under the Manufacturers warranty, refer to the Warranty Policy and Procedure manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Causes	Action
P0500-82	Vehicle Speed Sensor A - Alive / sequence counter incorrect / not updated	<ul style="list-style-type: none"> Vehicle speed - invalid signal received over CAN 	<ul style="list-style-type: none"> Check ABS for related DTCs and refer to relevant DTC Index
P0500-86	Vehicle Speed Sensor A - Signal invalid	<ul style="list-style-type: none"> Vehicle speed - invalid signal received over CAN 	<ul style="list-style-type: none"> Check ABS for related DTCs and refer to relevant DTC Index
P0501-00	Vehicle Speed Sensor A Range/Performance - No sub type information	<ul style="list-style-type: none"> Vehicle speed signal from ABS not plausible 	<ul style="list-style-type: none"> Carry out CAN network integrity test using the manufacturer approved diagnostic system. Contact Dealer Technical Support

DTC	Description	Possible Causes	Action
			for further assistance
P0501-62	Vehicle Speed Sensor A Range/Performance - Signal compare failure	<ul style="list-style-type: none"> Vehicle speed - range performance 	<ul style="list-style-type: none"> Check ABS/TCM for related DTCs and refer to relevant DTC Index
P0504-00	Brake Switch A / B Correlation - No sub type information	<ul style="list-style-type: none"> The brake pressure reading does not agree with the brake light switch value 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check brake switch circuits for short, open circuit, high resistance
P0504-01	Brake Switch A / B Correlation - General electrical failure	<ul style="list-style-type: none"> Brake switch high fault: <ul style="list-style-type: none"> Brake lights stuck on Gearshift interlock inoperative Speed control inoperative Brake switch low fault: <ul style="list-style-type: none"> Brake lights inoperative Gearshift stuck in Park Reduced engine braking 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check brake switch circuits for short, open circuit, high resistance
P0566-00	Cruise Control OFF Signal - No sub type information	<ul style="list-style-type: none"> Speed control Cancel switch 2 stuck closed 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check speed control switch circuits for short, open circuit. Check for stuck switch. Check and install a new speed control switch as required
P0567-00	Cruise Control DECREASE DISTANCE Signal - No sub type information	<ul style="list-style-type: none"> Speed control Resume switch 7 stuck closed 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check speed control switch circuits for short, open circuit. Check for stuck switch. Check and install a new speed control switch as required
P0568-00	Cruise Control INCREASE DISTANCE Signal - No sub type information	<ul style="list-style-type: none"> Speed control Accel Set Plus Switch 6 stuck closed 	<ul style="list-style-type: none"> Check and install a new speed control switch as required
P0569-00	Cruise Control COAST Signal - No sub type information	<ul style="list-style-type: none"> Speed control Coast Set Minus switch 3 stuck closed 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check speed control switch circuits for short, open circuit. Check for stuck switch. Check and install a new speed control switch as required
P056A-00	Cruise Control INCREASE DISTANCE Signal - No sub type information	<ul style="list-style-type: none"> Speed control Headway Plus switch 4 stuck closed 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check speed control switch circuits for short, open circuit. Check for stuck switch. Check and install a new speed control switch as required
P056B-00	Cruise Control DECREASE DISTANCE Signal - No sub type information	<ul style="list-style-type: none"> Speed control Headway Minus switch 5 stuck closed 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check speed control switch circuits for short, open circuit. Check for stuck switch. Check and install a new speed control switch as required
P0571-62	Brake Switch A Circuit - Signal compare failure	<ul style="list-style-type: none"> Plausibility error 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check brake light switch signal circuits for short, open circuit. Check and install a new brake light switch as required
P0575-01	Cruise Control Input Circuit - General electrical failure	<ul style="list-style-type: none"> General electrical failure 	<ul style="list-style-type: none"> Check speed control system for related DTCs and refer to relevant DTC Index. Carry out CAN network integrity tests using the

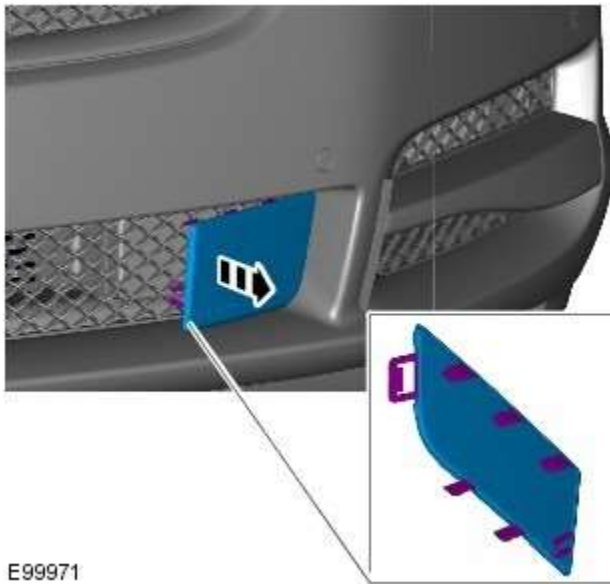
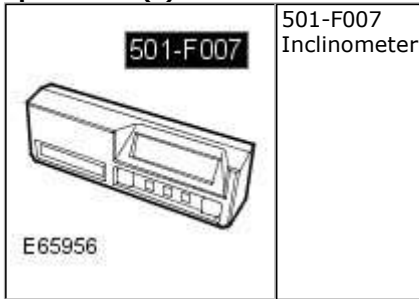
DTC	Description	Possible Causes	Action
			manufacturer approved diagnostic system
P0576-16	Cruise Control Input Circuit Low - Circuit voltage below threshold	<ul style="list-style-type: none"> • Circuit voltage below threshold 	<ul style="list-style-type: none"> • Check speed control system for related DTCs and refer to relevant DTC Index. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
P0577-17	Cruise Control Input Circuit High - Circuit voltage above threshold	<ul style="list-style-type: none"> • Circuit voltage above threshold 	<ul style="list-style-type: none"> • Check speed control system for related DTCs and refer to relevant DTC Index. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
P0578-00	Cruise Control Multi-Function Input A Circuit Stuck - No sub type information	<ul style="list-style-type: none"> • One of speed control switches stuck 	<ul style="list-style-type: none"> • Check for stuck speed control switch, install a new switch pack as required
P0578-1C	Cruise Control Multi-Function Input A Circuit Stuck - Circuit voltage out of range	<ul style="list-style-type: none"> • Circuit voltage out of range 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check speed control switch circuits for short, open circuit. Check for stuck switch. Check and install a new speed control switch as required
P0579-1C	Cruise Control Multi-Function Input A Circuit Range/Performance - Circuit voltage out of range	<ul style="list-style-type: none"> • Speed control switch pack internal failure 	<ul style="list-style-type: none"> • Check and install a new speed control switch pack as required
P0579-29	Cruise Control Multi-Function Input A Circuit Range/Performance - Signal invalid	<ul style="list-style-type: none"> • Signal invalid 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check speed control switch circuits for short, open circuit. Check for stuck switch. Check and install a new speed control switch as required
P0590-00	Cruise Control Multi-Function Input B Circuit Stuck - No sub type information	<ul style="list-style-type: none"> • Active speed limiter fault 	<ul style="list-style-type: none"> • Check for active speed limiter fault, install a new transmission shift module as required

Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Speed Control Sensor

Adjustment

General Procedures

Special Tool(s)

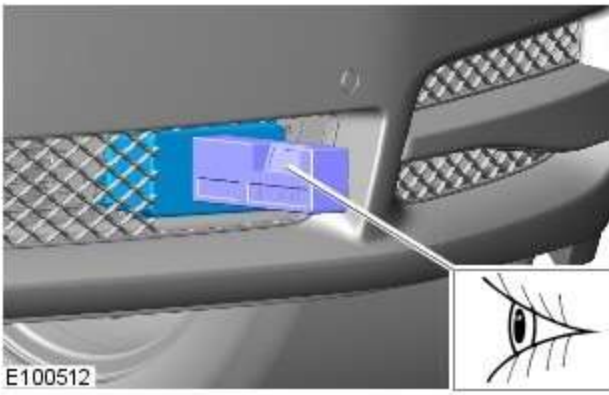


1. **CAUTION:** Protect the surrounding paintwork to avoid damage.



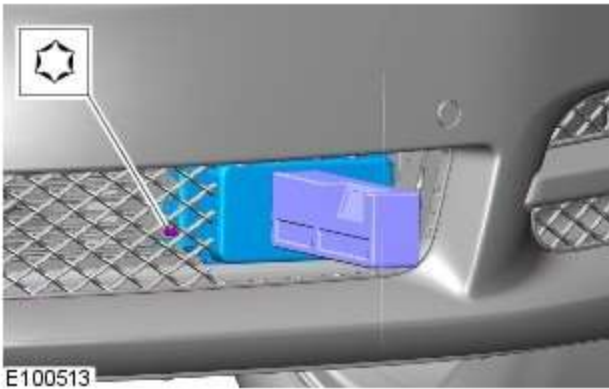
2. **NOTE:** Make sure that the vehicle is standing on a level surface.

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3. NOTE: Make sure that the vehicle is standing on a level surface.

Special Tool(s): [501-F007](#)

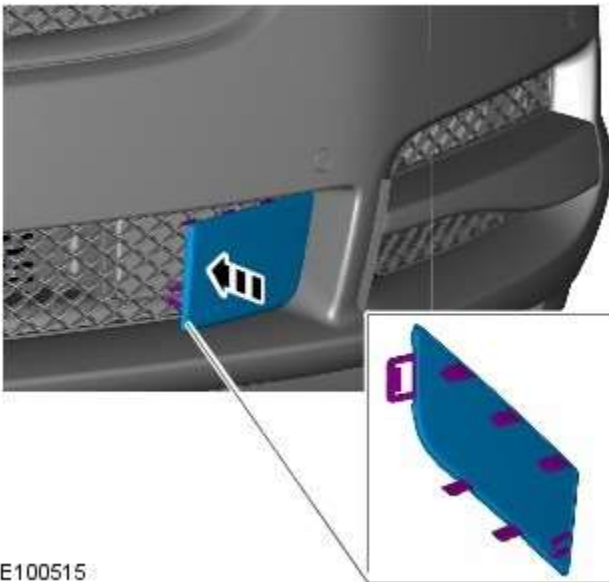



4. NOTES:

 Do not release the lock nut.

 Make sure that the vehicle is standing on a level surface.

Special Tool(s): [501-F007](#)



5.  CAUTION: Protect the surrounding paintwork to avoid damage.

6.

- Configure the ACC module using the diagnostic tool.
- This procedure is required if:
- A new ACC radar and, or ACC module are installed.
- The ACC radar needed to be removed or is misaligned in its position due to another repair operation.

7.

- From the diagnostic tool menu, select: Service Alignment Mode.

- The follow indicator will now be flashing, this indicates that the vehicle is in "service alignment" and now requires driving.
- The vehicle speed must be above 30mph (48 kph).
- Choose a road with plenty of stationary objects, like street lights, road signs, or barriers. Use an inside or outside lane.
- Following vehicles too closely will obscure the stationary targets from the radar, a time gap of 2 seconds is recommended.
- A straight road will produce a quicker and better result, although the process will still operate on a curved road.
- The time that the ACC module takes to align will vary, depending on the route, speed, number of targets, and individual module.
- When the flashing follow indicator light extinguishes, the ACC system is now functional, and a required vehicle speed can now be set by the driver and the ACC system will operate as normal.

Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Speed Control Deactivator Switch

Removal and Installation

Removal

1. Refer to: Stoplamp Switch (417-01, Removal and Installation).

Installation

1. Refer to: Stoplamp Switch (417-01, Removal and Installation).

Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Speed Control Module

Removal and Installation

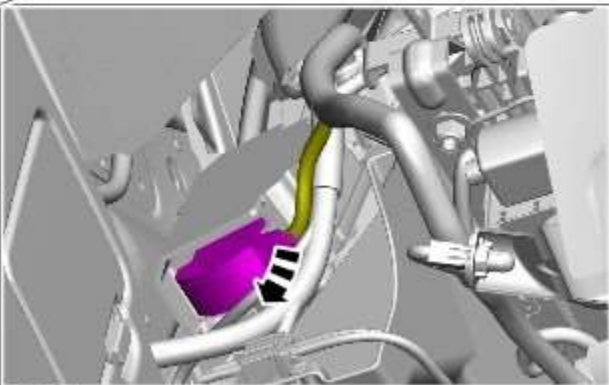
Removal



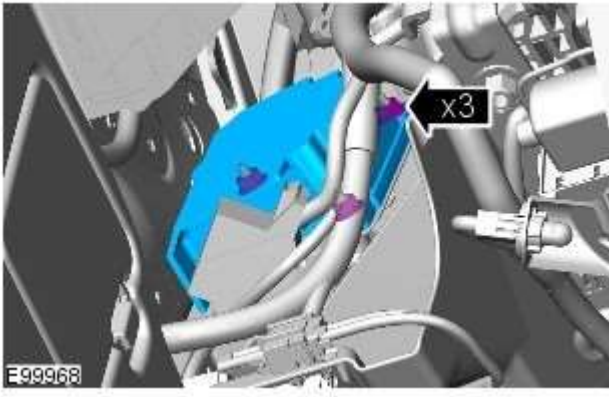
NOTE: Removal steps in this procedure may contain installation details.


1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Speed Control Sensor Adjustment](#) (310-03C Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).
3. Refer to: [Instrument Panel Lower Trim Panel](#) (501-12 Instrument Panel and Console, Removal and Installation).

4.



E99967



5.  **CAUTION:** Make sure that all diagnostic trouble codes (DTCs) have been removed after the road test.

Torque: 4 Nm

Installation

1. To install, reverse the removal procedure.

Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Speed Control Sensor

Removal and Installation

Removal

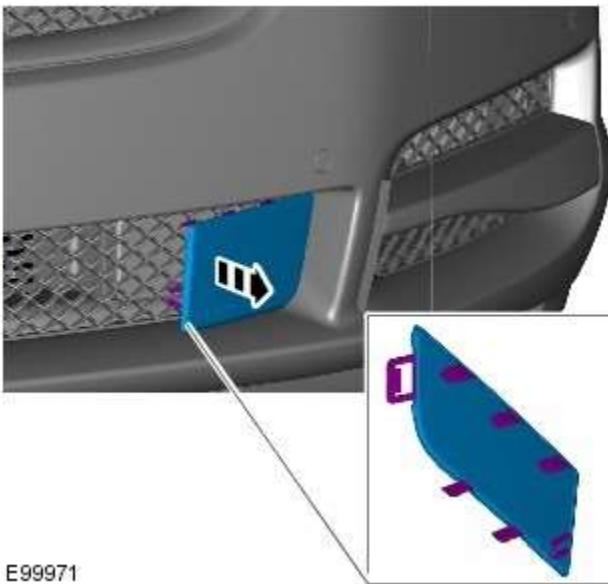


NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Speed Control Sensor Adjustment](#) (310-03C Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

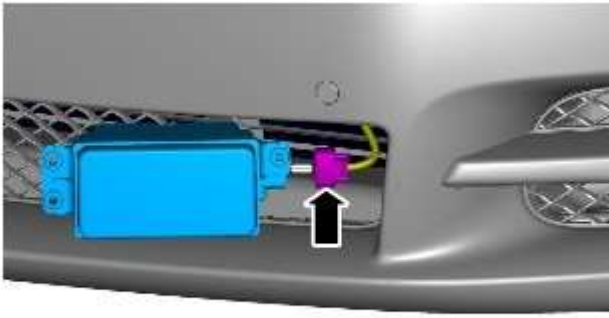


3. CAUTION: Protect the surrounding paintwork to avoid damage.



4. Torque: 5 Nm







E99973

Installation

1. To install, reverse the removal procedure.

5.  CAUTION: Make sure that all diagnostic trouble codes (DTCs) have been removed after the road test.

 NOTE: Make sure that the sensor is aligned after installation as described in the speed control sensor adjustment procedure.

Speed Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Speed Control Switch

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Make the SRS system safe.

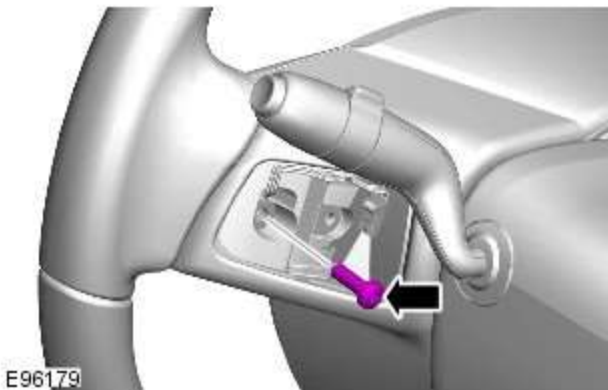
Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

2. Refer to: [Driver Air Bag Module](#) (501-20B Supplemental Restraint System, Removal and Installation).

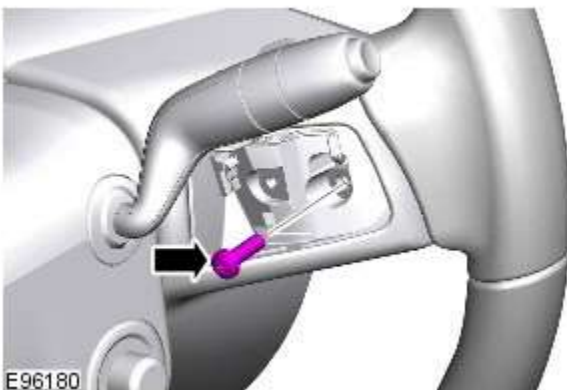
3. Refer to: [Upshift Paddle Switch](#) (307-05A Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol, Removal and Installation).

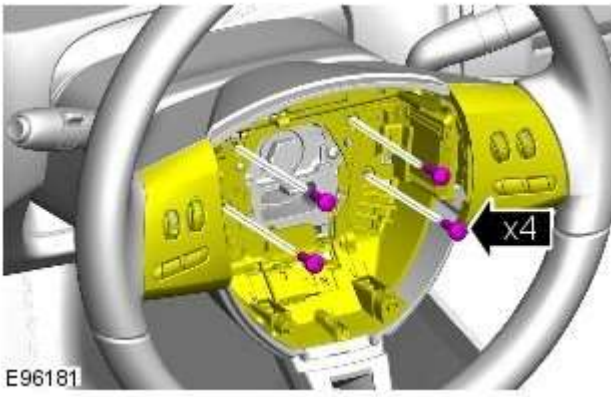
4. Refer to: [Downshift Paddle Switch](#) (307-05A Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol, Removal and Installation).

5. Torque: 3 Nm

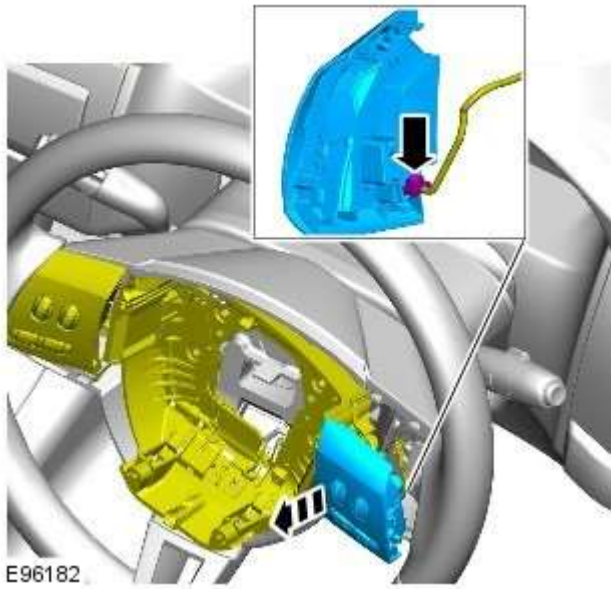


6. Torque: 3 Nm





7. Torque: 6 Nm



8.

Installation

1. To install, reverse the removal procedure.

Climate Control System - General Information -

Lubricants, Fluids, Sealers and Adhesives



NOTE: NAS vehicles.

Description	Specification
Air conditioning (A/C) refrigerant	R-1234yf
A/C compressor oil	SPA2



NOTE: ROW vehicles.

Description	Specification
Air conditioning (A/C) refrigerant	R-134a
A/C compressor oil	SPA2



NOTE: EU vehicles.

Description	Specification
Air conditioning (A/C) refrigerant	R-1234yf
A/C compressor oil	SPA2

Capacities

Description	Grammes
A/C refrigerant - all engine variants	700

Refrigerant Oil Adding Capacities



NOTE: Rotate the A/C compressor shaft at least 6 to 8 turns when draining the refrigerant oil.

Item	Milliliters
A/C condenser core and desiccant bag	Add 25ml oil
A/C evaporator	Add 30ml oil
A/C compressor	1. Drain old A/C compressor. With drain plug removed and ports uncapped, rotate shaft to remove A/C compressor oil and measure the amount of oil captured. 2. Drain new A/C compressor into a clean vessel. With drain plug removed and ports uncapped, rotate shaft to remove oil. Then add back a quantity of the new oil that is identical to the quantity of oil removed from the old A/C compressor. However, if this quantity is less than 30ml, then make it up to 30ml.
A/C lines - if air conditioning has been operational.	Add 5ml oil per A/C line
A/C system after flushing - with new compressor installed	No oil should be used- new oil in new compressor is sufficient
A/C system after flushing - without a new compressor installed - remaining A/C compressor oil is to be drained. Compressor and expansion valve must not be flushed (removed from the circuit)	Add 80ml oil
A/C compressor drain plug	Torque 12Nm

Climate Control System - General Information - Climate Control System

Diagnosis and Testing

Principles of Operation

For a detailed description of the Climate Control System, refer to the relevant Description and Operation sections in the Workshop Manual. REFER to:

[Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation),
[Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation),
[Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation),
[Heating and Ventilation](#) (412-01 Climate Control, Description and Operation),
[Heating and Ventilation](#) (412-01 Climate Control, Description and Operation),
[Heating and Ventilation](#) (412-01 Climate Control, Description and Operation),
[Air Conditioning](#) (412-01 Climate Control, Description and Operation),
[Air Conditioning](#) (412-01 Climate Control, Description and Operation),
[Air Conditioning](#) (412-01 Climate Control, Description and Operation),
[Control Components](#) (412-01 Climate Control, Description and Operation),
[Control Components](#) (412-01 Climate Control, Description and Operation),
[Control Components](#) (412-01 Climate Control, Description and Operation),
[Electric Booster Heater](#) (412-02 Auxiliary Climate Control, Description and Operation),
[Electric Booster Heater](#) (412-02 Auxiliary Climate Control, Description and Operation),
[Electric Booster Heater](#) (412-02 Auxiliary Climate Control, Description and Operation).

Inspection and Verification



WARNING: Servicing must be carried out by personnel familiar with both vehicle system and the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.



NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection



Mechanical	Electrical
<ul style="list-style-type: none"> • Coolant level • Hose(s) • Coolant pump • Control flap(s) • Duct(s) • Vent(s) • Cabin air filter • Drive belt • Air conditioning compressor • Thermostatic expansion valve • Evaporator • Receiver drier • Air conditioning condenser • Refrigerant pipes Auxiliary • drive belt • Fuel fired booster heater • Fuel fired booster heater fuel pump • Fuel fired booster heater fuel pipes 	<ul style="list-style-type: none"> • Fuse(s) • Wiring harness • Electrical connectors • Blower • Air conditioning compressor • Electric cooling fan • Automatic Temperature Control Module (ATCM) • Refrigerant pressure sensor



3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart









Symptom	Possible Causes	Action
Air conditioning performance poor or inoperative	<ul style="list-style-type: none"> Refrigerant undercharged Refrigerant overcharged Thermostatic expansion valve faulty Receiver drier restricted Water in refrigerant 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
Air conditioning operates briefly and then switches off	<ul style="list-style-type: none"> Electric cooling fan inoperative Air conditioning condenser airflow obstructed 	<ul style="list-style-type: none"> Test the operation of the electric cooling fan Check the air conditioning condenser for external obstructions

Pinpoint Tests

PINPOINT TEST A : PRELIMINARY TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: PRELIMINARY TEST 1	
NOTES:	
 This test is performed with the engine not running.	
 Normal pressure for a correctly charged and switched off system is approximately 4.5 bar on both gauges (system equalised).	
	1 Close the valves on the air conditioning station
	2 Connect the air conditioning station to the vehicle charging ports
	3 Check the pressure values
	Is a pressure registered on both gauges?
	Yes GO to Pinpoint Test B.
	No GO to Pinpoint Test D.


PINPOINT TEST B : FUNCTIONALITY TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: FUNCTIONALITY TEST 1	
NOTES:	
 Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low) and 11.0 bar to 15.0 bar (high).	
 Normal temperature (measured at the center air vent) for a correctly charged and working system is -7°C to -2°C when ambient temperature is 20°C.	
	1 Close the valves on the air conditioning station
	2 Connect the air conditioning station to the vehicle charging ports
	3 Open all doors and the tailgate
	4 Start the engine
	5 Set the temperature to the lowest setting (all zones)
	6 Set the fan speed to maximum
	7 Set the recirculate switch to off
	8 Insert a temperature probe into the centre air vent
	9 Raise engine speed to 1500rpm and maintain this speed for 5 minutes
	10 Check the temperature value
	11 Check the pressure values
	Are the pressure readings stable and in the green 'normal' region of the gauge?
	Yes Air conditioning system operating normally
	No Air conditioning system fault present. GO to Pinpoint Test C.

PINPOINT TEST C : GAUGE TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: GAUGE TEST 1	
	NOTE: This test is performed with the engine running and the air conditioning set to on.
	1 Check the pressure values
	Did the gauges register a change in pressure when the air conditioning was switched on? Yes GO to C2. No Using the manufacturer approved diagnostic system, check the Automatic Temperature Control Module (ATCM) for related DTCs and refer to the relevant DTC index
C2: GAUGE TEST 2	
	NOTE: This test is performed with the engine running and the air conditioning set to on.
	1 Check the pressure values
	Are the pressure gauge readings fluctuating? Yes Moisture present in the air conditioning system. Recover the refrigerant. Install a new receiver drier. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B. No GO to C3.
C3: GAUGE TEST 3	
NOTES:	
	This test is performed with the engine running and the air conditioning set to on.
	Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low) and 11.0 bar to 15.0 bar (high).
	1 Check the pressure values
	Are the pressure gauge readings too low? Yes GO to C4. No GO to C6.
C4: GAUGE TEST 4	
	NOTE: This test is performed with the engine not running.
	1 Stop the engine
	2 Using the manufacturer approved refrigerant leak detector, check for a refrigerant leak
	Was a refrigerant leak detected? Yes Refer to the relevant section of the workshop manual and recover the refrigerant. Repair as necessary. Evacuate and recharge the air conditioning system. GO to Pinpoint Test B. No GO to C5.
C5: GAUGE TEST 5	
	NOTE: This test is performed with the engine not running.
	1 Refer to the relevant section of the workshop manual and recover the refrigerant
	Was the weight of the recovered refrigerant less than specified for the air conditioning system? Yes Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B. No Install a new receiver drier. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.
C6: GAUGE TEST 6	
NOTES:	
	This test is performed with the engine running and the air conditioning set to on.
	Normal pressures for a correctly charged and working system are 1.0 bar to 2.0 bar (low) and 11.0 bar to 15.0 bar (high).



	1 Check the pressure values
	Are the pressure gauge readings too high?
	Yes GO to C7.
	No Test inconclusive. GO to Pinpoint Test B.

C7: GAUGE TEST 7

 NOTE: This test is performed with the engine **not** running.

	1 Stop the engine
	2 Refer to the relevant section of the workshop manual and recover the refrigerant
	Was the weight of the recovered refrigerant more than specified for the air conditioning system?
	Yes Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.
	No Install a new thermal expansion valve. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.

PINPOINT TEST D : NITROGEN LEAK TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: NITROGEN LEAK TEST	
 CAUTION: When charging the system with nitrogen, the pressure should be regulated to 7.0 bar.	
 NOTE: This test is performed with the engine not running.	
	1 Charge the air conditioning system with nitrogen
	2 Isolate the nitrogen supply
	3 Monitor the pressure gauge and check for leaks
	Has the source of the leak been identified?
	Yes Rectify the leak as necessary. Install a new receiver drier. Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.
	No Refer to the relevant section of the workshop manual and evacuate and recharge the air conditioning system. GO to Pinpoint Test B.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Climate Control Module \(HVAC\)](#) (100-00 General Information, Description and Operation).

Climate Control System - General Information - Air Conditioning (A/C) System Recovery, Evacuation and Charging

General Procedures



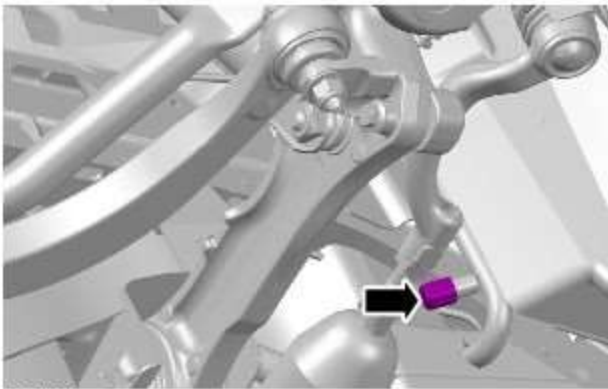
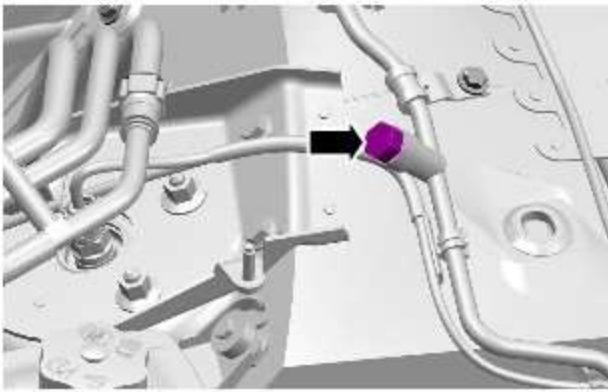
1. **WARNING:** Servicing must be carried out by personnel familiar with both vehicle system and the charging and testing equipment. All operations must be carried out in a well ventilated area away from open flame and heat sources.



NOTE: The receiver drier need only be changed under the following circumstances: There is dirt in the refrigerant circuit (eg. compressor seizure), the system is leaking and refrigerant has been lost to atmosphere, or the refrigerant circuit has been open more than 24 hours, due to repair.

Refrigerant recovery.

2. Remove the dust covers from the high and low pressure connections.



E97765

3. Connect the high and low pressure lines to the appropriate connections.
4. Open the valves on the connections.
5. Turn the valves on the station to the correct positions.
6. Turn the process switch to the correct position.
7. Turn the main switch to 'ON'.



8. **WARNING:** Refrigerant must always be recycled before re-use to ensure that the purity of the refrigerant is high enough for safe use in the air conditioning system. Recycling should always be carried out with equipment which is design certified by Underwriter Laboratory Inc. for compliance with SEA J1991. Other equipment may not recycle refrigerant to the required level of purity. R143a Refrigerant Recover Recycling Recharging station must not be used with any other type of refrigerant. Refrigerant R134a from domestic and commercial sources must not be used in motor vehicles air conditioning systems.

Allow the system to recover the refrigerant from the system.

9. Close the valves on the refrigerant station.
10. Turn the main switch 'OFF'.
11. Close the valves on the connections.
12. Disconnect the high and low pressure connections.
13. Install the dust covers to the connectors.
14. Open the tap at the rear of the station to drain the refrigerant oil.
15. Measure and record the quantity of refrigerant oil recovered from the system.
16. Close the tap at the rear of the station.
17. Evacuation.
18. Remove the dust covers from the high and low pressure connections.
19. Connect the high and low pressure lines to the appropriate connections.
20. Open the valves on the connections.
21. Turn the valves on the station to the correct positions.
22. Turn the process switch to the correct position.
23. Turn the main switch to 'ON'.
24. Allow the station to evacuate the A/C system.



25. **CAUTION:** The system must be evacuated immediately before recharging commences. Delay between evacuation and recharging is not permitted

Recharging

26. Close the valves on the refrigerant station.

27. Close the valve on the oil charger.
28. Disconnect the yellow line from the refrigerant station.
29. Remove the cover from the oil charger.
30. Pour the correct quantity of refrigerant oil into the oil charger.
31. Install the cover to the oil charger.
32. Connect the yellow line to the refrigerant station.
33. Open the valve on the oil charger.
34. Move the pointer on the refrigerant gauge to mark the position of the refrigerant drop.
35. Slowly open the correct valve on the refrigerant to allow the vacuum to pull the refrigerant into the system.
36. Close the valve on the refrigerant station when the correct amount of refrigerant has been drawn into the air conditioning system.
37. Turn the main switch 'OFF'.
38. Close the valves on the connections.
39. Disconnect the high and low pressure connections.

Climate Control System - General Information - Air Conditioning (A/C) System Flushing

General Procedures

1. WARNINGS:



Use extreme care and observe all safety precautions related to the use of refrigerants. Due to refrigerant hazards, always wear safety goggles and non-penetrable gloves when working on or flushing air conditioning (A/C) systems. Failure to follow this instruction may result in personal injury.



When flushing the A/C system, refer to the manufacturers equipment instructions for additional information. Failure to do so may result in system damage or personal injury.



The A/C refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts shop bulk refrigerant at risk of contamination. If the vehicle A/C refrigerant is contaminated, refer the customer to return to the repair facility that performed the last A/C repair. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For additional information, refer to the manufacturers equipment instructions. Failure to follow this instruction may result in personal injury.



Prior to using the A/C flushing equipment for the first time, follow the operating instructions. Failure to follow this instruction may result in personal injury.



CAUTION: Prior to flushing, remove and discard the desiccant sack. Depending on the equipment used, other A/C components may have to be removed prior to flushing. For additional information, refer to the manufacturers equipment instructions before flushing the A/C system.

Recover the refrigerant.

For additional information, refer to [Air conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.

2. Remove the desiccant sack.
For additional information, refer to Section [412-03 Air Conditioning](#).
3. Flush the system. For additional information, refer to the manufacturers equipment instructions.
4. Install new refrigerant lines if blocked with debris.
5. Install a new desiccant sack.
For additional information, refer to Section [412-03 Air Conditioning](#).
6. Add the required amount of oil to the A/C system depending on the repair procedure.
For additional information, refer to [Refrigerant Oil Adding](#) in this section.
7. Evacuate and charge the A/C system.
For additional information, refer to [Air conditioning \(A/C\) System Recovery, Evacuation and Charging](#) in this section.
8. Carry out fluorescent dye leak detection test.

For additional information, refer to [Flourescent Dye Leak Detection](#) in this section.

9. Check the A/C system for correct operation.

Climate Control System - General Information - Contaminated Refrigerant Handling

General Procedures

1. If contaminated refrigerant is detected DO NOT recover the refrigerant into your R-134a OR R-12 recovery/recycling equipment. Take the following actions:
 1. Repeat the test to verify contaminated refrigerant is present.
 2. Advise the customer of the contaminated A/C system and any additional cost to repair the system. The customer may wish to return to the repair facility performing the last A/C repair.
 3. Recover the contaminated refrigerant using suitable recovery only equipment designed for capturing and storing contaminated refrigerant. This equipment must only be used to recover contaminated refrigerant to prevent the spread to other vehicles. As an alternative, contact an A/C repair facility in your area with the proper equipment to perform the repair.
 4. On completion of the recovery of the contaminated refrigerant, it will be necessary to carry out the A/C system flushing procedure. For additional information, refer to [Air Conditioning \(AC\) System Flushing](#) in this section.

Climate Control System - General Information - Electronic Leak Detection

General Procedures



1. **WARNING:** Good ventilation is necessary in the area where A/C leak testing is to be carried out. If the surrounding air is contaminated with refrigerant gas, the leak detector will indicate this gas all the time. Odors from other chemicals such as antifreeze, diesel fuel, disc brake cleaner, or other cleaning solvents can cause the same problem. A fan, even in a well ventilated area, is very helpful in removing small traces of contamination from the air that might affect the leak detector. Failure to follow this instruction may result in personal injury.

Attach an R-134a manifold gauge set or use a UL-approved recovery/recycling device such as an R-134a A/C refrigerant center (which meets SAE Standard J 1991). For additional information, refer to the manufacturers equipment instructions.

- Both gauges should indicate 413-551 kPa (60-80 psi) at 24°C (75°F) with the engine off.
 - If little or no pressure is indicated, carry out the air conditioning (A/C) system recovery, evacuation and charging procedure. For additional information, refer to [Air Conditioning \(AC\) System Recovery, Evacuation and Charging](#) in this section.
2. Use an R134-a Automatic calibration halogen leak detector to leak test the refrigerant system. For additional information, refer to the manufacturers equipment instructions.
 3. If a leak is found, carry out the air conditioning (A/C) system recovery procedure. For additional information, refer to [Air Conditioning \(AC\) System Recovery, Evacuation and Charging](#) in this section.

Climate Control System - General Information - Fluorescent Dye Leak

Detection

General Procedures



1. **WARNING:** Eye protection glasses supplied with the ultraviolet (UV) lamp should be used to protect eyesight from harm.



NOTE: The air conditioning (A/C) system has an R-134a leak trace dye wafer incorporated into the desiccant bag. The exact location of leaks can be pinpointed by the bright yellow/green glow of the tracer dye. Since more than one leak may exist, always inspect each component. If it is necessary to add dye (due to a severe leakage for example) use proprietary tracer dye injection equipment.

Check for leaks using ultraviolet (UV) lamp.

2. Check all components, fittings and lines of the A/C system.
3. Carry out the repair. For additional information, refer to Section [412-03 Air Conditioning](#).
4. After the leak is repaired, remove any traces of leak trace dye with a general purpose oil solvent.
5. Check the A/C system for correct operation.
6. Verify the repair by operating the system for a short time and inspecting with the (UV) lamp.

Climate Control System - General Information - Inspection and Assembly Requirements

General Procedures

1. Check for leaks using ultraviolet (UV) Lamp.
For additional information, refer to [Flourescent Dye Leak Detection](#) in this section.

2. NOTES:



Any time a hose or component connection leak is observed, the component and fitting must be separated, cleaned and a new O-ring fitted and lubricated with air conditioning compressor oil.
For additional information, refer to [Specifications](#) in this section.



When separating A/C joints, cap the open connections immediately. Do not leave open to atmosphere.

O-ring seal surfaces must be free of dirt, lint, burrs and scratches. The O-ring and connector should be lubricated with air conditioning compressor oil.

For additional information, refer to [Specifications](#) in this section.

Climate Control System - General Information - Manifold Gauge Set Connection

General Procedures

1. **WARNINGS:**



Use extreme care and observe all safety precautions related to the use of refrigerants. Failure to follow this instruction may result in personal injury.



For additional information, refer to the manufacturers equipment instructions. Failure to follow this instruction may result in personal injury and system damage.

Install the manifold gauge set. For additional information, refer to the manufacturers equipment instructions.

2. Carry out the repair.
3. Remove the manifold gauge set. For additional information, refer to the manufacturers equipment instructions.
4. Carry out flourescent dye leak detection test.
For additional information, refer to [Flourescent Dye Leak Detection](#) in this section.
5. Check air conditioning (A/C) system for correct operation.

Climate Control System - General Information - Refrigerant Oil Adding TDV6

3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

General Procedures

Check

CAUTIONS:



Collect the refrigerant oil in a clean measuring cylinder.



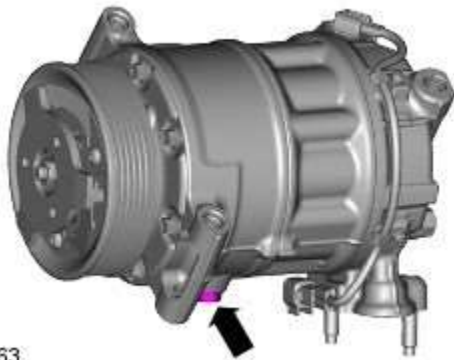
Make sure that all openings are sealed. Use new blanking caps.



Be prepared to collect escaping fluids.



NOTE: Removal steps in this procedure may contain installation details.



E115063

1. NOTES:



This step only needs to be carried out when replacing the A/C compressor.



Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 15 Nm



E115064

2. NOTES:



This step only needs to be carried out when replacing the A/C compressor.



Some variation in the illustrations may occur, but the essential information is always correct.

Rotate the A/C compressor shaft at least 6 to 8 turns when draining the refrigerant oil.

3. CAUTIONS:



The refrigerant oil top-up quantity must not exceed the refrigerant oil fill quantity.



If other A/C components are being renewed in addition to the A/C compressor, there is no need to top up with additional refrigerant oil, apart from filling the compressor.

Top up with the calculated quantity of new refrigerant oil.

Refer to: Specifications (412-00, Specifications).

Adjustment

1. To install, reverse the removal procedure.

Climate Control System - General Information - Refrigerant System Tests

General Procedures

1. WARNINGS:



Use extreme care and observe all safety precautions related to the use of refrigerants. Failure to follow this instruction may result in personal injury.



The A/C refrigerant analyzer must be used before the recovery of any vehicle's A/C refrigerant. Failure to do so puts shop bulk refrigerant at risk of contamination. If the vehicle A/C refrigerant is contaminated, refer the customer to return to the repair facility that carried out the last A/C repair. If the customer wishes to pay the additional cost, use the A/C recovery equipment that is designated for recovering contaminated A/C refrigerant. All contaminated A/C refrigerant must be disposed of as hazardous waste. For all equipment, follow the equipment manufacturers procedures and instructions. Failure to follow this instruction may result in personal injury.



NOTE: Jaguar Land Rover Limited supports the efficient usage, recovery and recycling of the refrigerant used in passenger car air conditioners. Jaguar Land Rover Limited recommends the use of UL-approved recovery/recycling device such as R-134a A/C refrigerant center (which meets SAE Standard J 1991) during any A/C system repair and recharge procedure which requires that the system be evacuated.

Use R-134a A/C Refrigerant Centre to evacuate and recover the A/C system.

- Follow the equipment manufactures procedures and instructions for use of equipment.

Climate Control System - General Information - Air Conditioning (A/C) Compressor Commissioning

General Procedures

Activation



CAUTION: Failure to follow this instruction may result in damage to the component.

1. Set the ignition to the on position, make sure the air conditioning (A/C) is in the off position.
2. Start the engine and allow to run for a minimum of 5 minutes.
3. Set the heater controls to 22°C, with the fan speed set to 75%.
4. Switch on the A/C system.
5. Open all air vents in the dashboard.
6. Run the A/C system for a minimum of 5 minutes, while the engine is still at idle speed.
7. Once this is achieved the compressor is stabilized, with the oil being distributed evenly throughout the system.

Climate Control -

Description	Nm	lb-ft	lb-in
Blower motor control module retaining bolts	1	-	9
Foot duct to cross car beam retaining bolt	5	-	44
Climate control assembly to cross car beam retaining bolts	9	-	80
Climate control module retaining bolts	1	-	9
Defrost vent/register blend door actuator retaining bolts	1	-	9
Evaporator pipe bracket retaining bolts	1	-	9
Evaporator housing retaining bolts	1	-	9
Footwell vent/duct blend door actuator retaining bolt	1	-	9
Heater core housing retaining bolts	2	-	18
Sunload sensor retaining bolt	2	-	18
Evaporator core pipes mounting bracket retaining bolts	1	-	9
Evaporator core pipes to thermostatic expansion valve retaining bolt	5	-	44
Thermostatic expansion valve retaining bolts	3	-	26

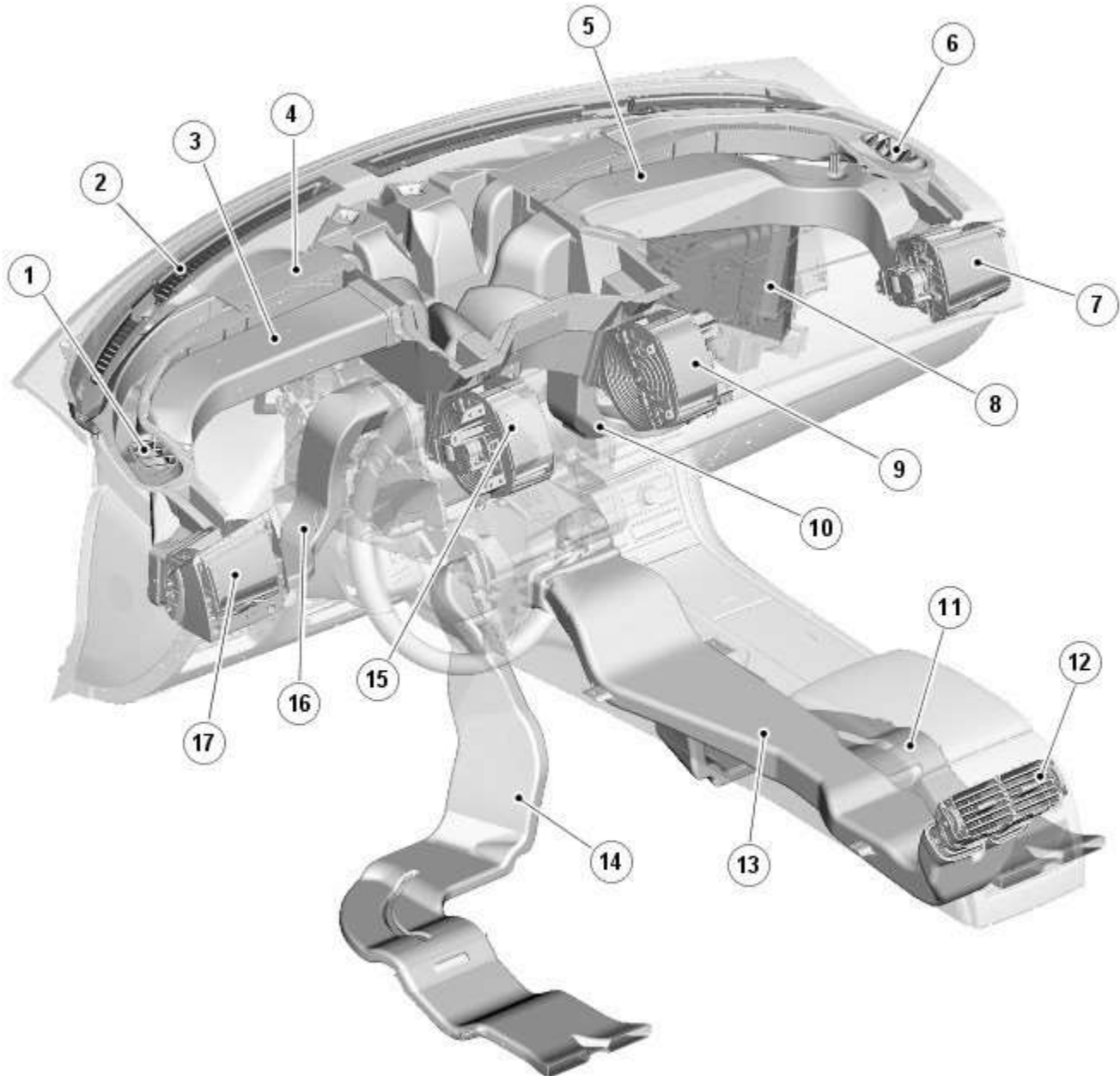
Climate Control - Air Distribution and Filtering - Component Location

Description and Operation



NOTE: LHD (left-hand drive) vehicle shown, RHD (right-hand drive) vehicle similar.

Component Location



E98200

Item	Description
1	LH (left-hand) side window vent
2	Windshield vent
3	Driver's face level duct
4	Windshield/Side window vent duct
5	Front passenger's face level duct
6	RH (right-hand) side window vent
7	Front passenger's face level register

8	Pollen filter
9	RH inner face level register
10	Front passenger's footwell duct
11	RH rear footwell duct
12	Rear face level registers
13	Rear face level duct
14	LH rear footwell duct
15	LH inner face level register
16	Driver's footwell duct
17	Driver's face level register

Climate Control - Air Distribution and Filtering - Overview

Description and Operation

Overview

The air distribution and filtering system controls the distribution and quality of air supplied to the passenger compartment. The system comprises of a pollen filter and a number of ducts, vents and registers.

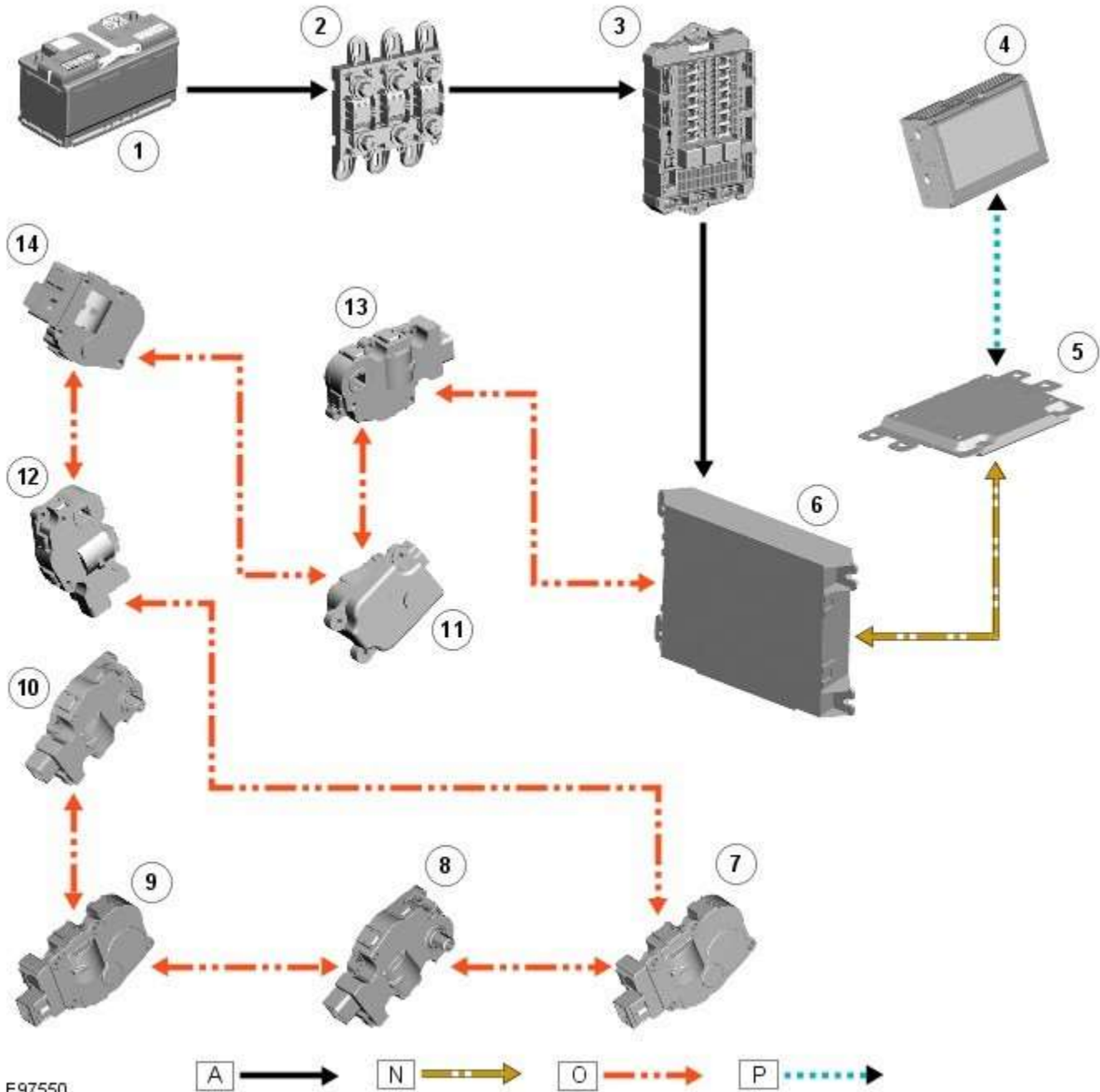
Climate Control - Air Distribution and Filtering - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **N** = Medium speed CAN (controller area network) bus; **O** = LIN (local interconnect network) bus; **P** = Media orientated system transport (MOST) ring.



E97550

Item	Description
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	Touch screen display (TSD)
5	Information and entertainment module

6	ATC (automatic temperature control) module
7	RH (right-hand) outer face level register
8	RH inner face level register
9	LH (left-hand) inner face level register
10	LH outer face level register
11	Face/Feet distribution stepper motor
12	RH temperature blend stepper motor
13	Windshield (defrost) distribution stepper motor
14	LH temperature blend stepper motor

System Operation

Face Level Registers

Operation of the face level registers is controlled by the [ATC](#) module, using [LIN](#) bus messages to the integral stepper motors. The four registers operate together in both the opening and closing phases.

The face level registers can be selected to run in one of two modes; 'automatic' or 'always open'. The mode is selected on the climate control screen of the TSD.

Refer to: [Navigation System \(415-01 Information and Entertainment System, Description and Operation\)](#).

In the automatic mode, operation of the face level registers is synchronized with the engine START/STOP button. When the engine starts the [ATC](#) module opens the registers. When the engine stops, the [ATC](#) module closes the registers.

If a face level register is fouled, when it receives an open or close request, the register concerned makes a number of attempts to reach the requested position. If the register still does not move, it is left in the fouled position. The remaining registers will continue to open and close as normal.

The automatic mode is disabled when the climate control system is off. The [ATC](#) module closes the registers if they are open in the automatic mode and the climate control system is selected off.

Diagnostics

If a fault occurs with the face level registers, a [DTC \(diagnostic trouble code\)](#) is stored in the [ATC](#) module. The [DTC](#) can be read using the Jaguar approved diagnostic system. The Jaguar approved diagnostic system can also initiate a self test routine to check the operation of the face level registers.

Refer to: [Climate Control System \(412-00 Climate Control System - General Information, Diagnosis and Testing\)](#).

Component Description

Air Ducts

The air ducts distribute air from the heater assembly to the registers and vents in the instrument panel and the center floor console. Air ducts also direct air from the heater assembly into the front and rear footwells.

Registers and Vents

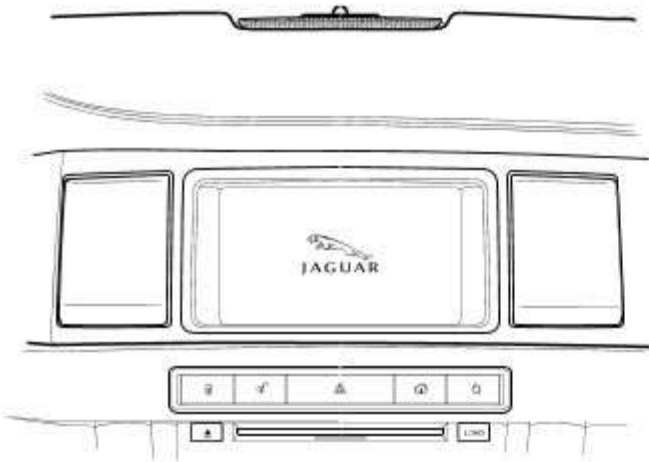
The registers control the flow and direction of air from the air ducts. The instrument panel contains four face level registers; one at each end and two mounted centrally. For the rear seat occupants, two registers are installed in the rear face of the center floor console. All of the registers incorporate vertical and horizontal directional vane adjustment and full air flow adjustment down to zero.

The four face level registers in the instrument panel each contain an integral stepper motor. The stepper motors enable the registers to rotate between the open and closed positions. In the open position, the registers have normal appearance and functionality. In the closed position, the registers present a smooth surface flush with the surrounding instrument panel.

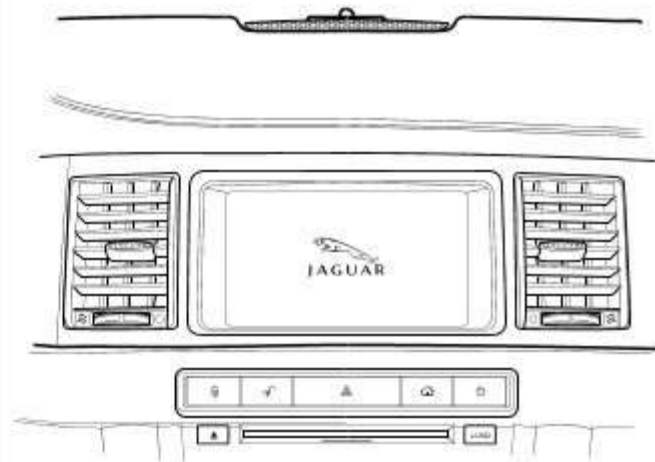
The vents are fixed outlets. There are four vents in the upper surface of the instrument panel; one in each end to direct air onto the side windows and two along the front edge to direct air onto the windshield.

Central Face Level Registers

A



B



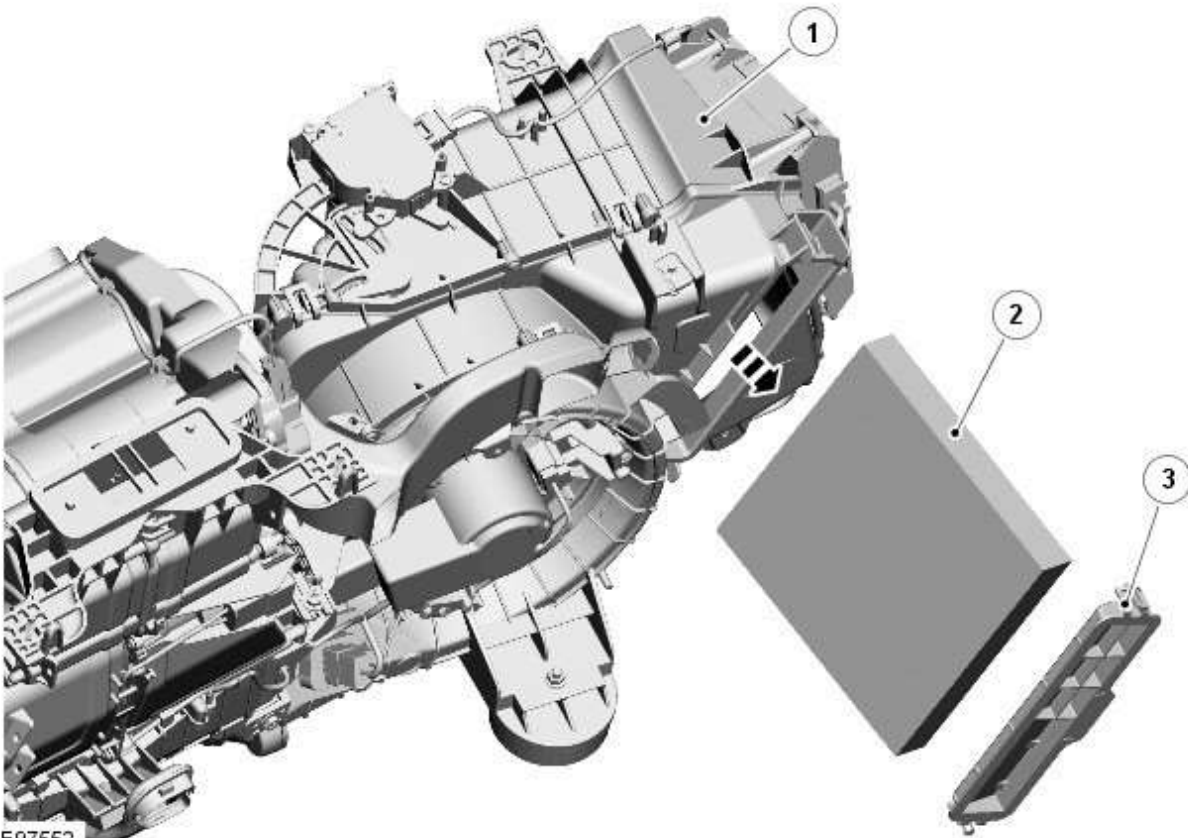
E97551

Item	Description
A	Registers closed
B	Registers open

Pollen Filter



NOTE: LHD (left-hand drive) vehicle shown, RHD (right-hand drive) vehicle similar.



E97552

Item	Description
1	Air inlet duct
2	Pollen filter
3	Cover

The pollen filter removes odors and fine particles from fresh air entering the passenger compartment. The pollen filter is located in the air inlet duct, in the inlet to the blower. A cover on the underside of the air inlet duct provides access to the pollen filter for servicing.

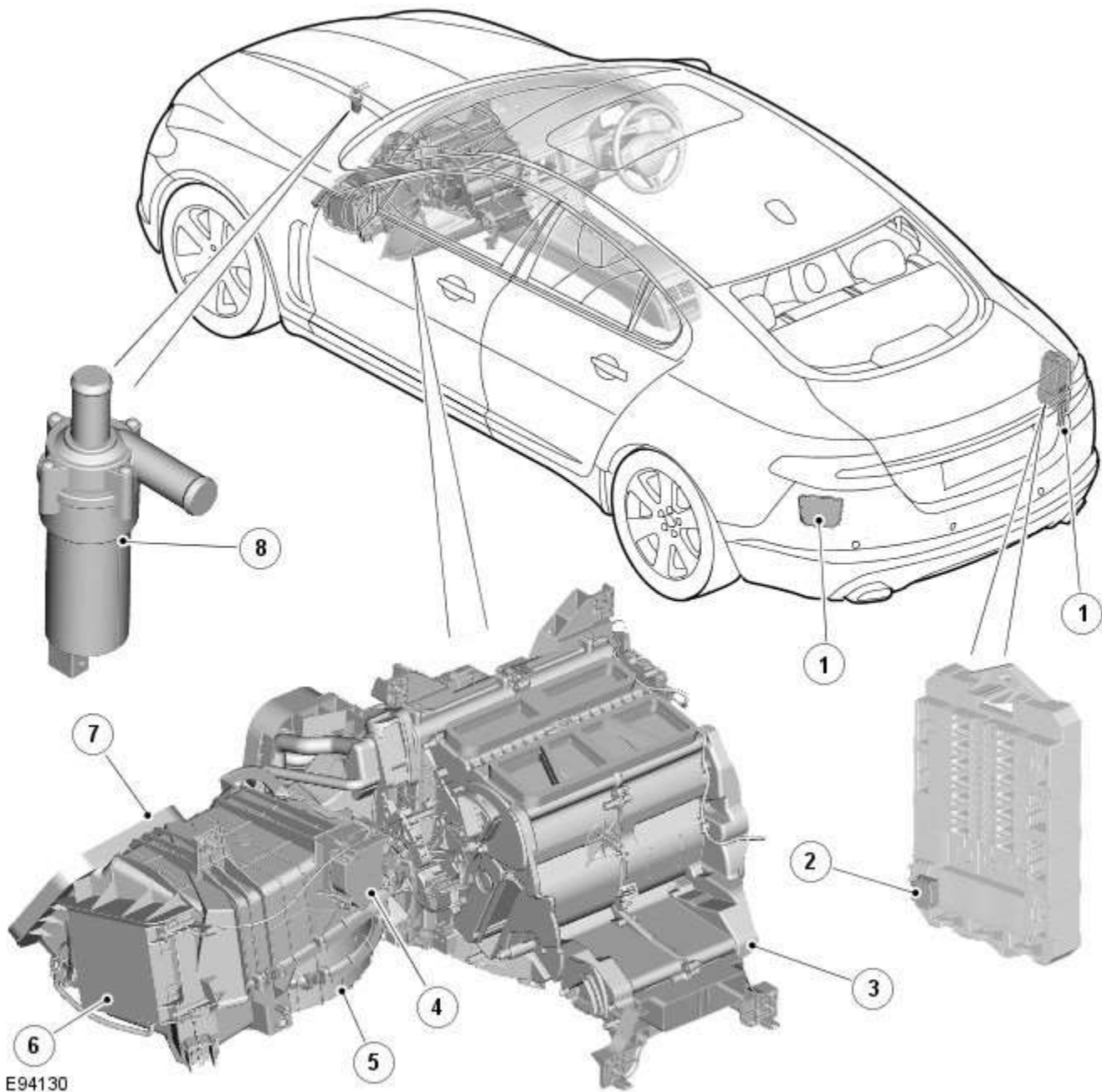
Climate Control - Heating and Ventilation - Component Location

Description and Operation



NOTE: RHD (right-hand drive) vehicle shown, LHD (left-hand drive) vehicle similar.

Component Location



E94130

Item	Description
1	Ventilation outlet
2	Blower relay (on RJB (rear junction box))
3	Heater assembly
4	Blower control module
5	Blower
6	ATC (automatic temperature control) module
7	Air inlet duct
8	Auxiliary coolant pump
Comments:	
All except 3.0L vehicles; 5.0L version shown, 3.0L diesel version similar.	

Climate Control - Heating and Ventilation - Overview

Description and Operation

Overview

The heating and ventilation system controls the temperature and flow of air supplied to the passenger compartment. The system is a dual zone automatic system, which can provide different temperature settings for the [LH \(left-hand\)](#) and [RH \(right-hand\)](#) sides of the passenger compartment.

5	Touch screen display (TSD)
6	Integrated control panel
7	Information control module
8	ATC (automatic temperature control) module
9	Face/Feet distribution stepper motor
10	RH (right-hand) temperature blend stepper motor
11	LH (left-hand) temperature blend stepper motor
12	Windshield (defrost) distribution stepper motor
13	Blower control module
14	RJB (rear junction box)
15	Blower

System Operation

Operation of the heating and ventilation system is controlled by the [ATC](#) module. Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

The system can be operated in automatic or manual mode, with temperature settings selected using the switches on the integrated control panel.

When the engine is running, coolant is constantly circulated through the heater core by the engine coolant pump and the auxiliary coolant pump. Where fitted, the auxiliary coolant pump is energized by the [CJB](#) on receipt of medium speed [CAN](#)_bus signals from the [ATC](#) module. The [CJB](#) broadcasts auxiliary coolant pump status over the medium speed [CAN](#)_bus for use by other vehicle systems.

The blower is supplied with power by the blower relay on the [RJB](#) and connected to ground via the blower control module. The blower control module regulates the voltage across the blower motor to control blower speed. The voltage set by the blower control module is controlled by a [PWM \(pulse width modulation\)](#) signal from the [ATC](#) module. The [ATC](#) module uses a feedback signal from the blower control module to monitor blower speed. Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

Component Description

Heater Assembly

The heater assembly controls the temperature and flow of air supplied to the air distribution ducts. The heater assembly is mounted on the vehicle centerline, between the instrument panel and the engine bulkhead.

The heater assembly consists of a casing that contains an [A/C \(air conditioning\)](#) evaporator, a heater core, two air distribution control doors and two temperature blend control doors. On 2.7L diesel vehicles, the heater assembly also contains an electric booster heater.

Refer to: [Electric Booster Heater](#) (412-02 Auxiliary Climate Control, Description and Operation).

Mounted on the heater casing are four stepper motors. Each of the stepper motors is connected to either an air distribution control door or a temperature blend control door.

The [A/C](#) evaporator is part of the [A/C](#) system. Refer to: [Air Conditioning](#) (412-01 Climate Control, Description and Operation).

The heater core provides the heat source to warm the air supplied to the passenger compartment. The heater core is an aluminum two pass, fin and tube heat exchanger, and is installed across the width of the heater housing. Two aluminum tubes attached to the heater core extend through the engine bulkhead and connect to the engine cooling system. For additional information, refer to:

Engine Cooling (303-03A, Description and Operation),
[Engine Cooling](#) (303-03B Engine Cooling - V6 3.0L Petrol, Description and Operation),
 Engine Cooling (303-03C, Description and Operation).

Air Inlet Duct

The air inlet duct connects the fresh air inlet in the engine bulkhead to the heater assembly. The air inlet duct is installed behind the instrument panel on the passenger side.

The air inlet duct consists of a casing that contains a pollen filter, an air inlet door, a blower and a blower control module. A recirculation air inlet is incorporated into the casing. A servo motor is mounted on the casing and connected to the air inlet door, to allow selection between fresh and recirculated air.

Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

The pollen filter is part of the air distribution and filtering system. Refer to: [Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation).

The blower regulates the volume of air flowing through the air inlet duct to the heater assembly. The blower consists of an open hub, centrifugal fan and an electric motor.

The blower control module regulates the power supply to the blower motor. The blower control module is installed in the air

inlet duct downstream of the blower, where any heat generated during operation is dissipated by the air flow.

Auxiliary Coolant Pump

On all vehicles except 3.0L, an auxiliary coolant pump is installed on the rear right side of the radiator housing, in the return line from the heater core. The auxiliary coolant pump is an electric pump that boosts the flow of coolant through the heater core.

Ventilation Outlets

The ventilation outlets allow the free flow of air through the passenger compartment. The outlets are installed in the LH and RH rear quarter panels, below the rear lamps. Each ventilation outlet consists of a grille covered by a soft rubber flap, and is effectively a non-return valve. The flaps open and close automatically depending on the pressure differential between the air inside and outside the vehicle.

Climate Control - Air Conditioning - Component Location

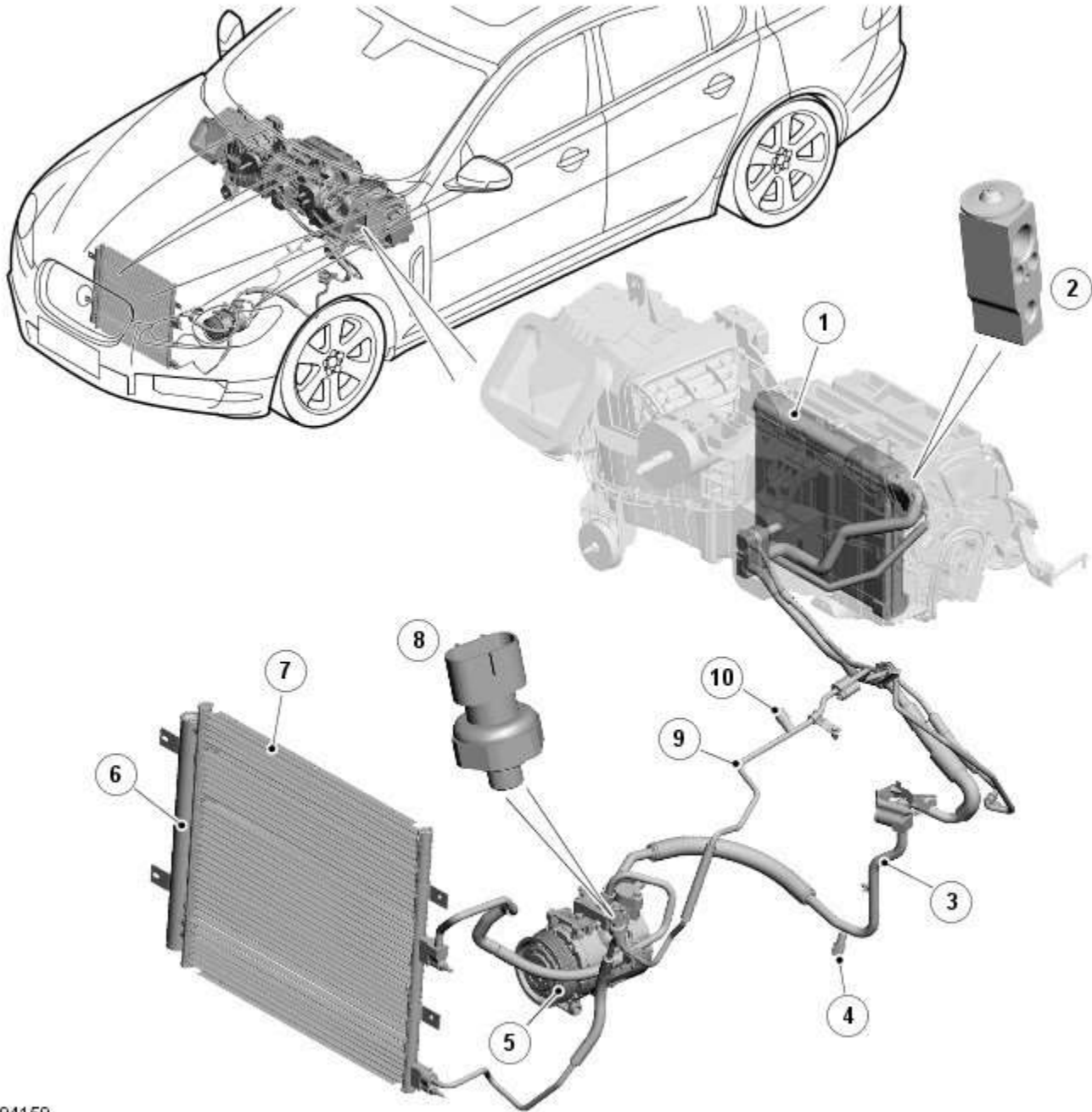
Published: 11-May-2011

Description and Operation



NOTE: LHD (left-hand drive) .SL vehicle shown, other vehicles similar.

Component Location



E94159

Item	Description
1	Evaporator
2	Thermostatic expansion valve
3	Low pressure line
4	Low pressure servicing connection
5	A/C (air conditioning) compressor
6	Receiver/Drier
7	Condenser

8	Refrigerant pressure sensor
9	High pressure line
10	High pressure servicing connection

Climate Control - Air Conditioning - Overview

Description and Operation

Overview

The [A/C \(air conditioning\)](#) system transfers heat from the passenger compartment to the outside atmosphere to provide the heater assembly with dehumidified cold air. It is a sealed, closed loop system filled with a charge weight of R134a refrigerant as the heat transfer medium. Oil is added to the refrigerant to lubricate the internal components of the [A/C](#) compressor.

Climate Control - Air Conditioning - System Operation and Component Description

Description and Operation

System Operation

General

To accomplish the transfer of heat, refrigerant is circulated around a sealed system, where it passes through two pressure/temperature regimes. In each of the regimes the refrigerant changes state, during which process maximum heat absorption or dissipation occurs.

The low pressure/temperature regime is from the thermostatic expansion valve, through the evaporator to the compressor. The refrigerant decreases in pressure and temperature at the thermostatic expansion valve, then changes state from a liquid to a vapor in the evaporator to absorb heat.

The high pressure/temperature regime is from the compressor, through the condenser and receiver drier assembly to the thermostatic expansion valve. The refrigerant increases in pressure and temperature as it passes through the compressor, then releases heat and changes state from a vapor to a liquid in the condenser.

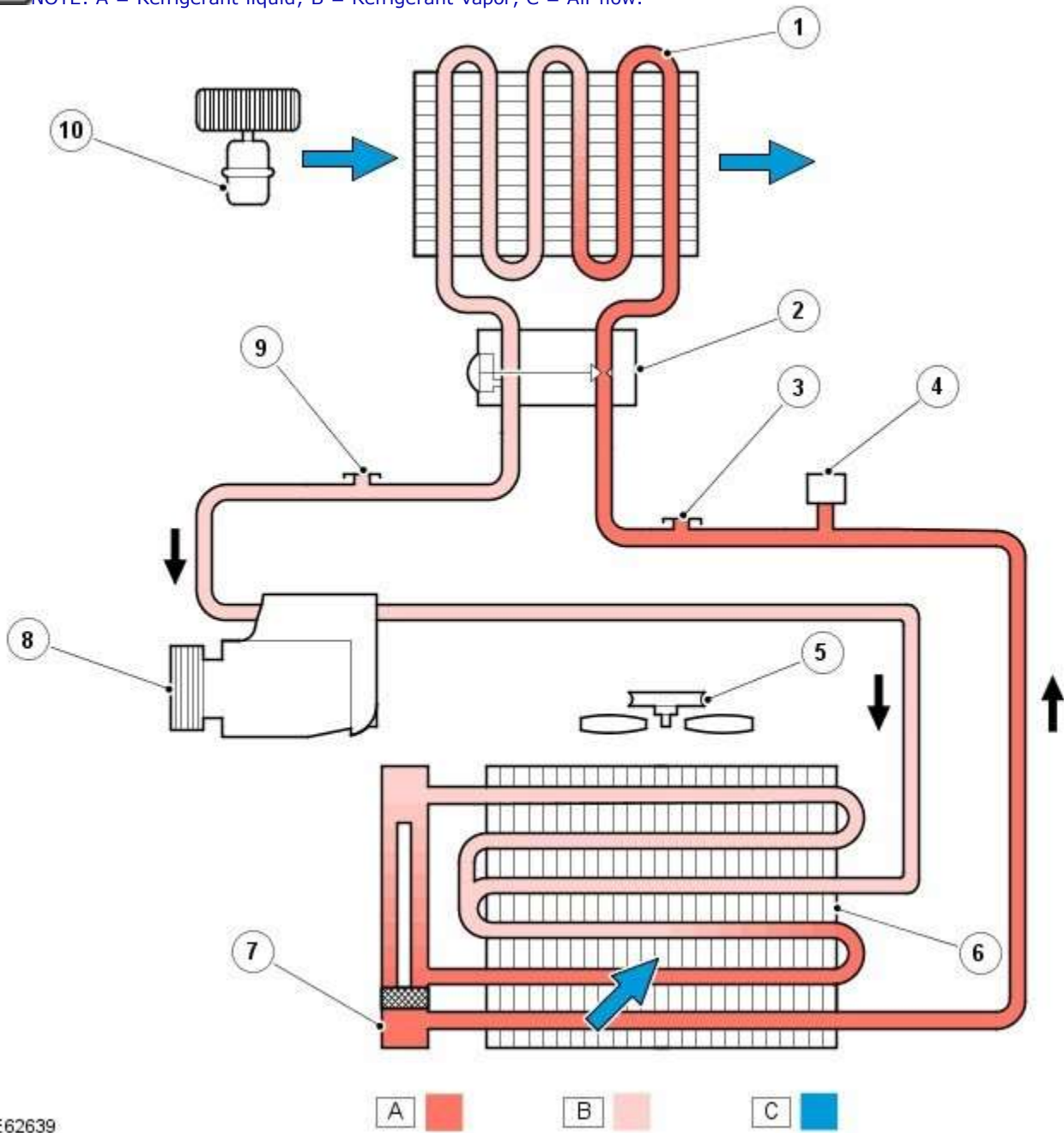
Operation of the [A/C \(air conditioning\)](#) system is controlled by the [ATC \(automatic temperature control\)](#) module. Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

The [A/C](#) system works in conjunction with:

- The air distribution and filtering system.
Refer to: [Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation).
- The heating and ventilation system.
Refer to: [Heating and Ventilation](#) (412-01 Climate Control, Description and Operation).

A/C System Flow Diagram

△ NOTE: A = Refrigerant liquid; B = Refrigerant vapor; C = Air flow.

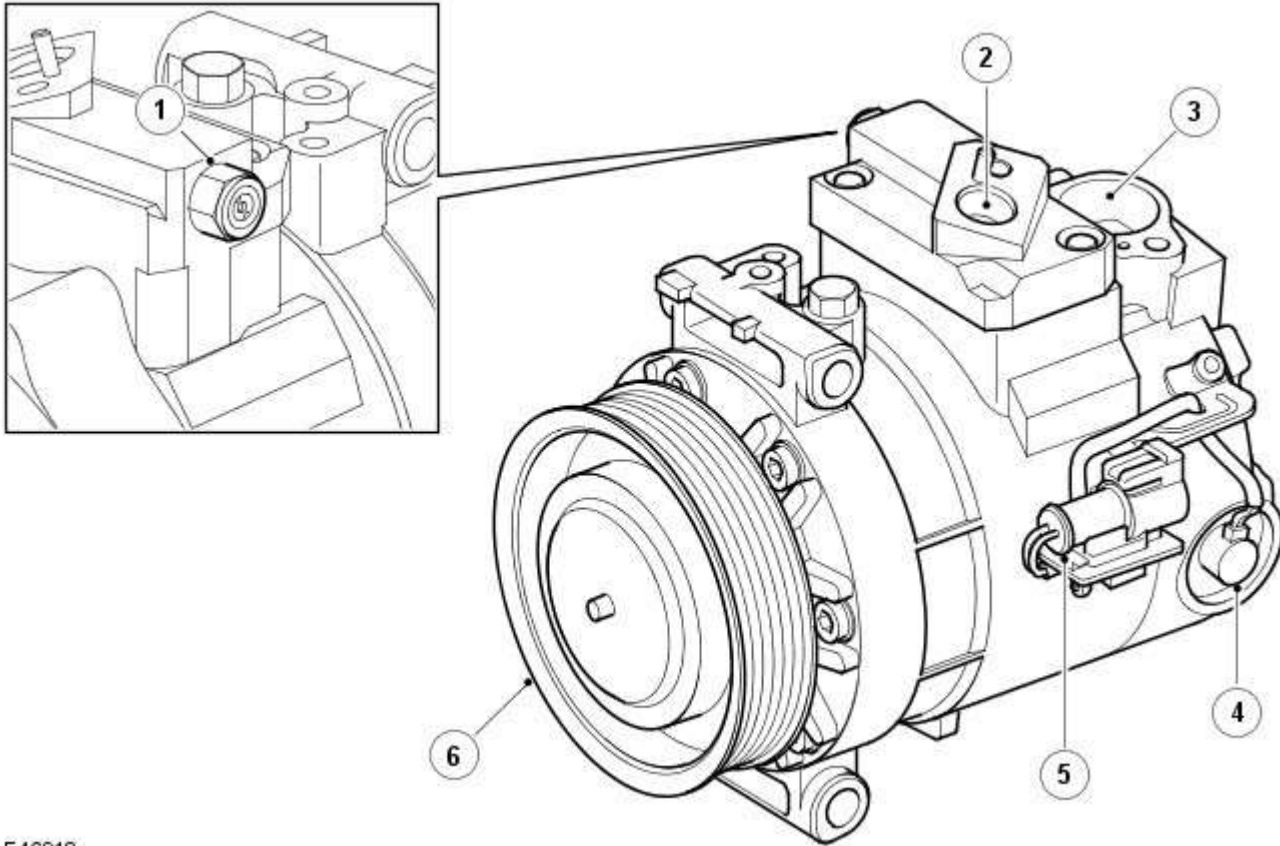


E62639

Item	Description
1	Evaporator
2	Thermostatic expansion valve
3	High pressure servicing connection
4	Refrigerant pressure sensor
5	Engine cooling fan
6	Condenser
7	Receiver/Drier
8	A/C compressor
9	Low pressure servicing connection
10	Blower

Component Description

A/C Compressor



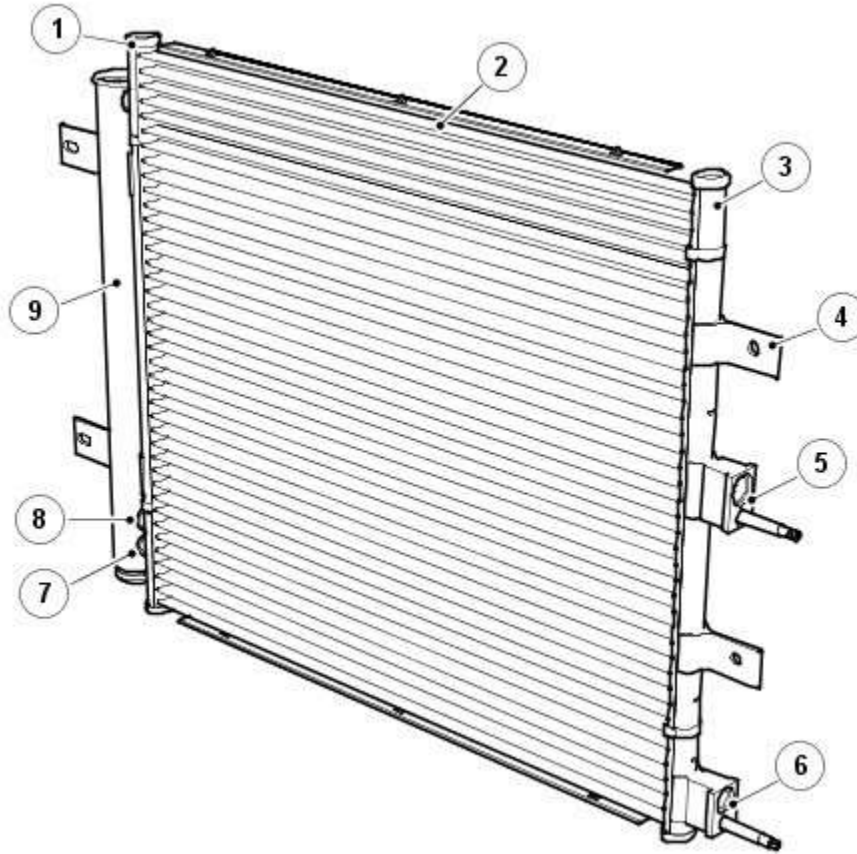
E46918

Item	Description
1	Pressure relief valve
2	Outlet port
3	Inlet port
4	Solenoid valve
5	Electrical connector
6	Pulley

The [A/C](#) compressor circulates refrigerant around the system by compressing low pressure, low temperature vapor from the evaporator and discharging the resultant high pressure, high temperature vapor to the condenser.

The [A/C](#) compressor is a permanently engaged variable displacement unit which is driven by the engine accessory drive belt. To protect the system from excessive pressure, a pressure relief valve is installed in the outlet side of the [A/C](#) compressor. The pressure relief valve vents excess pressure into the engine compartment.

Condenser



E72963

Item	Description
1	RH (right-hand) end tank
2	Condenser core
3	LH (left-hand) end tank
4	Mounting brackets (4 off)
5	High pressure compressor discharge line connector block
6	High pressure liquid outlet line connector block
7	Receiver/Drier outlet pipe
8	Receiver/Drier inlet pipe
9	Receiver/Drier

The condenser transfers heat from the refrigerant to the surrounding air to convert the high pressure vapor from the compressor into a liquid. The condenser is installed immediately in front of the radiator. Two brackets on each end tank attach the condenser to the end tanks of the radiator.

The condenser is classified as a sub-cooling condenser and consists of a fin and tube heat exchanger core installed between two end tanks. Divisions in the end tanks separate the heat exchanger into a four pass upper (condenser) section and a two pass lower (sub-cooler) section.

The [LH](#) end tank provides the connections to the high pressure line from the [A/C](#) compressor and the high pressure liquid line to the evaporator.

The [RH](#) end tank provides the connections to the receiver drier.

Receiver Drier

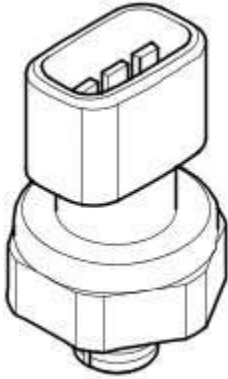
The receiver drier is integrated into the [RH](#) end tank of the condenser to remove solid impurities and moisture from the refrigerant. It also provides a reservoir for liquid refrigerant to accommodate changes of heat load at the evaporator.



NOTE: The receiver drier is part of the condenser assembly and is not serviceable separately.

Refrigerant entering the receiver drier passes through a filter and a desiccant pack, then collects in the base of the unit before flowing through the outlet pipe back to the condenser.

Refrigerant Pressure Sensor

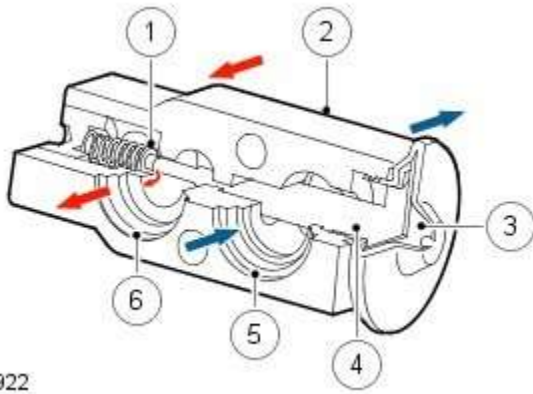


E43581

The refrigerant pressure sensor is located in the high pressure/temperature refrigerant line between the condenser and the thermostatic expansion valve.

Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

Thermostatic Expansion Valve



E46922

Item	Description
1	Metering valve
2	Housing
3	Diaphragm
4	Temperature sensor
5	Outlet passage from evaporator
6	Inlet passage to evaporator

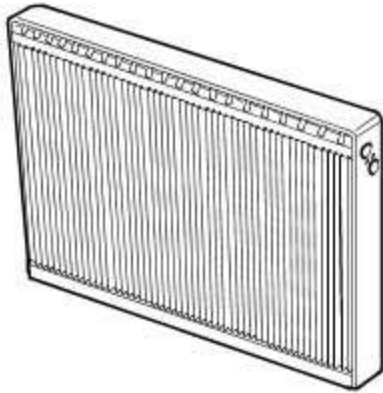
The thermostatic expansion valve meters the flow of refrigerant into the evaporator, to match the refrigerant flow with the heat load of the air passing through the evaporator.

The thermostatic expansion valve is a block type valve located behind the heater assembly, and attached to the inlet and outlet ports of the evaporator. The thermostatic expansion valve consists of an aluminium housing containing inlet and outlet passages. A ball and spring metering valve is installed in the inlet passage and a temperature sensor is installed in the outlet passage. The temperature sensor consists of a temperature sensitive tube connected to a diaphragm. The bottom end of the temperature sensitive tube acts on the ball of the metering valve. Pressure on top of the diaphragm is controlled by the evaporator outlet temperature conducted through the temperature sensitive tube. The bottom of the diaphragm senses evaporator outlet pressure.

Liquid refrigerant flows through the metering valve into the evaporator. The restriction across the metering valve reduces the pressure and temperature of the refrigerant. The restriction also changes the liquid stream of refrigerant into a fine spray, to improve the evaporation process. As the refrigerant passes through the evaporator, it absorbs heat from the air flowing through the evaporator. The increase in temperature causes the refrigerant to vaporise and increase in pressure.

The temperature and pressure of the refrigerant leaving the evaporator acts on the diaphragm and temperature sensitive tube, which regulate the metering valve opening and so control the volume of refrigerant flowing through the evaporator. The warmer the air flowing through the evaporator, the more heat available to evaporate refrigerant and thus the greater volume of refrigerant allowed through the metering valve.

Evaporator



E46923

The evaporator is installed in the heater assembly, between the blower and the heater matrix, to absorb heat from the exterior or recirculated air.

Most of the moisture in the air passing through the evaporator condenses into water, which drains out of the vehicle by passing through a drain tube to the underside of the vehicle.

Refrigerant Lines

To maintain similar flow velocities around the [A/C](#) system, the diameter of the refrigerant lines varies to suit the two pressure/temperature regimes. Larger diameter pipes are installed in the low pressure/temperature regime and smaller diameter pipes are installed in the high pressure/temperature regime.

Low and high pressure charging connections are incorporated into the refrigerant lines for system servicing.

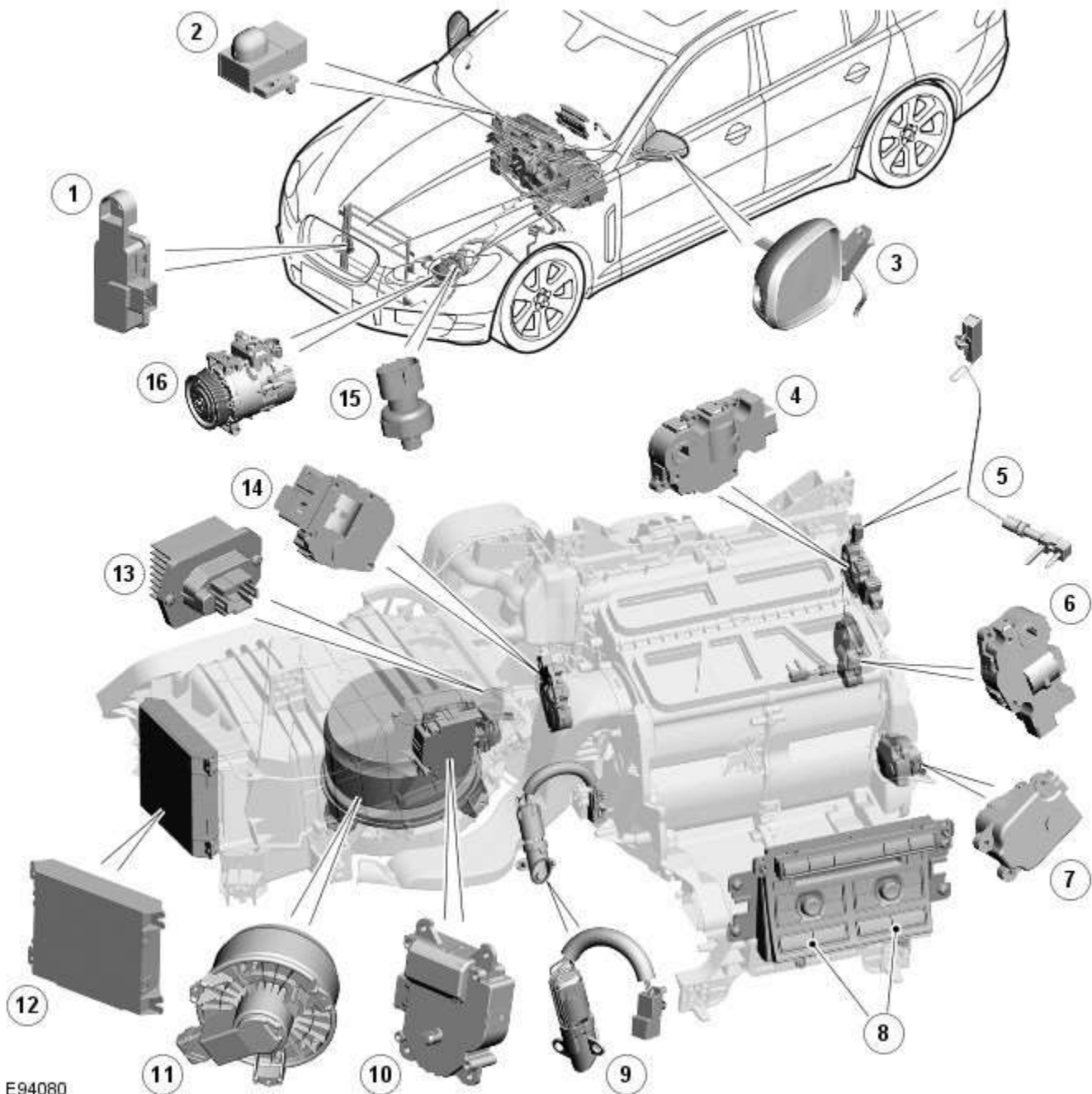
Climate Control - Control Components - Component Location

Description and Operation



NOTE: RHD (right-hand drive) vehicle shown, LHD (left-hand drive) vehicle similar.

Component Location



E94080

Item	Description
1	Pollution sensor Comments: where fitted
2	Sunload sensor
3	Ambient air temperature sensor
4	Windshield (Defrost) distribution stepper motor
5	Evaporator temperature sensor

6	RH (right-hand) temperature blend stepper motor
7	LH (left-hand) temperature blend stepper motor
8	Control switches
9	Humidity and temperature sensor
10	Air inlet servo motor
11	Blower
12	ATC (automatic temperature control) module
13	Blower control module
14	Face/Feet distribution stepper motor
15	Refrigerant pressure sensor
16	A/C (air conditioning) compressor solenoid valve

Climate Control - Control Components - Overview

Description and Operation

Overview

The climate control system is controlled by the [ATC \(automatic temperature control\)](#) module. It controls the heating and ventilation system and the [A/C \(air conditioning\)](#) system to regulate the temperature, volume and distribution of air into the passenger compartment. The system is a fully automatic dual zone system capable of maintaining individual temperature levels selected for the [LH \(left-hand\)](#) and [RH \(right-hand\)](#) sides of the passenger compartment, up to a maximum differential of approximately 3 °C (5.4 °F). Manual overrides for the system include inlet air source, blower speed and air distribution. These selections can be made using either the soft switches on the home and climate control screens of the touch screen display (TSD), or the switches on the integrated control panel.

The [ATC](#) module also controls:

- The rear window heater.
- The windshield heater (where fitted).
- The exterior mirror heaters.
- The seat heaters (where fitted).
- The steering wheel heater.

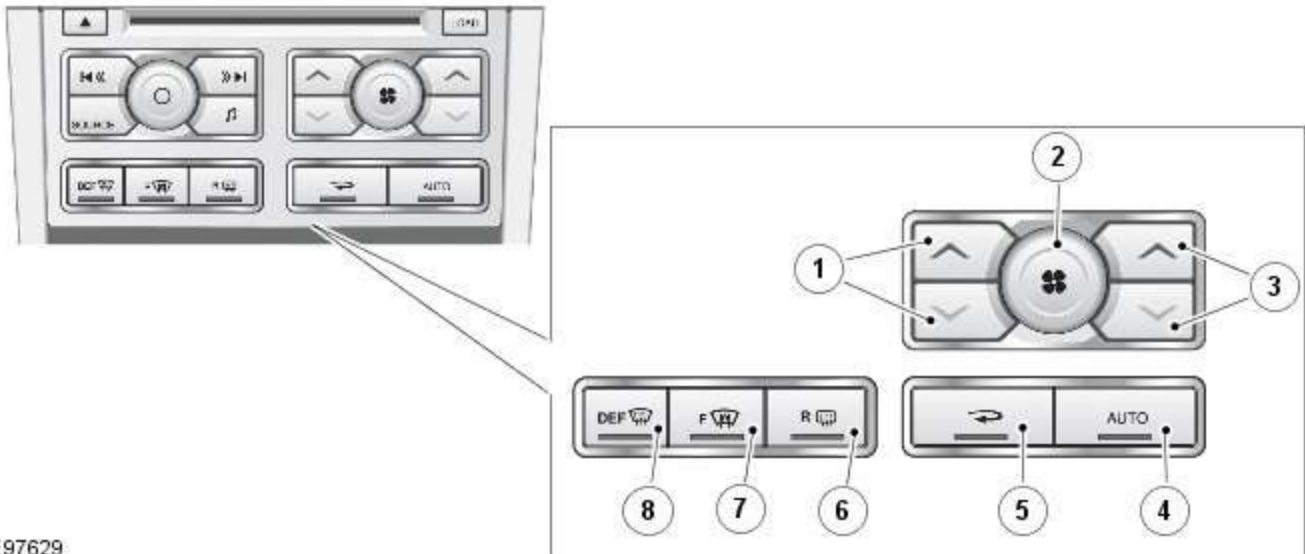
TSD Home Screen



TSD Climate Control Screen



Integrated Control Panel



E97629

Item	Description
1	LH temperature switches
2	Blower switch
3	RH temperature switches
4	Automatic climate control switch
5	Recirculation switch
6	Rear window heater switch
7	Windshield heater switch
Comments: where fitted	
8	Programmed defrost switch

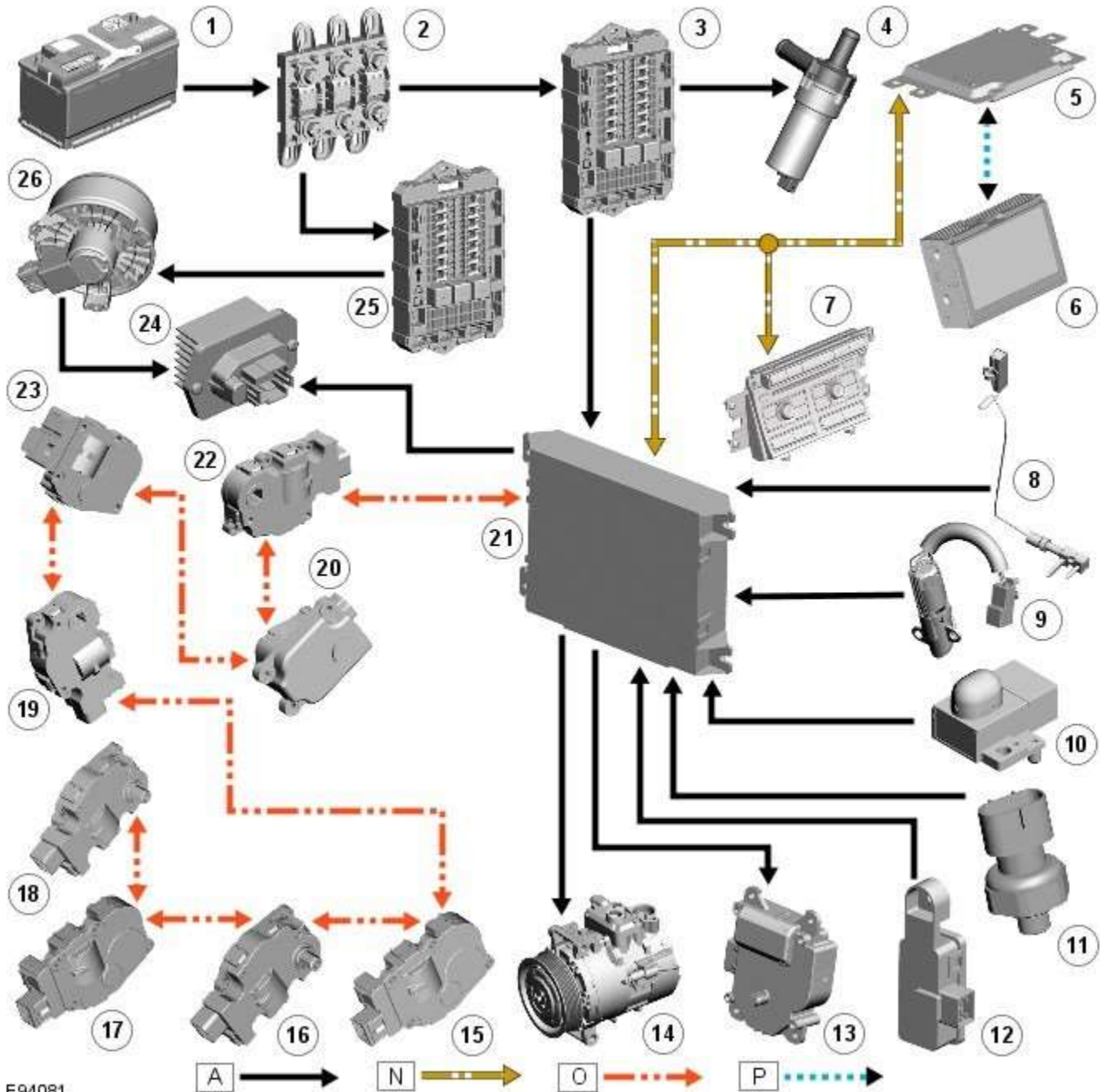
Climate Control - Control Components - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **N** = Medium speed CAN (controller area network) bus; **O** = LIN (local interconnect network) bus; **P** = Media orientated system transport (MOST) ring.



E94081

Item	Description
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	Auxiliary coolant pump
Comments:	
All except 3.0L vehicles; 5.0L version shown, 3.0L diesel version similar.	

5	Information and entertainment module
6	TSD (touch screen display)
7	Integrated control panel
8	Evaporator temperature sensor
9	Humidity and temperature sensor
10	Sunload sensor
11	Refrigerant pressure sensor
12	Pollution sensor Comments: where fitted
13	Air inlet servo motor
14	A/C (air conditioning) compressor solenoid valve
15	RH (right-hand) outer face level register
16	RH inner face level register
17	LH (left-hand) inner face level register
18	LH outer face level register
19	RH temperature blend stepper motor
20	Face/Feet distribution stepper motor
21	ATC (automatic temperature control) module
22	LH temperature blend stepper motor
23	Windshield (Defrost) stepper motor
24	Blower control module
25	RJB (rear junction box)
26	Blower

System Operation

Air Inlet Control

The source of inlet air is automatically controlled unless overridden by pressing the air recirculation switch on the integrated control panel. During automatic control, the [ATC](#) module determines the required position of the recirculation door from its 'comfort' algorithm and, if fitted, the pollution sensor.

The [ATC](#) module provides analogue signals to the air inlet servo motor along a hardwired connection. A potentiometer in the motor supplies the [ATC](#) module with a position feedback signal for closed loop control.

Air Temperature Control

Cooled air from the evaporator enters the heater assembly, where temperature blend doors direct a proportion of the air through the heater core to produce the required output air temperature.

The two temperature blend doors operate independently to enable individual temperature settings for the left and right sides of the passenger compartment. The temperature blend doors are operated by stepper motors, which are controlled by the [ATC](#) module using [LIN](#) bus messages.

The [ATC](#) module calculates the temperature blend stepper motor positions required to achieve the selected temperature and compares it against the current position. If there is any difference, the [ATC](#) module signals the stepper motors to adopt the new position.

Air temperature is controlled automatically unless maximum heating (HI) or maximum cooling (LO) is selected. When maximum heating or cooling is selected, a 'comfort' algorithm in the [ATC](#) module adopts an appropriate strategy for air distribution, blower speed, and air source.

Temperature control in one side of the passenger compartment can be compromised by the other side of the passenger compartment being set to a high level of heating or cooling. True maximum heating or cooling (displayed as 'HI' or 'LO' on the TSD) can only be selected for the driver's side of the passenger compartment. If 'HI' or 'LO' is selected for the driver's side, the temperature for the front passenger's side is automatically set to match the driver's side.

If [A/C](#) is selected off in the automatic mode, no cooling of the inlet air will take place. The minimum output air temperature from the system will be ambient air temperature plus any heat pick up in the air inlet path.

If the Temp. sync. soft button on the TSD is pressed, the [ATC](#) module synchronizes the temperature of the passenger side of the passenger compartment with the driver's side.

Blower Control

When the system is in the automatic mode, the [ATC](#) module determines the blower speed required from a comfort algorithm. When the system is in the manual mode, the [ATC](#) module operates the blower at the speed selected using either the rotary

control switch on the integrated control panel or the + and - soft buttons on the touch screen display (TSD). The [ATC](#) module also adjusts blower speed to compensate for the ram effect on inlet air produced by forward movement of the vehicle. As vehicle speed and ram effect increases, blower motor speed is reduced, and vice versa.

Air Distribution Control

Two air distribution doors are used to direct air into the passenger compartment. The doors are operated by stepper motors, which are controlled by the [ATC](#) module using [LIN](#) bus messages.

When the [A/C](#) system is in automatic mode, the [ATC](#) module automatically controls air distribution into the passenger compartment in line with its 'comfort' algorithm. Automatic control is overridden if any of the TSD air distribution soft buttons are selected. Air distribution in the passenger compartment will remain as selected until the 'Auto' switch is pressed or a different manual selection is made.

A/C Compressor Control

When [A/C](#) is selected the [ATC](#) module maintains the evaporator at an operating temperature that varies with the passenger compartment cooling requirements. If the requirement for cooled air decreases, the [ATC](#) module raises the evaporator operating temperature by reducing the flow of refrigerant provided by the [A/C](#) compressor. The [ATC](#) module closely controls the rate of temperature increase to avoid introducing moisture into the passenger compartment.

If the requirement for cooled air increases, the [ATC](#) module lowers the evaporator operating temperature by increasing the flow of refrigerant provided by the [A/C](#) compressor.

When [A/C](#) is off, the compressor current signal supplied by the [ATC](#) module holds the [A/C](#) compressor solenoid valve in the minimum flow position, effectively switching off the [A/C](#) function.

The [ATC](#) module incorporates limits for the operating pressure of the refrigerant system. If the system approaches the high pressure limit, the compressor current signal is progressively reduced until the system pressure decreases. If the system falls below the low pressure limit, the compressor current signal is held at its lowest setting so that the [A/C](#) compressor is maintained at its minimum stroke. This avoids depletion of the lubricant from the [A/C](#) compressor.

A/C Compressor Torque

The [ATC](#) module transmits refrigerant pressure and [A/C](#) compressor current values to the [ECM](#) (engine control module) over the medium speed then high speed [CAN](#) bus, using the [CJB](#) as a gateway. The [ECM](#) uses these values to calculate the torque being used to drive the [A/C](#) compressor. The [ECM](#) compares the calculated value with its allowable value and if necessary forces the [ATC](#) module to inhibit the [A/C](#) compressor by transmitting the 'ACClutchInhibit' [CAN](#) message. This forces the [ATC](#) module to reduce the drive current to the [A/C](#) compressor solenoid valve, which reduces refrigerant flow. This in turn reduces the torque required to drive the [A/C](#) compressor.

By reducing the maximum [A/C](#) compressor torque, the [ECM](#) is able to reduce the load on the engine when it needs to maintain vehicle performance or cooling system integrity.

Cooling Fan Control

The [ATC](#) module determines the amount of condenser cooling required from the refrigerant pressure sensor, since there is a direct relationship between the temperature and pressure of the refrigerant. The cooling requirement is broadcast to the [ECM](#) on the medium speed [CAN](#) bus. The [ECM](#) then controls the temperature of the condenser using the cooling fan.

Programmed Defrost

The programmed defrost DEF switch is located on the integrated control panel. When the switch is pressed, the [ATC](#) module instigates the programmed defrost function. When selected, the [ATC](#) module configures the system as follows:

- Automatic mode off.
- [A/C](#) on.
- Selected temperature unchanged.
- Air inlet set to fresh air.
- Air distribution set to windshield.
- Blower speed set to level 6.
- Windshield heater (where fitted) and rear window heater on.

The programmed defrost function can be cancelled by one of the following:

- Selecting any air distribution switch on the TSD.
- Pressing the AUTO switch on the integrated control panel.
- A second press of the DEF button.
- Switching the ignition OFF.

The blower speed can be adjusted without terminating the programmed defrost function.

Rear Window Heater

Rear window heater operation is only enabled when the engine is running. The [ATC](#) module controls operation of the rear window heater using a relay in the [RJB](#). When rear window heater operation is required, the [ATC](#) module broadcasts a message to the [RJB](#) on the medium speed [CAN](#) bus. On receipt of the message, the [RJB](#) energizes the relay by providing a ground path for the relay coil. This allows a battery feed to flow across the relay to power the rear window heater element.

There are two modes of rear window heater operation; manual and automatic.

Manual operation is activated by pressing the rear window heater switch on the integrated control panel. When the switch is pressed, the status [LED \(light emitting diode\)](#) in the switch illuminates and the rear window heater element is energized. Manual operation is discontinued when the rear window heater switch is pressed a second time, 21 minutes have elapsed (the heating phase), or the engine stops. If manual operation is discontinued by the engine stopping, the previous heating phase is resumed if the engine is re-started within 30 seconds.

There are two variants of automatic operation; automatic operation at the start of a journey and automatic operation during a journey.

Automatic operation at the start of a journey is initiated if the ambient air temperature is below 5 °C (41 °F). In this instance, the switch [LED](#) is illuminated and the heater element is energized for 21 minutes. Automatic operation is discontinued if the rear window heater switch is pressed or the engine stops.

Automatic operation during a journey is initiated when low ambient air temperatures are experienced and the vehicle has been travelling for a set period of time above a threshold speed. In this instance, no feedback is given to the driver to inform him the rear window heater is operational (the switch [LED](#) is not illuminated). The duration of heater operation is variable depending on the ambient air temperature, vehicle speed and the amount of time the vehicle has been travelling.

Windshield Heater (Where Fitted)

Windshield heater operation is only enabled when the engine is running. The [ATC](#) module controls operation of the windshield heater using two relays in the [EJB \(engine junction box\)](#). When windshield heater operation is required, the [ATC](#) module broadcasts a message to the [CJB](#) on the medium speed [CAN](#) bus. On receipt of the message, the [CJB](#) energizes the relays by providing a ground path for both relay coils. This allows a battery feed to flow across the relays to power the windshield left and right heater elements.

There are two modes of windshield heater operation; manual and automatic.

Manual operation is activated by pressing the windshield heater switch on the integrated control panel. When the switch is pressed, the status [LED](#) in the switch illuminates and the windshield heater elements are energized. Manual operation is discontinued when the windshield heater switch is pressed a second time, 5 minutes have elapsed (the heating phase), or the engine stops. If manual operation is discontinued by the engine stopping, the previous heating phase is resumed if the engine is re-started within 30 seconds.

There are two variants of automatic operation; automatic operation at the start of a journey and automatic operation during a journey.

Automatic operation at the start of a journey is initiated if the ambient air temperature is below 5 °C (41 °F). In this instance, the switch [LED](#) is illuminated and the heater elements are energized for 6.5 minutes. Automatic operation is discontinued if the windshield heater switch is pressed or the engine stops.

Automatic operation during a journey is initiated when low ambient air temperatures are experienced and the vehicle has been travelling for a set period of time above a threshold speed. In this instance, no feedback is given to the driver to inform him the windshield heater is operational (the switch [LED](#) is not illuminated) and the duration of operation is variable depending upon the ambient air temperature, vehicle speed and the amount of time the vehicle has been travelling.

Exterior Mirror Heaters

Operation of the exterior mirror heaters is fully automatic and not controllable by the driver. Exterior mirror heater operation is determined by ambient air temperature and windshield wiper status. When ambient air temperature reaches a pre-determined level, the [ATC](#) module broadcasts an exterior mirror heating request to the door modules over the medium speed [CAN](#) bus. On receipt of this message, the door modules provide feed and ground connections to both exterior mirror heater elements.

The amount of time the exterior mirror heaters are operational increases if the windshield wipers are switched on. This ensures the mirrors remain mist free in damp and wet conditions, where there is an increased risk of misting.

Seat Heaters (Where Fitted)

There are four seat heater settings available; off, 1, 2 and 3, which can be selected on the home and climate control screens of the TSD. The heat setting is relayed to the vehicle occupants through a graduated display on the TSD.

Operation of the heated seats is controlled by the [ATC](#) module. When the [ATC](#) module receives a heating request from the TSD, it broadcasts a message to the [CJB](#) over the medium speed [CAN](#) bus. The [CJB](#) then provides a hardwired 12 V supply to the three heater elements in the related front seat. The heater elements, two in the seat cushion and one in the seat squab, are wired in series. The [ATC](#) module monitors seat temperature using a temperature sensor located in each seat cushion. The [CJB](#) provides the temperature sensors with a 5 V supply. The level of the returned voltage back to the [CJB](#) is proportional to the seat temperature. The value of the return signal is broadcast to the [ATC](#) module, over the medium speed [CAN](#) bus, which allows it to control the seat temperature to the required level. The [ATC](#) module will suspend or disable operation of the seat heaters if any of the following occur:

- Battery voltage exceeds 16.5 ± 0.3 V for more than 5 seconds. Seat heating is re-enabled when battery voltage decreases to 16.2 ± 0.3 V.
- If a short or open circuit is detected.
- If the seat heat temperature rises significantly above the target temperature setting.

The graduated display on the TSD remains illuminated until the seat heaters are turned off or the engine stops. If the engine is restarted within 30 seconds the seat heater resumes the previous heating level.

Steering Wheel Heater

The steering wheel heater has a single heat setting and is turned on/off on the home and climate control screens of the TSD. The on/off status of the steering wheel heater is relayed to the vehicle occupants through the TSD. When the ignition is switched off, the steering wheel heater will reset to off.

Power for the heater element is supplied by the [CJB](#) on receipt of a request from the [ATC](#) module over the medium speed [CAN](#) bus. Temperature control for the heater element is provided by the steering wheel heater control module which receives a temperature feedback signal from a [NTC \(negative temperature coefficient\)](#) thermistor located within the steering wheel.

Component Description

ATC Module



E97625

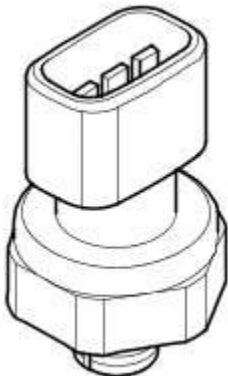
The [ATC](#) module is mounted on the outboard end of the air inlet duct, behind the front passenger side of the instrument panel. The [ATC](#) module processes inputs from the TSD, the switches on the integrated control panel and the system sensors. In response to these inputs, the [ATC](#) module outputs control signals to the [A/C](#) system and the heating and ventilation system.

Two electrical connectors provide the interface between the [ATC](#) module and the vehicle wiring. The [ATC](#) module uses hardwired inputs from the system sensors, the [LIN](#) bus to communicate with the stepper motors and the medium speed [CAN](#) bus to communicate with other control modules on the vehicle.

A/C Compressor Solenoid Valve

The [A/C](#) compressor solenoid valve is integral with the [A/C](#) compressor. Operation of the solenoid valve is controlled by the [ATC](#) module using a hardwired drive current of differing values. By controlling the flow of refrigerant through the compressor, the solenoid valve can control the [A/C](#) system pressure and the evaporator operating temperature.

Refrigerant Pressure Sensor



E43581

The refrigerant pressure sensor provides the [ATC](#) module with a pressure input from the high pressure side of the refrigerant system. The refrigerant pressure sensor is located in the refrigerant line between the condenser and the thermostatic expansion valve.

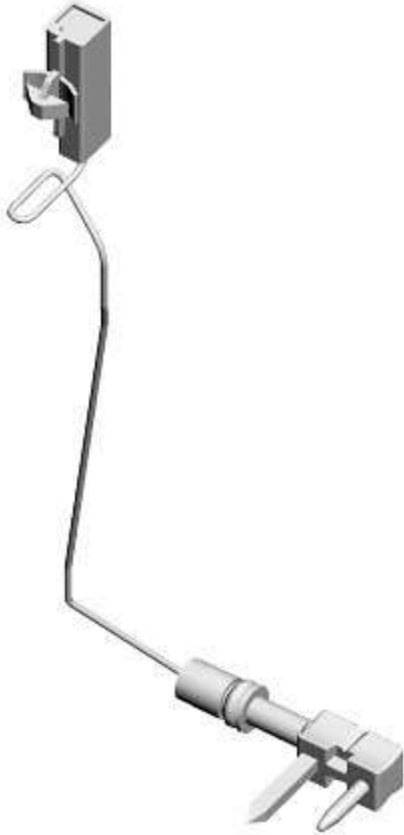
The [ATC](#) module supplies a 5 V reference voltage to the refrigerant pressure sensor and receives a return signal voltage, between 0 V and 5 V, related to system pressure.

The [ATC](#) module uses the signal from the pressure sensor to protect the refrigerant system from extremes of pressure. The [ATC](#) module transmits the [A/C](#) pressure, along with the compressor drive current value, to the instrument cluster on the medium speed [CAN](#) bus. These signals are broadcast to the [ECM](#) on the high speed [CAN](#) bus to allow it to calculate the torque being applied to the engine by the compressor.

To protect the system from extremes of pressure, the [ATC](#) module sets the [A/C](#) compressor to the minimum flow position if the pressure:

- Decreases to 2.1 ± 0.2 bar (31.5 ± 3 lbf/in²); the [ATC](#) module loads the [A/C](#) compressor again when the pressure increases to 2.3 ± 0.2 bar (33.4 ± 3 lbf/in²).
- Increases to 31 ± 1 bar (450 ± 14.5 lbf/in²); the [ATC](#) module loads the [A/C](#) compressor again when the pressure decreases to 26 ± 1 bar (377 ± 14.5 lbf/in²).

Evaporator Temperature Sensor



E97626

The evaporator temperature sensor is a [NTC](#) thermistor that provides the [ATC](#) module with a temperature signal from the downstream side of the evaporator. The evaporator temperature sensor is mounted directly onto the evaporator matrix fins.

The [ATC](#) module uses the input from the evaporator temperature sensor to control the load of the [A/C](#) compressor and thus the operating temperature of the evaporator.

Humidity and Temperature Sensor



E97627

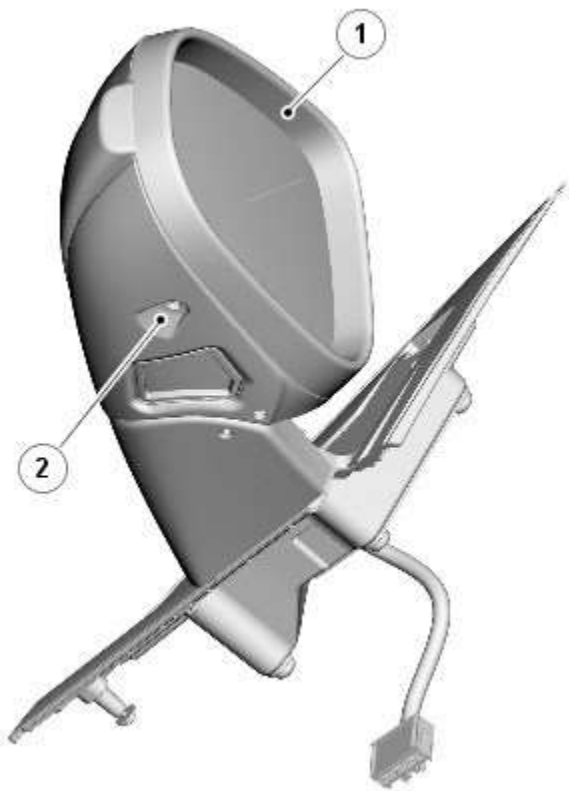
The humidity and temperature sensor is installed above the glovebox in the instrument panel. The sensor incorporates:

- A [NTC](#) thermistor to measure temperature.
- A capacitive sensor element to measure humidity.
- A motor driven fan to draw air through the sensor and over the sensing elements.

The humidity sensor element is built out of a film capacitor on different substrates. The dielectric is a polymer which absorbs or releases water proportional to the relative humidity of the air being drawn through the sensor, and thus changes the capacitance of the capacitor. For protection, the sensor element is contained in a nylon mesh cover.

Humidity within the passenger compartment is controlled by raising and lowering the evaporator temperature. An increase in evaporator temperature increases the moisture content of the air entering the passenger compartment. Lowering the evaporator temperature reduces the moisture content of the air entering the passenger compartment.

Ambient Air Temperature Sensor

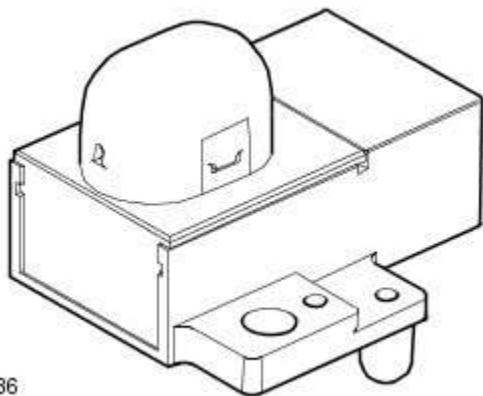


E97628

Item	Description
1	LH door mirror
2	Ambient air temperature sensor

The ambient air temperature sensor is a [NTC](#) thermistor that provides the [ATC](#) module with an input of external air temperature. The sensor is hard wired to the [ECM](#) and its signal is transmitted to the instrument cluster on the high speed [CAN](#) bus. The instrument cluster acts as a gateway and transmits the ambient air temperature signal to the [ATC](#) module on the medium speed [CAN](#) bus. The sensor is installed in the [LH](#) door mirror, and is accessed by removing the mirror glass, cap and actuator.

Sunload Sensor



E71886

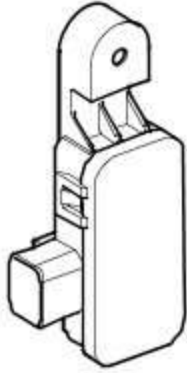
The sunload sensor consists of two photoelectric cells that provide the [ATC](#) module with inputs of light intensity; one as sensed coming from the left of the vehicle and one as sensed coming from the right. The inputs are a measure of the solar heating effect on vehicle occupants, and are used by the [ATC](#) module to adjust blower speed, temperature and distribution to improve comfort.

The sensor is installed in the speaker grill on the upper surface of the instrument panel. Power for the sensor is provided by a 5 V feed from the instrument cluster.

The sensor also contains the active anti-theft alarm indicator.

Refer to: Anti-Theft - Active (419-01 Anti-Theft - Active, Description and Operation).

Pollution Sensor (Where Fitted)



E43588

The pollution sensor allows the [ATC](#) module to monitor the ambient air for the level of hydrocarbons and oxidized gases such as nitrous oxides, sulphur oxides and carbon monoxide. The sensor is attached to the center of the upper front crossmember.

The pollution sensor is powered by an ignition controlled voltage feed from the [CJB](#) and provides the [ATC](#) module with separate signals of hydrocarbon and oxidized gas levels. With a pollution sensor fitted, the [ATC](#) module can control the air inlet source to reduce the amount of contaminants entering the passenger compartment. This function is fully automatic, but can be overridden by manual selection of the air source using the recirculation switch on the integrated control panel.

If there is a fault with the sensor, the [ATC](#) module disables automatic operation of the recirculation door.

Climate Control - Ambient Air Temperature Sensor

Removal and Installation

Removal



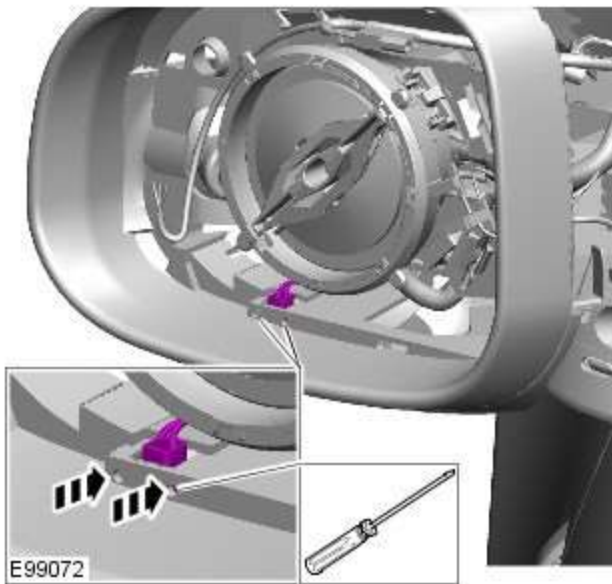
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Exterior Mirror Cover](#) (501-09 Rear View Mirrors, Removal and Installation).

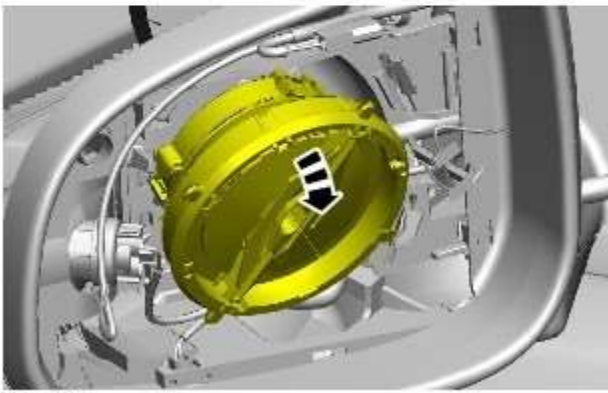
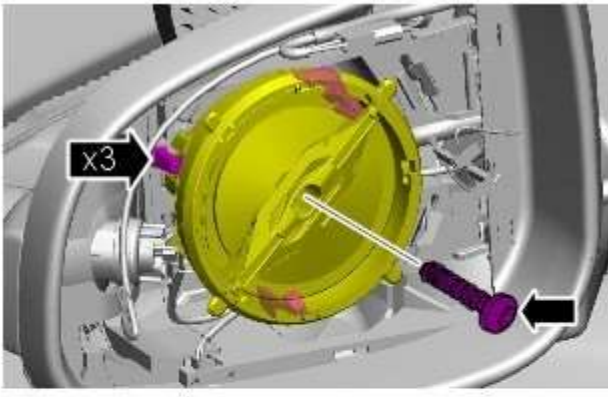
2.



3.

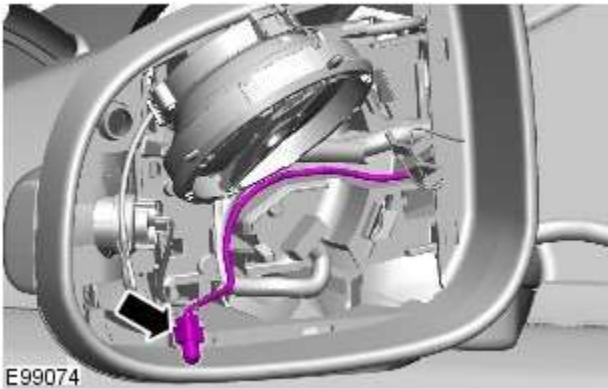


4.



E99073

5.



E99074

Installation

1. To install, reverse the removal procedure.

Climate Control - Blower Motor

Removal and Installation

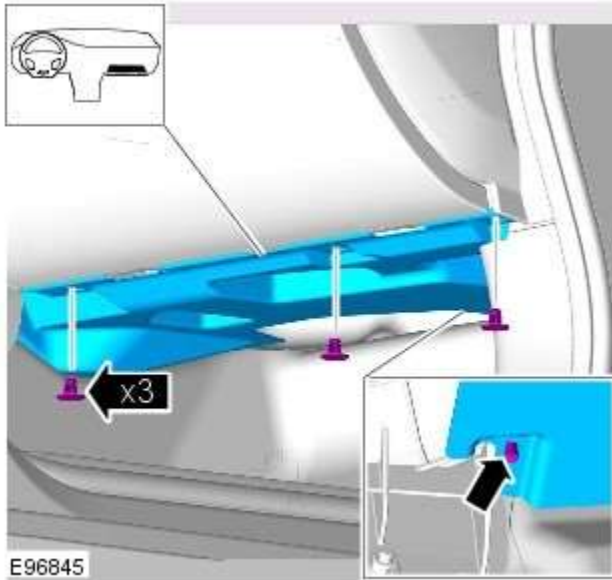
Removal



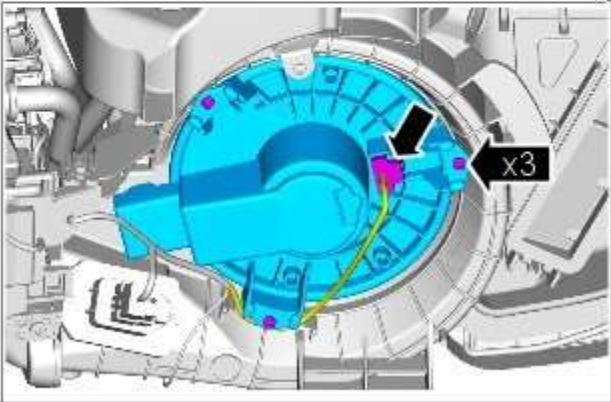
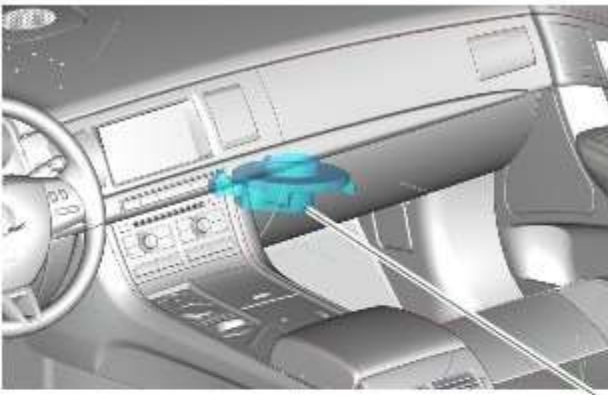
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2.



3.



E100074

Installation

1. To install, reverse the removal procedure.

Climate Control - Blower Motor Control Module

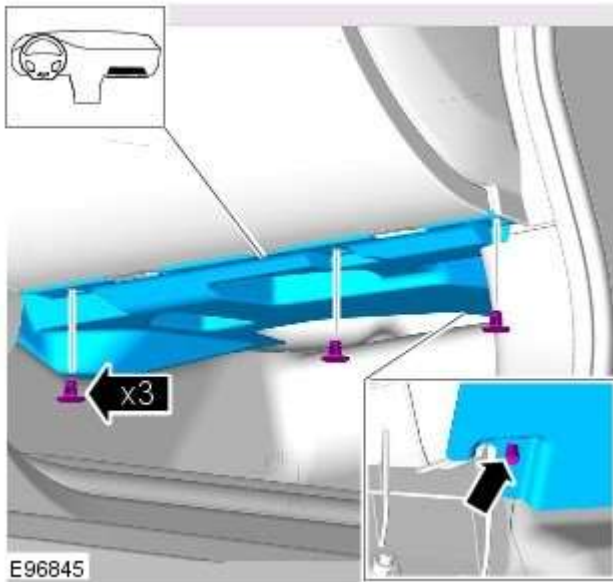
Removal and Installation


Removal



NOTE: Removal steps in this procedure may contain installation details.

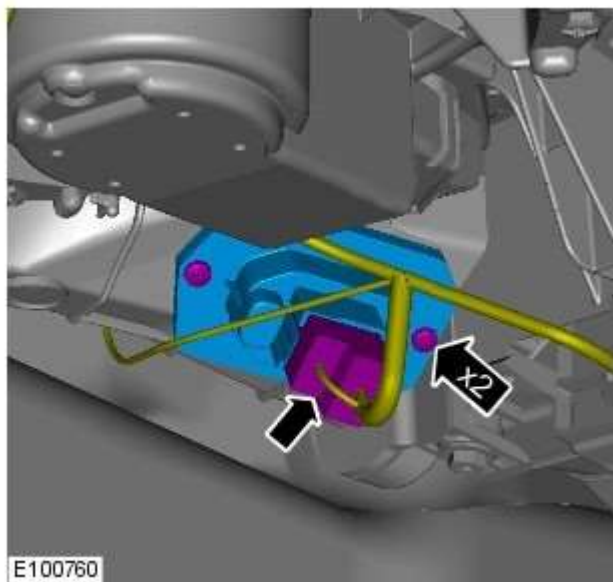
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2.  CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.



NOTE: RHD illustration shown, LHD is similar.



3. Torque: 1.3 Nm

Installation

1. To install, reverse the removal procedure.

Climate Control - Center Registers

Removal and Installation

Removal



CAUTION: Do not manually open the registers. Failure to follow this instruction may result in damage to the internal components.

NOTES:



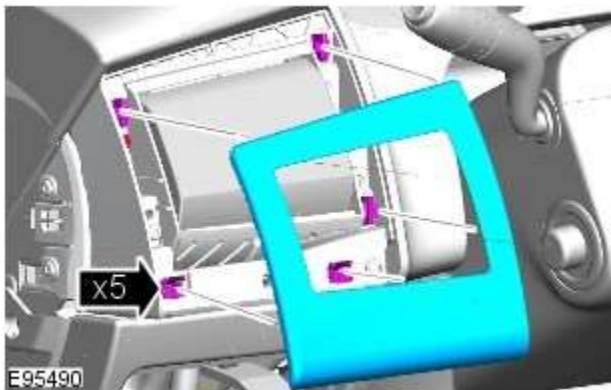
The center registers must be open before carrying out this procedure. To achieve this set the registers to 'Always Open' using the climate settings tab on the information and entertainment display. If the registers are set to 'Automatic' mode (rotating with ignition on/off) and one or more are disconnected during an ignition cycle, a vehicle battery reset may be required to reconnect the affected registers to the LIN BUS.

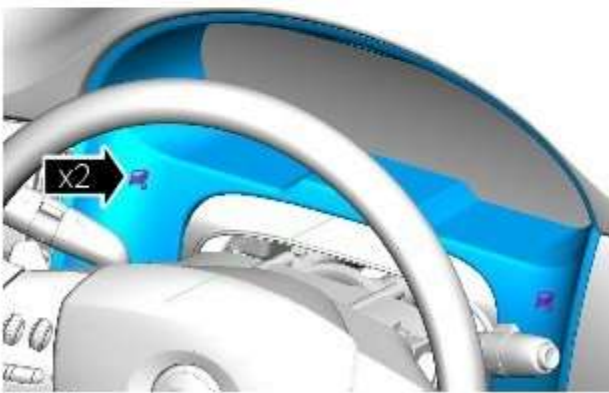
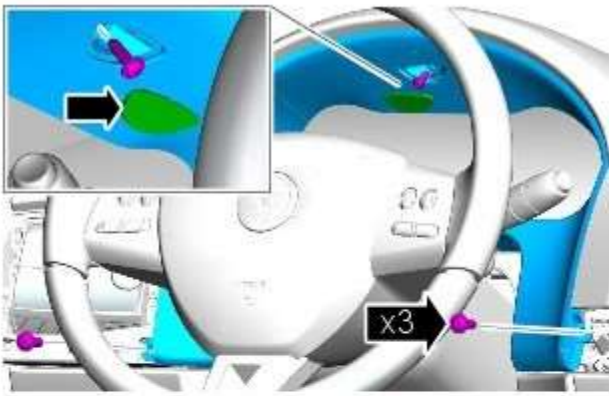


Removal steps in this procedure may contain installation details.

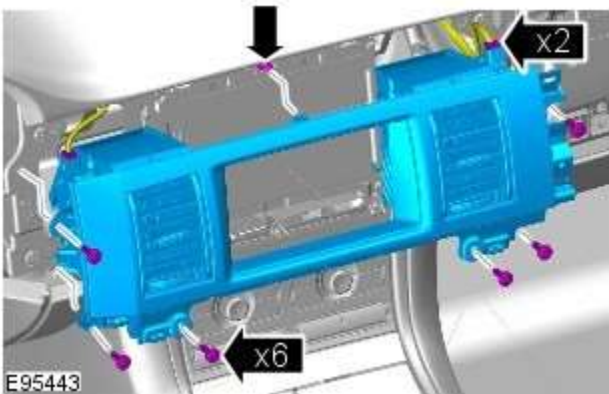
1. Set the registers to 'Always Open', using the information and entertainment display.
2. Refer to: [Passenger Side Register](#) (412-01 Climate Control, Removal and Installation).
3. Fully extend and lower the steering column for access.

4.

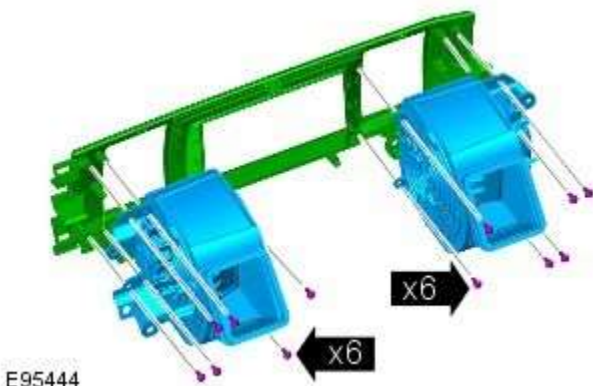




E95491




E95443




E95444

5.

6. CAUTIONS:

 The center registers must be open to aid access and prevent damage to surrounding trim.

 Do not manually open the registers. Failure to follow this instruction may result in damage to the internal components.

7.  NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.
2. Return the registers to their original setting - 'Automatic' - using the information and entertainment display.

Climate Control - Climate Control Assembly

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



RHD illustration shown, LHD is similar.

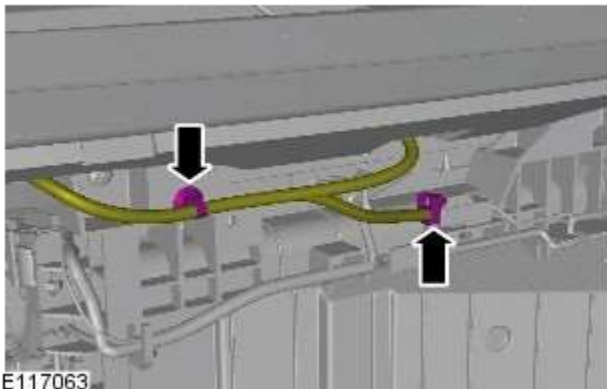
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

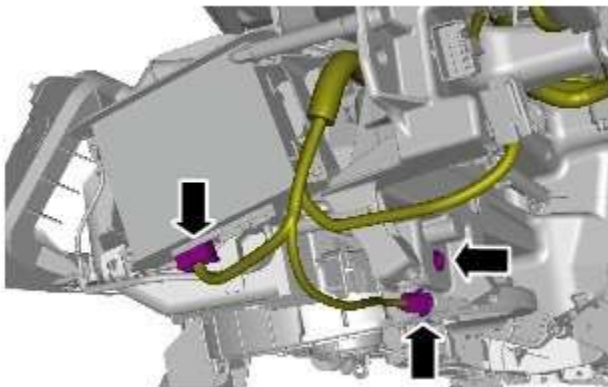
3. Refer to: [Instrument Panel Console](#) (501-12 Instrument Panel and Console, Removal and Installation).

4.

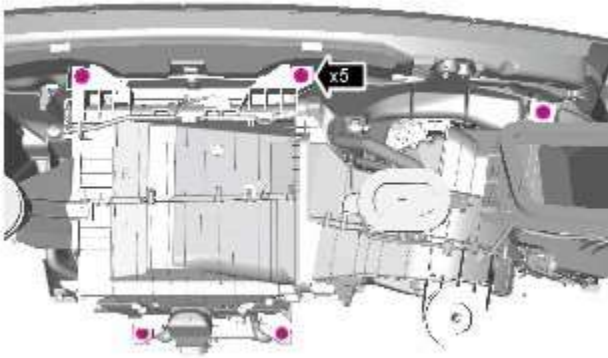


E117063

5. Torque: 9 Nm



E117064

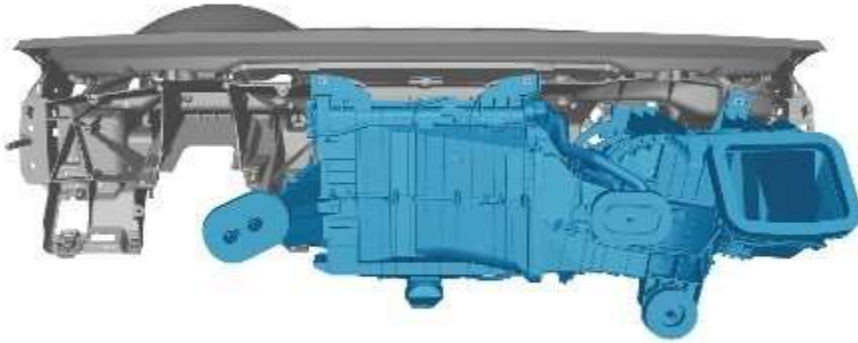


E117065

6.  CAUTION: Be prepared to collect escaping coolant.

Torque: 9 Nm

7.



E117066

Installation

1. To install, reverse the removal procedure.

Climate Control - Climate Control Module

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Instrument Panel Console](#) (501-12 Instrument Panel and Console, Removal and Installation).

3. CAUTIONS:



Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

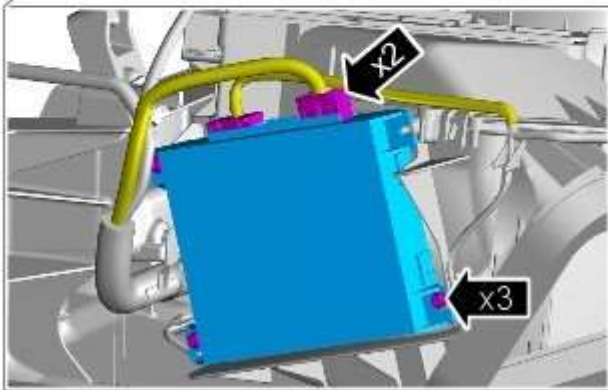
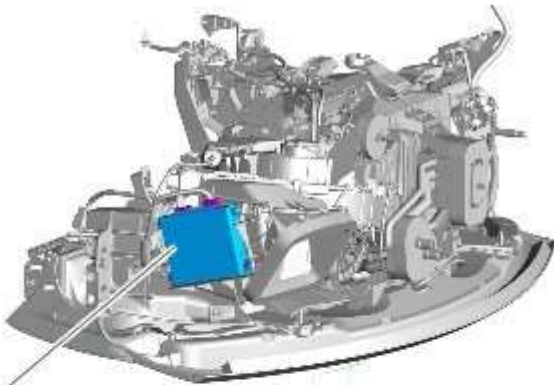


Make sure that the component is correctly located on the locating dowels.



NOTE: RHD illustration shown, LHD is similar.

Torque: 1.3 Nm



E100701

Installation

1. To install, reverse the removal procedure.

Climate Control - Defrost Vent/Register Blend Door Actuator

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01, General Procedures).
2. Refer to: Instrument Panel Console (501-12, Removal and Installation).

3. CAUTIONS:



Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

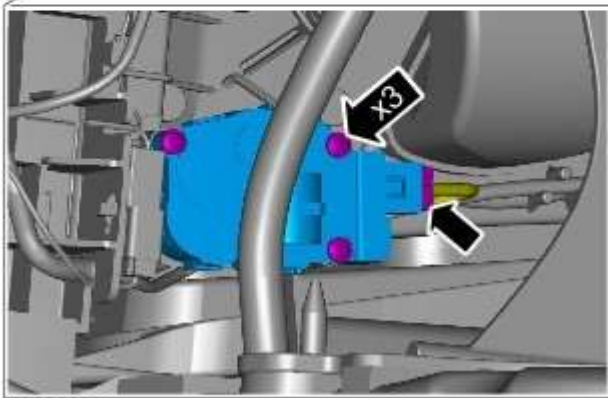
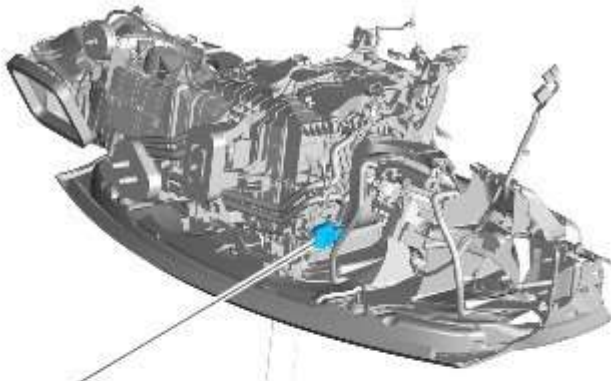


Make sure that the component is correctly located on the locating dowels.



NOTE: RHD illustration shown, LHD is similar.

Torque: 1.3 Nm



E100698

Installation

1. To install, reverse the removal procedure.

Climate Control - Driver Side Register

Removal and Installation

Removal



CAUTION: Do not manually open the registers. Failure to follow this instruction may result in damage to the internal components.

NOTES:

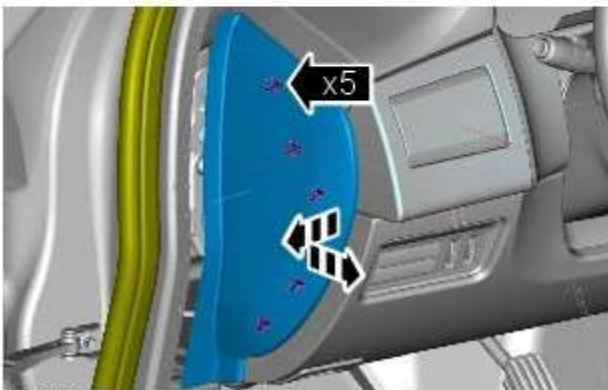


If the registers are set to 'Automatic' mode and one or more are disconnected during an ignition cycle, a vehicle battery reset may be required to reconnect the affected registers to the LIN BUS.

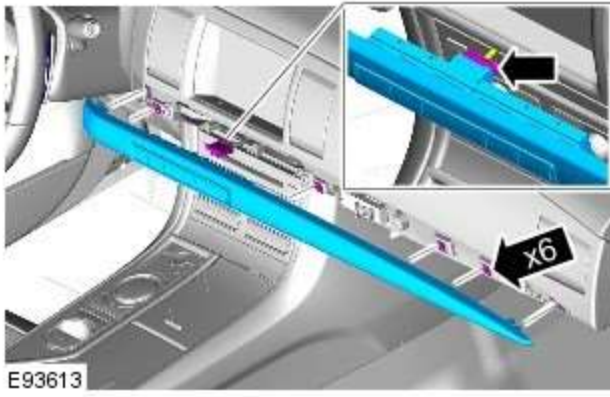


Removal steps in this procedure may contain installation details.

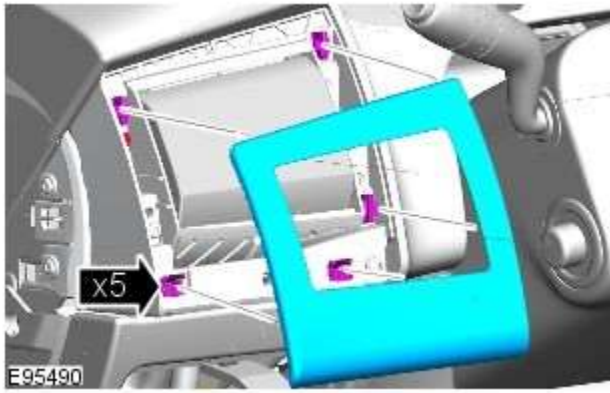
1.



E95489



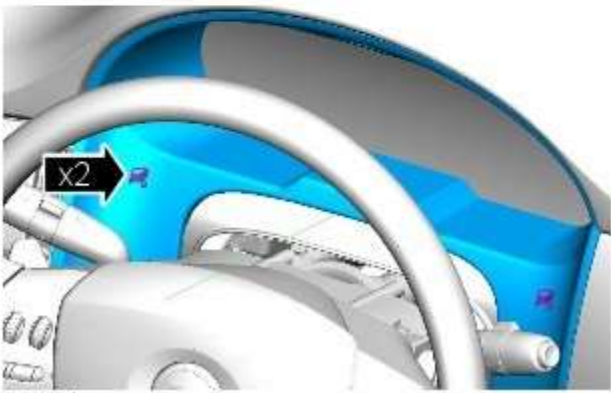
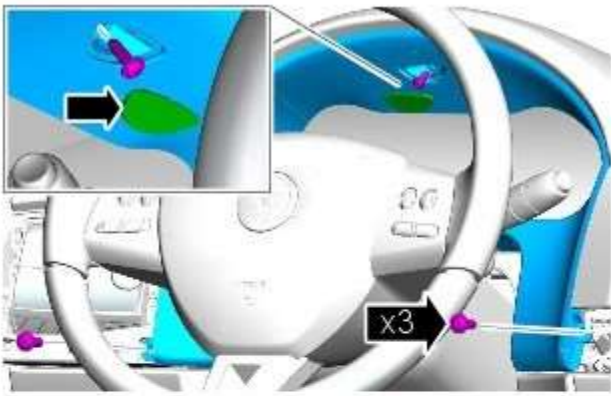
2.



3.

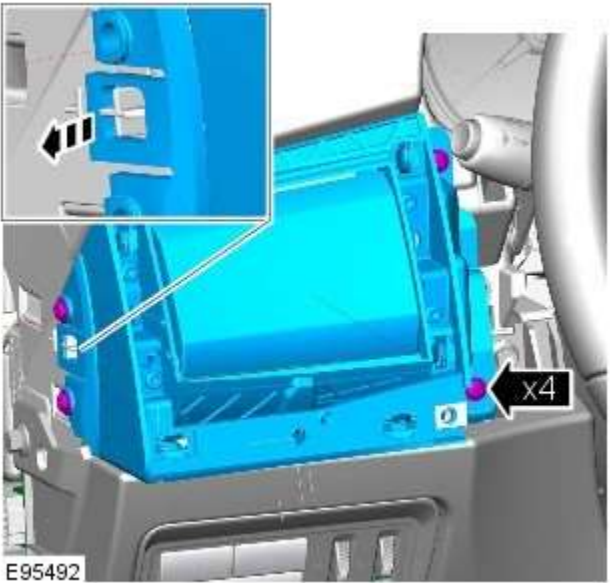
4. Fully extend and lower the steering column for access.

5.

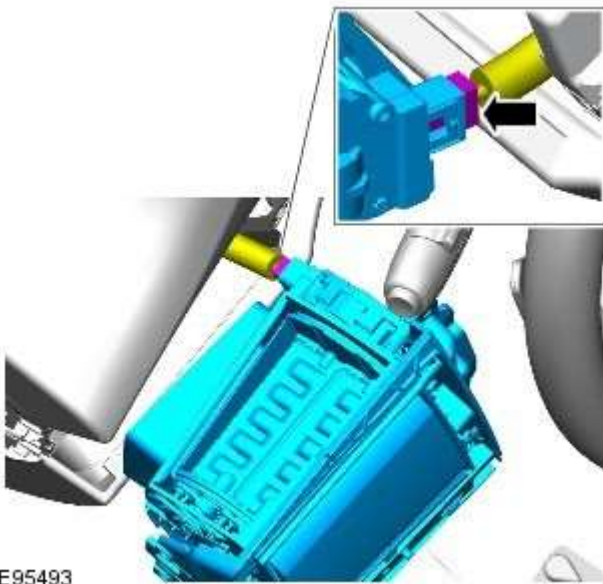


E95491

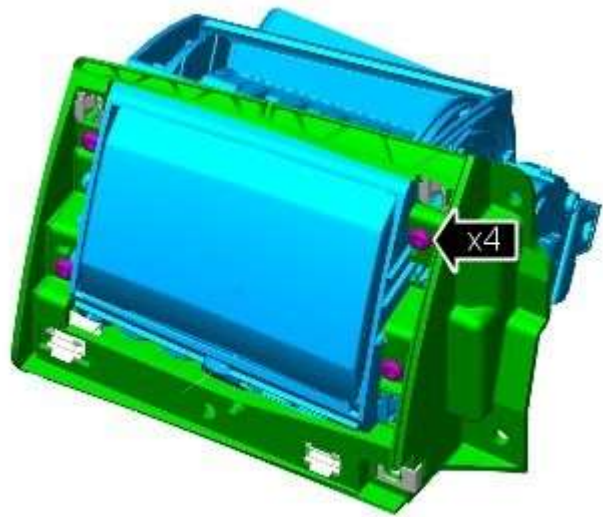
6.



E95492



7.



8.  NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

Climate Control - Evaporator

Removal and Installation

Removal

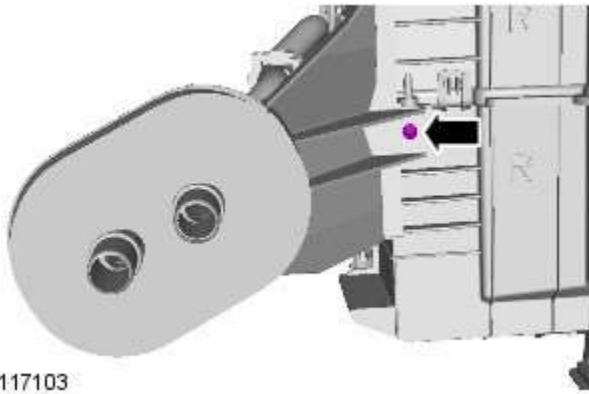


NOTE: Removal steps in this procedure may contain installation details.


All vehicles

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Heater Core and Evaporator Core Housing](#) (412-01 Climate Control, Removal and Installation).
3. Refer to: [Thermostatic Expansion Valve](#) (412-01 Climate Control, Removal and Installation).

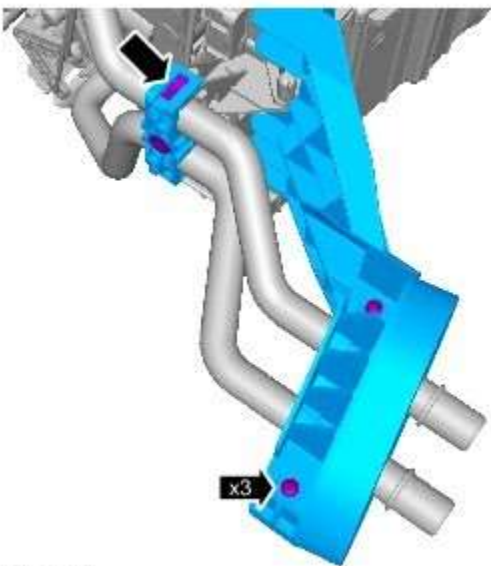
Right-hand drive vehicles



E117103

4.  CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

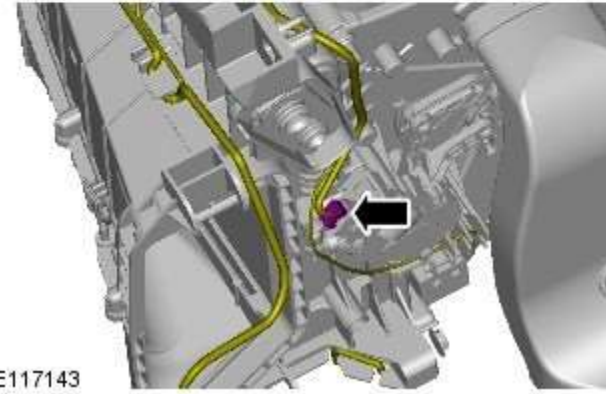
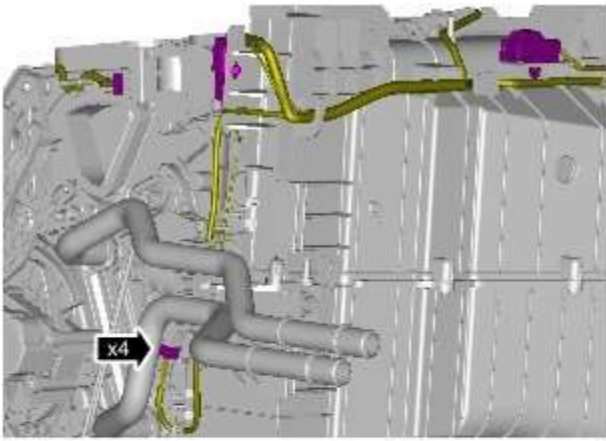
Torque: 1.3 Nm



E117104

5. *Torque: 1.3 Nm*

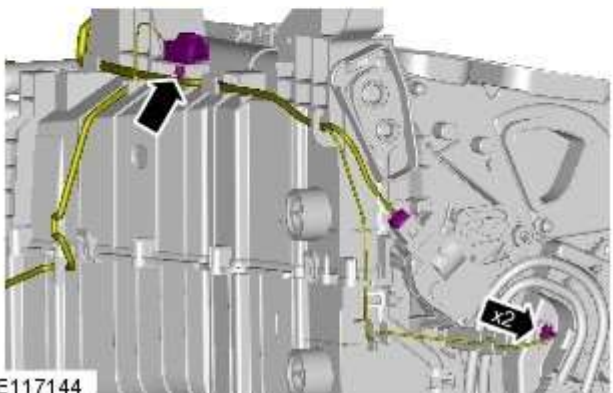
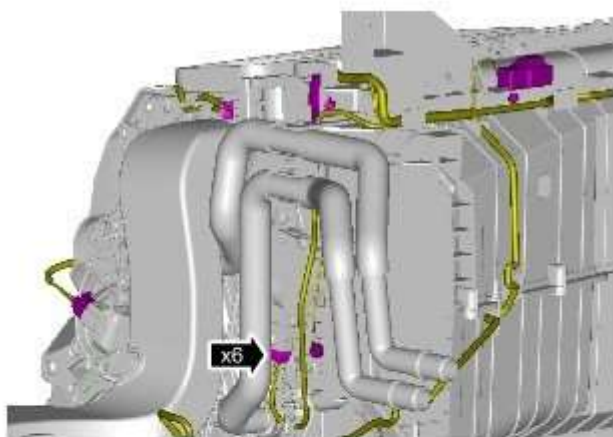
6.



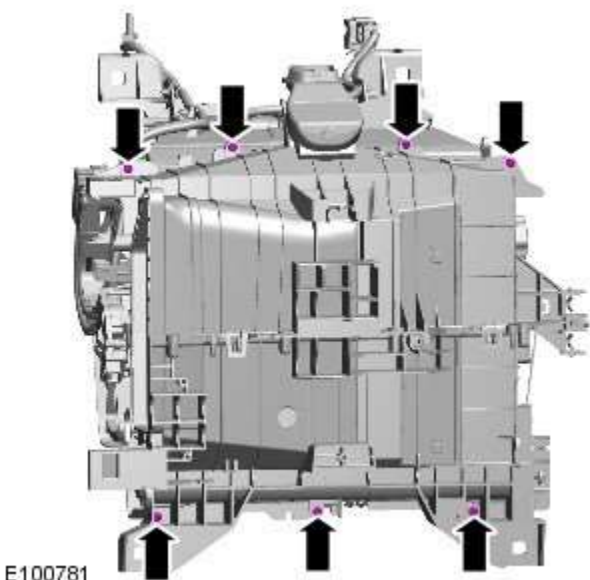
E117143


Left-hand drive vehicles

7.

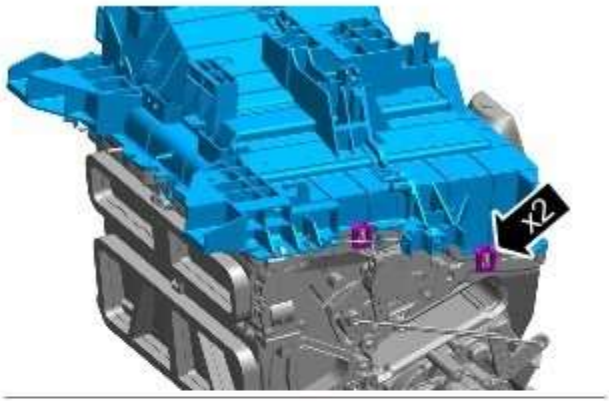



All vehicles

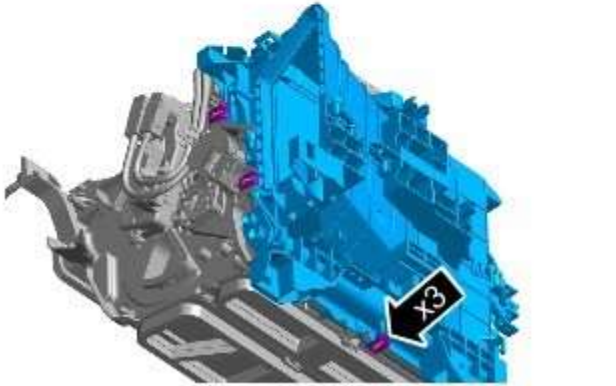


8.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

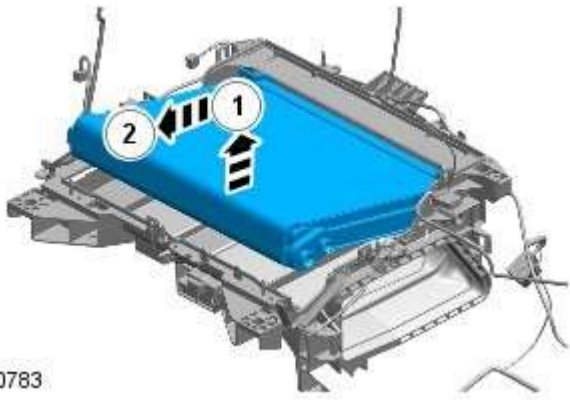
Torque: 1.3 Nm



9.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E100782




E100783

10.  WARNING: Only use moderate force when installing the sensor.

CAUTIONS:

 Make sure the evaporator temperature sensor harness does not become trapped.

 Make sure that the sensor is correctly installed.

 NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

Climate Control - Floor Console Register

Removal and Installation

Removal

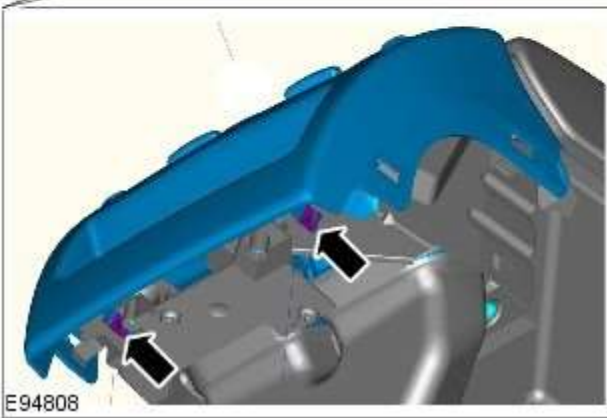


NOTE: Removal steps in this procedure may contain installation details.

1. Remove both floor console side trim panels.


Refer to: [Floor Console Side Trim Panel](#) (501-12 Instrument Panel and Console, Removal and Installation).

- 2.





E94809

3.  NOTE: Do not disassemble further if the component is removed for access only.



E94810

4. Remove the 2 clips.

Installation

1. To install, reverse the removal procedure.

Climate Control - Footwell Vent/Duct Blend Door Actuator

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Climate Control Assembly](#) (412-01 Climate Control, Removal and Installation).

3. CAUTIONS:



Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

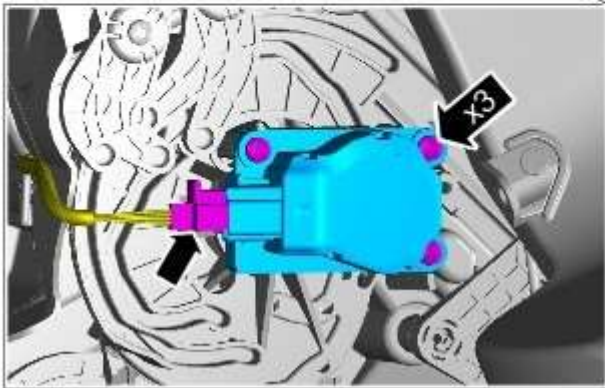
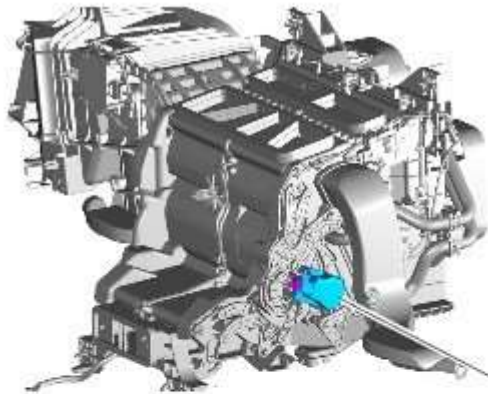


Make sure that the component is correctly located on the locating dowels.



NOTE: RHD illustration shown, LHD is similar.

Torque: 1.3 Nm



E100700

Installation

1. To install, reverse the removal procedure.

Climate Control - Heater Core

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.

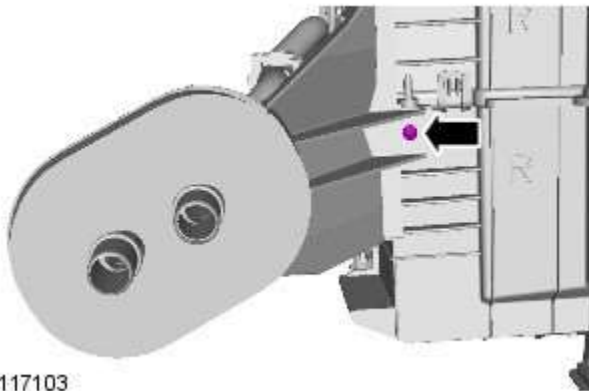


Some variation in the illustrations may occur, but the essential information is always correct.


All vehicles

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Heater Core and Evaporator Core Housing](#) (412-01 Climate Control, Removal and Installation).

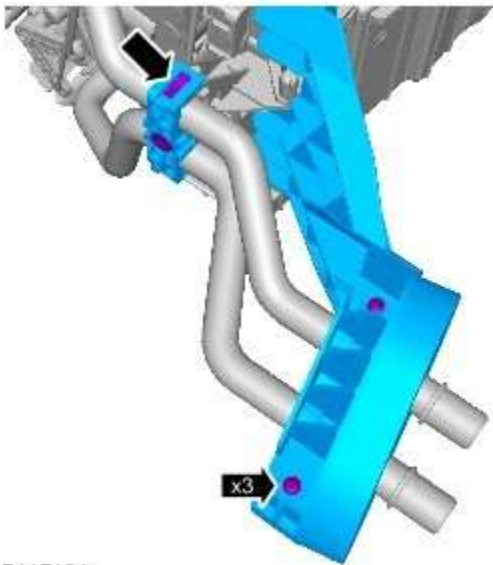
Right-hand drive vehicles



E117103

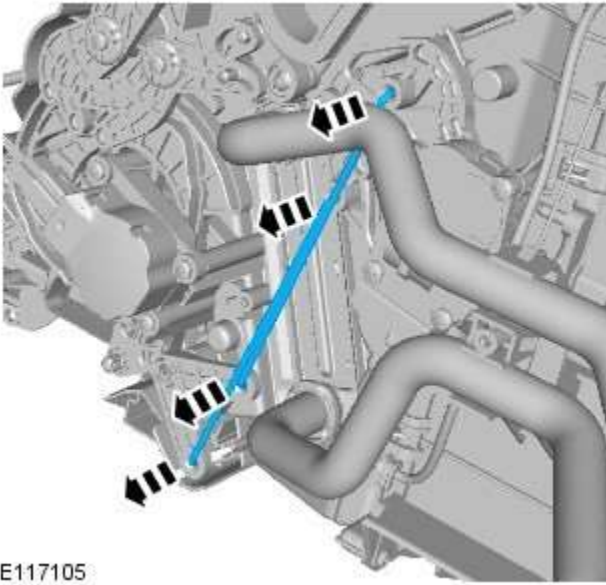
3.  CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

Torque: 1.3 Nm



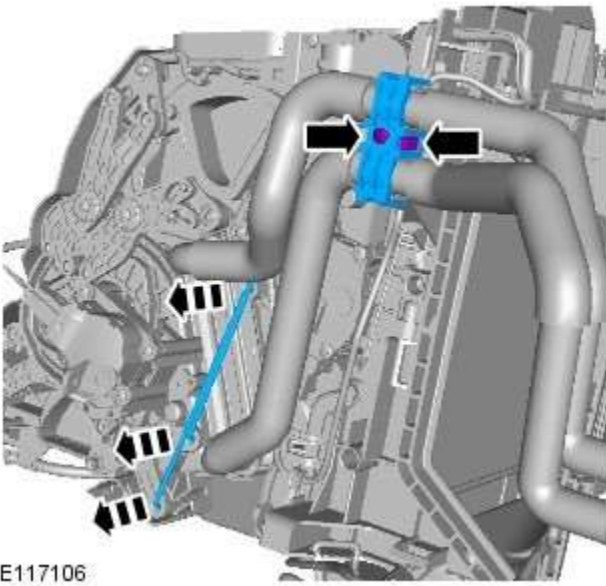
E117104

4. *Torque:* 1.3 Nm



5.  CAUTION: Take extra care not to damage the component.

Left-hand drive vehicles

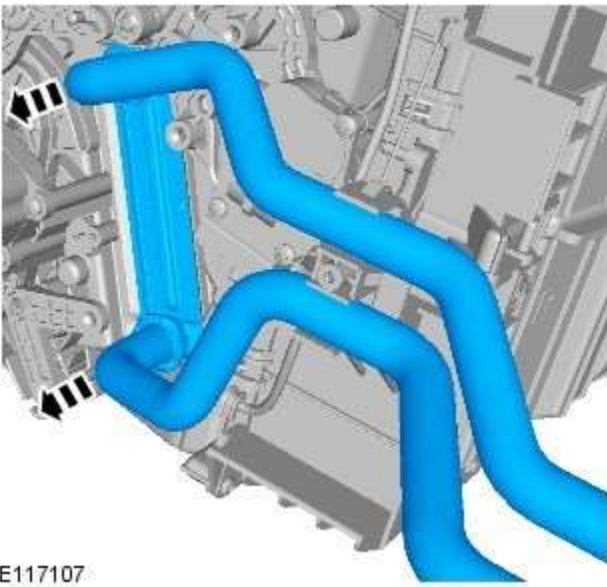


6.  CAUTION: Take extra care not to damage the component.

Torque: 1.3 Nm

Right-hand drive vehicles

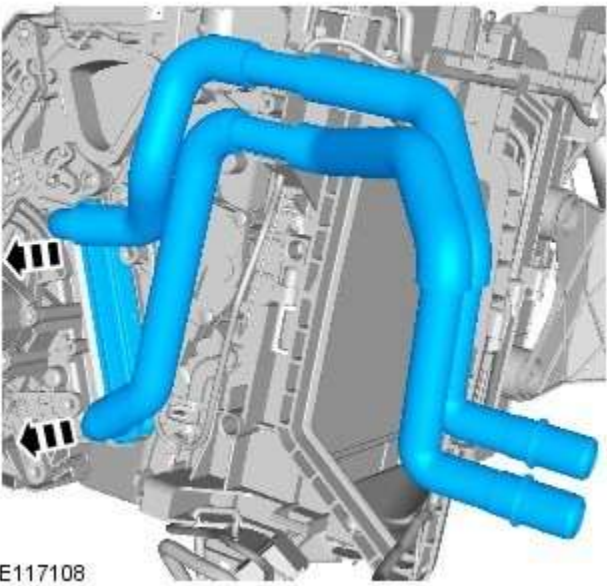
7.



E117107

Left-hand drive vehicles

8.



E117108

Installation

1. To install, reverse the removal procedure.

Climate Control - Heater Core and Evaporator Core Housing

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

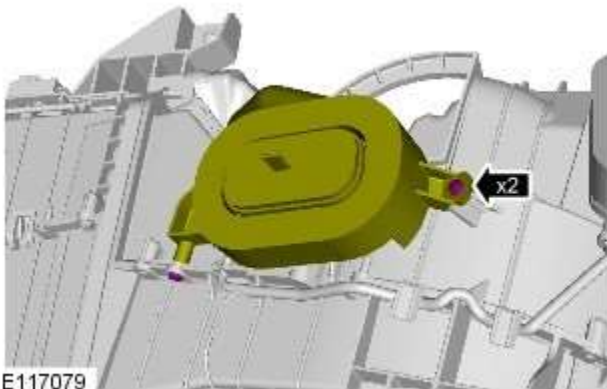
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).




2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

3. Refer to: [Climate Control Assembly](#) (412-01 Climate Control, Removal and Installation).

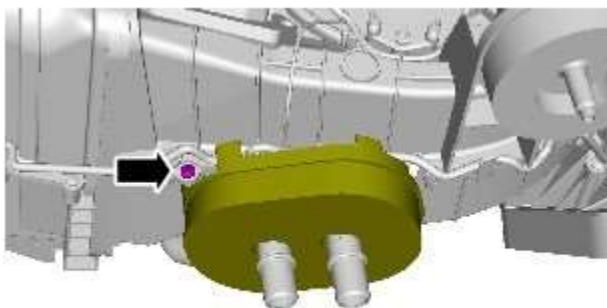
Right-hand drive vehicles




4.  **CAUTION:** Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

Torque: 1.3 Nm

Left-hand drive vehicles

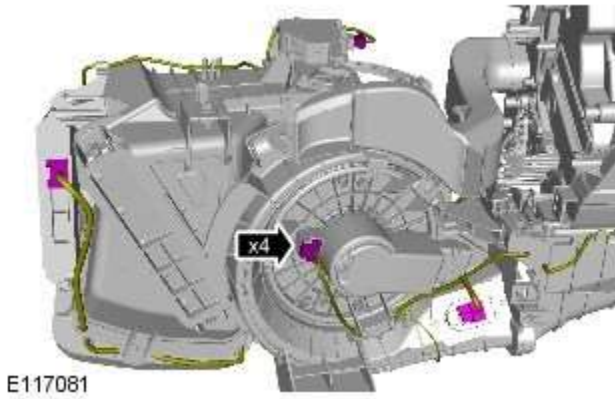




5.  **CAUTION:** Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

Torque: 1.3 Nm

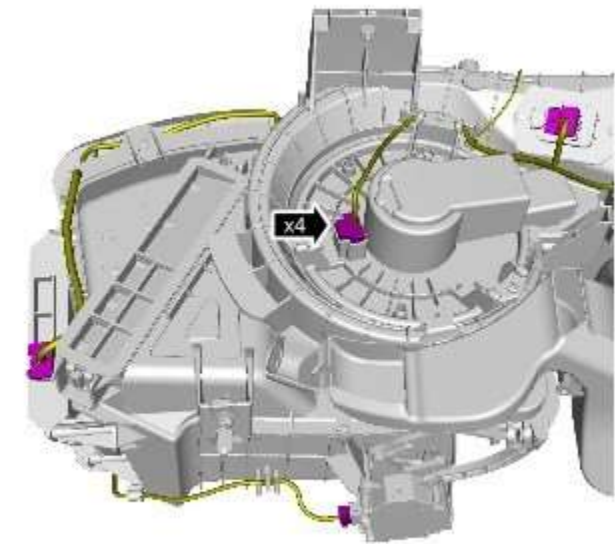
E117080



Right-hand drive vehicles



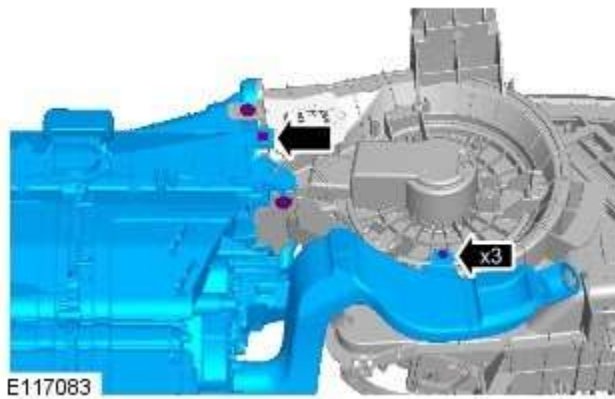
6.  **CAUTION:** Make sure that the wiring harnesses are correctly located.
-  **NOTE:** Note the position of the wiring harnesses to aid installation.

Left-hand drive vehicles



7.  **CAUTION:** Make sure that the wiring harnesses are correctly located.
-  **NOTE:** Note the position of the wiring harnesses to aid installation.

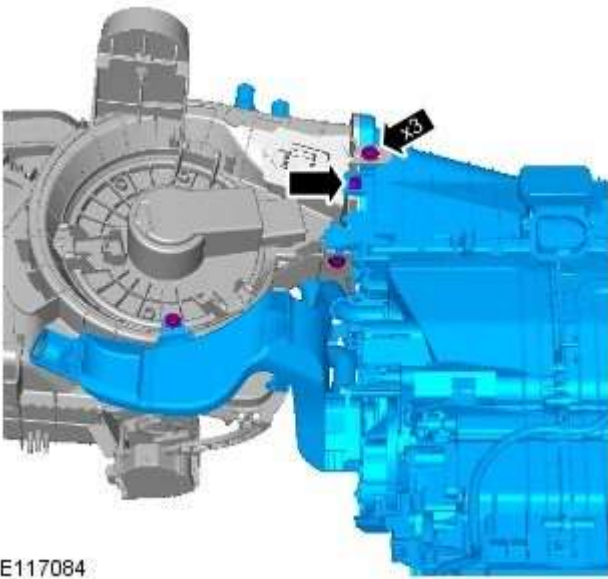
Right-hand drive vehicles



8. *Torque:* 2.4 Nm

Left-hand drive vehicles

9. *Torque:* 2.4 Nm



E117084

Installation

1. To install, reverse the removal procedure.

Climate Control - Instrument Panel Register Trim Panel

Removal and Installation

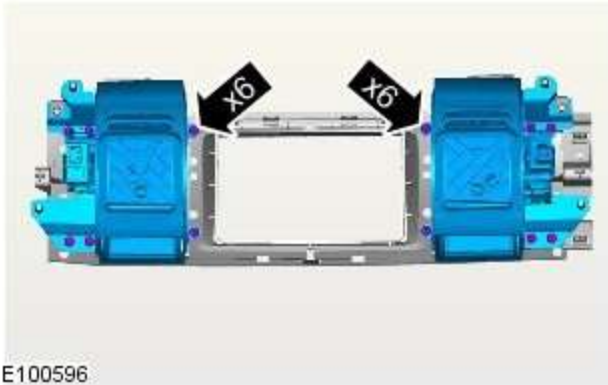
Removal



NOTE: Removal steps in this procedure may contain installation details.

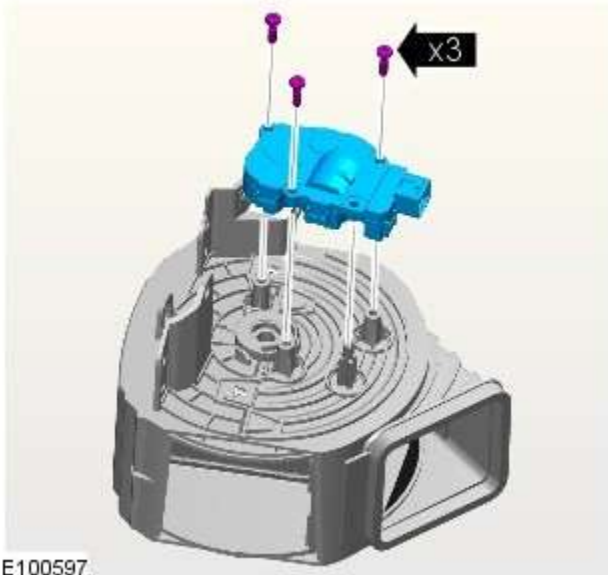
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Center Registers](#) (412-01 Climate Control, Removal and Installation).

3.



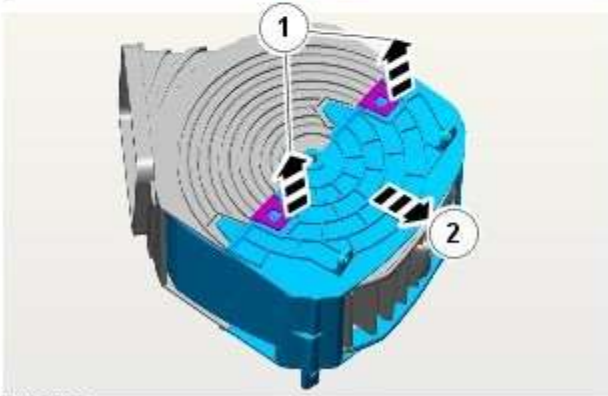
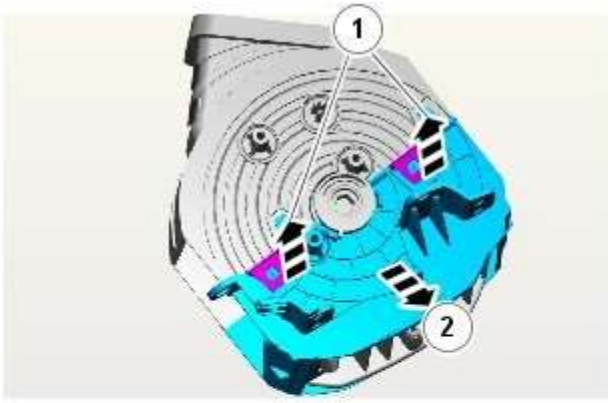
E100596

4.



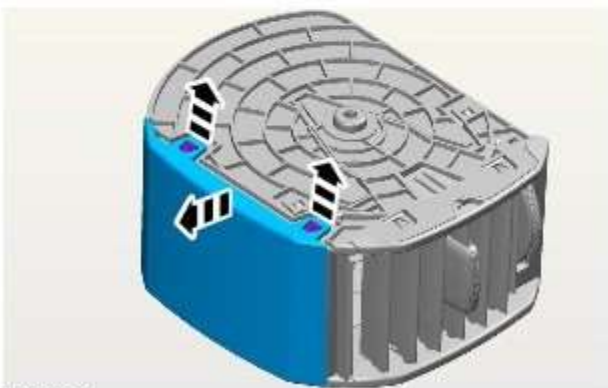
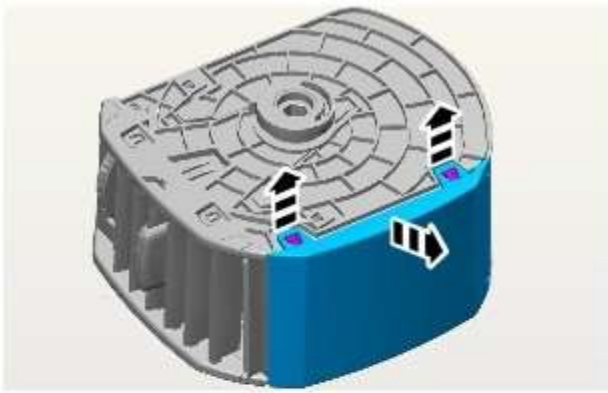
E100597

5.



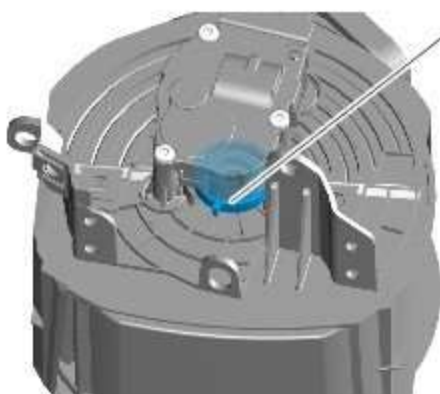
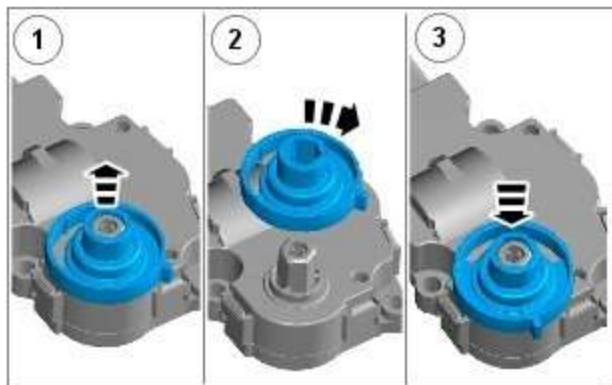
E100598

6.



E100599

Installation



E100759

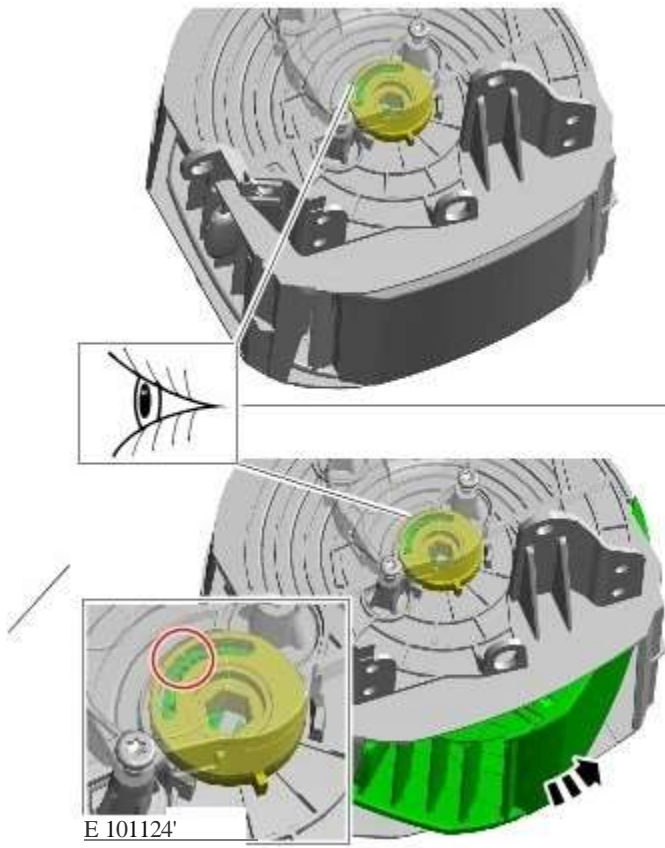


1. **CAUTION:** Make sure that the clutch rib is located between the two ribs on the car rearward (front half), of the register housing to avoid damage on installation.

To install, reverse the removal procedure.

2.

- Position the locating peg.



Climate Control - In-Vehicle Temperature Sensor

Removal and Installation

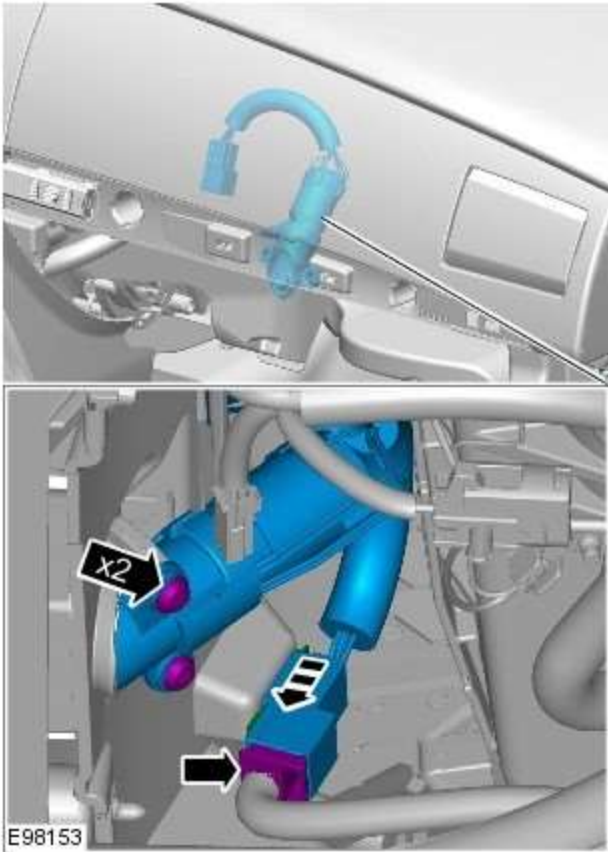
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Glove Compartment](#) (501-12 Instrument Panel and Console, Removal and Installation).

2.



Installation

1. To install, reverse the removal procedure.

Climate Control - Passenger Side Register

Removal and Installation

Removal



CAUTION: Do not manually open the registers. Failure to follow this instruction may result in damage to the internal components.

NOTES:

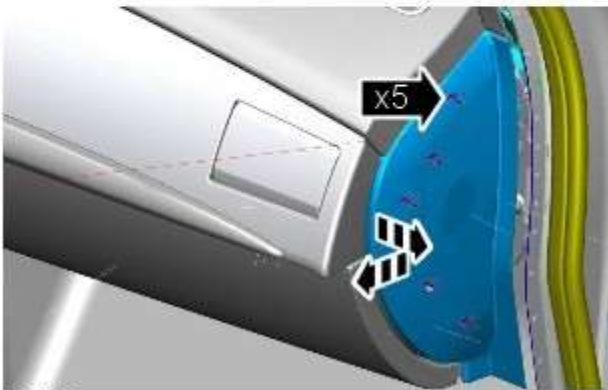


If the registers are set to 'Automatic' mode and one or more are disconnected during an ignition cycle, a vehicle battery reset may be required to reconnect the affected registers to the LIN BUS.

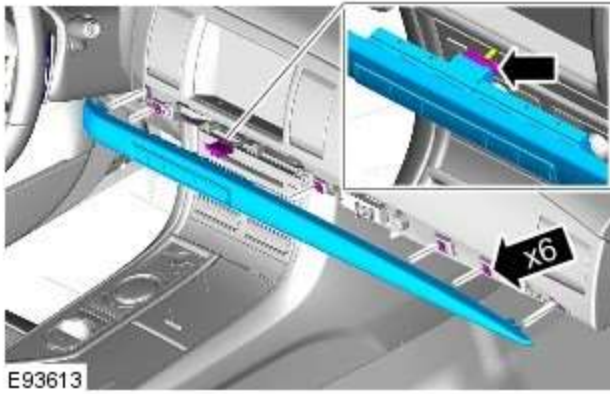


Removal steps in this procedure may contain installation details.

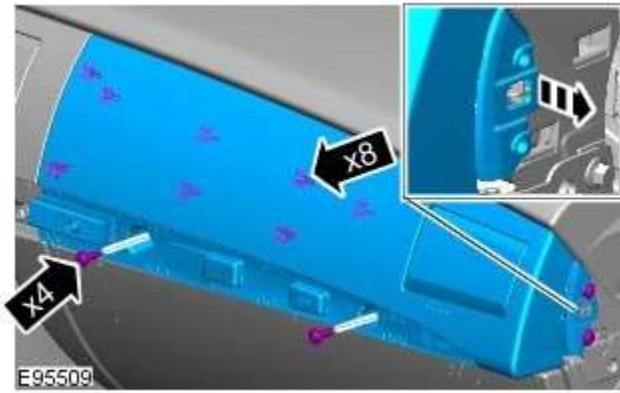
1.



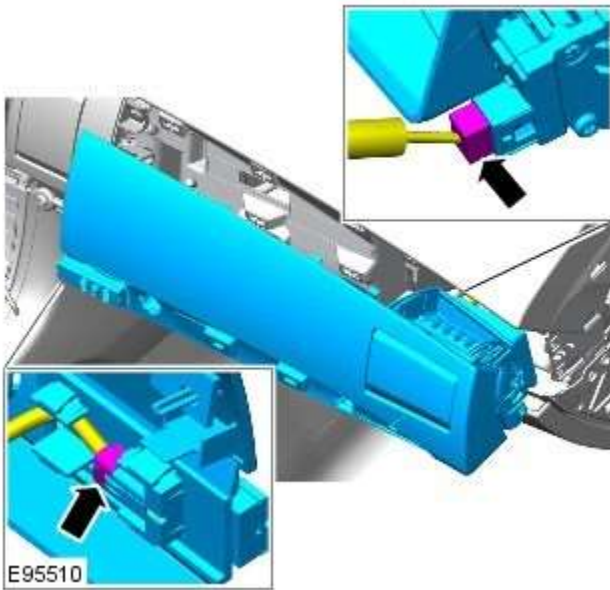
E95508



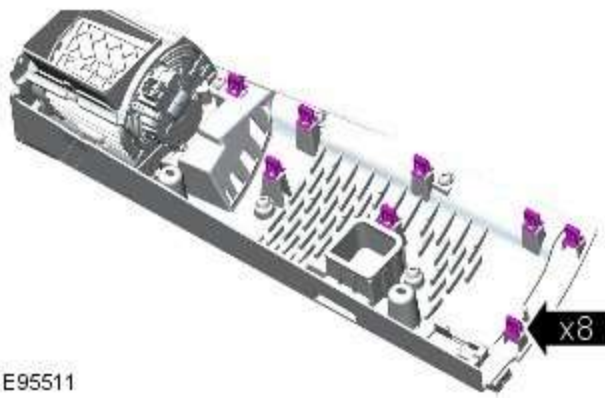
2.



3.

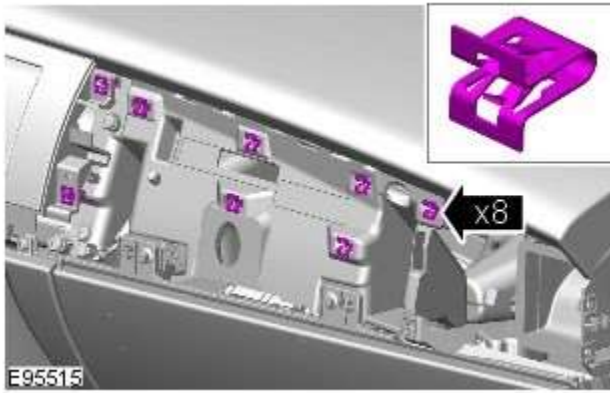


4.

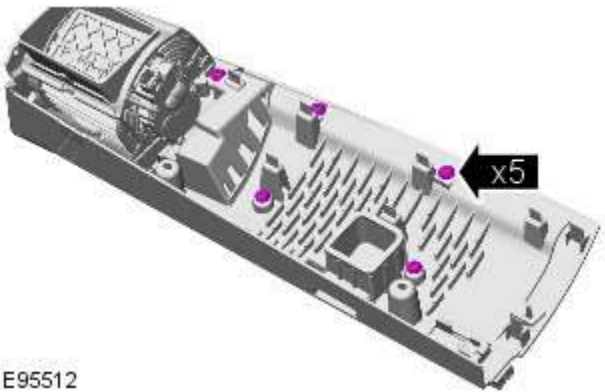


E95511

5.

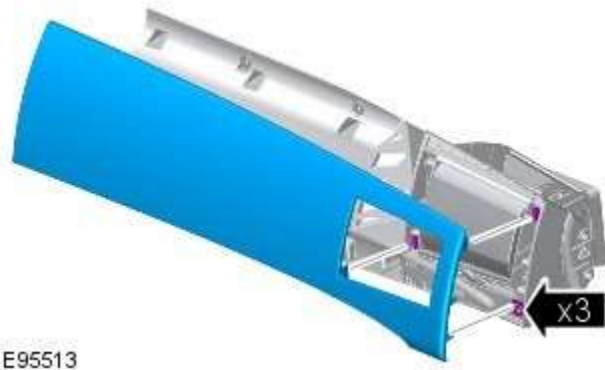


6. Install the clips into the instrument panel.




E95512

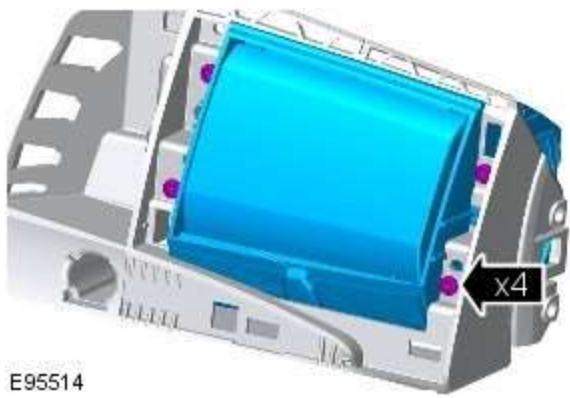
7.  NOTE: Do not disassemble further if the component is removed for access only.



E95513

8.  NOTE: When removing the component, some of the clips may remain attached. These clips should be removed and returned to their original positions in the passenger side register carrier.

9.



E95514

Installation

1. To install, reverse the removal procedure.

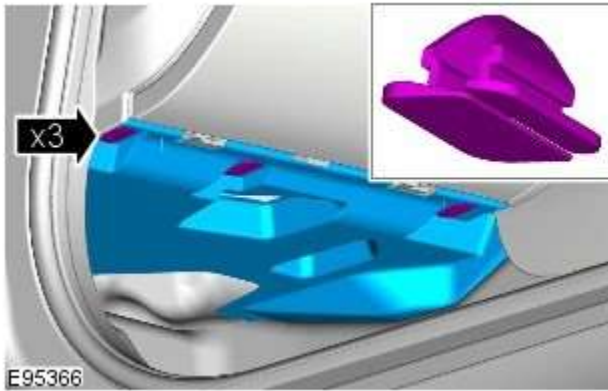
Climate Control - Pollen Filter

Removal and Installation

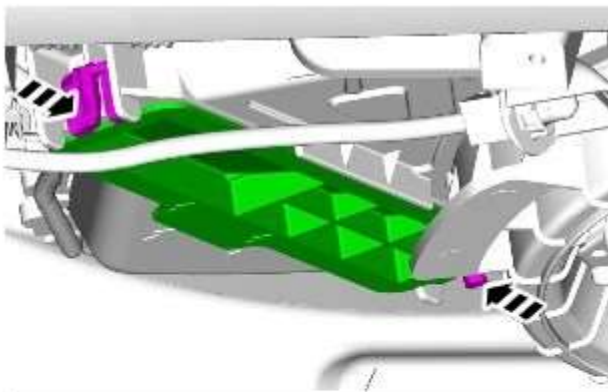
Removal



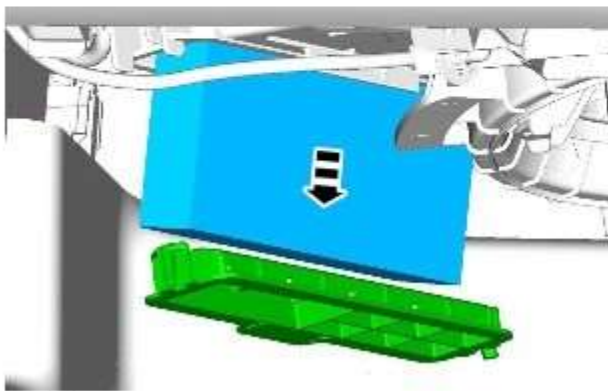
NOTE: Removal steps in this procedure may contain installation details.



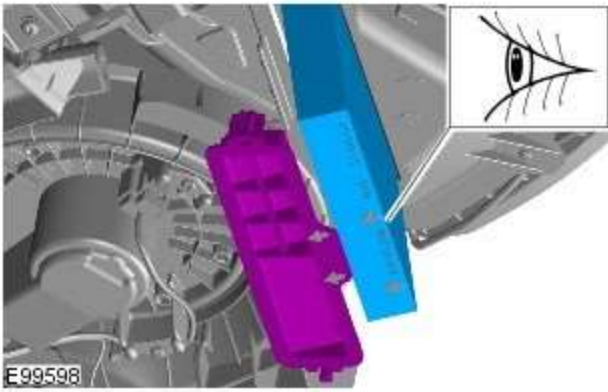
1.



2.



E95367



3.

Installation

1. To install, reverse the removal procedure.

Climate Control - Recirculation Blend Door Actuator

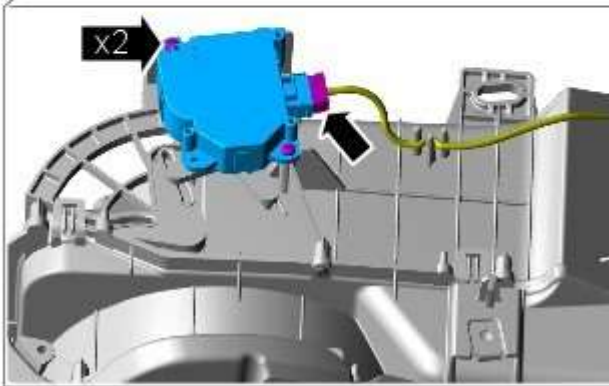
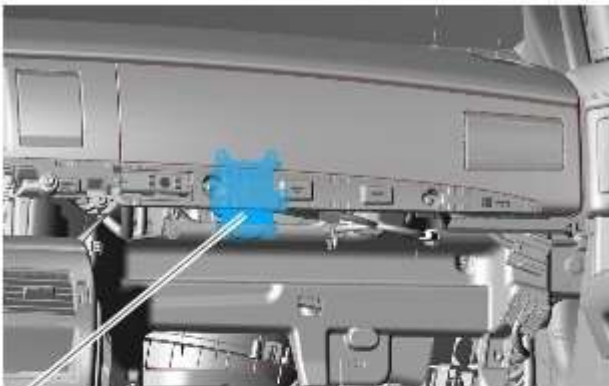
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Glove Compartment](#) (501-12 Instrument Panel and Console, Removal and Installation).



E100075



3. NOTE: Make sure that the actuator is correctly aligned to the recirculation blend door arm.

Installation

1. To install, reverse the removal procedure.

Climate Control - Sunload Sensor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

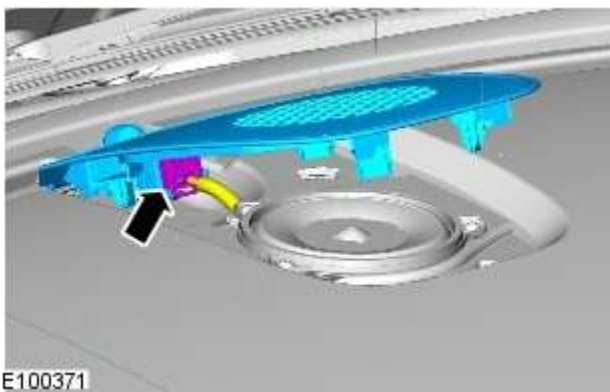
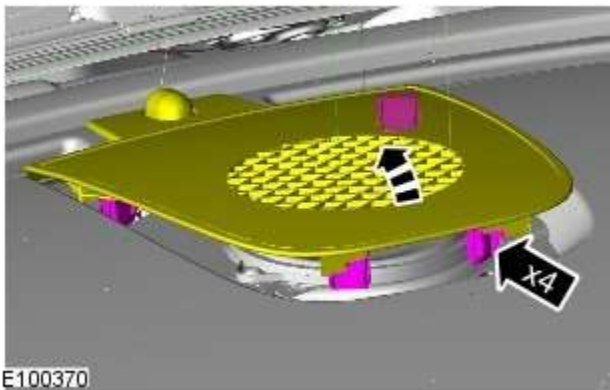
2. CAUTIONS:



Protect the surrounding trim to avoid damage.



Make sure that the clips are correctly located.

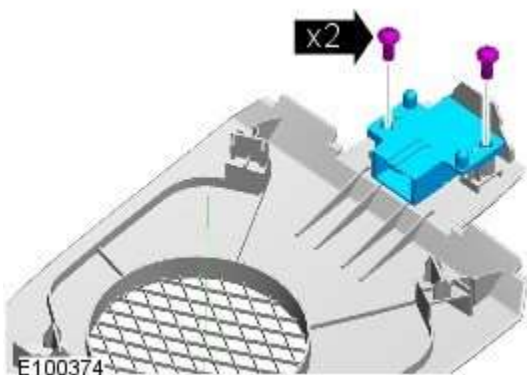


3.

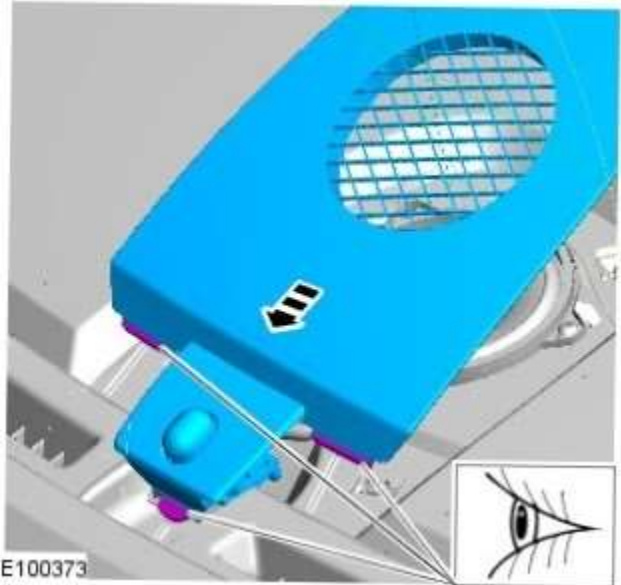


4. CAUTION: Make sure that the component is correctly located on the locating dowels.

Torque: 2 Nm



Installation



1. To install, reverse the removal procedure.

Climate Control - Thermostatic Expansion Valve

Removal and Installation

Removal

NOTES:



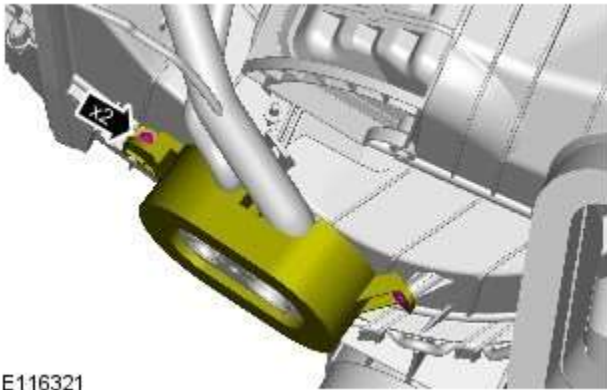
Removal steps in this procedure may contain installation details.




Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Climate Control Assembly](#) (412-01 Climate Control, Removal and Installation).

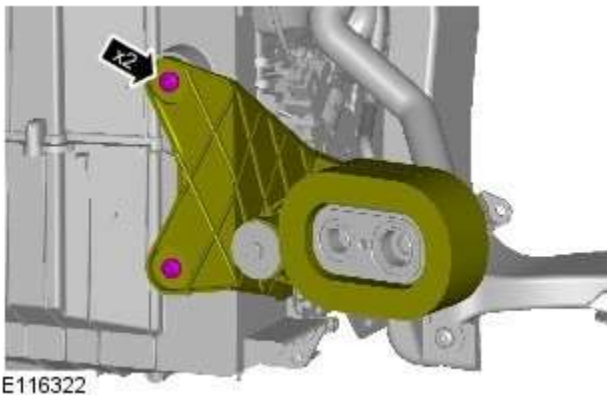
Right-hand drive vehicles




3.  CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

Torque: 1.3 Nm

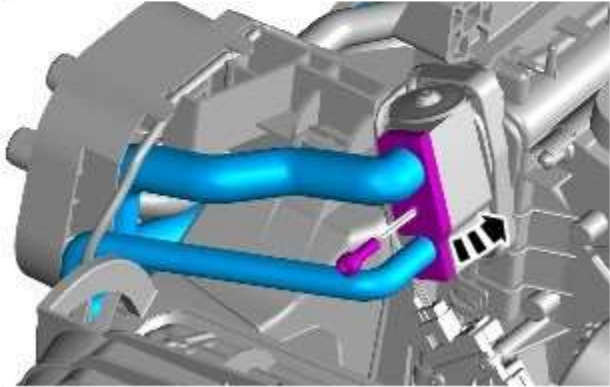
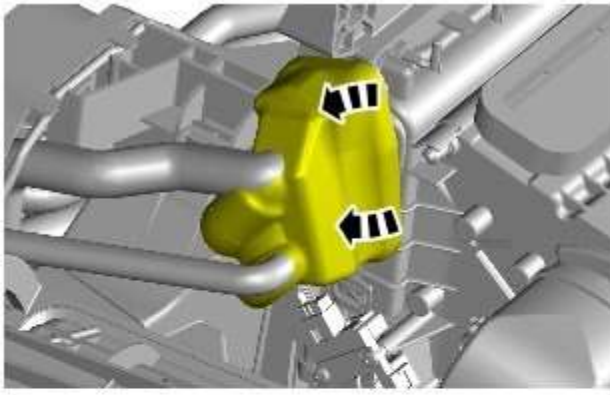
Left-hand drive vehicles



4.  CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.

Torque: 1.3 Nm

All vehicles



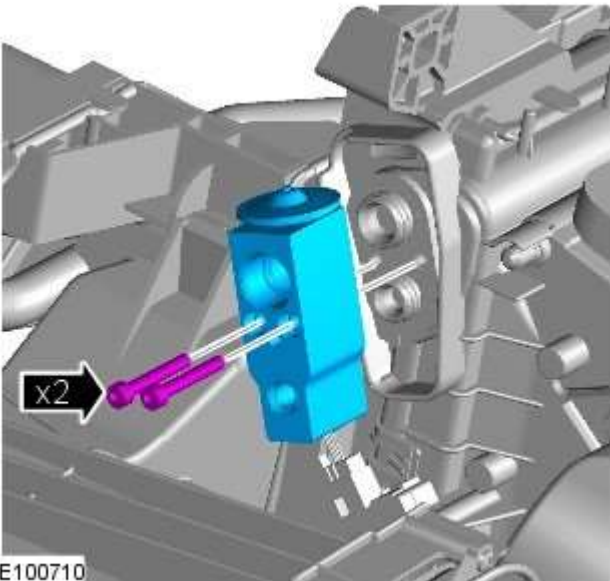
E100709

5. CAUTIONS:

 Take care not to damage the O-ring seals during installation.

 A new O-ring seal is to be installed.

Torque: 5.3 Nm



E100710

6. CAUTIONS:

 Take care not to damage the O-ring seals during installation.

 A new O-ring seal is to be installed.

Torque: 3.5 Nm

Installation

1. To install, reverse the removal procedure.

Climate Control - Desiccant Bag V6 3.0L Petrol/V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal

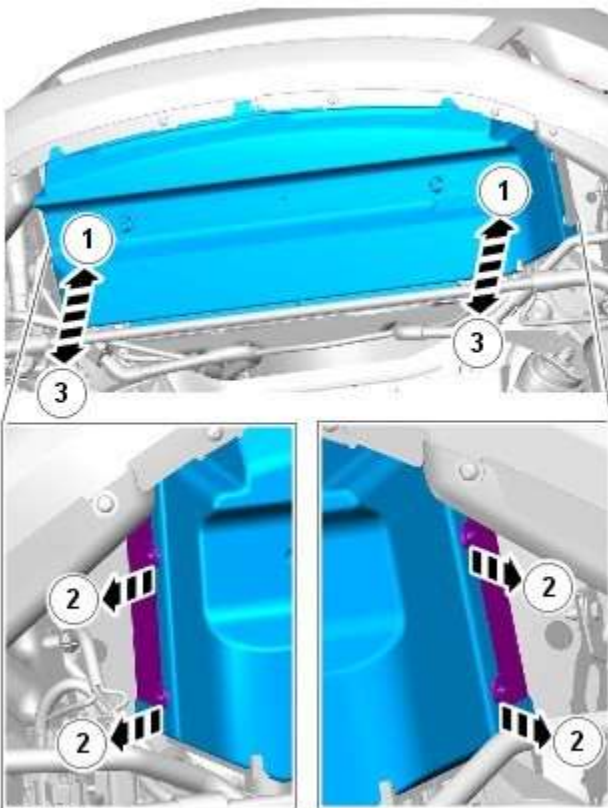


NOTE: Removal steps in this procedure may contain installation details.



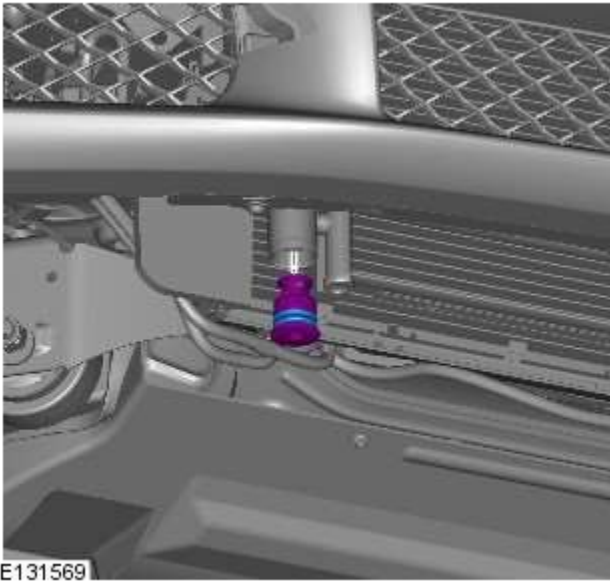
1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
3. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).

4.

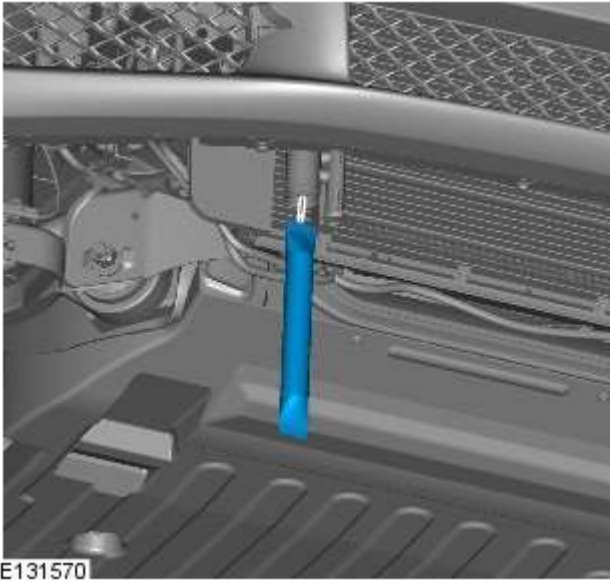


E97870

5. Torque: 12 Nm



6.



Installation

1. To install, reverse the removal procedure.

Auxiliary Climate Control -

Description	Nm	lb-ft	lb-in
Electric booster heater retaining screws	1.3	-	11

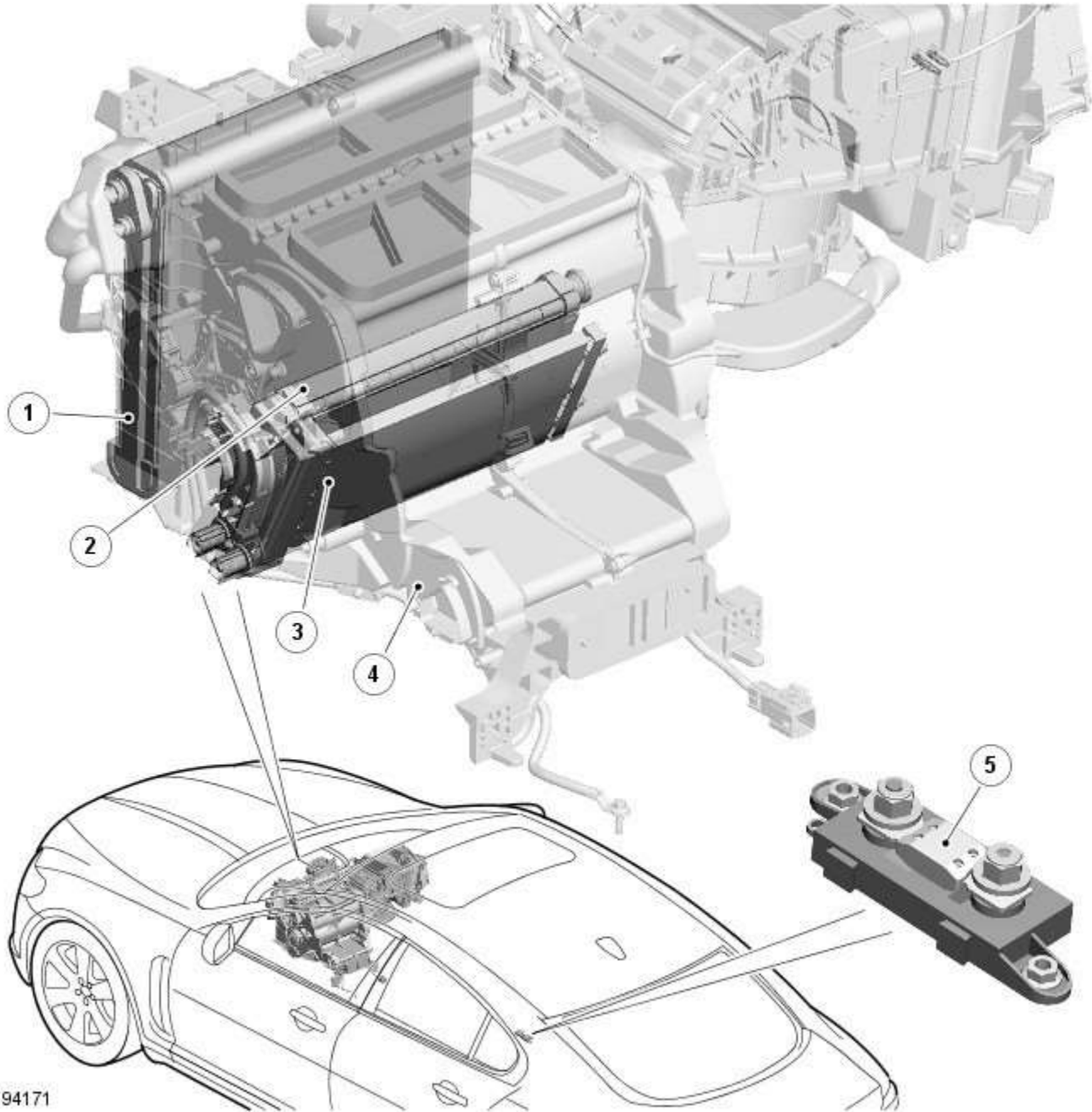
Auxiliary Climate Control - Electric Booster Heater - Component Location

Description and Operation



NOTE: LHD (left-hand drive) vehicle shown, RHD (right-hand drive) vehicle similar.

Component Location



E94171

Item	Description
1	Evaporator
2	Heater core
3	Electric booster heater
4	Heater assembly
5	150 A megafuse

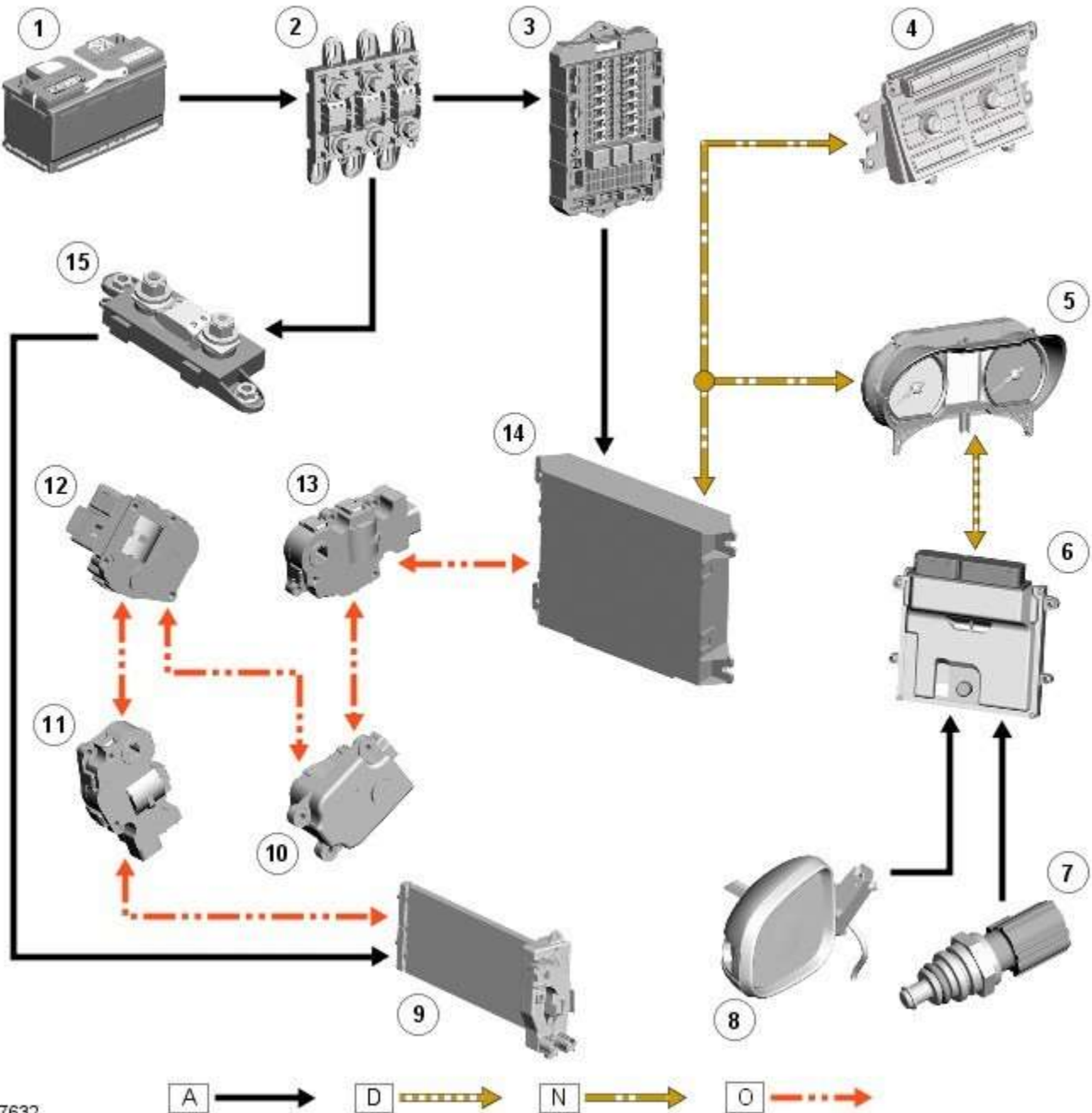
Auxiliary Climate Control - Electric Booster Heater - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus; **N** = Medium speed CAN bus; **O** = LIN (local interconnect network) bus.



E97632

Item	Description
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	Integrated control panel
5	Instrument cluster

6	ECM (engine control module)
7	ECT (engine coolant temperature) sensor
8	Ambient temperature sensor
9	Electric booster heater
10	Face/Feet distribution stepper motor
11	RH (right-hand) temperature blend stepper motor
12	LH (left-hand) temperature blend stepper motor
13	Windshield (defrost) distribution stepper motor
14	ATC (automatic temperature control) module
15	150 A megafuse

System Operation

General

Operation of the electric booster heater is controlled by the [ATC](#) module, which communicates with the micro-controller in the booster heater using the [LIN](#) bus. The temperature requested by the [ATC](#) module is based on:

- The ambient air temperature.
- The engine coolant temperature.
- The temperatures selected on the integrated control panel.

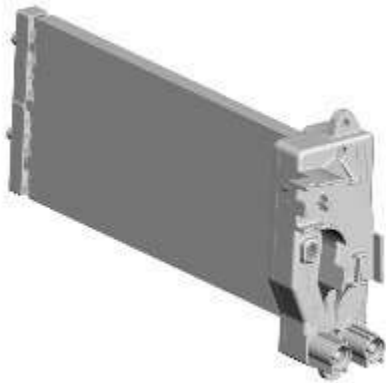
The blower must be running for the electric booster heater to operate.

If electrical load management is in force, electric booster heater performance is reduced. For additional information, refer to:

[Electronic Engine Controls \(303-14A, Description and Operation\)](#),
[Electronic Engine Controls \(303-14B Electronic Engine Controls - V6 3.0L Petrol, Description and Operation\)](#),
[Electronic Engine Controls \(303-14C, Description and Operation\)](#).

Component Description

Electric Booster Heater



E97633

The electric booster heater is installed in the heater assembly, on the downstream side of the heater core. It consists of ceramic coated thermistor elements, rated at 1.25 kW, and a micro-controller. Electrical power for the booster heater is supplied by the [BJB](#) via a 150 A megafuse installed under the [RH](#) front seat.

Auxiliary Climate Control - Auxiliary Coolant Flow Pump

Removal and Installation

Removal

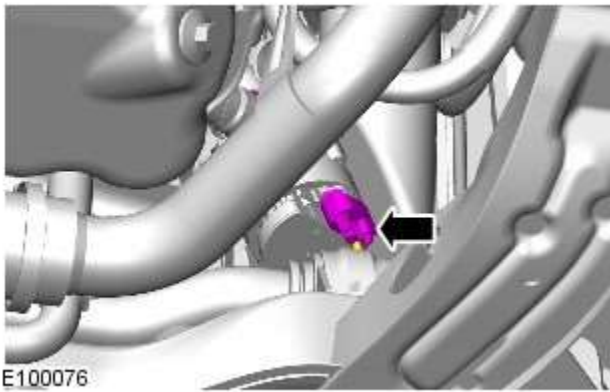


1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

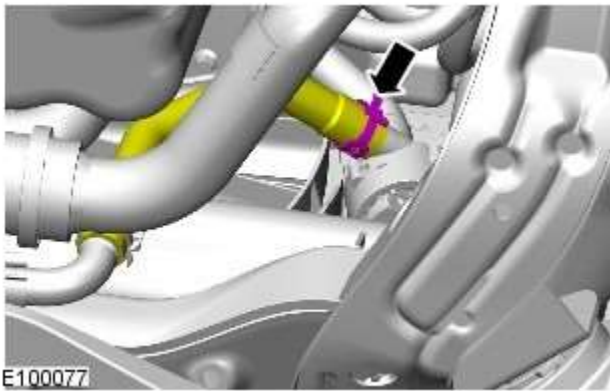
Raise and support the vehicle.

2. Refer to: Air Deflector (501-02, Removal and Installation).

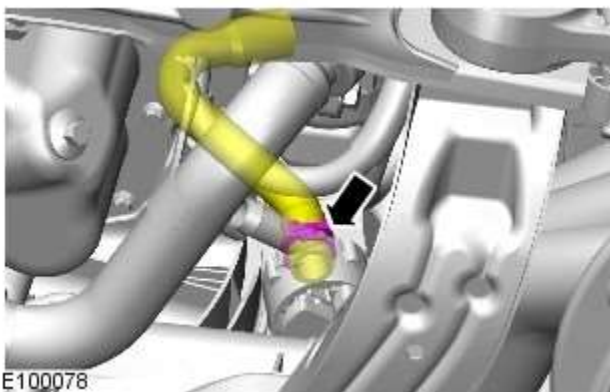
3.

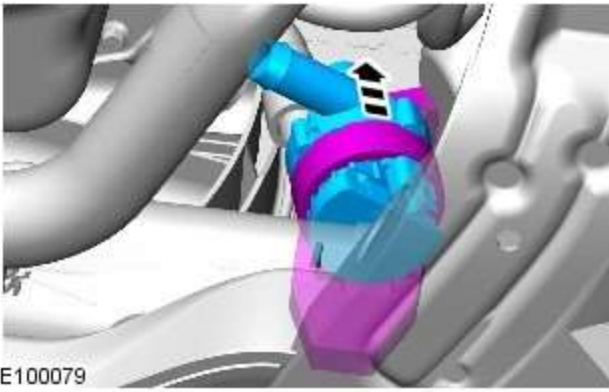


4.  **NOTE:** Clamp the coolant hose to minimize coolant lose.



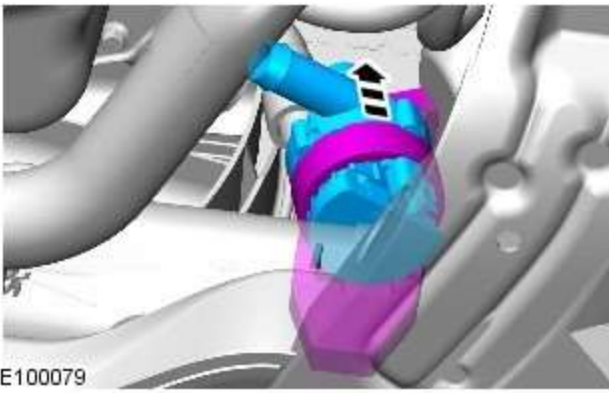
5.  **NOTE:** Clamp the coolant hose to minimize coolant lose.



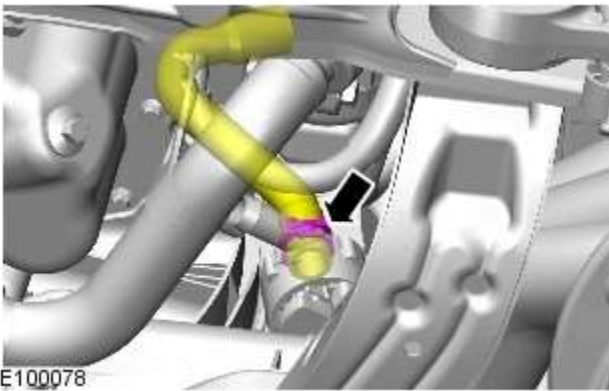


6.

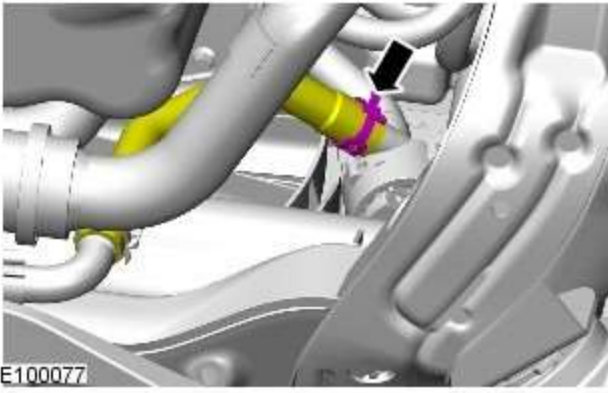
Installation



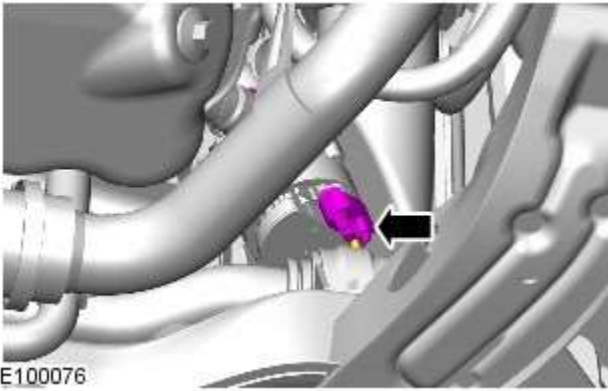
1.




2.  NOTE: Clamp the coolant hose to minimize coolant lose.



3.  NOTE: Clamp the coolant hose to minimize coolant lose.



- 4.

5. Lower the vehicle.
6. Remove the coolant expansion tank pressure cap.
7. Fill the cooling system up to the MAX mark on the coolant expansion tank using a fifty percent mixture of Jaguar Premium Cooling System Fluid or equivalent, meeting Jaguar specification WSS M97B44-D and fifty percent water.
8. Install the coolant expansion tank pressure cap.
9. Start and run the engine.
10. Set the heating system to MAX heat, the blower motor to MAX speed and the air distribution to the instrument panel registers.
11.  CAUTION: Observe the engine temperature gauge. If the engine starts to over-heat switch off immediately and allow to cool. Failure to follow this instruction may cause damage to the vehicle

Allow the engine to run until hot air is emitted from the instrument panel registers, while observing the engine temperature gauge.
12. Switch the engine off.
13. Allow the engine to cool.

14. WARNINGS:



Never remove the coolant expansion tank cap under any circumstances while the engine is operating. Failure to follow this instruction may result in personal injury.



To avoid having scalding hot coolant or steam blowing out of the cooling system, use extreme care when removing the coolant pressure cap from a hot cooling system. Wait until the engine has cooled, then wrap a thick cloth around the coolant pressure cap and turn it slowly until the pressure begins to release. Step back while the pressure is released from the system. When certain all the pressure has been released (still with a cloth) turn and remove the coolant pressure cap from the coolant expansion tank. Failure to follow these instructions may result in personal injury.

Release the cooling system pressure.

15. Fill the cooling system up to the MAX mark on the coolant expansion tank using a fifty percent mixture of Jaguar Premium Cooling System Fluid or equivalent, meeting Jaguar specification WSS M97B44-D and fifty percent water.

16. Install the coolant expansion tank pressure cap.

17. Raise the vehicle.

18. Check all coolant hoses for visible signs of coolant leaks.

19. Install the air deflector.

Refer to: Air Deflector (501-02, Removal and Installation).

Auxiliary Climate Control - Electric Booster Heater

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

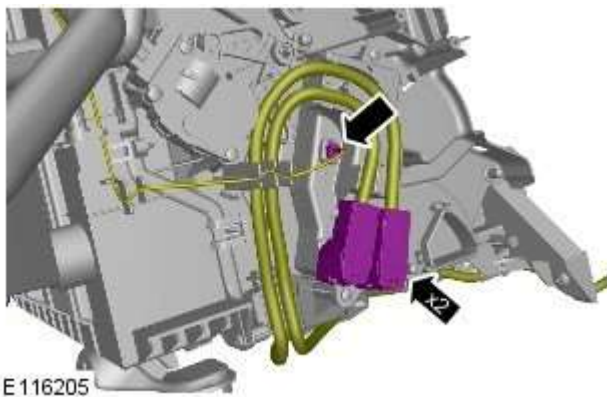
All vehicles

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Right-hand drive vehicles

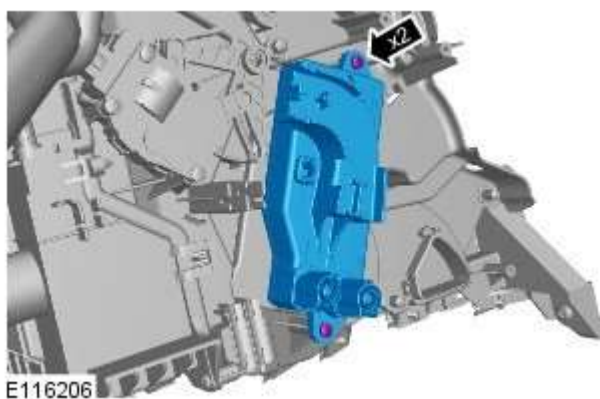
2. Refer to: [Heater Core and Evaporator Core Housing](#) (412-01 Climate Control, Removal and Installation).

All vehicles



3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 1.3 Nm



4. CAUTION: Take extra care not to damage the clips or screw threads. Failure to follow this instruction may result in damage to the climate control assembly.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.

Air Conditioning -

Torque Specifications

Description	Nm	lb-ft	lb-in
A/C compressor retaining bolts	25	18	-
A/C compressor manifold and tube retaining bolt	9	-	80
A/C condenser core retaining studs	5	-	48
A/C condenser core supply and return lines retaining nuts	8	-	71
Power steering oil cooler retaining nuts	7	-	62
A/C desiccant bag retaining screw (vehicles fitted with petrol engines)	22	16	-
A/C desiccant bag retaining screw (vehicles fitted with diesel engines)	4	-	37
A/C pressure cutoff switch	8	-	71

Air Conditioning - Air Conditioning

Diagnosis and Testing

For additional information.

REFER to: [Climate Control System](#) (412-00 Climate Control System - General Information, Diagnosis and Testing).

Air Conditioning - Air Conditioning (A/C) Compressor V8 5.0L Petrol/V8 S/C

5.0L Petrol

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

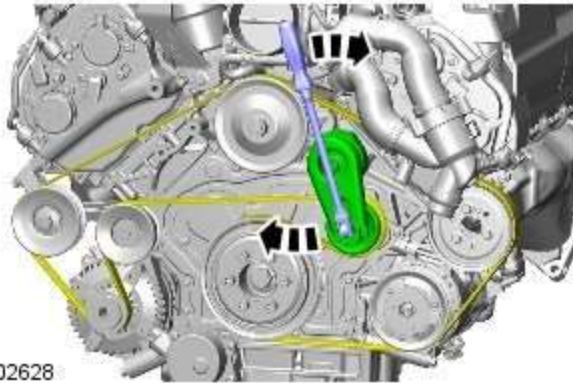


2. **WARNING:** Make sure to support the vehicle with axle stands.

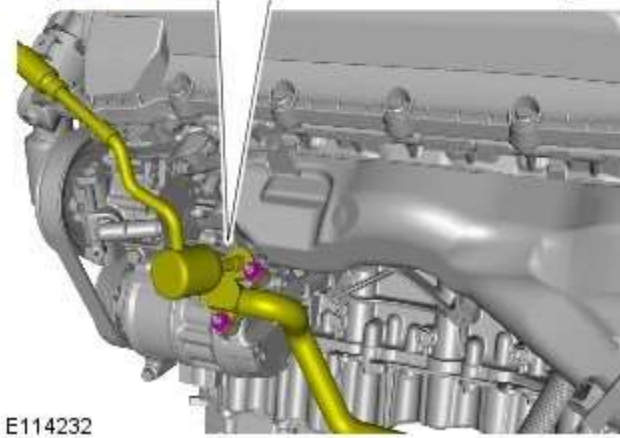
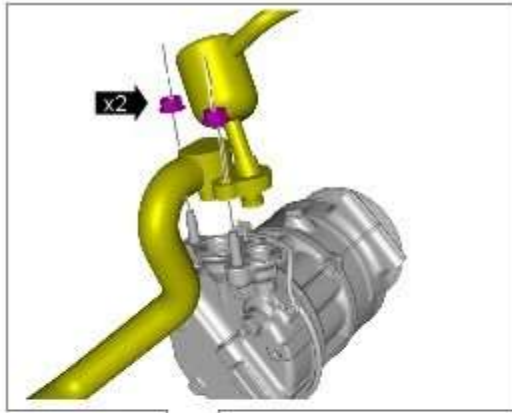
Raise and support the vehicle.

3. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
4. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
5. Refer to: [Specifications](#) (412-00 Climate Control System - General Information, Specifications).
6. Refer to: [Refrigerant Oil Adding - V6 3.0L Petrol](#) (412-00 Climate Control System - General Information, General Procedures).

7.




E102628



E114232

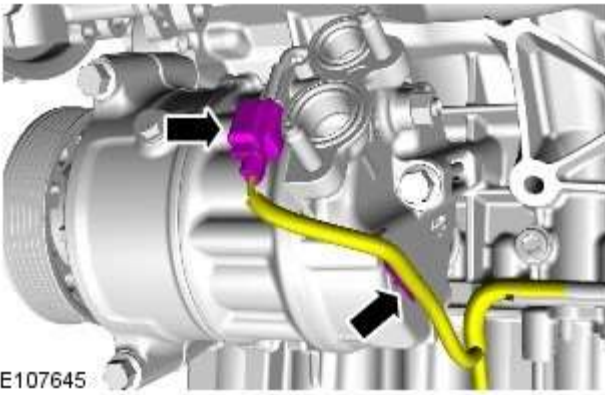
8. CAUTIONS:

 Immediately cap all refrigerant lines to prevent ingress of dirt and moisture.

 Make sure that all openings are sealed. Use new blanking caps.

Torque: 9 Nm

9.



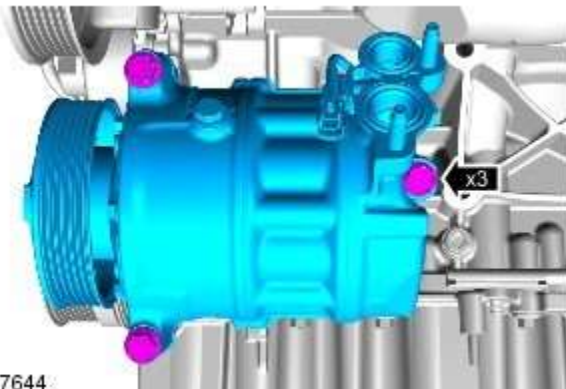
E107645

10. CAUTIONS:

 Make sure that all openings are sealed. Use new blanking caps.

 Take care not to damage the O-ring seals during installation.

Torque: 25 Nm



E107644

Installation

1. To install, reverse the removal procedure.

Air Conditioning - Condenser Core V8 S/C 5.0L Petrol

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).

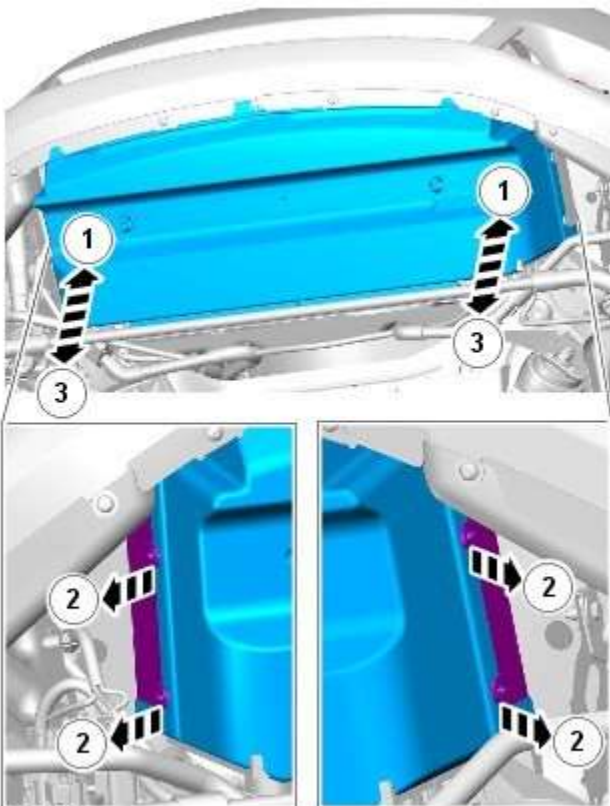


2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

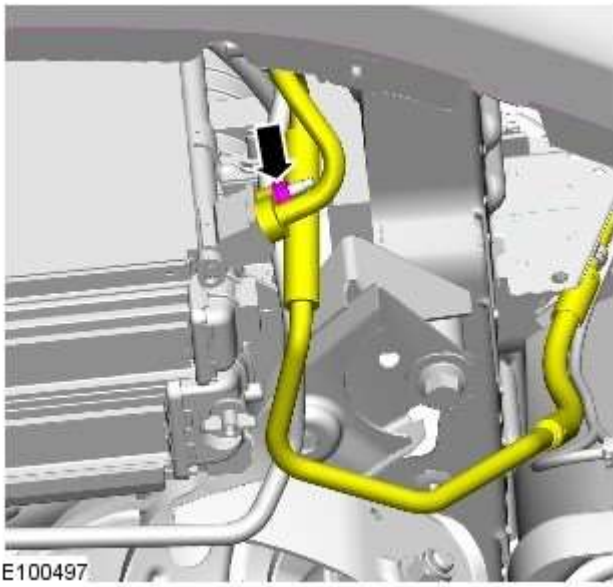
Raise and support the vehicle.

3. Refer to: [Radiator](#) (303-03D Supercharger Cooling - V8 S/C 5.0L Petrol, Removal and Installation).

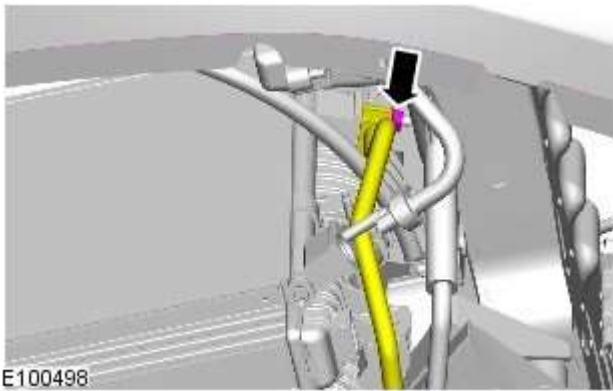
4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



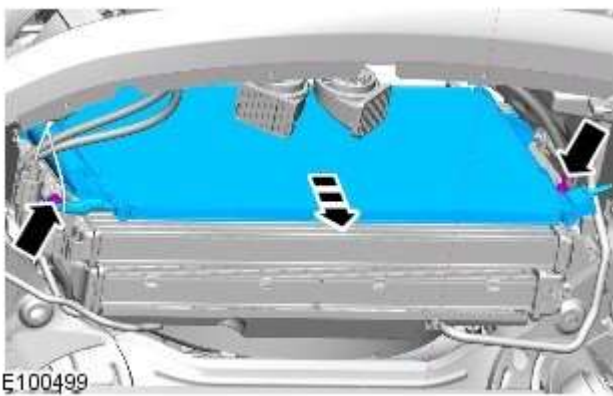
E97870




5. Torque: 8 Nm



6. Torque: 8 Nm



7.  NOTE: Support the air conditioning (A/C) condenser.
Torque: 7 Nm

Installation

1. To install, reverse the removal procedure.

Air Conditioning - Pressure Cutoff Switch

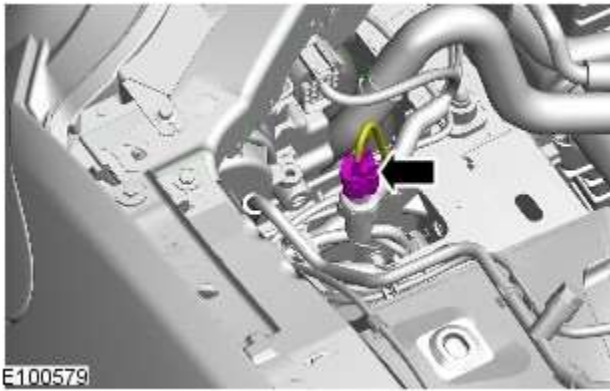
Removal and Installation

Removal

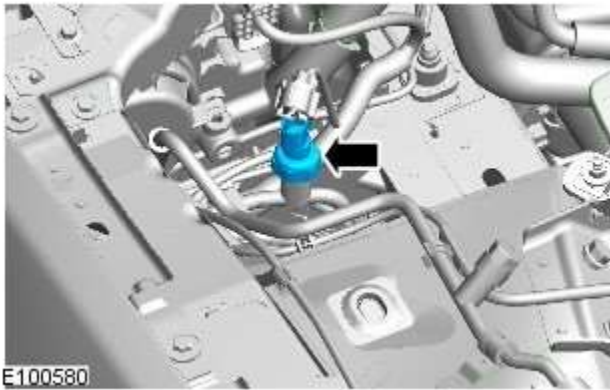



NOTE: Removal steps in this procedure may contain installation details.

1. For additional information, refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).
2. For additional information, refer to: Air Cleaner (303-12, Removal and Installation).



3.



4.  CAUTION: Make sure the air conditioning (A/C) hose does not turn when removing the low pressure switch.

TORQUE: 8 Nm

Installation

1. To install, reverse the removal procedure.

Instrument Cluster -

Description	Specification
Illumination bulb.	3.0 Watt

Instrument Cluster - Instrument Cluster - Component Location

Description and Operation

COMPONENT LOCATION



E93401

Item	Description
1	Speedometer
2	Message Center
3	Tachometer

Instrument Cluster - Instrument Cluster - Overview

Description and Operation

OVERVIEW

The primary task of the instrument cluster is to display current vehicle status through a series of analogue gauges, indicator lamps, and a [LCD \(liquid crystal display\)](#) message center. In addition to this, the instrument cluster:

- Acts as a gateway between the medium speed and high speed [CAN \(controller area network\)](#) bus networks
- Is connected by the [LIN \(local interconnect network\)](#) bus to the start control unit and the steering wheel clockspring
- Controls operation of the steering column adjust feature
Refer to: [Steering Column](#) (211-04 Steering Column, Description and Operation).
- Acts as an interface for the passive anti-theft system.
Refer to: [Anti-Theft - Active](#) (419-01A Anti-Theft - Active, Description and Operation).

Two analogue gauges are located in the instrument cluster; the speedometer and the tachometer. The speedometer is located on the [LH \(left-hand\)](#) side of the instrument cluster. The tachometer is located on the [RH \(right-hand\)](#) side of the instrument cluster

and displays engine speeds up to 7000 Revolutions Per Minute (RPM) for the supercharged engine, 8000 RPM for the naturally aspirated engines and 6000 RPM for diesel variants.

The message center is a [LCD](#) located in a central position in the cluster. The message center displays system status information including fuel quantity remaining.

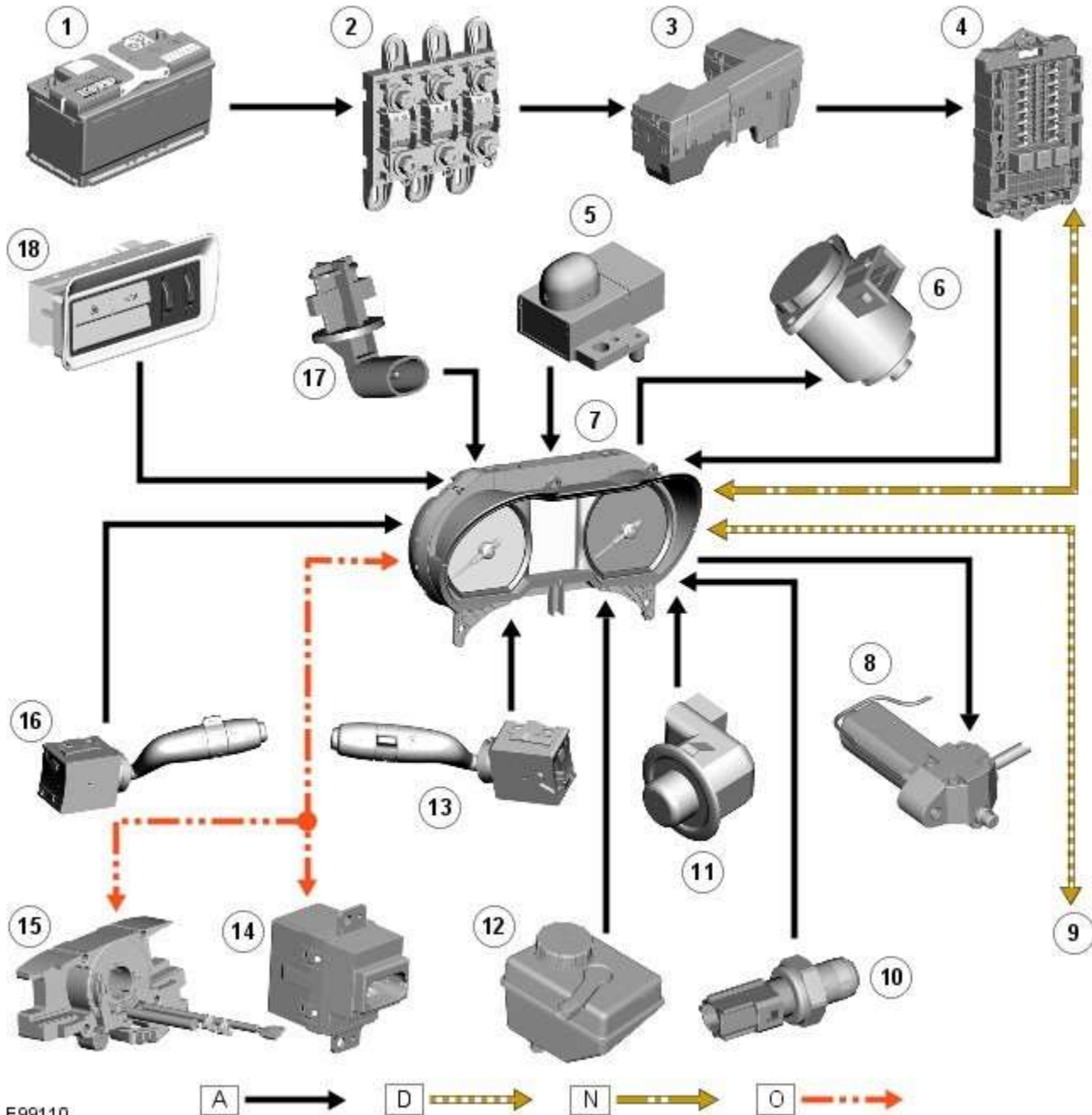
Instrument Cluster - Instrument Cluster - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus; **N** = Medium speed CAN bus; **O** = LIN (local interconnect network) bus

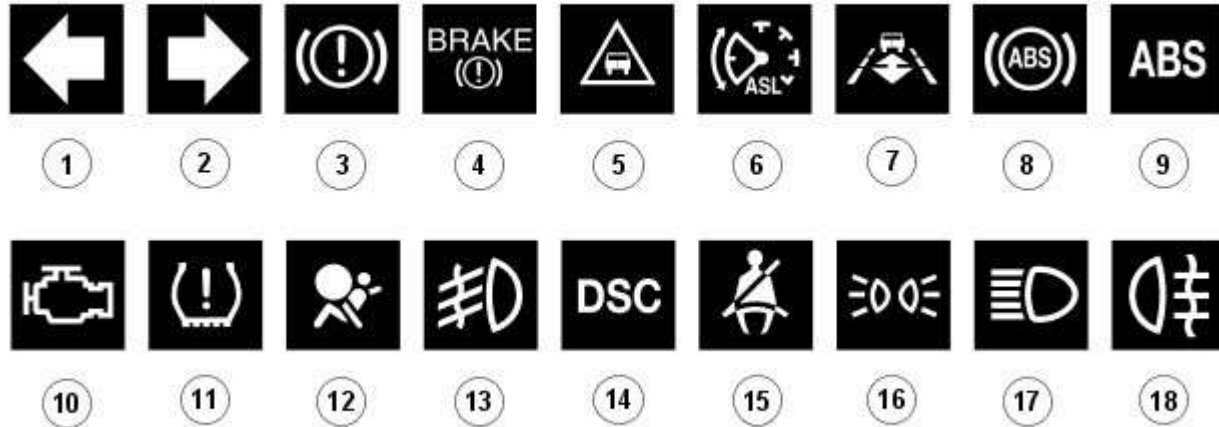


Item	Description
1	Battery
2	BJB (battery junction box)
3	EJB (engine junction box)
4	CJB (central junction box)
5	Sun load sensor (alarm LED (light emitting diode))

6	Servotronic valve
7	Instrument cluster
8	Steering column motor
9	High speed CAN bus connection to other vehicle systems
10	Engine oil pressure switch
11	Steering column adjustment switch
12	Brake fluid level switch
13	LH (left-hand) steering column multifunction switch
14	Start control module
15	Clockspring
16	RH (right-hand) steering column multifunction switch
17	Engine coolant level sensor
18	Auxiliary lighting switch

System Operation

WARNING INDICATOR FUNCTIONALITY



E99113

Item	Description
1	LH turn signal
2	RH turn signal
3	Brake warning
4	Brake warning (NAS)
5	Forward alert
6	Automatic Speed Limiter (ASL)
7	Adaptive speed control
8	ABS (anti-lock brake system) warning
9	ABS warning (NAS)
10	Malfunction Indicator Lamp (MIL)
11	Tire Pressure Monitoring System (TPMS)
12	Airbag warning
13	Front fog lamps
14	Dynamic Stability Control (DSC) warning
15	Seat belt warning
16	Side lamps
17	High beam
18	Rear fog lamps

The functionality for each of the above warning indicators is described in the following sections:

1 and 2. Turn Signal Indicators

The turn signal indicators are controlled by the [CJB](#) on receipt of medium speed [CAN](#) bus signals from the instrument cluster.

The instrument cluster outputs a voltage to the turn signal indicator switch. The switch contains resistors of different values. When the switch is operated in either the [LH](#) or [RH](#) direction, the voltage is passed to a ground connection in the instrument cluster which detects the reduced voltage supplied via the resistors. When the turn signal indicator switch is operated in the [LH](#) or [RH](#) direction, the instrument cluster detects the ground voltage and determines whether a [LH](#) or [RH](#) selection is made.

The instrument cluster transmits a medium speed [CAN](#) message to the [CJB](#) for operation of the applicable turn signal indicators. The message can contain a number of states for each possible switch position and also an out of range low and high state for circuit faults and an initial value for the switch neutral position. The turn signal indicators are not subject to the 3 second indicator check when the ignition is switched on.

The [RJB](#) (rear junction box) software controls the flash rate of the warning indicator which sends 'ON' and 'OFF' signals to the instrument cluster which flashes the indicators in a green color. During normal operation, the warning indicator flashes slowly, accompanied simultaneously by a sound from the instrument cluster sounder. If a fault exists, the [RJB](#) transmits a message to the instrument cluster which responds by displaying an appropriate message in the message center.

The hazard warning indicators are controlled by the [CJB](#) on receipt of a completed ground path from the hazard warning indicator switch. The [CJB](#) outputs a medium speed [CAN](#) message to the instrument cluster which operates both the [LH](#) and [RH](#) turn signal indicators simultaneously. The hazard warning indicators can operate with the ignition switched off, therefore the [CAN](#) message from the [CJB](#) will also carry a 'wake-up' message for the instrument cluster.

3. Brake Warning Indicator

This warning indicator is displayed in a red or amber color (dependant on market) as a brake symbol in all markets except United States of America (USA) which have the word 'BRAKE' in place of the symbol. The indicator is controlled by high speed [CAN](#) messages from the [ABS](#) module and the parking brake control module. The indicator is illuminated in a red color for a 3 second indicator check when the ignition is switched on.

The instrument cluster monitors the fluid level in the brake fluid reservoir using a hardwired level switch. If the fluid level falls to below a determined level, the switch contact is broken and the [ABS](#) module detects the low fluid level condition. The instrument cluster illuminates the warning indicator and simultaneously displays a 'BRAKE FLUID LOW' message in the message center.



NOTE: If both the brake warning indicator and the [ABS](#) warning indicator illuminate simultaneously, a major fault in the brake system will have occurred.

The warning indicator also displays parking brake status. When the parking brake is applied, the warning indicator will be illuminated by the instrument cluster and, if the vehicle is moving, the message 'PARK BRAKE APPLIED' will be also displayed in the message center in response to a [CAN](#) message from the parking brake control module.

If a condition exists where the parking brake cannot be applied, the parking brake control module issues a [CAN](#) message to the instrument cluster which flashes the warning lamp on and off and is accompanied with a message 'CANNOT APPLY PARK BRAKE'. If a fault occurs in the parking brake system, the parking brake control module issues a [CAN](#) message to the instrument cluster which illuminates the warning indicator and displays the message 'PARK BRAKE FAULT' in the message center.

4. Forward Alert Indicator

The forward alert system uses the components of the adaptive speed control system to alert the driver of the presence of a vehicle ahead. The system can be turned on and off using a switch located in the auxiliary lighting switch when the adaptive speed control system is off. The indicator is illuminated in an amber color for a 3 second indicator check when the ignition is switched on.

The forward alert system is controlled by the adaptive speed control module. When the switch is pressed, the forward alert system is activated and the adaptive speed control module issues a forward alert active message on the high speed [CAN](#) bus to the instrument cluster. The forward alert icon in the instrument cluster will illuminate in an amber color and a 'FORWARD ALERT' message will be displayed in the message center. When the button is pressed a second time, the module issues a forward alert off [CAN](#) message. The forward alert system will be deactivated, the forward alert icon will go off and a message 'FORWARD ALERT OFF' will be displayed in the message center.

5. Automatic Speed Limiter (ASL) Indicator

The ASL is controlled by the [ECM](#) (engine control module). An ASL switch is located in the floor console, adjacent to the gear selector lever. When the ASL switch is pressed, this is sensed by the [ECM](#) which issues a high speed [CAN](#) message to the instrument cluster. The instrument cluster illuminates the ASL warning indicator in an amber color to show the driver that ASL is active. The driver sets the required speed using the speed control SET +/- switches on the steering wheel. The selected speed is shown by the message 'LIMITER SET XXX MPH / K/MH' in the message center. The indicator is illuminated in an amber color for a 3 second indicator check when the ignition is switched on. ASL can be deselected by pressing the ASL switch, by depressing the throttle pedal initiating kick-down or by pressing the 'cancel' switch on the steering wheel. The ASL indicator will go off and the message center will display the message 'limiter cancelled' for 4 seconds. If a fault occurs in the ASL system, the [ECM](#) will send a message to the instrument cluster to illuminate the ASL indicator and display the message 'LIMITER NOT AVAILABLE'.

6. Adaptive Speed Control Indicator

The adaptive speed control system is controlled by the adaptive speed control module. Operation of the SET +/- switches on the steering wheel will activate the system. Operation of the switches is detected by the adaptive speed control module. The module issues a high speed [CAN](#) message to the instrument cluster which illuminates the adaptive speed control indicator, when the system is in 'follow mode', in an amber color and displays a 'SETSPEED XXX MPH / KM/H' message in the message center. The indicator is illuminated in an amber color for a 3 second indicator check when the ignition is switched on.

7. Anti-lock Braking System (ABS) Warning Indicator

The [ABS](#) warning indicator is controlled by the [ABS](#) module. If a fault in the [ABS](#) system is detected by the [ABS](#) module, the module issues a high speed [CAN](#) message to the instrument cluster to illuminate the [ABS](#) warning indicator in an amber color and display the message 'ABS FAULT' in the instrument cluster. The indicator is illuminated in an amber color for a 3 second indicator check when the ignition is switched on. If a fault is present when the ignition is on, the bulb will remain illuminated after the 3 second indicator check period.

NOTES:



The 'ABS FAULT' message is not displayed in NAS markets).



If both the [ABS](#) warning indicator and the brake warning indicator illuminate simultaneously, a major fault in the brake system will have occurred.

On NAS vehicles, the [ABS](#) warning indicator is also used for parking brake operation. The NAS warning indicator does not have 'ABS' on the icon and will function as described previously for the parking brake operation of the brake warning indicator.

8. Engine Malfunction Indicator Lamp (MIL)

The MIL warning indicator is controlled by the [ECM](#) and illuminated by the instrument cluster on receipt of a message on the high speed [CAN](#) bus from the [ECM](#). The indicator is illuminated in an amber color for a 3 second indicator check when the ignition is switched on.

If the MIL remains illuminated after the engine is started or illuminates when driving, a fault is present and must be investigated at the earliest opportunity. Illumination of the MIL warning indicator alerts the driver to an [OBD \(on-board diagnostic\)](#) fault which will cause excessive emissions output. This may relate to either an engine management system fault or a transmission.

9. Tire Pressure Monitoring System (TPMS) Warning Indicator

The TPMS warning indicator is illuminated by the instrument cluster on receipt of a medium speed [CAN](#) message from the TPMS module. The indicator is illuminated in an amber color for a 3 second indicator check when the ignition is switched on.

If the indicator illuminates and is accompanied by the message 'TYRE PRESSURE SYSTEM FAULT' in the message center, then a TPMS fault has occurred. If the indicator illuminates and accompanied by a different message, then a low tire pressure has been detected, a spare wheel has been fitted or a TPMS sensor has failed.

10. Airbag Warning Indicator

The airbag warning indicator is controlled by the instrument cluster. The indicator is illuminated in an amber color for the 3 second indicator check when the ignition is switched on. The indicator remains illuminated after the 3 second period has expired until the instrument cluster receives a turn off message on the high speed [CAN](#) bus from the [RCM \(restraints control module\)](#).

11. Front Fog Lamp Indicator

The green colored front fog lamp indicator is controlled by the [CJB](#) and illuminated by the instrument cluster on receipt of a front fog lamp on message on the medium speed [CAN](#) bus from the [CJB](#). The indicator is illuminated for as long as the front fog lamps are active. The front fog lamp indicator is not subject to the 3 second indicator check when the ignition is switched on.

12. Dynamic Stability Control (DSC) Indicator

The DSC warning lamp is controlled by the [ABS](#) module and illuminated by the instrument cluster in response to messages received on the high speed [CAN](#) bus. The indicator is illuminated in an amber color for the 3 second indicator check when the ignition is switched on. The [DSC](#) warning indicator, are permanently illuminated in an amber color if the instrument cluster receives a high speed [CAN](#) message from the [ABS](#) module relating to one of the following faults:

- Traction control fault
- Yaw control fault
- Engine drag torque control fault
- Panic Brake Assist (PBA) fault
- Signal missing relating to either traction control active, yaw control active or DSC switch input.

The above faults will also generate an applicable DSC and ABS warning message in the message center. The DSC warning indicator will flash at 2 Hz for if the traction control or yaw control is active when the DSC system is enabled. If the DSC system is switched off, the warning indicator will be permanently illuminated until the DSC system is subsequently re-activated.

13. Safety Belt Warning Indicator

The safety belt warning indicator operates for both the driver and passenger safety belts. The warning indicator is controlled by

the [RCM](#) and illuminated by the instrument cluster on receipt of high speed [CAN](#) bus messages. The safety belt warning indicator is not subject to the 3 second indicator check when the ignition is switched on.

The operation of the passenger seat buckle switch is as described below with the exception that the instrument cluster must receive a hardwired signal from the belt minder control module to indicate that a passenger is occupying the seat.

The safety belt warning indicator is subject to a timer. The warning indicator is activated when the following conditions exist:

- Ignition is switched on
- One of the front seat belts is unbuckled
- USA market only - 75 seconds has elapsed after ignition on mode is selected
- Vehicle is not in reverse gear
- Vehicle speed is more than 8 km/h (5 mph).

Once the above parameters are met, the instrument cluster flashes the warning indicator at 2 Hz for 10 seconds accompanied by a simultaneous chime. After 10 seconds the chime ceases and the warning indicator is permanently illuminated for 20 seconds. This sequence is repeated every 30 seconds until one of the following events occurs:

- 300 seconds has elapsed
- The safety belt of the occupied front seats is fastened
- The ignition is switched to off mode
- The vehicle speed decreases to below 5 km/h (3 mph).



NOTE: On USA market vehicles, the warning indicator is not permanently illuminated.

The safety belt minder function cannot be disabled. The seat belt minder function can be disabled. Refer to: [Safety Belt System](#) (501-20A Safety Belt System, Description and Operation).

14. Side Lamp Indicator

The instrument cluster controls the green colored side lamp indicator on receipt of a side lamp status message on the medium speed [CAN](#) bus from the [CJB](#) and the auxiliary junction box. The lighting switch on the [LH](#) steering column multifunction switch is connected to the instrument cluster. Selections using this switch are detected by the cluster which requests the side or headlamp operation via a message to the [CJB](#) and the [RJB](#). The [CJB](#) and the [RJB](#) responds with a side lamp active message and the cluster illuminates the side lamp indicator. The side lamp indicator is not subject to the 3 second indicator check when the ignition is switched on.

15. High Beam Indicator

The instrument cluster controls the blue colored high beam indicator on receipt of a high beam status message on the medium speed [CAN](#) bus from the [CJB](#). The lighting switch on the [LH](#) steering column multifunction switch is connected to the instrument cluster. High beam or flash selections using this switch are detected by the cluster which requests the light operation via a [CAN](#) message to the [CJB](#). The [CJB](#) responds with a high beam active message and the cluster illuminates the high beam indicator. The high beam indicator is not subject to the 3 second indicator check when the ignition is switched on.

16. Rear Fog Lamp Indicator

The amber colored rear fog lamp indicator is controlled by the auxiliary junction box and illuminated by the instrument cluster on receipt of a rear fog lamp on message on the medium speed [CAN](#) bus from the [RJB](#). The indicator is illuminated for as long as the rear fog lamps are active. The rear fog lamp indicator is not subject to the 3 second indicator check when the ignition is switched on.

SPEEDOMETER

The speedometer is driven by high speed [CAN](#) signals transmitted by the [ABS](#) module. The wheel speeds are measured by sensors reading the rotational speed of the rear wheels from toothed targets on the hubs. An average of the two wheel speeds are passed from the sensors to the [ABS](#) module in the form of pulsed signals. The [ABS](#) module converts these signals into a speed output on the high speed [CAN](#) to the instrument cluster. The same speed outputs from the wheel speed sensors are also used to calculate the distance the vehicle has travelled.

TACHOMETER

The tachometer is driven by an engine speed signal transmitted on the high speed [CAN](#) from the [ECM](#). The signal is derived from the [CKP \(crankshaft position\)](#) sensor. The signal is received by the instrument cluster microprocessor and the output from the microprocessor drives the tachometer.

FUEL GAGE

The fuel gage is controlled by [CAN](#) messages from the [RJB](#). The [RJB](#) reads the values output by the fuel level sensors every 131 ms and transmits a fuel tank contents value, corrected for battery voltage, in a [CAN](#) message to the instrument cluster. A fuel pump symbol is displayed to the left of the linear gage. An arrow above the symbol shows the driver on which side of the vehicle the fuel filler cap is located. Above the linear fuel gage, is a [LCD \(liquid crystal display\)](#) area which displays odometer and trip readouts. When a trip computer function is selected, these are replaced by a trip computer display for the trip function selected.

LIQUID CRYSTAL DISPLAY

In the area above and below the message center is a [LCD](#) display. The area below the message center displays a linear fuel

gauge, odometer, trip distance and trip computer readouts. The trip distance and trip computer information is derived from information supplied on the high speed [CAN](#) bus to the instrument cluster from the [ABS](#) module and the [ECM](#).

The area above the message center displays the transmission gear position information and speed control related information. The transmission information is supplied on the high speed [CAN](#) bus from the [TCM \(transmission control module\)](#).



NOTE: There is no engine coolant temperature gage displayed. If the engine coolant temperature increases to above a predetermined threshold, a warning message is displayed in the message center. The message is sent from the [ECM](#) in a high speed [CAN](#) message to the instrument cluster.

TRANSMISSION GEAR SELECTION POSITION

The gear position display shows JaguarDrive selector position or selected gear when using the Jaguar Sequential Shift. The gear selector module transmits a [CAN](#) message to the instrument cluster for gear selector lever position. The module also outputs a 'not in park' signal to the instrument cluster. The [TCM](#) transmits a high speed [CAN](#) message to the instrument cluster with data containing the selected gear when in Jaguar Sequential Shift mode.

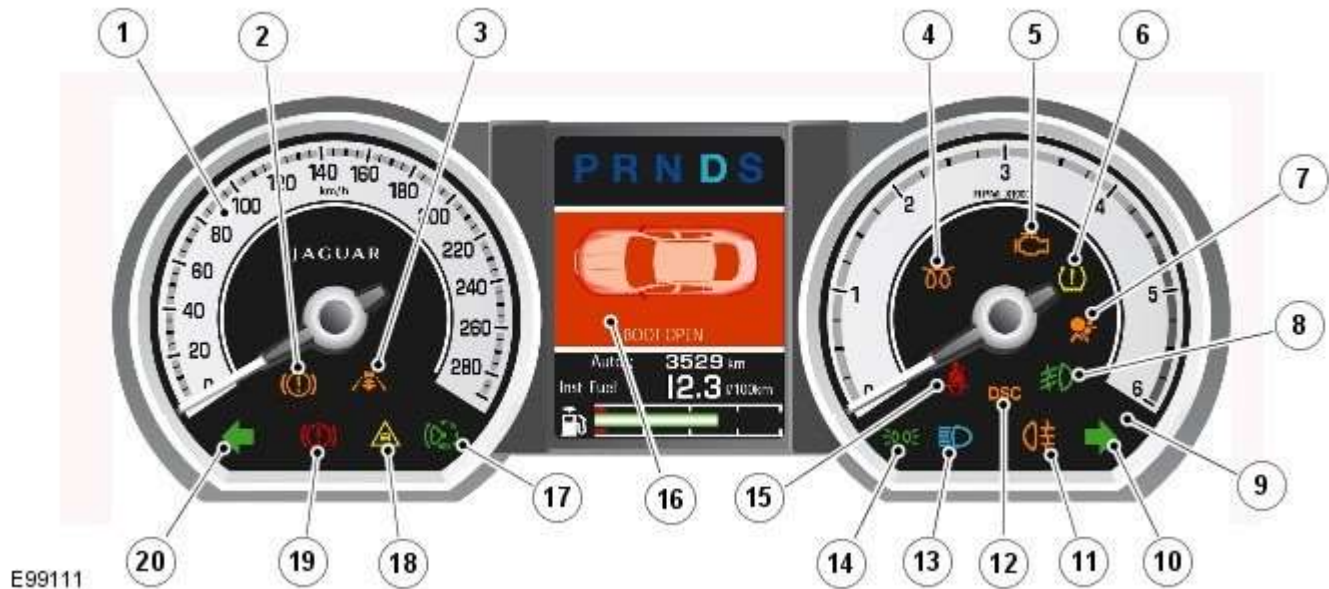
Component Description

INSTRUMENT CLUSTER - WARNING INDICATOR LOCATIONS



NOTE: Other market variants of instrument cluster are similar.

EUROPEAN MARKET - DIESEL INSTRUMENT CLUSTER



Item	Description
1	Speedometer
2	ABS indicator
3	Adaptive speed control indicator
4	Glow plug indicator
5	Malfunction Indicator Lamp (MIL)
6	Tire Pressure Monitoring System (TPMS) indicator
7	Airbag warning indicator
8	Front fog lamp indicator
9	Tachometer
10	RH turn signal indicator
11	Rear fog lamp indicator
12	Dynamic Stability Control (DSC) indicator
13	High beam indicator
14	Side lamp indicator
15	Seat belt warning indicator

16	Message center
17	Automatic Speed Limiter (ASL) indicator
18	Forward alert indicator
19	Brake warning indicator
20	LH turn signal indicator

NAS MARKET - V8 NORMALLY ASPIRATED INSTRUMENT CLUSTER



E99112

Item	Description
1	Speedometer
2	ABS indicator (NAS)
3	ABS indicator (ROW)
4	Adaptive speed control indicator
5	Tachometer
6	Malfunction Indicator Lamp (MIL)
7	Tire Pressure Monitoring System (TPMS) indicator
8	Airbag warning indicator
9	Front fog lamp indicator
10	RH turn signal indicator
11	Rear fog lamp indicator
12	Dynamic Stability Control (DSC) indicator
13	High beam indicator
14	Seat belt warning indicator
15	Side lamp indicator
16	Message center
17	Automatic Speed Limiter (ASL) indicator
18	Forward alert indicator
19	Brake warning indicator (NAS)
20	Brake warning indicator (ROW)
21	LH turn signal indicator

The warning indicators are located in various positions in the instrument cluster. The indicators can be split into two groups; instrument cluster controlled and externally controlled.

Instrument cluster controlled warning indicators are dependent on software logic within the instrument cluster for activation. The cluster software controls the indicator illumination check at ignition on (power mode 6).

Externally controlled indicators are supplied with current from another vehicle system control module or illuminated by the instrument cluster software on receipt of a bus message from another vehicle sub-system. The indicator illumination check at ignition on (powermode 6) is also controlled by the sub-system module for these indicators.

MESSAGE CENTER

The message center is a [LCD](#) located in a central position in the cluster. The message center displays system status information.

Refer to: [Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

ANALOGUE GAGES

Speedometer

The analogue speedometer is located on the [LH](#) side of the instrument cluster and is available in 4 market variants:

- Major scale Miles Per Hour (MPH), minor scale kilometers per hour (km/h) (ROW)
- Major scale MPH, minor scale km/h (NAS)
- Major scale km/h, minor scale MPH
- Major scale km/h only.

Tachometer

The analogue tachometer is located on the [RH](#) side of the instrument cluster. The tachometer has different Revolutions Per Minute (RPM) scales depending on the engine variant fitted to the vehicle as follows:

- 4.2L V8 Naturally aspirated 8000 RPM (NAS Only)
- 5.0L V8 Naturally aspirated 8000 RPM
- 5.0L V8 Supercharger 8000 RPM
- 3.0L V6 Naturally aspirated 8000 RPM
- 3.0 V6 Diesel 6000 RPM.

ELECTRONIC GAGES

Fuel Gage

The linear fuel gage has a colored bar which moves left or right depending on the tank contents. As the bar moves to the left the fuel tank contents displayed is decreasing. A warning message is displayed in the message center when the fuel tank contents fall to below the reserve level.

Transmission Gear Position Display

The gear position display shows the JaguarDrive selector position or the selected gear when using the Jaguar Sequential Shift.

The applicable drive letter is highlighted to show that a selection has been made using the JaguarDrive selector.

When Jaguar Sequential Shift is selected, the letters change to numbers; 1 - 6, and the selected gear is highlighted to emphasize the selection to the driver.

Instrument Cluster - Instrument Cluster

Diagnosis and Testing

Principles of Operation

For a detailed description of the Instrument Cluster, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (413-01 Instrument Cluster)

[Instrument Cluster](#) (Description and Operation),
[Instrument Cluster](#) (Description and Operation),
[Instrument Cluster](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Fluid level(s) • Accessory installations 	<ul style="list-style-type: none"> • Fuse(s) • Wiring harness • Electrical connector(s) • Instrument cluster • Central Junction Box (CJB) • Engine Junction Box (EJB) • Driver Door Module (DDM) • Engine Control Module (ECM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

Symptom Chart

The instrument cluster contains a self-diagnostic mode known as engineering test mode (ETM). This can be used to show the status of the instrument cluster inputs as well as a number of other useful features.

When in the ETM, the Message Centre displays internal data that can be cycled through. All functions except the message centre display will continue to operate normally unless otherwise noted.

This document is to be used in conjunction with the instrument cluster ETM (see relevant section within this document) and the Integrated Diagnostic System (IDS) facility; this does not supersede or replace the IDS facility.

Go directly to the 'Area of Concern/Symptom' that indicates the customer concern(s) and perform the actions described within the relevant section(s):

Area of Concern/Symptom	Diagnostic Ref. No.	Actions	Notes
Warning lights	A-1	Perform instrument cluster Self-Diagnostic Mode/ETM test 3.	When this test is ended the warning lamps currently required to be 'ON' will remain illuminated.
Multiple warning lights 'ON'	B-1	Check with IDS for DTCs related to identified vehicle system(s).	.
.	B-2	Check instrument cluster battery and ignition wiring - refer to circuit diagrams.	Specifically check continuity of Standard Corporate Protocol (SCP) and Controller Area Network (CAN) lines.
.	B-3	Check instrument cluster grounds.	.
.	B-4	Check fuses in battery junction box.	.
.	B-5	Check for harness traps in fascia.	.
.	B-6	Perform instrument cluster Self-Diagnostic Mode/ETM test 3.	Frost/ice warning illuminated in mixed red and amber; therefore colour differs from other warning lamps. When this test is ended, warning lamps currently required to be 'ON' will remain illuminated.
.	B-7	Check for open circuit/shorts in wiring to related warning lamp trigger (module, sensor, switch).	.

Area of Concern/Symptom	Diagnostic Ref. No.	Actions	Notes
Specific warning lamp 'ON'	C-1	Check with IDS for DTCs related to identified vehicle system.	.
.	C-2	Check for open circuit/shorts in wiring related to warning lamp circuit (module, sensor, switch) where appropriate.	.
.	C-3	Perform cluster Self-Diagnostic Mode/ETM test 3.	Frost/ice warning illuminated in mixed red and amber; therefore colour differs from other warning lamps. When this test is ended, warning lamps currently required to be 'ON' will remain illuminated.
.	C-4	Check the specific vehicle system indicated by the warning lamp illuminated?	What is the warning lamp telling me? Does this check out with the DTC logged by the system indicating the fault?
Fuel gauge operation	D-1	Perform Self-Diagnostic Mode/ETM test 21 to establish if fuel level input to cluster is out of range or invalid.	0 - 9 = short circuit; gauge will show empty. 10 - 254 = normal range. 255 = open circuit; gauge will show empty. --- = missing signal; gauge will show empty.
.	D-2	Check gauge function versus Self-Diagnostic Mode/ETM test 21.	0 = empty, 254 = full. 255 = invalid; gauge will show empty.
.	D-3	Check for open circuit/shorts in wiring between the Fuel Delivery Module, Jet Pump Module and Rear Electronic Module (REM).	.
Fuel gauge reading	E-1	Check gauge position versus Self-Diagnostic Mode/ETM test 21.	0 = empty to 254 = full (255 invalid; gauge will show empty). Other values percentage of above range e.g. 127 = half.
.	E-2	Calculate percentage fuel level from figure obtained from Self-Diagnostic Mode/ETM test 21 and compare to IDS vehicle fuel percentage test.	Self-Diagnostic Mode fuel level percentage can be calculated as follows: Value from Self-Diagnostic Mode test 26 ÷ 254 x 100 = % shown on gauge.
.	E-3	Monitor value of Self-Diagnostic Mode test/ETM test 21 (during test drive) to establish if input drops out of range.	0 - 9 = short circuit; gauge will show empty. 10 - 254 = normal range. 255 = open circuit; gauge will show empty. --- = missing signal; gauge will show empty.
.	E-4	Monitor 'FUEL LEVEL' in IDS data logger (during test drive) to correlate gauge position to vehicle reported fuel level.	Gauge function is damped so will not follow rapidly changing Fuel Delivery Module values.
Speedometer operation	H-1	Monitor Self-Diagnostic Mode/ETM test 19 (during test drive) check to establish if vehicle speed input to cluster is out of range or invalid.	Display speed input in 1/10 mile/h, no decimal point shown, and is compensated for tire size etc. Displays ---- or INV if message is not received or if received data is invalid.
Speedometer reading	I-1	During test drive compare speedometer position to Self-Diagnostic Mode/ETM test 19, displayed value.	Self-Diagnostic Mode displayed speed figure will be approx 3% higher than speed indicated by speedometer. Allowed tolerance - minus nothing/+ 10% + 2.5 mile/h.
.	I-2	Monitor Self-Diagnostic Mode/ETM test 19 (during test drive) to establish if vehicle speed input to cluster drops out of range or is invalid.	Displays ---- if message is not received or if received data is invalid for two seconds or more.
.	I-3	Check that installed wheels and tires are standard Jaguar fitment. Confirm wheel size in IDS, 'ADD REMOVE ACCESSORY' section.	Non standard wheels and tires may lead to speed indication inaccuracies. Incorrectly set wheel size will result in speed indication inaccuracies. Trip and odometer distance accumulation will also be incorrect.
Tachometer operation	J-1	Perform Self-Diagnostic Mode/ETM test 20 to establish if vehicle rpm input to cluster out of range or invalid.	Displays ---- or INV if message is not received or if received data is invalid.
Tachometer reading	K-1	Check tachometer position versus Self-Diagnostic Mode/ETM test 20, displayed value.	Tachometer accuracy +/- 100 rpm.
.	K-2	Monitor 'ENGINE RPM' in IDS data logger at constant engine rpm to compare tachometer indicated engine rpm to engine rpm reported by Engine Control Module (ECM).	Tachometer accuracy +/- 100 rpm.
.	K-3	Monitor Self-Diagnostic Mode test/ETM test 20, (during test drive) to establish if input to cluster drops out of range or is invalid.	Displays ---- or INV if message is not received or if received data is invalid.
Gauge judder	L-1	Perform Self-Diagnostic Mode test/ETM test 2, to prove out smooth gauge operation.	.
Gauge noise	M-1	Perform vehicle road test. Gauges should not be audible during operation in drive cycle.	.

Area of Concern/Symptom	Diagnostic Ref. No.	Actions	Notes
.	M-2	Benchmark noise against non-complaint vehicle.	.
Trip (fuel) computer	N-1	Check for consistent display (during test drive) of valid 'Rolling Odometer' count in Self-Diagnostic Mode/ETM test 24.	Displays ---- , INV or 255 if message is not received, or if received data is invalid.
.	N-2	Check that installed wheels and tires are standard Jaguar fit. Confirm fitted wheel size in IDS, 'ADD REMOVE ACCESSORY' section.	Non standard wheels and tires or incorrectly set wheel size may lead to Odometer increment inaccuracies. This will impact the distance accumulators, which in turn affects the rolling average, fuel economy and range values. Trip distance accumulation will also be incorrect.
.	N-3	Consider noting odometer value and resetting fuel computer system. Advise customer to conduct brim-to-brim fuel tank test. Use collected information to determine if system accurate.	.
Column adjust	O-1	Check with IDS for DTCs related to powered column system.	.
.	O-2	Check cluster battery supply voltage and ground resistance. Check for loose connections.	.
.	O-3	Check power column motors supply voltage.	.
.	O-4	Check power column switch for physical damage.	.
Passive Anti-Theft System (PATS) indicator	P-1	Check for three second prove out when vehicle start button is pressed.	.
.	P-2	Check for loose connections/wiring continuity.	.
.	P-3	Check ignition switch for physical damage.	.
Cluster illumination	Q-1	Check for loose connections/wiring continuity.	.
.	Q-2	Check dimmer switch operation.	.
Cluster backlight operation	R-1	Is the backlight on other components inoperative.	.
.	R-2	Check dimmer switch operation.	.
.	R-3	Check for loose connections/wiring continuity.	.
Chime/tone operation	S-1	Check vehicle configuration.	.
.	S-2	Utilize lights ON, ignition OFF, door open warning to verify chime operation.	.
.	S-3	Check appropriate sensing circuit.	.
Continuous chime/tone	T-1	Check appropriate sensing circuit.	.
Unexpected chime operation	U-1	Check vehicle configuration.	.
Message centre display illumination	V-1	Is the backlight 'ON' and other components dim?	.
.	V-2	Does the lighting level of other components change when dimmer adjusted?	.
Message centre display issue	W-1	Perform Self-Diagnostic Mode test/ETM tests 5 to 9, to prove out LCD display function.	.
Message centre missing lines	X-1	Perform Self-Diagnostic Mode test/ETM tests 5 to 9, to prove out LCD display function.	.
Message centre incorrect message	Y-1	What is the message?	.
.	Y-2	Check for open circuit/shorts in wiring to related warning light trigger (module, sensor, switch).	.
Cluster/connectivity	Z-1	Check cluster battery and ignition wiring.	.
.	Z-2	Check cluster grounds.	.
.	Z-3	Disconnect/reconnect cluster.	.
.	Z-4	Attempt to enter Self-Diagnostic Mode/ETM to prove cluster response to inputs.	.
No crank	AA-1	Check with IDS for presence of related DTCs.	.
.	AA-2	Is there a Passive Anti-Theft System (PATS) flash code?	.
.	AA-3	Does the vehicle crank with the other passive key?	.

Area of Concern/Symptom	Diagnostic Ref. No.	Actions	Notes
.	AA-4	Ensure only one key is in the vehicle, try both keys in the Starter Control Unit (SCU).	If this test starts the vehicle this tends to indicate an issue with the keyless vehicle module.
.	AA-5	Tried new key?	.
.	AA-6	Check battery voltage.	.
.	AA-7	Diagnose non-start condition with IDS.	.
.	AA-8	Attempt PATS key erase and re-learn.	Ensure keys are erased from current cluster if replacing cluster.
Crank but no-start	AB-1	Diagnose non-start condition with IDS.	Not usually caused by cluster issue.
Incorrect configuration	AC-1	Attempt to configure cluster.	.
.	AC-2	Ensure battery voltage is maintained above 12.5 volts if cluster re-configured.	.

1. If the cause is not visually evident, verify the symptom and refer to the Self-Diagnostic Mode

Self-Diagnostic Mode

To place the cluster in engineering test mode (ETM) carry out the following steps

1. Press and hold the stalk trip cycle button, for more than five seconds but less than eight seconds, whilst briefly pressing the vehicle START button. There is no initial display indication that the instrument cluster has entered ETM. If ETM has successfully been entered then 'ENGINEERING TEST MODE' will be displayed in the Message Centre when the stalk trip button is released .
2. To navigate forward through the instrument cluster Self-Diagnostic Mode tests, press the stalk trip cycle button.
3. Each push of the stalk trip cycle button will advance one step through the ETM sequence. It is not possible to move backward through the test sequence.
4. To exit the Self-Diagnostic Mode press and hold the stalk trip cycle button for more than three seconds.
5. The Self-Diagnostic Mode is also deactivated when the ignition switch is turned to the 'OFF' position or low battery voltage is detected.
6. If the Self-Diagnostic Mode cannot be accessed repeat the above paying particular care to the sequence timing.
7. The ETM text is not language configurable and will be displayed in English.

ETM Test/no.	Message Center Display	Gauge/Indicator/Display Tested.	Range	Description
1 - Self-diagnostic entry.	ENGINEERING TEST MODE.	.	Not Applicable (N/A).	Establishes Self - Diagnostic mode.
2 - Gauge sweep.	GAUGE SWEEP.	Tachometer and speedometer. Gauges display current values after test.	(N/A).	All gauges go through a full up and down pointer sweep smoothness check.
3- Warning lamp LED's.	TELL TALE TEST.	All internally controlled lamps/LED's regardless of software configuration.	(N/A).	Illuminates all the LED warning indicators that are controlled by the instrument cluster. When this test is exited current vehicle warning lamps will remain illuminated.
4 - Version information.	PROGRAM VERSION. <ul style="list-style-type: none"> • ROM: XXXX • NVM: XXXX • REV: XXXX • DATE: XXXX 	Software Read only memory (ROM) and Non volatile memory (NVM) version and date.	(N/A).	Display's the instrument cluster ROM and NVM level version and date or indication of ROM checksum fault.
5 - Message Center display.	LCD display in WHITE.	Message center LCD display.	(N/A).	Activates all pixels of LCD display in White.
6 - Message Center display.	LCD display in DARK GREY.	Message center LCD display.	(N/A).	Activates all pixels of LCD display in Dark Grey.
7 - Message Center display.	LCD display in LIGHT GREY.	Message center LCD display.	(N/A).	Activates all pixels of LCD display in Light Grey.
8 - Message Center display.	LCD display in four bands black to white, top to bottom.	Message center LCD display.	(N/A).	Activates all pixels of LCD in four bands from black to white, from top to bottom.
9 - Message Center display.	LCD display in four bands dark to light left to right.	Message center LCD display.	(N/A).	Activates all pixels of LCD in four bands from dark to light, from left to right.
10 - Digital I/O.	DIGITAL I/O. <ul style="list-style-type: none"> • A: XXXX • E: XXXX • B: XXXX • F: XXXX 	Cluster configuration settings.	(N/A).	Display Hex coding of cluster configuration settings ports A to H. Not defined for diagnostic purpose.

ETM Test/no.	Message Center Display	Gauge/Indicator/Display Tested.	Range	Description
	<ul style="list-style-type: none"> C: XXXX G:XXXX D: XXXX H:XXXX 			
11 - Analogue Inputs.	ANALOG INPUTS. <ul style="list-style-type: none"> #: RAW - RATIO 0:XXX - XXXX 1:XXX - XXXX 2:XXX - XXXX 3.XXX - XXXX 	Cluster inputs.	TDB.	Displays Hex coding of inputs 0 - 3. <ul style="list-style-type: none"> 0 - Main beam / FTP 1 - Master light switch 2 - Power column joystick switch 3 - DI / Hazard
12 - Analogue Inputs.	ANALOG INPUTS. <ul style="list-style-type: none"> #: RAW - RATIO 4:XXX - XXXX 5:XXX - XXXX 6:XXX - XXXX 7.XXX - XXXX 	Cluster inputs.	TDB.	Displays Hex coding of inputs 4 - 7. <ul style="list-style-type: none"> 4 - Auto lamp sensor 5 - battery in 6 - Pedal position 7 - Display temperature
13 - Analogue Inputs.	ANALOG INPUTS. <ul style="list-style-type: none"> #: RAW - RATIO 8:XXX - XXXX 9:XXX - XXXX 10:XXX - XXXX 11.XXX - XXXX 	Cluster inputs.	TDB.	Displays Hex coding of inputs 8 - 11. <ul style="list-style-type: none"> 8 - Power column Rake position 9 - Power column Reach position 10 - Auxiliary switch 11 - Power column mode switch
14 - Analogue Inputs.	ANALOG INPUTS. <ul style="list-style-type: none"> #: RAW - RATIO 12:XXX - XXXX 13:XXX - XXXX 14:XXX - XXXX 15.XXX - XXXX 	Cluster inputs.	TDB.	Displays Hex coding of inputs 12 - 15. <ul style="list-style-type: none"> 12 - Not used 13 -Airbag LED monitor 14 - Battery voltage 15 - Low brake fluid
15- Analogue Inputs.	ANALOG INPUTS. <ul style="list-style-type: none"> #: RAW - RATIO 16:XXX - XXXX 17:XXX - XXXX 18:XXX - XXXX 19.XXX - XXXX 	Cluster inputs.	TDB.	Displays Hex coding of inputs 16-19. <ul style="list-style-type: none"> 16 - Fog light switch 17 - Flick wipe switch 18 - Int. wipe switch 19 - Exit delay switch
16 - Analogue Inputs.	ANALOG INPUTS. <ul style="list-style-type: none"> #: RAW - Ratio 20:XXX - XXXX 21:XXX - XXXX 22:XXX - XXXX 23.XXX - XXXX 	Cluster inputs.	TDB.	Displays Hex coding of inputs 20 - 23. <ul style="list-style-type: none"> 20 - Wash wipe switch 21 - Trip cycle switch 22 - dimmer level 23 - Master wipe switch
17 - Analogue Inputs.	ANALOG INPUTS. <ul style="list-style-type: none"> #: RAW- Ratio 24:XXX - XXXX 	Cluster inputs.	TDB.	Displays Hex coding of inputs 24 - 27. <ul style="list-style-type: none"> 24 - Brake pad wear

ETM Test/no.	Message Center Display	Gauge/Indicator/Display Tested.	Range	Description
	<ul style="list-style-type: none"> • 25:XXX - XXXX • 26:XXX - XXXX • 27.XXX - XXXX 			<ul style="list-style-type: none"> • 25 - Passenger seat belt • 26 - Not used • 27 - On-board temp ref
18 - Analogue Inputs.	<ul style="list-style-type: none"> • ANALOG INPUTS. • #: RAW - Ratio • 28:XXX - XXXX • 29:XXX - XXXX • 30:XXX - XXXX • 31.XXX - XXXX 	Cluster inputs.	TDB.	Displays Hex coding of inputs 28 - 31. <ul style="list-style-type: none"> • 28 - On-board temp • 29 - Not used • 30 - Not used • 31 - Not used
19 - Speedometer.	SPEEDOMETER. <ul style="list-style-type: none"> • RAW: • MPH: • KMH: • DRIVER: 	Speedometer inputs.	.	<ul style="list-style-type: none"> • Displays present . • Speedometer inputs values; • Speedometer will indicate present road speed.
20 - Tachometer.	TACHOMETER. <ul style="list-style-type: none"> • RAW: • ACTUAL: • DRIVER: 	Tachometer inputs.	.	Displays present received Tachometer input values, tachometer will indicate present engine RPM.
21 - Fuel system.	FUEL SYSTEM. <ul style="list-style-type: none"> • (A) (B) • RAW: X X • FILT: X X • PERCENT: X X 	Fuel indication system.	.	Displays present received fuel level A/D inputs in decimal, fuel gauge will indicate present filtered level.
22 - Battery voltage.	BATTERY VOLTAGE. <ul style="list-style-type: none"> • LOCAL: • VEHICLE: • RAW: • A/D: 	Battery voltage.	.	Displays present received battery input voltage values. If message not received or invalid display will be ' _ _ _ '.
23 - Rolling counts.	ROLLING COUNTS. <ul style="list-style-type: none"> • ODO: • FUEL: 	Odometer and fuel gauge.	0 - 255.	Displays present received odometer and fuel level input values in decimal, value is a rolling count. If either message not received or invalid respective display will be ' _ _ _ '.
24 - VAPS.	VAPS. <ul style="list-style-type: none"> • CURRENT: • COMMAND: • STATUS: 	Variable assistance power steering (VAPS) status.	.	CURRENT is displayed in mA. COMMAND is last command sent to VAPS chip. STATUS is last status returned from VAPS chip.
25 - Module status.	MODULE STATUS. <ul style="list-style-type: none"> • IGN • DSC • ACC • ADCM 	Provides status of; Ignition (IGN), Dynamic Stability Control (DSC), Adaptive Cruise Control (ACC) and Adaptive damping control module (ADCM) modules.	<ul style="list-style-type: none"> • CONNECTED • WAITING • MISSING • FAULTY. 	<ul style="list-style-type: none"> • Communication (Coms) ok • Coms not received, not an issue • Coms never received • Coms error .
26 - Module status.	MODULE STATUS. <ul style="list-style-type: none"> • EPB • PIE • RCM • TCM 	Provides status of; Electronic park brake (EPB), Pedestrian Impact ECU (PIE), Restraints control module (RCM) and Traction control module (TCM), modules..	<ul style="list-style-type: none"> • CONNECTED • WAITING • MISSING • FAULTY. 	<ul style="list-style-type: none"> • Communication (Coms) ok • Coms not received, not an issue • Coms never received • Coms error .
27 - Module status.	MODULE STATUS. <ul style="list-style-type: none"> • ECM • RCC 	Provides status of; Engine control module (ECM), Rear Climate Control (RCC), Driver Door Control (DDC) and	<ul style="list-style-type: none"> • CONNECTED • WAITING • MISSING 	<ul style="list-style-type: none"> • Communication (Coms) ok • Coms not received, not an issue

ETM Test/no.	Message Center Display	Gauge/Indicator/Display Tested.	Range	Description
	<ul style="list-style-type: none"> • DDC • PDC 	Passenger Door Control (PDC) modules..	<ul style="list-style-type: none"> • FAULTY. 	<ul style="list-style-type: none"> • Coms never received • Coms error .
28 - Module status.	MODULE STATUS. <ul style="list-style-type: none"> • KVM • DSM • ICM • ICP 	Provides status of; Keyless vehicle module (KVM), Drivers seat module (DSM), Infotainment control module (ICM) and Integrated control panel (ICP) modules..	<ul style="list-style-type: none"> • CONNECTED • WAITING • MISSING • FAULTY. 	<ul style="list-style-type: none"> • Communication (Coms) ok • Coms not received, not an issue • Coms never received • Coms error .
29 - Module status.	MODULE STATUS. <ul style="list-style-type: none"> • FSJB • RSJB • TPMS • AFLS 	Provides status of; Front smart junction box (FSJB), Rear smart junction box (RSJB), Tyre pressure monitoring system (TPMS) and Adaptive front lighting system (AFLS) modules.	<ul style="list-style-type: none"> • CONNECTED • WAITING • MISSING • FAULTY. 	<ul style="list-style-type: none"> • Communication (Coms) ok • Coms not received, not an issue • Coms never received • Coms error .
30 - Module status.	MODULE STATUS. <ul style="list-style-type: none"> • PATS • BSM • GSM • SCU 	Provides status of; Passive anti-theft system (PATS), Blind Spot Monitoring (BSM), Gear shift module (GSM) and Starter Control Unit (SCU) modules.	<ul style="list-style-type: none"> • CONNECTED • WAITING • MISSING • FAULTY. 	<ul style="list-style-type: none"> • Communication (Coms) ok • Coms not received, not an issue • Coms never received • Coms error .
31- Back to test 2.	GAUGE SWEEP.	Tachometer and speedometer.	N/A.	Repeats display cycle from test 2.

1. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B100811	Wiper Mode Switch	<ul style="list-style-type: none"> • Master wiper switch circuit - short to ground 	Refer to the electrical circuit diagrams and check master wiper switch circuit for short to ground
B100815	Wiper Mode Switch	<ul style="list-style-type: none"> • Master wiper switch circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check master wiper switch circuit for short to power, open circuit
B100951	Ignition Authorisation	<ul style="list-style-type: none"> • Instrument cluster power and ground supply circuits - short, open circuit • Target SID synchronization error following re-programming • CAN fault 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check instrument cluster power and ground supply circuits for short, open circuit. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Check CAN communications between instrument cluster and tester

DTC	Description	Possible Cause	Action
B100962	Ignition Authorisation	<ul style="list-style-type: none"> LS CAN fault CJB ignition, power and ground supply circuits - short, open circuit Instrument cluster power and ground supply circuits - short, open circuit Incorrect CJB or instrument cluster installed Target SID synchronization error following re-programming Noise/EMC related error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between CJB and instrument cluster. Refer to the electrical circuit diagrams and check CJB ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check correct CJB and instrument cluster installed. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Check CAN network for interference/EMC related issues
B100987	Ignition Authorisation	<ul style="list-style-type: none"> CJB ignition, power and ground supply circuits - short, open circuit LS CAN fault Instrument cluster power and ground supply circuits - short, open circuit Low battery voltage <9 volts 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CJB ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between CJB and instrument cluster. Check battery is in serviceable condition and fully charged
B100A62	Fuel Pump Authorisation	<ul style="list-style-type: none"> LS CAN fault RJB power and ground supply circuits - short, open circuit Instrument cluster power and ground supply circuits - short, open circuit Incorrect RJB or instrument cluster installed Target SID synchronization error following re-programming Noise/EMC related error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between RJB and instrument cluster. Refer to the electrical circuit diagrams and check RJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check correct RJB and instrument cluster installed. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Check CAN network for interference/EMC related issues
B100A64	Fuel Pump Authorisation	<ul style="list-style-type: none"> Target SID synchronization error following re-programming RJB power and ground supply circuits - short, open circuit LS CAN fault 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check RJB power and ground supply circuits for short, open circuit. Check CAN communications between RJB and instrument cluster
B100A87	Fuel Pump Authorisation	<ul style="list-style-type: none"> RJB power and ground supply circuits - short, open circuit LS CAN fault Instrument cluster power and ground supply circuits - short, open circuit Low battery voltage <9 volts 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check RJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between RJB and instrument cluster. Check battery is in serviceable condition and fully charged
B100B67	Column Lock Ground Authorisation	<ul style="list-style-type: none"> Algorithm based failure-signal is incorrect after the event Instrument cluster power and ground supply circuits - short, open circuit LS CAN fault RJB power and ground supply circuits - short, open circuit Vehicle speed present when attempting to power ESCL Engine speed present when attempting to power ESCL PowerMode status > 4 when attempting to perform lock action 	If a non start issue has not been identified, clear the DTC and check vehicle starts correctly. If a non start issue has been identified run the manufacturers approved diagnostic system Start Authorisation Application. Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check RJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between RJB and instrument cluster. Check for invalid vehicle speed signal from ABS/instrument cluster gateway. Check for invalid engine speed signal from ECM/instrument cluster gateway. Check for invalid signal from CJB
B100B87	Column Lock Ground Authorisation	<ul style="list-style-type: none"> Instrument cluster power and ground supply circuits - short, open circuit LS CAN fault RJB power and ground supply circuits - short, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check RJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between RJB and instrument cluster

DTC	Description	Possible Cause	Action
B100C67	Column Lock Supply Authorisation	<ul style="list-style-type: none"> Instrument cluster power and ground supply circuits - short, open circuit LS CAN fault CJB power and ground supply circuits - short, open circuit Vehicle speed present when attempting to power ESCL Engine speed present when attempting to power ESCL PowerMode status > 4 when attempting to perform lock action 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between CJB and instrument cluster. Check for invalid vehicle speed signal from ABS/instrument cluster gateway. Check for invalid engine speed signal from ECM/instrument cluster gateway. Check for invalid signal from CJB
B100C87	Column Lock Supply Authorisation	<ul style="list-style-type: none"> Instrument cluster power and ground supply circuits - short, open circuit LS CAN fault CJB power and ground supply circuits - short, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CJB power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check CAN communications between CJB and instrument cluster
B100D62	Column Lock Authorisation	<ul style="list-style-type: none"> CAN fault ESCL power and ground supply circuits - short, open circuit Instrument cluster power and ground supply circuits - short, open circuit Incorrect ESCL or instrument cluster installed Target SID synchronization error following re-programming Noise/EMC related error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communication between Electronic Steering Column Lock and instrument cluster. Refer to the electrical circuit diagrams and check Electronic Steering Column Lock power and ground supply circuits for short, open circuit and Instrument cluster power and ground supply circuits for short, open circuit. Check correct Electronic Steering Column Lock and instrument cluster installed. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Check CAN network for interference/EMC related issues
B100D64	Column Lock Authorisation	<ul style="list-style-type: none"> Algorithm based failure-signal plausibility failure CAN fault ESCL power and ground supply circuits - short, open circuit Instrument cluster power and ground supply circuits - short, open circuit 	If the customer has not reported a non start issue, clear the DTC and check vehicle starts correctly. If a non start issue has been reported run the manufacturers approved diagnostic system Start Authorisation Application and follow the actions required for this DTC. Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communication between Electronic Steering Column Lock and instrument cluster (check transmission out speed, vehicle speed, engine speed, gear position and powermode signals to Electronic Steering Column Lock). Refer to the electrical circuit diagrams and check Electronic Steering Column Lock power and ground supply circuits for short, open circuit and Instrument cluster power and ground supply circuits for short, open circuit.
B100D87	Column Lock Authorisation - Missing message	<ul style="list-style-type: none"> Missing message CAN fault No response from electric steering column lock control module, instrument cluster, central junction box Battery voltage at electric steering column lock control module too low Electric steering column lock control module, instrument cluster, central junction box fault 	<ul style="list-style-type: none"> Clear DTC, repeatedly lock and unlock car using the key fob and retest. Check for related DTCs and refer to the relevant DTC index If the fault is cleared, notify the customer that the steering column lock may fail to unlock if the vehicle is parked with a high steering angle or with the road wheel against a curb. If the column lock is failing to disengage, the customer may be able to rectify this by rotating the steering wheel while pressing the engine start button If fault persists, complete a CAN network integrity test using the manufacturers approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits between the central junction box, the instrument cluster and the electronic steering column lock. Refer to the electrical circuit diagrams and check the central junction box, the instrument cluster and the electronic steering column lock power and ground supply circuits for short circuit to ground, short circuit to power, open circuit, high resistance. Repair circuit(s) as required. Clear DTC, perform an on demand self-test and retest If fault persists, check that the vehicle battery supply voltage is between 9-16 volts. Rectify as required

DTC	Description	Possible Cause	Action
B100D96	Column Lock Authorisation - Component internal failure	<ul style="list-style-type: none"> Battery voltage at electric steering column lock control module too low Torque load on steering column CAN fault Electric steering column lock control module - Internal failure 	<ul style="list-style-type: none"> Clear DTC, repeatedly lock and unlock car using the key fob and retest If fault persists, check that the vehicle battery supply voltage is between 9-16 volts. Rectify as required Ensure the column lock bolt movement is not obstructed or restricted (the parked position of the road wheels may be exerting a turning force through the steering column, preventing the lock from releasing. The steering wheel may need to be held against the force to allow the column lock to release). Clear DTC, repeatedly lock and unlock car using the key fob and retest If fault persists, complete a CAN network integrity test using the manufacturers approved diagnostic system. Alternatively, refer to the electrical circuit diagrams and check CAN circuits between the central junction box, the instrument cluster and the electronic steering column lock. Refer to the electrical circuit diagrams and check the central junction box, the instrument cluster and the electronic steering column lock power and ground supply circuits for short circuit to ground, short circuit to power, open circuit, high resistance. Repair circuit(s) as required. Clear DTC, perform an on demand self-test and retest If fault persists, check and install a new electric steering column lock control module as required
B102487	Start Control Unit	<ul style="list-style-type: none"> Smart card docking station failure - slave node not responding 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check the smart card docking station LIN circuit for short, open circuit. Suspect the smart card docking station, check and install a new docking station as required, refer to the new module/component installation note at the top of the DTC Index
B104611	Front Fog Lamp Control Switch	<ul style="list-style-type: none"> Fog lamp switch circuit - short to ground 	Refer to the electrical circuit diagrams and check fog lamp switch circuit for short to ground
B104615	Front Fog Lamp Control Switch	<ul style="list-style-type: none"> Fog lamp switch circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and check fog lamp switch circuit for short to power, open circuit
B104811	Brake Fluid Level Switch	<ul style="list-style-type: none"> Brake fluid level switch circuit - short to ground 	Refer to the electrical circuit diagrams and check brake fluid level switch circuit for short to ground
B10A011	Wiper/ Washer Switch	<ul style="list-style-type: none"> Wash/wipe circuit - short to ground 	Refer to the electrical circuit diagrams and check wash/wipe circuit for short to ground
B10A015	Wiper/ Washer Switch	<ul style="list-style-type: none"> Wash/wipe circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check wash/wipe circuit for short to power, open circuit
B10A611	Main Light Switch	<ul style="list-style-type: none"> Master lighting switch circuit - short to ground 	Refer to the electrical circuit diagrams and check master lighting switch circuit for short to ground
B10A615	Main Light Switch	<ul style="list-style-type: none"> Master lighting switch circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check master lighting switch circuit for short to power, open circuit
B112B87	Steering Wheel Module	<ul style="list-style-type: none"> Steering wheel module failure - slave node not responding 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check the clockspring LIN circuit for short, open circuit. Suspect the clockspring, check and install a new clockspring as required, refer to the new module/component installation note at the top of the DTC Index
B115C7A	Transfer Fuel Pump	<ul style="list-style-type: none"> Fuel pump system fault 	Check for fuel system jet pump or jet pump fuel level sensor fault
B1A8515	Ambient Light Sensor	<ul style="list-style-type: none"> Autolamp sensor circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check autolamp sensor circuit for short to power, open circuit

DTC	Description	Possible Cause	Action
B1B0100	Key Transponder	<ul style="list-style-type: none"> Operator only cycles one key During transponder key programming the instrument cluster, smartcard docking station or key loses power/circuit failure Faulty key during key programming Unable to program transponder key due to noise/EMC related error 	Ensure all keys to be programmed are available. Refer to electrical circuit diagrams and check power and ground supply circuits to all relevant modules. Replace faulty key and repeat key programming. Check CAN network for interference/EMC related issues
B1B0105	Key Transponder	<ul style="list-style-type: none"> Error following SCU replacement Smartcard docking station power and ground supply circuits - short, open circuit LIN fault Instrument cluster power and ground supply circuits - short, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check LIN communications between smartcard docking station and instrument cluster
B1B0151	Key Transponder	<ul style="list-style-type: none"> LIN fault Instrument cluster power and ground supply circuits - short, open circuit Key fault Smartcard docking station power and ground supply circuits - short, open circuit Attempted to program a non default key 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check LIN communications between smartcard docking station and instrument cluster. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Confirm transponder key operation. Ensure new keys are from a known source
B1B0155	Key Transponder	<ul style="list-style-type: none"> Un-programmed key inserted in SCU2 A non default key inserted during key programming 	Confirm the correct keys are used
B1B0162	Key Transponder	<ul style="list-style-type: none"> Instrument cluster power and ground supply circuits - short, open circuit Smartcard docking station power and ground supply circuits - short, open circuit Incorrect instrument cluster or smartcard docking station installed Error during or following the Write Target SID routine Noise/EMC related error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check correct instrument cluster and smartcard docking station are installed. Perform the Immobilisation application from the Set-Up menu using the manufacturer approved diagnostic system. Check CAN network for interference/EMC related issues
B1B0164	Key Transponder	<ul style="list-style-type: none"> LIN fault Instrument cluster power and ground supply circuits - short, open circuit Transponder key fault Smartcard docking station power and ground supply circuits - short, open circuit Error occurred during transponder key programming 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check LIN communications between smartcard docking station and instrument cluster. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Confirm transponder key operation. Repeat transponder key programming
B1B0167	Key Transponder	<ul style="list-style-type: none"> LIN fault Instrument cluster power and ground supply circuits - short, open circuit Transponder key fault Smartcard docking station power and ground supply circuits - short, open circuit Another key in close proximity Instrument cluster in incorrect 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check LIN communications between smartcard docking station and instrument cluster. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Confirm transponder key operation. Confirm single key operation. Ensure instrument cluster in correct mode i.e. Auto Enable, Key erase etc. Ensure new keys are from a known source. Check for intermittent power and ground to

DTC	Description	Possible Cause	Action
		<ul style="list-style-type: none"> programming state • Attempted to program a non default key • Instrument cluster Cold init whilst in Ignition On state, without key being present in the SCU • Race condition caused by closing driver door and pressing the start button within a small time window • Passive Key search function from last door closed and key inserted in the SCU 	instrument cluster. Design condition - advise customer of starting sequence. Design condition - determine customer transponder key usage
B1B0187	Key Transponder	<ul style="list-style-type: none"> • LIN fault • Instrument cluster power and ground supply circuits - short, open circuit • Smartcard docking station power and ground supply circuits - short, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check LIN communications between smartcard docking station and instrument cluster. Refer to the electrical circuit diagrams and check smartcard docking station power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit
B1B3305	Target I.D. Transfer	<ul style="list-style-type: none"> • CAN fault • ECM ignition, power and ground supply circuits - short, open circuit • Instrument cluster power and ground supply circuits - short, open circuit • ECM or instrument cluster incorrectly configured 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between ECM and instrument cluster. Refer to electrical circuit diagrams and check ECM ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system
B1B3362	Target I.D. Transfer	<ul style="list-style-type: none"> • CAN fault • ECM ignition, power and ground supply circuits - short, open circuit • Instrument cluster power and ground supply circuits - short, open circuit • Incorrect ECM or instrument cluster installed • Synchronisation error following re-programming • Noise/EMC related error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between ECM and instrument cluster. Refer to electrical circuit diagrams and check ECM ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check correct ECM and instrument cluster installed. Perform the Immobilisation application from the Set-up menu using the manufacturer approved diagnostic system. Check CAN network for interference/EMC related issues
B1B3364	Target identification transfer	<ul style="list-style-type: none"> • Algorithm based failure - signal plausibility failure • CAN fault • ECM ignition, power and ground supply circuits - short, open circuit • Instrument cluster power and ground supply circuits - short, open circuit • electronic steering column lock status incomplete • Race condition caused by closing driver door and pressing the start button within a small time window 	If the customer has not reported a non start issue, clear the DTC and check vehicle starts correctly. If a non start has been reported run the manufacturers approved diagnostic system Start Authorisation Application and follow the actions required for this DTC. Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between ECM and instrument cluster. Refer to electrical circuit diagrams and check ECM ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check electronic steering column lock operation. Advise customer of starting sequence and to allow time to elapse between closing door and pressing start button.
B1B3387	Target I.D. Transfer	<ul style="list-style-type: none"> • CAN fault • ECM ignition, power and ground supply circuits - short, open circuit • Instrument cluster power and ground supply circuits - short, open circuit • Low battery voltage 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CAN communications between ECM and instrument cluster. Refer to electrical circuit diagrams and check ECM ignition, power and ground supply circuits for short, open circuit and instrument cluster power and ground supply circuits for short, open circuit. Check battery is in serviceable condition and is fully charged, check terminals etc

DTC	Description	Possible Cause	Action
B1C3277	Steering Column Tilt Solenoid	<ul style="list-style-type: none"> TILT axis fails to move minimum distance within allotted time period. Motion may have been prohibited due to motor jamming, stalling or solenoid pin not engaging 	Check for restricted/jammed steering column motor mechanism. Refer to the electrical circuit diagrams and check steering column motor UP/IN, DOWN/OUT circuit for short, open circuit
B1C3294	Steering Column Tilt Solenoid	<ul style="list-style-type: none"> TELE axis moves when it has not been commanded to. Motion may have occurred due to solenoid pin not disengaging or mechanism has been jammed on, whilst REACH axis has been commanded to move 	Check for stuck/jammed solenoid/switch. Refer to the electrical circuit diagrams and check steering column motor UP/IN, DOWN/OUT circuit for short, open circuit
B1C3312	Steering Column Tilt Feedback Signal	<ul style="list-style-type: none"> Steering column tilt feedback signal circuit - short to power 	Refer to the electrical circuit diagrams and check steering column tilt feedback signal circuit for short to power
B1C3314	Steering Column Tilt Feedback Signal	<ul style="list-style-type: none"> Steering column tilt feedback signal circuit - short to ground, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check steering column tilt feedback signal circuit for short to ground, open circuit
B1C3477	Steering Column Telescope Solenoid	<ul style="list-style-type: none"> REACH axis fails to move minimum distance within allotted time period. Motion may have been prohibited due to motor jamming, stalling or solenoid pin not engaging 	Check for restricted/jammed steering column motor mechanism. Refer to the electrical circuit diagrams and check steering column motor UP/IN, DOWN/OUT circuit for short, open circuit
B1C3494	Steering Column Telescope Solenoid	<ul style="list-style-type: none"> REACH axis moves when it has not been commanded to. Motion may have occurred due to solenoid pin not disengaging or mechanism has been jammed on, whilst TILT axis has been commanded to move 	Check for stuck/jammed solenoid/switch. Refer to the electrical circuit diagrams and check steering column motor UP/IN, DOWN/OUT circuit for short, open circuit
B1C3512	Steering Column Telescope Feedback Signal	<ul style="list-style-type: none"> Steering column TELE feedback signal circuit - short to power 	Refer to the electrical circuit diagrams and check steering column TELE feedback signal circuit for short to power
B1C3514	Steering Column Telescope Feedback Signal	<ul style="list-style-type: none"> Steering column TELE feedback signal circuit - short to ground, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check steering column TELE feedback signal circuit for short to ground, open circuit
B1C3611	Steering Column Tilt/Telescope Switch	<ul style="list-style-type: none"> Steering column adjust switch circuit - short to ground 	Refer to the electrical circuit diagrams and check steering column adjust switch circuit for short to ground
B1C4811	Flash to Pass Switch	<ul style="list-style-type: none"> Main beam flash switch circuit - short to ground 	Refer to the electrical circuit diagrams and check main beam flash switch circuit for short to ground
B1C4815	Flash to Pass Switch	<ul style="list-style-type: none"> Main beam flash switch circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check main beam flash switch circuit for short to power, open circuit
B1C5311	Front Wiper Intermittent Data	<ul style="list-style-type: none"> Intermittent wipe switch circuit - short to ground 	Refer to the electrical circuit diagrams and check intermittent wipe switch circuit for short to ground
B1C5315	Front Wiper Intermittent Data	<ul style="list-style-type: none"> Intermittent wipe switch circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check intermittent wipe switch circuit for short to power, open circuit
B1D3611	Turn Indicator Switch	<ul style="list-style-type: none"> Direction indicator switch circuit - short to ground 	Refer to the electrical circuit diagrams and check direction indicator switch circuit for short to ground

DTC	Description	Possible Cause	Action
B1D3615	Turn Indicator Switch	<ul style="list-style-type: none"> Direction indicator switch circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check direction indicator switch circuit for short to power, open circuit
B1D3711	Wiper Switch Connection Circuit	<ul style="list-style-type: none"> Flick wipe switch circuit - short to ground 	Refer to the electrical circuit diagrams and check flick wipe switch circuit for short to ground
B1D3715	Wiper Switch Connection Circuit	<ul style="list-style-type: none"> Flick wipe switch circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check flick wipe switch circuit for short to power, open circuit
C111064	Power steering Calibration Data	<ul style="list-style-type: none"> Invalid VAPS curve loaded 	Re-configure the instrument cluster as new to download VAPS curve data
P063511	Power Steering Control Circuit	<ul style="list-style-type: none"> VAPS ignition supply circuit - short to ground 	Refer to the electrical circuit diagrams and check VAPS ignition supply circuit for short to ground
P063512	Power Steering Control Circuit	<ul style="list-style-type: none"> VAPS ignition supply circuit - short to power 	Refer to the electrical circuit diagrams and check VAPS ignition supply circuit for short to power
P063513	Power Steering Control Circuit	<ul style="list-style-type: none"> VAPS ignition supply circuit - open circuit 	Refer to the electrical circuit diagrams and check VAPS ignition supply circuit for open circuit
P063522	Power Steering Control Circuit	<ul style="list-style-type: none"> First valid received speed value above threshold 	Check ABS module for DTCs and refer to relevant DTC Index
P063544	Power Steering Control Circuit	<ul style="list-style-type: none"> Data memory failure 	Re-configure the instrument cluster as new to download VAPS curve data
U000188	High Speed CAN Communication Bus	<ul style="list-style-type: none"> Bus Off 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check HS CAN network to instrument cluster
U001088	Medium Speed CAN Communication Bus	<ul style="list-style-type: none"> Bus Off 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check MS CAN network to instrument cluster
U010000	Lost Communication With ECM/PCM "A"	<ul style="list-style-type: none"> Loss of CAN communication with ECM 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check ECM for DTCs and refer to the relevant DTC Index
U010100	Lost Communication with TCM	<ul style="list-style-type: none"> Loss of CAN communication with TCM 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check TCM for DTCs and refer to the relevant DTC Index
U010300	Lost Communication With Gear Shift Module	<ul style="list-style-type: none"> Loss of CAN communication with transmission shift module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check transmission shift module for DTCs and refer to the relevant DTC Index
U010400	Lost Communication With Cruise Control Module	<ul style="list-style-type: none"> Loss of CAN communication with speed control module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check speed control module for DTCs and refer to the relevant DTC Index
U012100	Lost Communication With Anti-Lock Brake System (ABS) Control Module	<ul style="list-style-type: none"> Loss of CAN communication with ABS module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check ABS module for DTCs and refer to the relevant DTC Index
U012700	Lost Communication With Tire Pressure Monitor Module	<ul style="list-style-type: none"> Loss of CAN communication with tire pressure monitoring module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check tire pressure monitoring module for DTCs and refer to the relevant DTC Index
U012800	Lost Communication With Park Brake Control Module	<ul style="list-style-type: none"> Loss of CAN communication with parking brake module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check parking brake module for DTCs and refer to the relevant DTC Index

DTC	Description	Possible Cause	Action
U013900	Lost Communication with Suspension Control Module 'B'	<ul style="list-style-type: none"> Loss of CAN communication with adaptive damping module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check adaptive damping module for DTCs and refer to the relevant DTC Index
U014000	Lost Communication With Body Control Module	<ul style="list-style-type: none"> Loss of CAN communication with CJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CJB for DTCs and refer to the relevant DTC Index
U014200	Lost Communication With Body Control Module "B"	<ul style="list-style-type: none"> Loss of CAN communication with RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check RJB for DTCs and refer to the relevant DTC Index
U015100	Lost Communication With Restraints Control Module	<ul style="list-style-type: none"> Loss of CAN communication with RCM 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check RCM for DTCs and refer to the relevant DTC Index
U015600	Lost Communication with Information Centre 'A'	<ul style="list-style-type: none"> Loss of CAN communication with information and entertainment control module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check information and entertainment control module for DTCs and refer to the relevant DTC Index
U016400	Lost Communication with HVAC Control Module	<ul style="list-style-type: none"> Loss of CAN communication with climate control module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check climate control module for DTCs and refer to the relevant DTC Index
U019900	Lost Communication with Door Control Module 'A'	<ul style="list-style-type: none"> Loss of CAN communication with driver door module (DDM) 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check DDM for DTCs and refer to the relevant DTC Index
U020000	Lost Communication with Door Control Module 'B'	<ul style="list-style-type: none"> Loss of CAN communication with passenger door module (PDM) 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check PDM for DTCs and refer to the relevant DTC Index
U020800	Lost Communication with Seat Control Module 'A'	<ul style="list-style-type: none"> Loss of CAN communication with driver seat module (DSM) 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check DSM for DTCs and refer to the relevant DTC Index
U021400	Lost Communication with Remote Function Actuation	<ul style="list-style-type: none"> Loss of CAN communication with keyless vehicle module (KVM) 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check KVM for DTCs and refer to the relevant DTC Index
U024100	Lost Communication with Headlamp Control Module 'A'	<ul style="list-style-type: none"> Loss of CAN communication with headlamp control module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check headlamp control module for DTCs and refer to the relevant DTC Index
U025000	Lost Communication with Impact Classification System Module	<ul style="list-style-type: none"> Loss of CAN communication with pedestrian protection module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check pedestrian protection module for DTCs and refer to the relevant DTC Index
U025600	Lost Communication with Front Controls Interface Module 'A'	<ul style="list-style-type: none"> Loss of CAN communication with integrated control panel 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check integrated control panel for DTCs and refer to the relevant DTC Index
U030000	Internal Control Module Software Incompatibility	<ul style="list-style-type: none"> Invalid configuration message is received 	Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC is still logged suspect the instrument cluster; refer to the new module/component installation note at the top of the DTC Index
U040268	Invalid data received from TCM	<ul style="list-style-type: none"> Algorithm based failures - events information 	Check TCM for DTCs and refer to the relevant DTC Index
U200411	Auxiliary Switch Pack	<ul style="list-style-type: none"> Auxiliary switch signal circuit - short to ground 	Refer to the electrical circuit diagrams and check auxiliary switch signal circuit for short to ground
U200415	Auxiliary Switch Pack	<ul style="list-style-type: none"> Auxiliary switch signal circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check auxiliary switch signal circuit for short to power, open circuit

DTC	Description	Possible Cause	Action
U300046	Control Module	<ul style="list-style-type: none"> • Calibration/parameter memory failure 	Suspect the instrument cluster, check and install a new instrument cluster as required, refer to the new module/component installation note at the top of the DTC Index
U300049	Control Module	<ul style="list-style-type: none"> • Internal electronic failure 	Suspect the instrument cluster, check and install a new instrument cluster as required, refer to the new module/component installation note at the top of the DTC Index
U300055	Control Module	<ul style="list-style-type: none"> • Incorrect car configuration data received 	Re-configure the RJB using the manufacturer approved diagnostic system. Clear DTC and re-test. If the DTC remains suspect the instrument cluster. Check and install a new instrument cluster as required, refer to the new module/component installation note at the top of the DTC Index
U300087	Control Module	<ul style="list-style-type: none"> • Missing message 	Re-configure the RJB using the manufacturer approved diagnostic system. Check instrument cluster for additional DTCs and refer to the DTC Index. Carry out CAN network integrity tests using the manufacturer approved diagnostic system. If DTC remains suspect the instrument cluster. Check and install a new instrument cluster as required, refer to the new module/component installation note at the top of the DTC Index
U300281	Vehicle Identification Number	<ul style="list-style-type: none"> • Vehicle/component mis-match. Corrupt VIN data being transmitted, instrument cluster previously installed to other vehicle 	Check and install original/new instrument cluster as required, refer to the new module/component installation note at the top of the DTC Index
U300316	Battery Voltage	<ul style="list-style-type: none"> • Instrument cluster logic power supply circuit - voltage below threshold 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check instrument cluster logic power supply circuit for short to ground, open circuit
U300317	Battery Voltage	<ul style="list-style-type: none"> • Instrument cluster logic power supply circuit - circuit voltage above threshold 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check charging system for over charging condition
U300362	Battery Voltage	<ul style="list-style-type: none"> • Mis-match in battery voltage, of 2 volts or more, between instrument cluster and RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check instrument cluster logic power supply circuit for short, open circuit

Instrument Cluster - Instrument Cluster

Removal and Installation

Removal



CAUTION: If a new instrument cluster is to be installed, the diagnostic tool must be connected prior to removal, the data must then be downloaded from it and the keys (remote control handsets) set into default mode. Failure to follow this instruction will result in permanent damage to the keys.

NOTES:



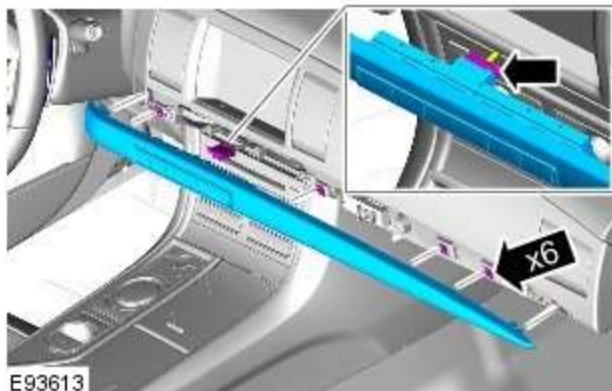
If a new instrument cluster is to be installed, make sure that all keys (remote control handsets) are present.



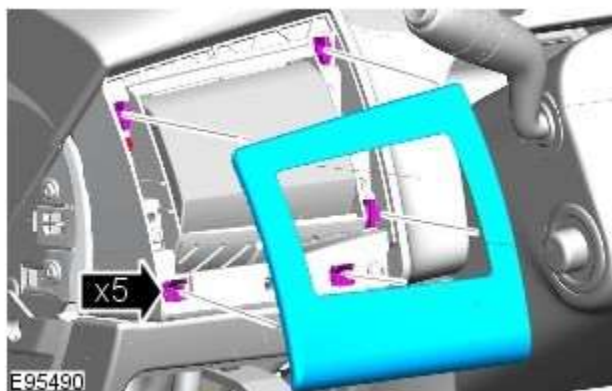
Removal steps in this procedure may contain installation details.

1. Fully extend and lower the steering column for access.
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

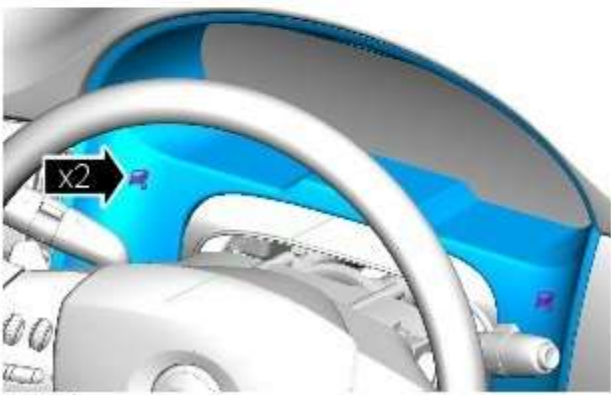
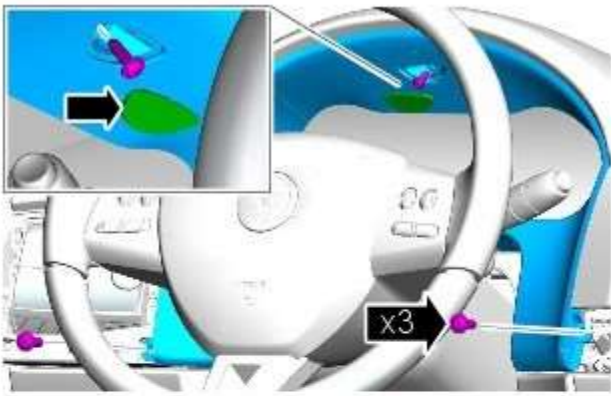
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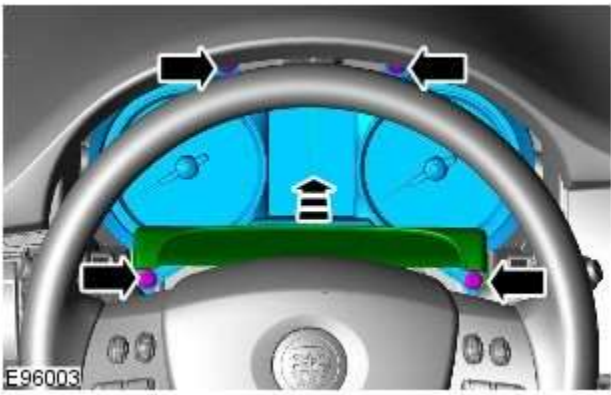


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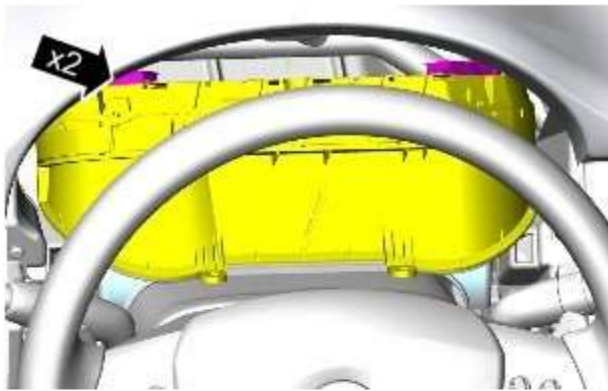
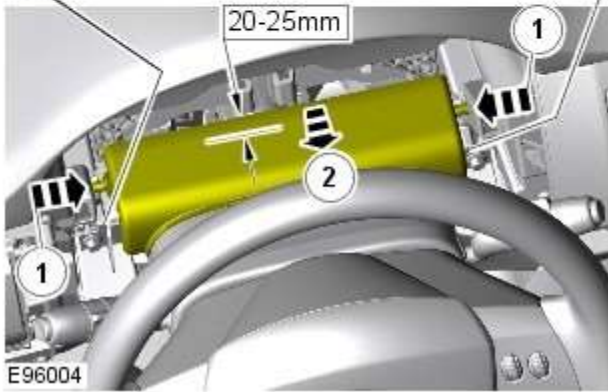
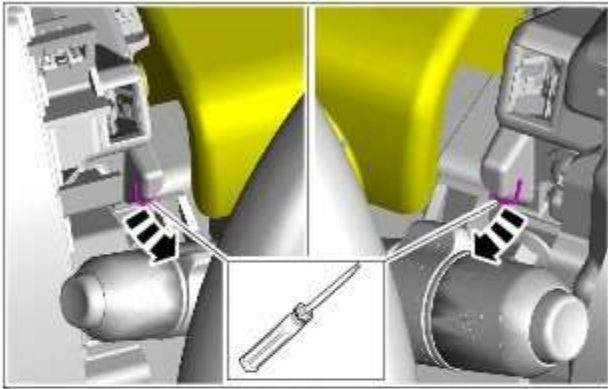
E95491


6.



E96003

7.



8.  CAUTION: Take extra care not to damage the instrument cluster face.

Installation

1. To install, reverse the removal procedure.
2. Configure the instrument cluster and ignition keys using the diagnostic tool.

Instrument Cluster - Instrument Cluster Lens

Removal and Installation

Removal

1. Fully extend the steering column for access.


2. Disconnect the battery ground cable.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: [Instrument Cluster](#) (413-01 Instrument Cluster, Removal and Installation).



E142894

4.  **CAUTION:** To prevent static damage to the circuits, place the instrument cluster inside the electro static discharge bag and use the gloves provided during this procedure.

5.



E145564

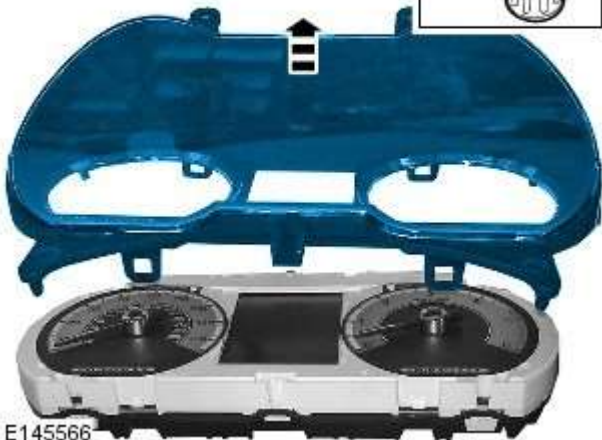
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E145565



7.  CAUTION: Take care not to damage the dials.



E145566

Installation

1. NOTE: Take care not to leave finger prints inside the new lens.



E145567

2. Refer to: [Instrument Cluster](#) (413-01 Instrument Cluster, Removal and Installation).

3. Disconnect the battery ground cable.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Horn -

Description	Nm	lb-ft	lb-in
Vehicle horn retaining bolt	25	18	-

Horn - Horn

Removal and Installation

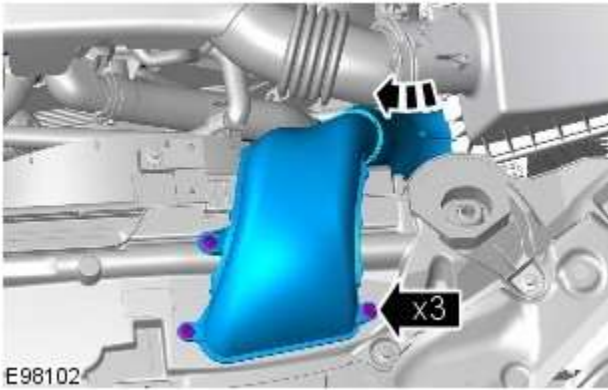
Removal



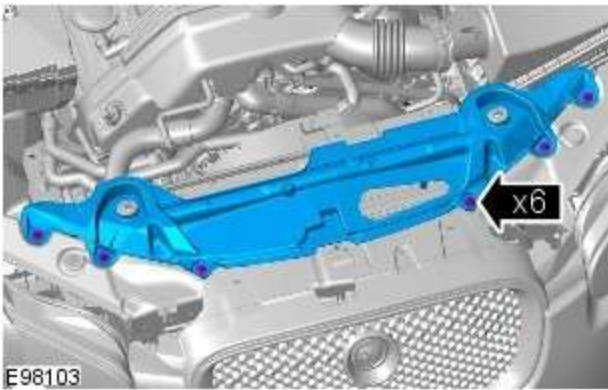
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

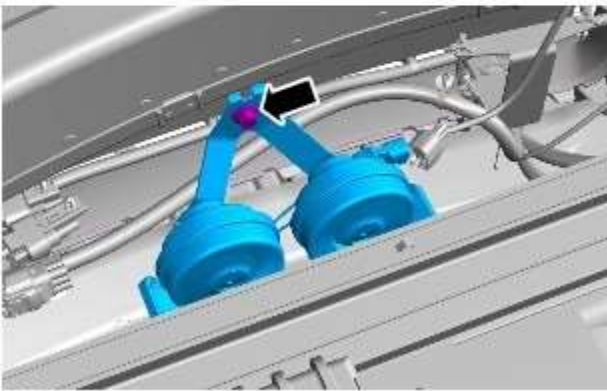
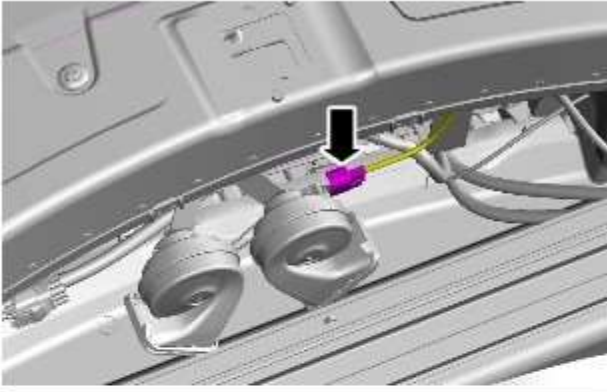
2. Torque: 7 Nm



3. Torque: 7 Nm



4. Torque: 25 Nm



E99894

Installation

1. To install, reverse the removal procedure.

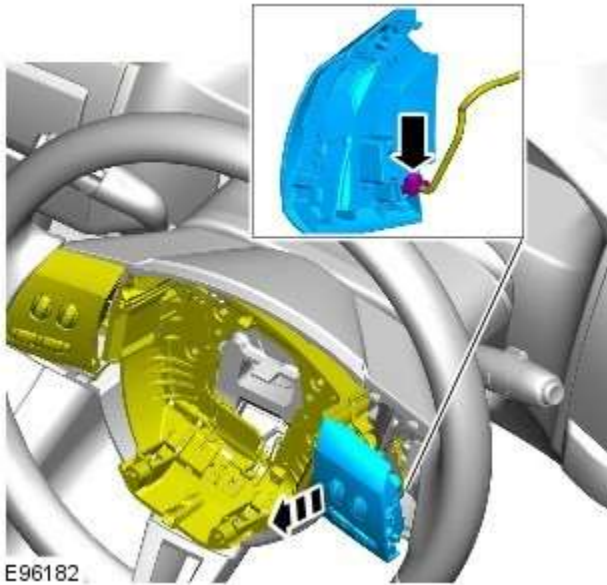
Horn - Horn Switch

Removal and Installation

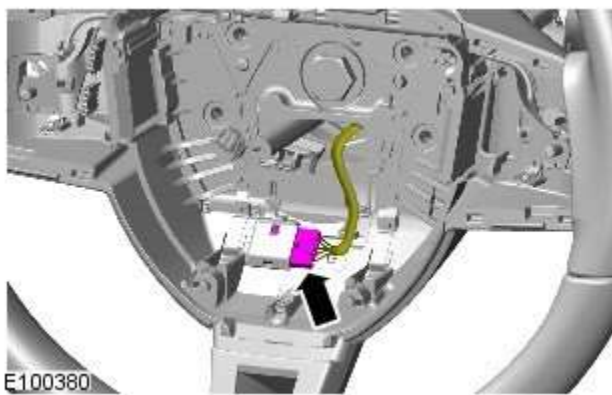
Removal

1. Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).
2. Refer to: [Steering Wheel Audio Controls](#) (415-01A Information and Entertainment System, Removal and Installation).

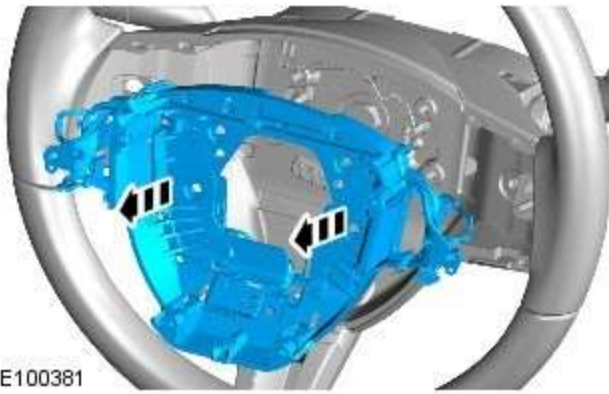
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5.



E100381

Installation

1. To install, reverse the removal procedure.

Information and Message Center - Information and Message Center - Component Location

Description and Operation

COMPONENT LOCATION



E93390

Item	Description
1	Message center

Information and Message Center - Information and Message Center -

Overview

Description and Operation

OVERVIEW

The message center is a [LCD \(liquid crystal display\)](#) located in a central position in the instrument cluster. The message center receives [CAN \(controller area network\)](#) bus, [LIN \(local interconnect network\)](#) bus, and hardwired signals from other vehicle system control modules to display current vehicle status information. Depending on message importance, the message center will be backlit in white, amber or red.

The message center will display:

- Fuel level
- Trip computer information
- Gear selected
- Speed control information
- Vehicle map
- Clock
- Turn by turn satellite navigation
- Voice control text
- JaguarDrive Control system messages.

Operation of the message center is controlled by software within the instrument cluster.
Refer to: [Instrument Cluster](#) (413-01 Instrument Cluster, Description and Operation).

Information and Message Center - Information and Message Center - System Operation and Component Description

Description and Operation

System Operation

SERVICE INTERVAL INDICATOR - 3.0L V6 DIESEL, 5.0L V8 SUPERCHARGER AND 5.0L V8 NATURALLY ASPIRATED ENGINES ONLY

If the vehicle is within 3,200 kilometers (1,988 miles) of a service, the message center will display 'SERVICE REQUIRED IN XXXX km or MILES'. The display reduces the 'service required in' readout by increments every 50 kilometers (30 miles). If this distance drops below 1 km (0.6 miles), the message center will display 'SERVICE REQUIRED'.

These messages are displayed every time the vehicle enters power mode 6, for 4 seconds after the instrument cluster bulb check routine has finished.



NOTE: The message center will display distance to next service in miles on an instrument cluster fitted with a Miles Per Hour (MPH) speedometer unless the driver has changed the display units on the Touch Screen Display (TSD).

Reset Procedure

To re-set the service interval indicator, the following process switch presses must each be carried out within 3 seconds:

- With the vehicle in power mode 0, (ignition off) press and hold the rear fog lamp switch
- Allow the vehicle to enter power mode 6 (Press the start button without a foot on the brake)
- Immediately release the rear fog lamp switch
- Press and hold the trip computer cycle switch
- Press and hold the rear fog lamp switch
- Continue to hold the trip computer and rear fog lamp switches
- If the process has been successful, the message center will display 'RESETTING SERVICE MODE' and then display 'SERVICE MODE RESET' after 10 seconds
- Release both switches and return the vehicle ignition to off, power mode 0.

Component Description

MESSAGE CENTER

The message center [LCD \(liquid crystal display\)](#) display has a viewable area of 126 pixels horizontal and 174 pixels vertical. It is divided into six information display zones as follows, starting from the top:

- Set speed
- Transmission position
- Warning /message display
- JaguarDrive Optimization icon
- Odometer/Trip computer information
- Fuel level.

The message center is active at all times when the ignition is on and can also be active when the ignition is off, dependant on the information to be displayed. The message center [LCD](#) illumination is controlled by the sun load light sensor located on the instrument panel. In bright conditions, the illumination is set to maximum brightness. As the ambient light levels drop, the illumination dims. When the lights are switched on or activated by the 'AUTO' function, the illumination operates in the same way until a defined ambient light threshold is reached, at this point the setting of the panel illumination dimmer in the auxiliary light switch will control the brightness.

If more than one message is active, each message is displayed for 4 seconds in the order of priority. Once all messages have been displayed, they are again displayed in turn for 2 seconds each. Warning messages can be displayed when the ignition is in accessory power mode 4 which is the initial ignition state when a door is opened.

Message Priority

Messages are assigned priorities which are defined by the effect on driving safety and functional ability of the vehicle. When new messages are displayed they may be accompanied by a chime from the instrument cluster sounder. A new message will be displayed immediately, providing the currently displayed message (if there is one) has been displayed for at least 4 seconds. A warning indicator will be activated simultaneously with the message being displayed. If more than one fault warning message is being displayed, the messages will cycle, in priority order, with each message being displayed for 2 seconds.

INFORMATION DISPLAY

The transmission display is located in the upper section of the [LCD](#). The transmission position information is sent from the [TCM \(transmission control module\)](#) in a high speed [CAN \(controller area network\)](#) message to the instrument cluster. The transmission has three modes of operation:

- Conventional automatic operation (JaguarDrive selector in 'D' position)
- Sport automatic operation (JaguarDrive selector in 'S' position)
- Manual gear operation - Jaguar Sequential Shift.

The following table shows the JaguarDrive selector position and the highlighted indication displayed in the transmission display.

JaguarDrive Selector Position	Transmission Display
P - Park	P
R - Reverse	R
N - Neutral	N
D - Drive	D
S - Sport	S

The following table shows the Jaguar Sequential Shift display. Selections are made using the steering wheel mounted paddle switches.

Jaguar Sequential Shift Gear Selection	Transmission Display
First	1
Second	2
Third	3
Fourth	4
Fifth	5
Sixth	6

The transmission may inhibit a requested up or down shift if the requested gear is outside the normal engine speed operating range. If this occurs, the transmission display will briefly display the gear requested by the driver but will then change to display the actual gear selection.

Speed Control and Set Speed Displays

The following table shows the possible messages which can be displayed, other visual or audible warnings and a description of the message.

Message	Other Warnings	Reason	Action
OVERLIMIT XXX MPH (km/h)	<ul style="list-style-type: none"> Amber ASL warning indicator illuminated at +4.8 km/h (+3 mph) above limit Amber ASL warning indicator flashing at +24 km/h (+15 mph) above limit Amber ASL warning indicator flashing and chime emitted at +24 km/h (+15 mph) for a certain time period 	Displayed when vehicle speed exceeds the ASL set speed	Reduce vehicle speed to ASL set limit
LIMITER CANCELLED	None	Displayed for 4 seconds when driver deselects ASL	None
LIMITER SET XXX MPH (km/h)	None	Displays new speed setting for the ASL	None
LIMITER STANDBY	None	Displayed when ASL is activated and speed control is selected	None
LIMITER NOT AVAILABLE	None	Displayed when ECM (engine control module) has detected a fault	Use an approved Jaguar Diagnostic System to diagnose fault.
TOO FAST TO RESUME	None	Displayed when 'Resume' switch is pressed but vehicle speed is 30 km/h (18 mph) above the set speed.	Reduce vehicle speed to set speed then press 'Resume' switch.
CRUISE CANCELLED	None	Driver has cancelled speed control or the brake pedal has been pressed.	None
CRUISE OVERRIDE	None	Driver has pressed the accelerator pedal, overriding the speed control system. Message will go off when accelerator pedal is released and speed control is active.	WARNING: Adaptive cruise braking will be disabled when this message is displayed.
GAP 1 / 2 / 3 / 4	None	Displays the current set or default adaptive speed control distance. Displayed along with a vehicle graphic in the LCD. Chevrons (>) denote gap figure selected.	If required, adjust distance using the steering wheel switches.
SETSPEED XXX MPH (km/h)	None	Displays the new speed input for the speed control	None
DRIVER INTERVENE	None	Immediate action required by the driver to apply the brakes if required.	<ul style="list-style-type: none"> Apply brakes if required. May also be displayed if speed control system loses CAN messages when active.

Message	Other Warnings	Reason	Action
CRUISE NOT AVAILABLE	None	Speed control cannot be engaged.	A fault has occurred in the speed control system. Diagnose fault using an approved Jaguar Diagnostic System.
RADAR SENSOR BLOCKED	None	The adaptive speed control radar sensor has become dirty or obstructed.	Remove obstruction or clean the radar sensor.
FORWARD ALERT OFF	None	Forward alert has been switched off. No warning will be given for objects in the vehicles forward direction.	None
FORWARD ALERT	None	Forward alert has been switched on or the gap settings have changed.	None
FORWARD ALERT UNAVAILABLE	None	Forward Alert and Emergency Brake Assist are not available.	Use an approved Jaguar Diagnostic System to diagnose fault..

Warning/Message Display

Warning and information messages are displayed in the central area of the [LCD](#). When no messages are required, an analogue clock is present on the display. The message display language can be changed by the driver using a selection menu on the Touch Screen Display (TSD). The following table shows the possible messages which can be displayed, other visual or audible warnings and a description of the message.

Message	Other Warnings	Reason	Action
DSC ON	DSC warning indicator flashes for a short time.	Displayed for a short time when the DSC switch is operated to activate the DSC system.	None
DSC OFF	DSC warning indicator illuminated.	Displayed for a short time when the DSC switch is operated to de-activate the DSC system.	None
TRAC DSC	DSC warning indicator illuminated.	Displayed for a short time when the DSC switch is operated to activate the TRAC DSC system.	None
DSC NOT AVAILABLE	DSC warning indicator illuminated.	A fault is present in the DSC system.	A fault has occurred in the DSC system. Interrogate ABS (anti-lock brake system) module for faults and diagnose fault using an approved Jaguar Diagnostic System.
BRAKE FLUID LOW	<ul style="list-style-type: none"> Brake warning indicator illuminated. Red warning triangle illuminated in LCD. 	Brake fluid level has become low and activated low level switch.	Investigate fluid loss and check brake system for leaks. Repair system as required and replenish brake fluid reservoir.
ABS FAULT	<ul style="list-style-type: none"> ABS warning indicator illuminated. Amber warning triangle illuminated in LCD. 	A fault is present in the ABS system. Braking system will operate but ABS will not be available.	A fault has occurred in the ABS system. Interrogate ABS module for faults and diagnose fault using an approved Jaguar Diagnostic System.
BRAKE ASSIST FAULT	Amber warning triangle illuminated in LCD .	A fault is present in the braking system preventing brake assist operation. Braking system will operate but brake assist will not be available and increased effort on the brake pedal may be required.	A fault has occurred in the brake assist system. Interrogate ABS module for faults and diagnose fault using an approved Jaguar Diagnostic System.
EBD FAULT	Red warning triangle illuminated in LCD .	A fault is present in the braking system preventing EBD operation. Braking system will operate but EBD will not be available.	A fault has occurred in the EBD system. Interrogate ABS module for faults and diagnose fault using an approved Jaguar Diagnostic System.
ADAPTIVE DYNAMICS FAULT	Amber warning triangle illuminated in LCD .	A fault is present in the Computer Active Technology Suspension (CATS) or the Adaptive Dynamic Suspension system. Suspension will default to the 'hard' setting.	A fault has occurred in the CATS system. Interrogate the CATS or adaptive damping module for faults and diagnose using an approved Jaguar Diagnostic System.
PARK BRAKE APPLIED	None	Parking brake has been applied when the vehicle moving at a speed 5 km/h (3 mph) or above.	None
PARK BRAKE FAULT	<ul style="list-style-type: none"> Brake warning indicator illuminated. Red warning triangle illuminated in LCD. 	A fault is present in the parking brake system.	A fault has occurred in the parking brake system. Interrogate the parking brake module for faults and diagnose using an approved Jaguar Diagnostic System.

Message	Other Warnings	Reason	Action
APPLY FOOT AND PARK BRAKE	Amber warning triangle illuminated in LCD .	The battery has been disconnected or power supply interrupted to the parking brake module.	Apply foot brake and parking brake to reset the parking brake module.
CANNOT APPLY PARK BRAKE	<ul style="list-style-type: none"> • Brake warning indicator flashing. • Red warning triangle illuminated in LCD. • NOTE: In certain markets the brake warning indicator does not flash. 	A fault is present in the parking brake system and the parking brake cannot be applied.	A fault has occurred in the parking brake system. Interrogate the parking brake module for faults and diagnose using an approved Jaguar Diagnostic System.
CHECK TYRE PRESSURE	<ul style="list-style-type: none"> • Tire Pressure Monitoring System (TPMS) warning indicator illuminated. • Vehicle graphic displaying tire location. 	A tire pressure has decreased to below the warning threshold.	Check tires for punctures and re-inflate to correct pressures.
TYRE NOT MONITORED	<ul style="list-style-type: none"> • Tire Pressure Monitoring System (TPMS) warning indicator illuminated. • Vehicle graphic displaying tire location. 	<ul style="list-style-type: none"> • One or more tire pressure sensors have developed a fault. • A temporary spare wheel or a wheel without a sensor has been fitted at the displayed position. • An unapproved accessory may be interfering with the TPMS. 	<ul style="list-style-type: none"> • Check for local RF interference. • A wheel has been fitted without a TPMS sensor fitted (space saver spare wheel). • TPMS sensor has developed a fault or the battery voltage is low. • A fault has occurred in the TPMS. Interrogate the TPMS module for faults and diagnose using an approved Jaguar Diagnostic System.
CHECK ALL TYRE PRESSURES	<ul style="list-style-type: none"> • Tire Pressure Monitoring System (TPMS) warning indicator illuminated. • Amber warning triangle illuminated in LCD. • Vehicle graphic displaying tire location. 	One or more tire pressures have decreased to below the warning threshold.	<ul style="list-style-type: none"> • Check tires for punctures and re-inflate to correct pressures. • Message may be displayed when TPMS is learning position of a new sensor.
TYRE PRESSURE SYSTEM FAULT	<ul style="list-style-type: none"> • Tire Pressure Monitoring System (TPMS) warning indicator illuminated. • Amber warning triangle illuminated in LCD. 	<ul style="list-style-type: none"> • Wheels and tires without sensors have been fitted to the vehicle. • TPMS sensors have become defective. • An unapproved accessory may be interfering with the TPMS. • A fault is present in the TPMS system and the tire pressures cannot be monitored. 	A fault has occurred in the TPMS. Interrogate the TPMS module for faults and diagnose using an approved Jaguar Diagnostic System.
TYRE PRESSURE LOW FOR SPEED	<ul style="list-style-type: none"> • Tire Pressure Monitoring System (TPMS) warning indicator illuminated. • Amber warning triangle illuminated in LCD. 	TPMS has detected current tire pressures are too low for sustained high speed driving	Check tire pressures and inflate to the correct pressures if necessary.
TYRE PRESSURE SYSTEM FAULT	<ul style="list-style-type: none"> • Tire Pressure Monitoring System (TPMS) warning indicator illuminated. • Amber warning triangle illuminated 	<ul style="list-style-type: none"> • Wheels and tires without sensors have been fitted to the vehicle. • TPMS sensors have become defective. • An unapproved accessory may be interfering with the TPMS. • A fault is present in the TPMS 	A fault has occurred in the TPMS. Interrogate the TPMS module for faults and diagnose using an approved Jaguar Diagnostic System.

Message	Other Warnings	Reason	Action
	in LCD .	system and the tire pressures cannot be monitored.	
ENGINE TEMPERATURE HIGH	Amber warning triangle illuminated in LCD at temperatures of between 118.0°C (244.4°F) and 119.3°C (246.8°F).	Engine coolant temperature has exceeded threshold for normal operation.	<ul style="list-style-type: none"> Stop vehicle and allow engine to idle for 5 minutes. Switch off engine and allow to stand for not less than 10 minutes. Check coolant level. If message re-appears, investigate coolant system for leakage.
ENGINE OVERHEATING	Red warning triangle illuminated in LCD at temperatures of 119.4°C (247°F) or above.	Engine coolant temperature has exceeded threshold for normal engine operation.	<ul style="list-style-type: none"> Stop vehicle and allow engine to idle for 5 minutes. Switch off engine and allow to stand for not less than 10 minutes. Check coolant level. If message re-appears, investigate coolant system for leakage.
ENGINE OIL PRESSURE LOW	Red warning triangle illuminated in LCD .	Engine oil pressure has fallen below the threshold for normal operation.	Stop the engine immediately. Check engine oil level. If oil level correct, do not restart engine until oil pressure loss has been identified and corrected.
RESTRICTED PERFORMANCE	Red or Amber warning triangle illuminated in LCD depending on nature of power loss.	A fault has occurred which has reduced engine power output.	Investigate cause of engine power loss. Interrogate control modules for faults and diagnose using an approved Jaguar Diagnostic System.
ENGINE SYSTEMS FAULT	<ul style="list-style-type: none"> MIL (malfunction indicator lamp) illuminated for certain faults. Red or Amber warning triangle illuminated in LCD. 	<ul style="list-style-type: none"> A fault has occurred in the engine management system or, if the MIL is illuminated, an emissions related fault is present which has been detected by the On-Board Diagnostic systems in the ECM and TCM. A fault has occurred with the start/stop switch. 	<ul style="list-style-type: none"> Investigate cause of fault. Interrogate ECM and TCM for faults and diagnose using an approved Jaguar Diagnostic System. Check start/stop switch for correct operation or short circuits.
CHECK FUEL FILLER CAP	<ul style="list-style-type: none"> (NAS Vehicles Only) Red warning triangle illuminated in LCD. 	The Diagnostic Monitoring Tank Leakage (DMTL) system has detected fuel filler cap has not been correctly installed or the system has a leak.	Check fuel filler cap to ensure it is correctly installed and secure or check the fuel system for leakage.
ENGINE TEMPERATURE INDICATION FAULT	Red warning triangle illuminated LCD .	A fault has occurred in the engine management system and the engine temperature signal is no longer being received.	Investigate cause of engine temperature failure. Interrogate ECM for faults and diagnose using an approved Jaguar Diagnostic System.
PLEASE WAIT COLD START IN PROGRESS	Amber warning triangle illuminated LCD .	Message appears after start/stop switch is pressed. Glow plugs are warming up, message will appear for up to 12 seconds dependant on ambient temperature. Engine will crank once message is switched off.	None
GEARBOX FAULT	Battery symbol and amber warning triangle illuminated in LCD .	TCM has detected a fault in the transmission. Transmission may default to 'limp home' mode and only allow limited operation of forward gears and reverse.	Investigate transmission fault. Interrogate TCM and diagnose fault using an approved Jaguar Diagnostic System.
BATTERY NOT CHARGING	Red warning triangle illuminated in LCD .	Charge output from generator not detected by ECM .	Investigate cause of generator failure.
OVER 120 km/h	<ul style="list-style-type: none"> (GULF States Only) Red text illuminated in LCD. 	Vehicle has exceeded the preset 120 km/h speed value.	Reduce vehicle speed.
DPF FULL SEE HANDBOOK	Amber or Red warning triangle illuminated LCD .	ECM has detected diesel particulate filter is becoming blocked or has become blocked.	Drive the vehicle as described in the owners handbook or the workshop manual to clean the filter.
COOLANT LEVEL LOW	Red warning triangle illuminated in LCD .	Coolant level in expansion tank has fallen below minimum level.	<ul style="list-style-type: none"> Stop vehicle and allow engine to idle for 5 minutes. Switch off engine and allow to stand for not less than 10 minutes. Check coolant level and replenish

Message	Other Warnings	Reason	Action
			expansion tank to maximum level. • If message re-appears, investigate coolant system for leakage.
BLIND SPOT MONITOR NOT AVAILABLE	Amber warning triangle illuminated LCD .	Blind spot monitoring system has a fault or vehicle speed is below threshold for system operation.	Drive vehicle above threshold speed or investigate cause of fault.
BLIND SPOT MONITOR SENSOR BLOCKED	Amber warning triangle illuminated LCD .	A blind spot monitoring sensor has become dirty or obstructed.	Remove obstruction or clean the radar sensor.
BRAKE PADS LOW	Amber warning triangle illuminated LCD .	Brake pads have reached the service limit.	Replace brake pads.
SERVICE REQUIRED IN XXXX MILES/km	Amber warning triangle illuminated LCD .	If the vehicle is within 3,200 kilometers (1,988 miles) of a service, the message center will display this message. The displayed distance will decrease in increments of 50 km (31 miles).	None
SERVICE REQUIRED	Amber warning triangle illuminated LCD .	This is displayed if the distance to next service drops below 1 km (0.6 miles).	Vehicle requires service.
RESETTING SERVICE MODE	Amber warning triangle illuminated LCD .	Displayed during the service reset procedure.	None
SERVICE MODE RESET	Amber warning triangle illuminated LCD .	Displayed when the service reset procedure has been successful.	None
WINTER MODE CONFIRMED	Snow mode symbol illuminated LCD .	Displayed when snow mode has been selected.	None
DYNAMIC MODE CONFIRMED	Dynamic mode symbol illuminated LCD .	Displayed when dynamic mode has been selected.	None
MODE CHANGE IN PROGRESS	None or Snow mode symbol illuminated or Dynamic mode symbol illuminated LCD LCD	Displayed when the driver has selected an alternative JaguarDrive mode.	None
RECOMMEND WINTER MODE FOR CONDITIONS	None or Dynamic mode symbol illuminated LCD	Displayed when the JaguarDrive senses excessive wheel slip.	Select winter mode.
WINTER MODE OFF	None	Confirmation that winter mode has been deselected.	None
DYNAMIC MODE OFF	None	Confirmation that dynamic mode has been deselected.	None
WINTER MODE FAULT	Amber warning triangle illuminated LCD .	A sub-system fault is present and the driver attempts to select a different JaguarDrive Control mode. The message 'WINTER MODE FAULT' can also in very rare circumstances be generated by a fault in the JaguarDrive Control module.	Investigate cause of message. Interrogate sub-system control modules for faults and diagnose using an approved Jaguar Diagnostic System. If no sub-system fault is found, investigate JaguarDrive Control module.
DYNAMIC MODE FAULT	Amber warning triangle illuminated LCD .	A sub-system fault is present and the driver attempts to select a different JaguarDrive Control mode. The message 'DYNAMIC MODE FAULT' can also, in very rare circumstances, be generated by a fault in the JaguarDrive Control module.	Investigate cause of message. Interrogate sub-system control modules for faults and diagnose using an approved Jaguar Diagnostic System. If no sub-system fault is found, investigate JaguarDrive Control module.
SPECIAL MODES NOT AVAILABLE	Amber warning triangle illuminated LCD .	A sub-system fault is present and the driver attempts to select a different JaguarDrive Control mode. The message 'SPECIAL MODES NOT AVAILABLE' can also in very rare circumstances be generated by a fault in the JaguarDrive Control module.	Investigate cause of message. Interrogate sub-system control modules for faults and diagnose using an approved Jaguar Diagnostic System. If no sub-system fault is found, investigate JaguarDrive Control module.
LISTENING	Tone emitted from the instrument cluster.	The voice button has been pressed and the Jaguar voice system is active and awaiting a voice command.	None
VOICE NOT READY	None	If the Voice button on the steering wheel is pressed before the system is ready to receive a command, VOICE NOT READY will be displayed	Press button a second time after a short delay.
INSERT MAP DISC	None	Navigation disc not loaded.	Load navigation disc in the navigation computer.
NOT AVAILABLE PHONE IN USE	None	Voice button has been pressed during a telephone call.	None
COMMAND NOT RECOGNISED	None	Jaguar Voice system has not recognised the command.	Repeat the command speaking clearly.

Message	Other Warnings	Reason	Action
NO SPEECH DETECTED	None	Jaguar Voice system is expecting a voice command .	Repeat required voice command.
STORING	None	Jaguar Voice system is storing input telephone information.	None
COMMAND CANCELLED	None	Jaguar Voice button has been pressed and held.	Previous command cancelled.
SEARCHING	None	Jaguar Voice system is searching for requested information from phone book.	None
HOLD BUTTON TO CANCEL	None	Jaguar Voice system has requested a command to be cancelled.	None
FUEL LEVEL LOW	Amber warning triangle illuminated LCD .	Fuel level in fuel tank has fallen below low fuel warning limit.	Replenish fuel tank.
FUEL PUMP SYSTEM FAULT	Amber warning triangle illuminated LCD .	Fuel pump or FPDM fault has occurred.	Investigate cause of fault. Interrogate ECM for faults and diagnose using an approved Jaguar Diagnostic System.
WASHER FLUID LOW	Amber warning triangle illuminated LCD .	Fluid level has fallen below low level switch in windshield washer reservoir.	Replenish reservoir.
DOOR OPEN	Red text is illuminated in LCD and vehicle view showing open luggage compartment lid is displayed.	Door is open or incorrectly closed.	Close open door.
BOOT OPEN	Red text is illuminated in LCD and vehicle view showing open door location is displayed.	Luggage compartment lid is open or incorrectly closed.	Close open luggage compartment lid.
COLUMN ADJUST	None	Manual column adjust has been selected on steering column adjustment switch.	None
COLUMN ADJUST AUTO	None	Automatic column adjust has been selected on steering column adjustment switch.	None
MEMORY 1 / 2 / 3 / 4 SETTINGS RECALLED	None	Memory button has been pressed to recall memory positions for seat, steering column and mirrors.	None
MEMORY 1 / 2 / 3 / 4 SETTINGS SAVED	None	Memory has been saved for one of the memory button positions.	None
SEAT BELT MINDER	None	Engine has been started and driver and/or front passenger seat belt has not been fastened.	Fasten seat belt(s).
CHECK PEDESTRIAN SYSTEM	Red warning triangle illuminated in LCD .	A fault has occurred with the pedestrian protection system.	Investigate cause of fault. Interrogate pedestrian protection system control module for faults and diagnose using an approved Jaguar Diagnostic System.
INERTIA SWITCH TRIPPED	Amber warning triangle illuminated LCD .	Message appears when the crash status signal from the RCM (restraints control module) changes to crash detected or a fault in the restraints system prevents the message from being transmitted.	RCM can be rest with an ignition on/off cycle. If fault has occurred, then investigate cause of fault and interrogate the RCM for faults and diagnose using an approved Jaguar Diagnostic System.
VALET MODE	None	Confirmation that valet mode has been entered.	None
VEHICLE ARMED	None	Confirmation that alarm and immobilization has been achieved.	None
SMART KEY NOT FOUND PLEASE INSERT IN SLOT	Red warning triangle illuminated in LCD .	Smart key has not been detected by the passive system inside the vehicle.	Smart key not present in vehicle. May be caused by a flat smart key battery. Replace internal battery in smart key. May also be due to a communications problem.
CHECK SMART KEY	None	The smart key detected is not the correct smart key for the vehicle.	Use the correct smart key coded to the vehicle.
REMOVE SMART KEY	None	Smart key is in the start control module and has been recognized by the passive start system.	Remove smart key from the start control module.
SMART KEY BATTERY LOW	None	Battery voltage in smart key is becoming low, resulting in a decrease in effective range of the smart key transmitter.	Replace smart key internal battery.
PRESS BRAKE WHEN STARTING	None	The stop/start button has been pressed without the brake pedal depressed. This will turn on the ignition power mode 6.	To start engine, press brake pedal, then press stop/start button.
GEARBOX NOT IN PARK	None	The transmission is not in the 'park' position. Engine starting will be prohibited until 'park' is selected.	Put transmission in the park position.

Message	Other Warnings	Reason	Action
STEERING COLUMN LOCKED	Red warning triangle illuminated in LCD .	Fault has occurred preventing the steering column lock from unlocking. This will also prevent the engine from starting.	Press the stop/start button to return to accessory mode 4. If steering column is still locked, investigate cause of fault and interrogate the CJB (central junction box) for faults and diagnose using an approved Jaguar Diagnostic System.
IGNITION ON	Red warning triangle illuminated in LCD .	Stop/start button has been pressed without the brake pedal depressed. Ignition is now in power mode 6.	None
ENGINE STOP BUTTON PRESSED	Red warning triangle illuminated in LCD .	Engine stop button has been pressed when the vehicle is moving. Engine will not be switched off until button is pressed quickly for a second time.	Do not stop engine when vehicle is moving unless necessary.
LIGHTS ON	Amber warning triangle illuminated in LCD .	Side lamps or headlamps are on and the driver's door has been opened.	Switch off headlamps to avoid excessive drain on battery.
AUTOLAMP DELAY OFF	None	Autolamp delay feature has been deactivated by moving light control switch from the auto position.	None
AUTOLAMP DELAY XX:XX	None	Lighting control switch has been moved to one of the 4 autolamp delay positions. Message displays delay timer period selected.	None
AUTOLAMP DELAY	None	Autolamp delay is selected on the light control switch and the driver has switched off ignition and opened driver's door initiating the autolamp delay.	None. Message will extinguish once the selected delay timer has switched off the headlamps.
TAIL LAMP FAILURE	None	The tail lamp LED (light emitting diode) 's are not functioning correctly. Location shown on vehicle image.	Correct fault in rear lamp assembly, RJB (rear junction box) or wiring.
BRAKE LAMP FAILURE	None	The brake lamp LED 's are not functioning correctly. Location shown on displayed vehicle image.	Correct fault in rear lamp assembly, RJB or wiring.
INDICATOR LAMP FAILURE	None	A turn signal indicator bulb has failed. Location is shown on displayed vehicle image.	Replace failed turn signal indicator bulb.
E-DIFF NOT AVAILABLE	Amber warning triangle illuminated in LCD accompanied with a single chime	Differential temperature has reached the overheat threshold. System deactivated until temperature returns within limits.	Allow differential to cool.
E-DIFF FAULT	Amber warning triangle illuminated in LCD accompanied with a single chime	Fault has occurred with electronic differential. System deactivated until fault rectified.	Investigate cause of fault and interrogate the system for faults and diagnose using an approved Jaguar Diagnostic System.
ENGINE OIL LOW	Amber warning triangle illuminated in LCD accompanied with a single chime	The oil is at the minimum level for safe operation.	Top-up with 1 liter (1.8 pints) of oil.
ENGINE OIL HIGH	Amber warning triangle illuminated in LCD accompanied with a single chime	This warning is displayed when the engine is started, if the oil is above the maximum level for safe operation.	Stop the vehicle as soon as safety permits and have the engine oil drained to correct level, before driving the vehicle.
ENGINE OIL CRITICALLY LOW	Red warning triangle illuminated LCD accompanied with a single chime	The oil is below the minimum level for safe operation.	Stop the vehicle as soon as safety permits and top-up with 1.5 liters (2.6 pints) of oil. Wait for 10 minutes, re-check the oil level reading and top-up again if necessary.
ENGINE OIL LEVEL MONITOR SYSTEM FAULT	Amber warning triangle illuminated in LCD accompanied with a single chime	A fault with the oil level monitoring system is indicated.	Investigate cause of fault and interrogate the ECM for faults and diagnose using an approved Jaguar Diagnostic System.
WATER IN FUEL	Amber warning triangle illuminated in LCD accompanied with a single chime	The water in fuel sensor in the fuel filter has detected water in the fuel system.	Drain fuel filter to remove collected water.

Odometer Display

The odometer displays the total distance which the vehicle has traveled. This is calculated by the instrument cluster using wheel speed signals from the [ABS](#) module.

The odometer can show 6 characters and distances up to 999,999 miles or kilometers. The total distance travelled is stored in a [EEPROM \(electrically erasable programmable read only memory\)](#) and the [RAM \(random access memory\)](#). This ensures that the total distance is not lost if the battery is disconnected.

The odometer value is passed to other vehicle system modules on the medium speed and high speed [CAN](#) bus. This is used to record the total vehicle mileage for diagnostic purposes and when storing [DTC \(diagnostic trouble code\)](#)'s.

Trip computer Information Display

The instrument cluster contains software which controls the trip computer. The computer allows the driver to access information for current fuel usage, current journey length, average speed and estimated vehicle range of fuel remaining.

The information is calculated from [CAN](#) messages from other vehicle systems, for example wheel speed signals from the [ABS](#) module and fuel injector operating data from the [ECM](#).

A 'Trip' button is located on the end of the [LH \(left-hand\)](#) multifunction switch and allows the driver to access, in sequence, the available trip information by repeatedly pressing the button. The trip information is displayed in the following order:

- Trip distance – The trip distance since the last reset is displayed
- Average speed – The average speed since the last reset is displayed
- Average fuel consumption – The average fuel consumption since the last reset is displayed
- Range – The range is displayed showing the distance which can be travelled until the fuel gage reads empty. If the range display shows dashes (-), this indicates a failure with one or both of the fuel level sensors.

The trip computer has three independent memories; A, B and Auto. Memories A and B can be set independently. The Auto memory is reset after each ignition cycle and therefore only contains information relating the current journey.

The trip information can also be accessed from the TSD located in the center console. The TSD allows the same information available with the trip button on the multifunction switch to be displayed on the TSD, with the addition of the option to reset the values in the A and B memories.

If the battery is disconnected, all trip data in memories A, B and Auto are erased.

Fuel Level Display

The fuel level display is a linear [LCD](#) display to show the usable fuel tank contents. The level display is active at all times when the ignition is on. Low fuel level is displayed as a LOW FUEL LEVEL message and an amber warning triangle in the message center.

The fuel level is obtained by fuel level sensors in the fuel tank. These are monitored by the [RJB](#) software and their output resistance values, corresponding fuel quantity, are transmitted to the instrument cluster on the medium speed [CAN](#) bus. The instrument cluster uses the two level sensor signals to calculate the fuel tank contents. This calculation takes into account fuel movement in the tank to display a steady fuel quantity in the [LCD](#).

The fuel level information is transmitted on the medium speed and high speed [CAN](#) bus for use by other vehicle system modules.

AUDIBLE WARNINGS

The instrument cluster can generate audible warnings to alert the driver to a displayed message and change of vehicle operating condition. The audible warning is generated by a sounder located within the instrument cluster. The audible warnings can be generated for the warnings below and are listed in order of priority, with the first being the highest priority:

- Seatbelt reminder
- EPB (High Pitch)
- ACC Driver Intervene 1
- Airbag fault
- Key in ignition switch
- ASL overspeed
- ACC Driver Intervene 2
- EPB (Low Pitch)
- Vehicle armed (entry delay)
- JaguarDrive selector not in park
- Valet mode
- Lights on reminder
- Hood operation
- Passive Entry / Passive Start (PEPS)
- Memory set
- Turn signal indicators
- Seat Belt Minder.

The audible warnings can take the form of a single chime, a number of chimes or a continuous chime. The audible warnings are initiated by a CAN message request from the requesting sub-system control module or by the instrument cluster software.

Information and Message Center - Information and Message Center

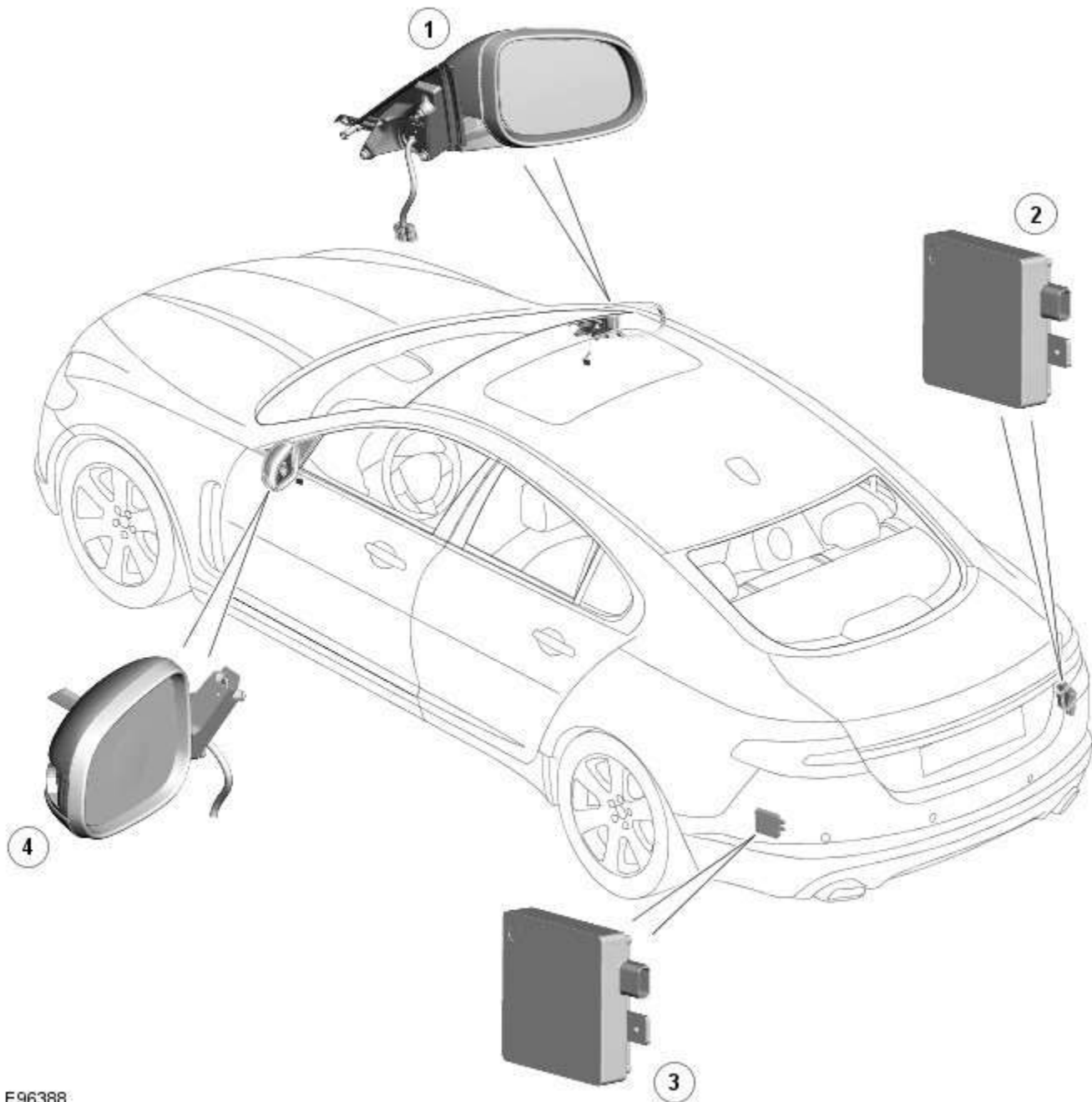
Diagnosis and Testing

For additional information.

REFER to: [Instrument Cluster](#) (413-01 Instrument Cluster, Diagnosis and Testing).

Warning Devices - Blindspot Monitoring System - Component Location

Description and Operation



E96388

Item	Description
1	RH (right-hand) door mirror
2	RH blind spot monitoring module
3	LH (left-hand) blind spot monitoring module
4	LH door mirror

Warning Devices - Blindspot Monitoring System - Overview

Description and Operation

OVERVIEW

Eliminating blind spots is a major element in vehicle body design, but because of the structural requirements of B, C and D posts, blind spots cannot be entirely eliminated. Statistics show that some accidents are directly attributable to drivers moving across into the path of overtaking vehicles that have not been seen in conventional mirrors. New mirror designs have improved the situation, but by remotely covering areas that cannot be seen either directly or by the vehicle mirrors, have led to the introduction of a radar-based blind spot monitoring system.

The blind spot monitoring system comprises:

- [LH \(left-hand\)](#) Blind spot monitoring sensor
- [RH \(right-hand\)](#) Blind spot monitoring sensor
- [LH](#)_door mirror
- [RH](#)_door mirror

The system uses two radar modules operating at a frequency of 24 GHz and each combining the radar face and electronic module in a single unit. The modules are located behind the rear bumper surface, symmetrically, one on each side of the car behind the rear wheels. They are side facing and inclined rearwards at an angle of 16 degrees, which is dictated by the shape at the rear of the vehicle. Each module is calibrated to detect a vehicle in the driver's blind spot. Once a vehicle is detected the module illuminates an amber warning 'alert icon' [LED \(light emitting diode\)](#) in the relevant exterior door mirror. If there is a fault or blockage with the blind spot monitoring system an amber warning indicator dot [LED](#) is displayed in the exterior mirror and the message 'blind spot monitoring not available' is displayed in the instrument cluster message center.

When the system initiates, it performs a self-check, during which the warning icons in the mirrors illuminate alternately for a short period of time. Each module does a left/right determination check when the ignition is switched on. Each mirror has a different circuit configuration so that the modules can determine which mirror they are connected to. If a module detects the wrong mirror it will go into a fault condition.

The blind spot monitoring modules receive vehicle speed on the medium speed [CAN \(controller area network\)](#) and are inactive until the vehicle reaches 16kph (10mph). Each blind spot monitor module emits a radar field greater than the blind spot area.

Each Blind Spot Monitor module emits a radar field greater than the blind spot area. The actual blind spot area is calibrated into the module during its manufacture.

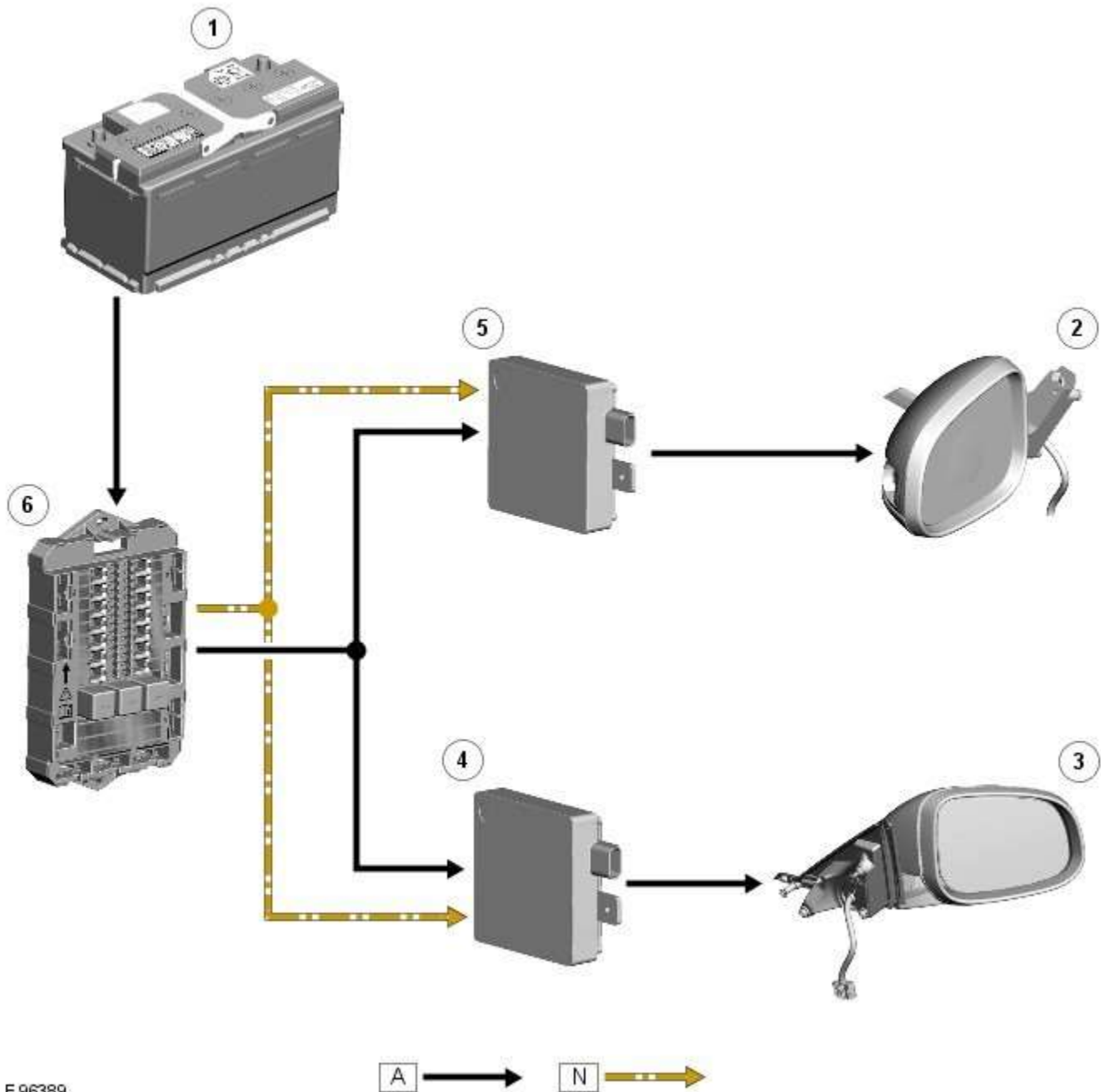


CAUTION: The blind spot monitoring system is designed as a driver aid not a safety device. The driver should always exercise due care and attention whilst driving.

Warning Devices - Blindspot Monitoring System - System Operation and Component Description

Description and Operation

Control Diagram



E 96389

Item	Description
1	Battery
2	LH (left-hand) door mirror
3	RH (right-hand) door mirror
4	RH blind spot monitoring module
5	LH blind spot monitoring module
6	RJB (rear junction box)

System Operation

Blind Spot Monitoring

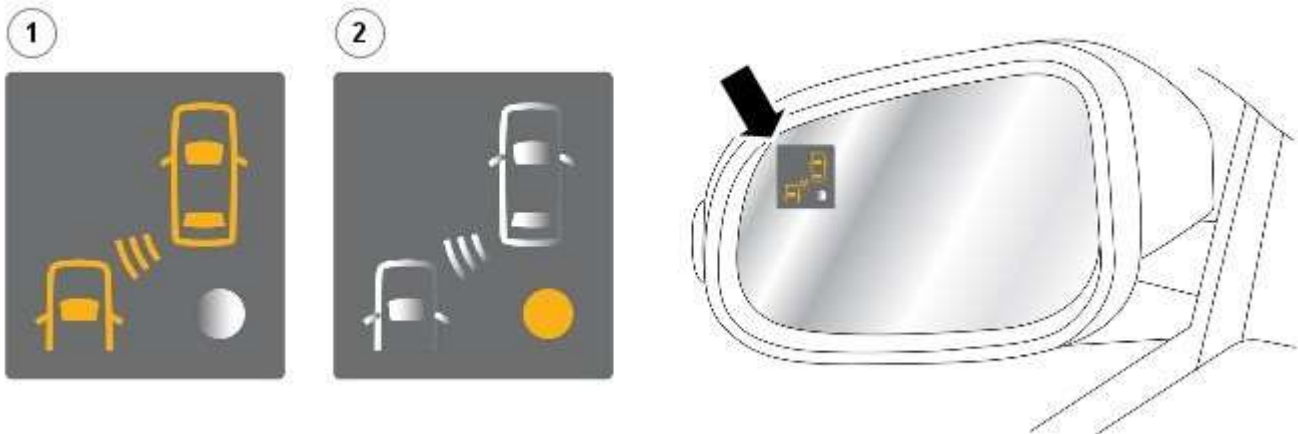
The purpose of the blind spot monitoring system is to detect an object moving with a positive velocity relative to the radar module, on either side of the vehicle, at a distance of up to 2.5 meters laterally and in an area from the door mirror up to 7.0 meters behind the module. These criteria identify an overtaking vehicle within the blind-spot area and within a typical carriageway lane width, while eliminating other objects that are not relevant, either because of their position, they are stationary, traveling in the opposite direction, or being overtaken. A vehicle is classed as a heavy goods vehicle, car or motorcycle. A motorcycle is defined as a minimum size of 2.0m long, 0.8m wide (widest point) and 1.1m high. The system is not affected by the mass of the overtaking vehicle providing all identification criteria, including relative velocity of (16km/h - 10mph) or above, is met.

The system emits radar pulses and analyses the reflections, identifying anything that moves into the blind spot zone. Having detected another vehicle in the defined blind spot zone it alerts the driver by illuminating the amber alert icon located in the appropriate exterior mirror.



NOTE: If an overtaking vehicle is detected on both sides of the vehicle simultaneously, the warning alert icons in both mirrors will illuminate.

The light lens is shaped so as to minimize the visibility to other drivers. The **LED (light emitting diode)**'s are located towards the outside extremity of the mirror face, within the peripheral view of the driver but not in any area of the mirror where they could obscure or distract from the image.



E97753

Item	Description
1	Warning alert icon
2	System status warning indicator

The **LED** lighting sequence is as follows;

- Amber alert **LED** icon permanently lit - system operational, vehicle detected in blind spot area
- No **LED**'s lit - system active no vehicle detected in blind spot area
- Amber status **LED** permanently lit - system not active or faulty

The system has operating limitations and is automatically turned off under certain operating conditions. During these operating conditions the amber status **LED** is permanently lit.

The system operating limitations are as follows;

- The area surrounding the radar face of the module must be clear of metallic items
- The system is inactive until vehicle speed is greater than 16km/h - 10mph (amber status **LED** permanently lit)
- The system is inactive if an approved trailer is connected to the vehicle (amber status **LED** permanently lit)
- The system is inactive when reverse gear or park is selected (amber status **LED** permanently lit)

If either of the radar signals are blocked or distorted, for example by water, the radar face of the module is covered in mud, sleet or snow the system may detect this and be disabled with the amber status **LED** permanently lit together with a 'blind spot monitoring blocked' message displayed in the instrument cluster message center. The system is disabled until the blockage is cleared.

If there is a fault in the system the amber status **LED** is permanently lit and a 'blind spot monitoring not available' message displayed in the instrument cluster message center. The system is disabled until the fault is rectified.

System fault and blockage warnings are as follows;

- The system is disabled when the radar module signal is blocked (amber status [LED](#) permanently lit and instrument cluster message)
- The system is disabled by a fault (amber status [LED](#) permanently lit and instrument cluster message)

If there is a failure in the communication network and the warning [LED](#)'s cannot be displayed in the mirror, a failure message will be displayed in the instrument cluster message center.

When any faults are present in the system [DTC \(diagnostic trouble code\)](#)'s are stored in both blind spot monitoring modules appropriate to each module. Replacement of modules requires the right hand module to be configured using the Jaguar approved diagnostic equipment. Due to the fact that all modules are supplied as left hand modules the replacement left hand modules do not require configuring.

Calibration of the modules using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

Warning Devices - Warning Devices

Diagnosis and Testing

Principles of Operation

For a detailed description of the Blindspot Monitoring system, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (413-09 Warning Devices)

[Blindspot Monitoring System](#) (Description and Operation),
[Blindspot Monitoring System](#) (Description and Operation),
[Blindspot Monitoring System](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.



NOTE: Particular attention should be paid to the following items where DTCs may not be logged:

- Check for contamination (e.g. dirt, grime, frosting, ice) around the blindspot monitoring sensors and clear.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Exterior rear view mirror glass • Mud or sleet contamination around rear bumper area • Blindspot Monitoring Modules 	<ul style="list-style-type: none"> • Fuse(s) • Relay(s) • Wiring Harness • Electrical connector(s) • Blindspot Monitoring Modules

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
<ul style="list-style-type: none"> • The instrument cluster displays 'BSM System Fault' • DTC B11C915 is logged within the left hand Blind Spot Monitoring module • The Left Alert icon is constantly illuminated 	<ul style="list-style-type: none"> • Left driver display alert LED circuit - short to power 	Refer to the electrical circuit diagrams and check left driver display alert LED circuit for short to power
<ul style="list-style-type: none"> • The instrument cluster displays 'BSM System Fault' • DTC B11C915 is logged within the left hand Blind Spot Monitoring module • No short to power or open circuit fault on the driver display status LED circuit 	<ul style="list-style-type: none"> • Left mirror ground circuit - open circuit 	Refer to the electrical circuit diagrams and check the left mirror ground circuit for open circuit
<ul style="list-style-type: none"> • The instrument cluster displays 'BSM System Fault' • DTC B11C915 is logged within the right hand Blind Spot Monitoring module • No short to power or open circuit fault on the driver display status LED circuit 	<ul style="list-style-type: none"> • Right mirror ground circuit - open circuit 	Refer to the electrical circuit diagrams and check the right mirror ground circuit for open circuit

Symptom	Possible Causes	Action
<ul style="list-style-type: none"> The instrument cluster displays 'BSM System Fault' DTC U023200 is logged within the right hand Blind Spot Monitoring module The left driver display status LED does not illuminate when the vehicle is stationary, in Park and the ignition is on 	<ul style="list-style-type: none"> Left driver display status LED circuit - short to ground Harness fault between left side mirror and left side module Suspect left hand module failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left driver display status LED circuit for short to ground. Clear DTC and re-test. If DTC remains suspect the left hand Blindspot Monitoring module Refer to the electrical circuit diagrams and check the left side harness between the left side mirror and left hand module Check and install a new left hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index
<ul style="list-style-type: none"> The instrument cluster displays 'BSM System Fault' DTC U023200 is logged within the right hand Blind Spot Monitoring module When the system is powered up the left driver display alert LED does not illuminate during the bulb self-checks 	<ul style="list-style-type: none"> Left driver display alert LED - short to ground, open circuit Harness fault between left side mirror and left side module Suspect left hand module failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left driver display alert LED circuit for short to ground, open circuit. Clear DTC and re-test. If DTC remains suspect the left hand Blindspot Monitoring module Refer to the electrical circuit diagrams and check the left side harness between the left side mirror and left hand module Check and install a new left hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index
<ul style="list-style-type: none"> The instrument cluster displays 'BSM System Fault' DTC U023300 is logged within the left hand Blind Spot Monitoring module The right driver display status LED is constantly illuminated 	<ul style="list-style-type: none"> Right driver display status LED - short to power Harness fault between right side mirror and right side module Suspect right hand module failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right driver display status LED circuit for short to power. Clear DTC and re-test. If DTC remains suspect the right hand Blindspot Monitoring module Refer to the electrical circuit diagrams and check the right side harness between the right side mirror and right hand module Check and install a new right hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index
<ul style="list-style-type: none"> The instrument cluster displays 'BSM System Fault' DTC U023300 is logged within the left hand Blind Spot Monitoring module When the system is powered up the right driver display status LED does not illuminate during the bulb self-checks 	<ul style="list-style-type: none"> Right driver display status LED - open circuit Harness fault between right side mirror and right side module Suspect right hand module failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right driver display status LED circuit for open circuit. Clear DTC and re-test. If DTC remains suspect the right hand Blindspot Monitoring module Refer to the electrical circuit diagrams and check the right side harness between the right side mirror and right hand module Check and install a new right hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index
<ul style="list-style-type: none"> The instrument cluster displays 'BSM System Fault' DTC U023300 is logged within the left hand Blind Spot Monitoring module When the system is powered up both the right driver display LEDs do not illuminate during the bulb self-checks 	<ul style="list-style-type: none"> Right mirror ground circuit - open circuit Harness fault between right side mirror and right side module Suspect right hand module failure 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the right mirror ground circuit for open circuit. Clear DTC and re-test. If DTC remains suspect the left hand Blindspot Monitoring module Refer to the electrical circuit diagrams and check the right side harness between the right side mirror and right hand module Check and install a new right hand Blindspot Monitoring module only, refer to the new module/component installation note at the top of the DTC Index

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



When carrying out repair/diagnosis of the system, on removal of the front or rear bumper inspect the sensor connectors to ensure they were correctly latched and check fly leads for signs of chaffing or trapped wires.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

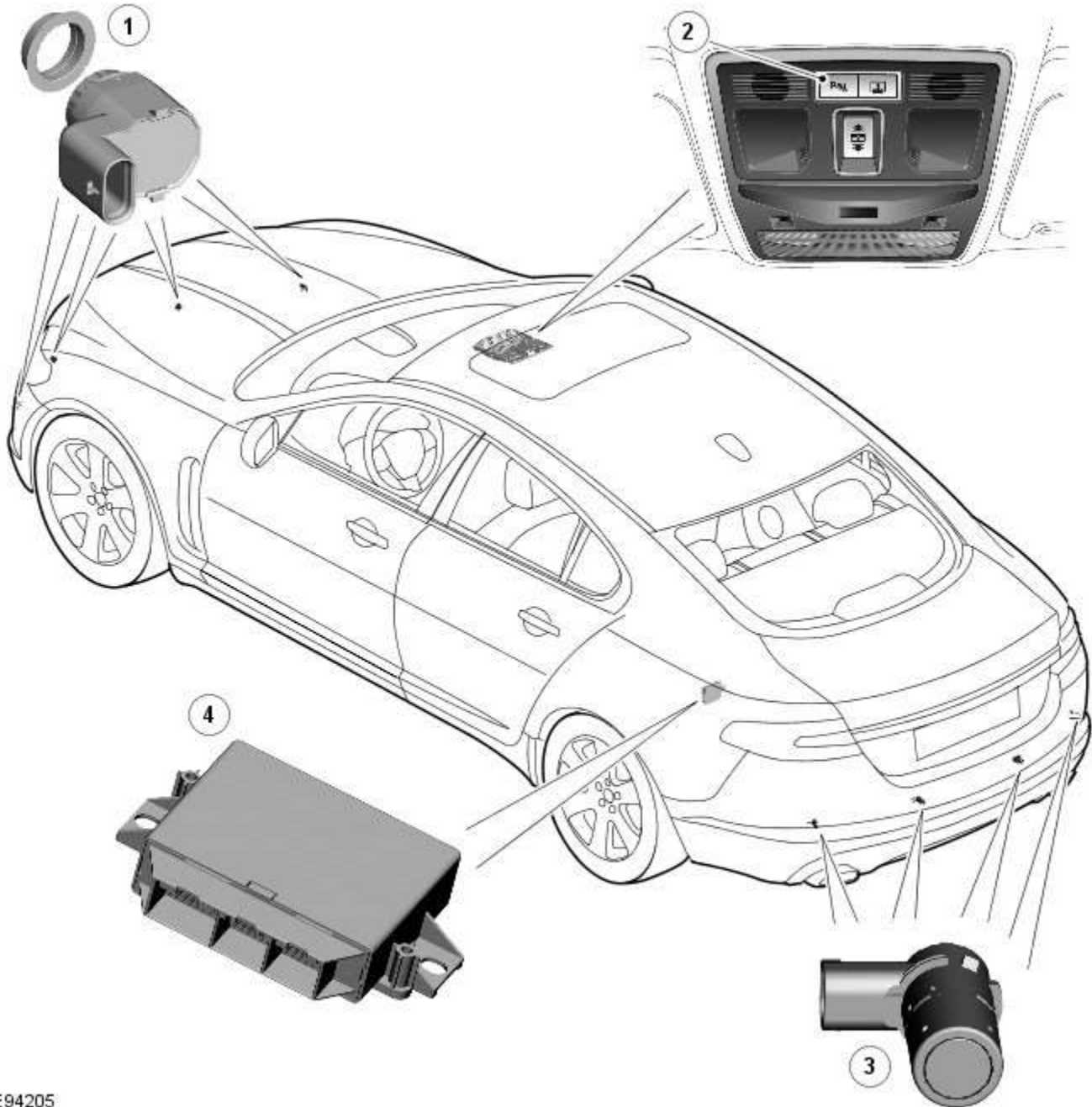
DTC	Description	Possible Causes	Action
B11C911	Driver Display Status LED	<ul style="list-style-type: none"> Driver Display Status LED circuit - short to ground 	Refer to the electrical circuit diagrams and check driver display status LED circuit for short to ground
B11C915	Driver Display Status LED	<ul style="list-style-type: none"> Driver Display Status LED circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and check driver display status LED circuit for short to power, open circuit
B11D611	Driver Display Alert LED	<ul style="list-style-type: none"> Driver Display Alert LED circuit - short to ground 	Refer to the electrical circuit diagrams and check driver display alert LED circuit for short to ground
B11D615	Driver Display Alert LED	<ul style="list-style-type: none"> Driver Display Alert LED circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and check driver display alert LED circuit for short to power, open circuit
U001000	Medium Speed CAN Communication Bus	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check MS CAN bus state, carry out CAN network integrity tests using the manufacturer approved diagnostic system
U014000	Lost Communication With Body Control Module	<ul style="list-style-type: none"> Lost communication with CJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CJB for related DTCs and correct function, refer to the relevant DTC Index
U014200	Lost Communication With Body Control Module "B"	<ul style="list-style-type: none"> Lost communication with RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check RJB for related DTCs and correct function, refer to the relevant DTC Index
U014600	Lost Communication With Gateway "A"	<ul style="list-style-type: none"> Lost communication with information and entertainment module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check information and entertainment module for related DTCs and correct function, refer to the relevant DTC Index
U015500	Lost Communication With Instrument Panel Cluster (IPC) Control Module	<ul style="list-style-type: none"> Lost communication with instrument cluster 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check instrument cluster for related DTCs and correct function, refer to the relevant DTC Index
U023200	Lost Communication With Side Obstacle Detection Control Module - Left	<ul style="list-style-type: none"> CAN bus circuit fault Harness fault between left side mirror and left side module 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the left Blind Spot Monitoring System Module and the right Blind Spot Monitoring System Module

DTC	Description	Possible Causes	Action
			<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the left side harness between the left side mirror and left hand module
U023300	Lost Communication With Side Obstacle Detection Control Module - Right	<ul style="list-style-type: none"> CAN bus circuit fault Harness fault between right side mirror and right side module 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module. Using the manufacturer approved diagnostic system, complete a CAN network integrity test. Refer to the electrical circuit diagrams and check the CAN network between the left Blind Spot Monitoring System Module and the right Blind Spot Monitoring System Module Refer to the electrical circuit diagrams and check the right side harness between the right side mirror and right hand module
U030000	Internal Control Module Software Incompatibility	<ul style="list-style-type: none"> RJB car configuration data is not compatible with the Blindspot Monitoring module 	Check RJB for related DTCs and refer to the relevant DTC Index. Clear DTCs and re-test. If DTC still logged, re-configure the RJB using the manufacturer approved diagnostic system. Clear DTCs and re-test. If DTC still logged, re-configure the Blindspot Monitoring module using the manufacturer approved diagnostic system. Clear DTC and re-test, if still logged suspect the Blindspot Monitoring module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U041568	Invalid Data Received From Anti-Lock Brake System Control Module	<ul style="list-style-type: none"> Event information 	Check ABS module for related DTCs and correct function, refer to the relevant DTC Index
U042268	Invalid Data Received From Body Control Module	<ul style="list-style-type: none"> Event information 	Check CJB for related DTCs and correct function, refer to the relevant DTC Index
U042368	Invalid Data Received From Instrument Panel Control Module	<ul style="list-style-type: none"> Event information 	Check instrument cluster for related DTCs and correct function, refer to the relevant DTC Index
U210000	Initial Configuration Not Complete	<ul style="list-style-type: none"> No configuration has been previously set 	Check RJB for related DTCs and refer to the relevant DTC Index
U210100	Control Module Configuration Incompatible	<ul style="list-style-type: none"> Data sent from RJB is invalid 	Check RJB for related DTCs and refer to the relevant DTC Index. Check/amend Car Configuration File using the manufacturer approved diagnostic system
U300044	Control Module	<ul style="list-style-type: none"> Data memory failure 	Cycle the ignition and check if the DTC is still logged. If DTC remains suspect the module, refer to the new module/component installation note at the top of the DTC Index
U300047	Control Module	<ul style="list-style-type: none"> Watchdog/safety Micro controller failure 	Cycle the ignition and check if the DTC is still logged. If DTC remains suspect the module, refer to the new module/component installation note at the top of the DTC Index
U300049	Control Module	<ul style="list-style-type: none"> Internal electronic failure 	Clear DTC, cycle ignition and retest. If fault persists, check and install a new Blindspot Monitoring module as required, refer to the new module/component installation note at the top of the DTC Index
U300281	Vehicle Identification Number	<ul style="list-style-type: none"> Vehicle/component mismatch. Corrupt VIN data being transmitted, suspect module previously installed to other vehicle 	Check RJB has not been previously installed to other vehicle. Install original/new module as required, refer to the new module/component installation note at the top of the DTC Index. Check RJB for DTCs and refer to the relevant DTC Index
U300362	Battery Voltage	<ul style="list-style-type: none"> Mis-match in battery voltage, of 2 volts or more, between Blindspot Monitoring module and RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

Parking Aid - Parking Aid - Component Location

Description and Operation

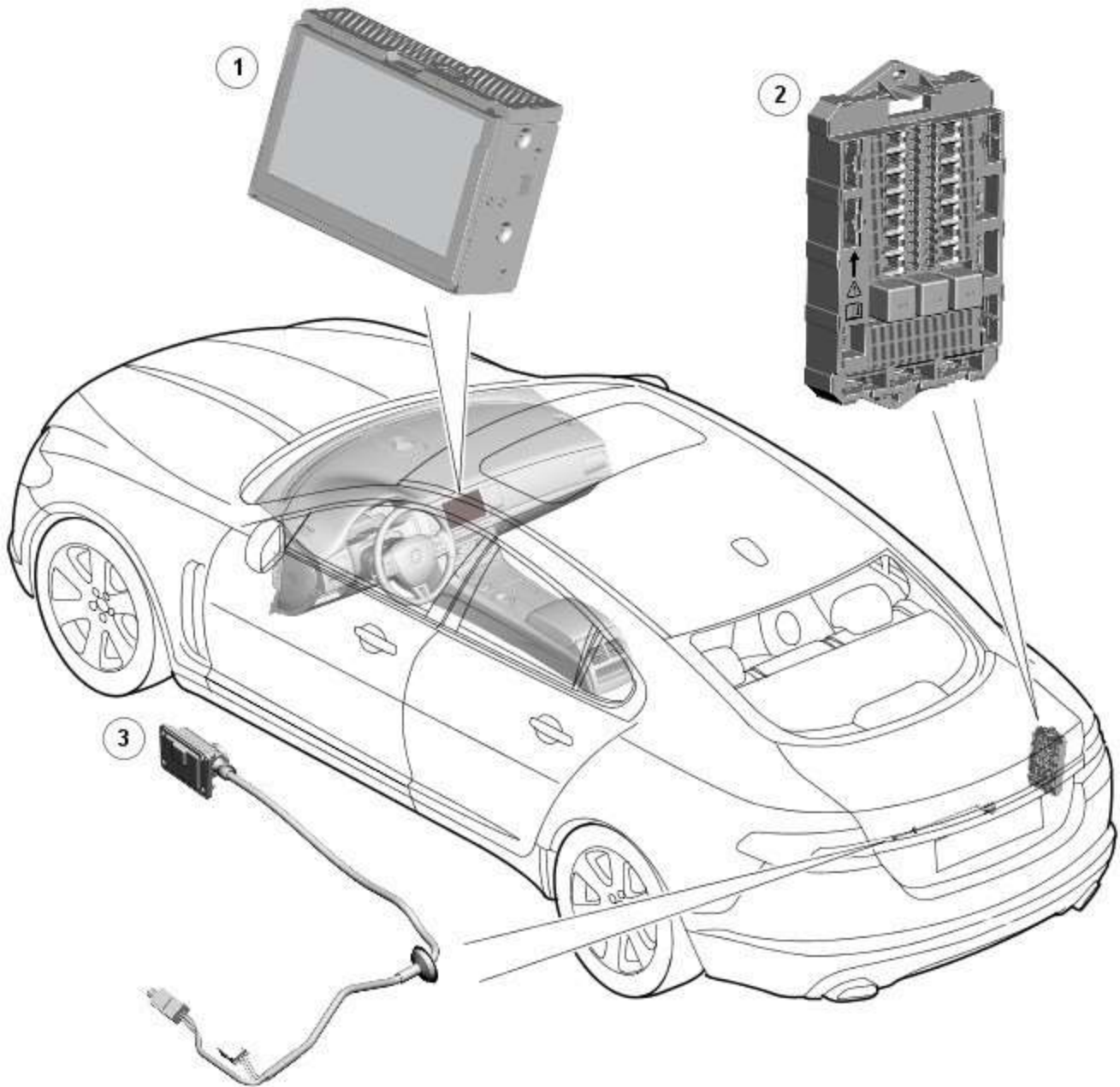
COMPONENT LOCATION - PARKING AID



E94205

Item	Description
1	Front parking aid sensors (4 off)
2	Parking aid switch
3	Rear parking aid sensors (4 off)
4	Parking aid module

COMPONENT LOCATION - PARKING AID CAMERA



E94206

Item	Description
1	Touch Screen Display (TSD)
2	RJB (rear junction box)
3	Parking aid camera

Parking Aid - Parking Aid - Overview

Description and Operation

OVERVIEW

The parking aid system provides an audible warning to the driver when any obstacles are in the path of the vehicle during a forward (if front sensors are fitted) or reversing manoeuvre. The purpose of the system is to assist the driver when parking or manoeuvring in a restricted space. It is not designed as a crash avoidance system or a replacement for visual interpretation by the driver.

All vehicles are fitted with rear parking aid sensors. Higher specification vehicles may also be fitted with front parking aid sensors.

A roof console mounted parking aid switch allows the driver to deactivate the parking aid system if operation is not required.



NOTE: The switch is only fitted to vehicles with front parking aid sensors.

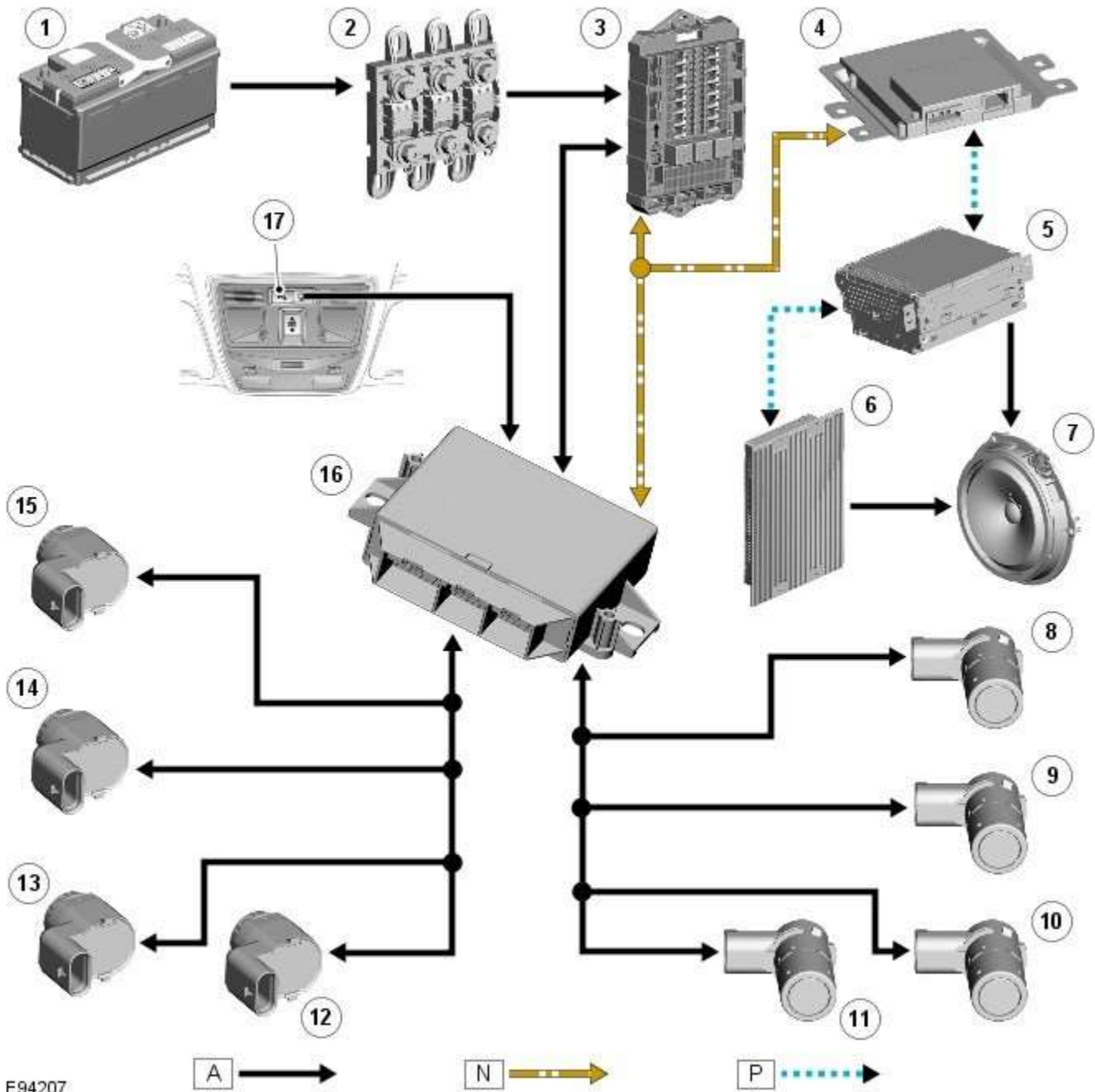
A parking aid camera is a standard fitment on some models and optional on others. The parking aid camera supplements the information provided by the parking aid system by providing the driver with a visual display of the area directly behind the vehicle.

Parking Aid - Parking Aid - System Operation and Component Description

Description and Operation

Control Diagram

CONTROL DIAGRAM - PARKING AID



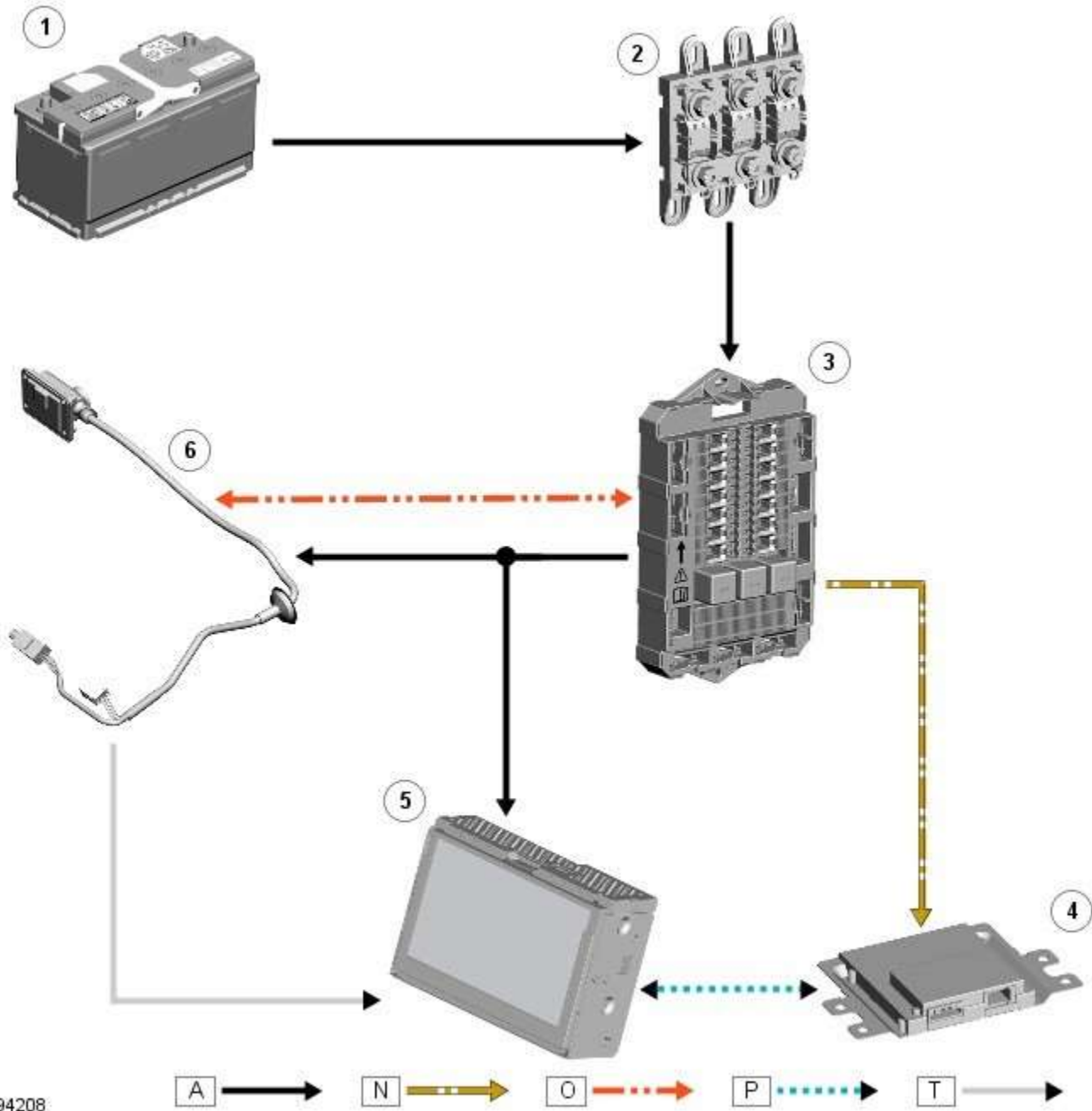
E94207

A = Hardwired; N = Medium speed CAN bus; P = MOST ring

Item	Description
1	Battery
2	Megafuses
3	RJB (rear junction box)
4	Entertainment system control module
5	Integrated audio module
6	Audio amplifier
7	Audio system speakers

8	RH (right-hand) outer rear sensor
9	RH inner rear sensor
10	LH (left-hand) inner rear sensor
11	LH outer rear sensor
12	LH outer front sensor
13	LH inner front sensor
14	RH inner front sensor
15	RH outer front sensor
16	Parking aid module
17	Parking aid switch

CONTROL DIAGRAM - PARKING AID CAMERA



A = Hardwired; N = Medium speed CAN bus; O = LIN bus; P = MOST ring; T = Co-axial cable

Item	Description
1	Battery

2	Megafuses
3	RJB
4	Entertainment system control module
5	Touch Screen Display (TSD)
6	Parking aid camera

System Operation

PARKING AID

Two levels of parking aid system can be fitted; a rear only system or a front and rear system.

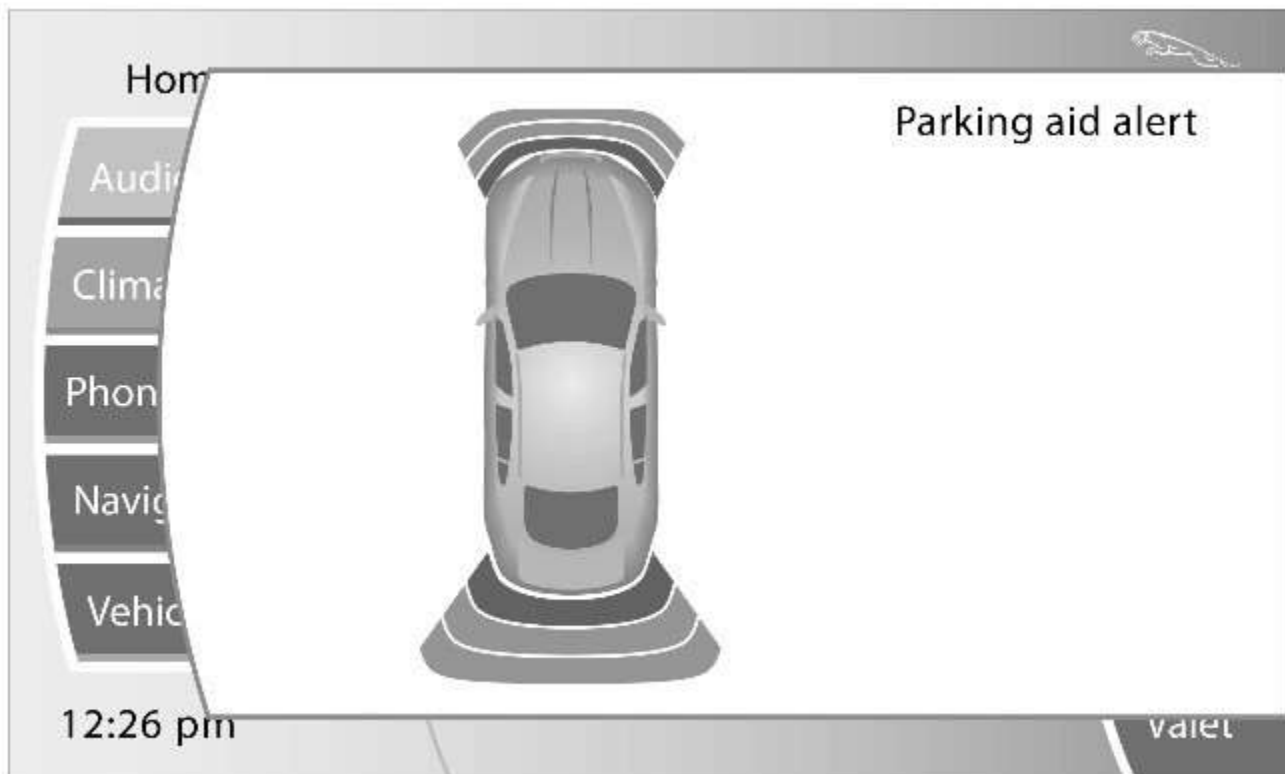
The parking aid module receives and ignition power mode 6 supply from the [RJB](#).

The parking aid module is connected to the entertainment system control module by the medium speed [CAN \(controller area network\)](#) bus and the Media Orientated System Transport (MOST). The entertainment system is used by the parking aid system to provide the driver with an audible warning. If an obstacle is sensed by the rear parking aid sensors, the rear audio system speakers will sound. If an obstacle is sensed by the front parking aid sensors (if fitted), the front audio system speakers will sound.

The parking aid system operates using ultrasonic signals which are transmitted by the sensors. The reflected echo from this output is received by the sensors and used by the parking aid module to calculate the distance from an object.

When the parking aid module activates the system, the switch [LED \(light emitting diode\)](#) is illuminated to indicate that the system is operating. The parking aid module then processes signals received from the sensors to determine if there is an object with the detection range of the sensors. A parking aid screen is automatically displayed in the Touch Screen Display. If the vehicle has a parking aid camera fitted, the camera display is automatically displayed in the TSD in preference to the parking aid alert display. To view the parking aid sensor display, a single touch of the TSD screen will remove the camera image display and show the parking aid alert display.

Parking Aid Alert Display



E99384

A visual interpretation of the detection areas is given in the TSD.

The visual interpretation dynamically updates as the sensors detect an objects within the set parameters. This feature can also be used as a diagnostic aid.

In the combined mode, the sensors emit a series of ultrasonic impulses and then switch to receiver mode to receive the echo reflected by an obstacle within the detection range. The received echo signals are amplified and converted from an analogue

signal to a digital signal by the sensor. The digital signal is passed to the parking aid module and compared with pre-programmed data stored in an [EEPROM \(electrically erasable programmable read only memory\)](#) within the module. The module receives this data via the signal line from the sensor and calculates the distance from the object using the elapsed time between the transmitted and received impulse. The duration of the impulse duration is determined by the module, with the sensor controlling the frequency of the impulse output.

In receiver mode, the sensor receives impulses that were emitted by adjacent sensors. The module uses this information to precisely determine the position and distance of the object.

If no objects are detected there are no further warning tones. If an object is detected, repeated audible tones are emitted from either the front or rear audio speakers as appropriate. The time delay between the tones decreases as the distance between the object and the vehicle decreases, until at approximately 300 mm (12 inches), the audible tone becomes continuous.

After the initial detection of an object, if there is no decrease in the distance between an object and the central sensors, the time delay between the audible warnings remains constant. If an object is detected by one of the corner sensors only, the audible warnings stop after approximately 5 seconds if there is no change in the distance between an object and the corner sensor.

When approaching several objects within detection range, the control module recognises the distance from the vehicle to the nearest object.

The PDC module will prioritise the objects detected, the nearest object detected will take priority and the corresponding audio outputs will be emitted. For example if 2 objects are detected (one front one rear) the nearest detected object will take priority and relevant audible tone will be heard.

If two objects are detected at equal distance (one front one rear) the audible tones will alternate between the front and rear speakers.

If reverse (R) is the first gear selected after the ignition is switched on, both the front (if fitted) and rear parking aid sensors will become operational. If a forward drive gear is subsequently selected, the front and rear parking aid sensors will remain operational until vehicle speed increases above 16 km/h (10 mph), park (P) is selected or the PDC control switch is pressed.

If drive (D) is the first gear selected after the ignition is switched on the parking aid system will have to be activated by pressing the PDC control switch.



NOTE: The PDC system can not be activated whilst the vehicle is in park (P).

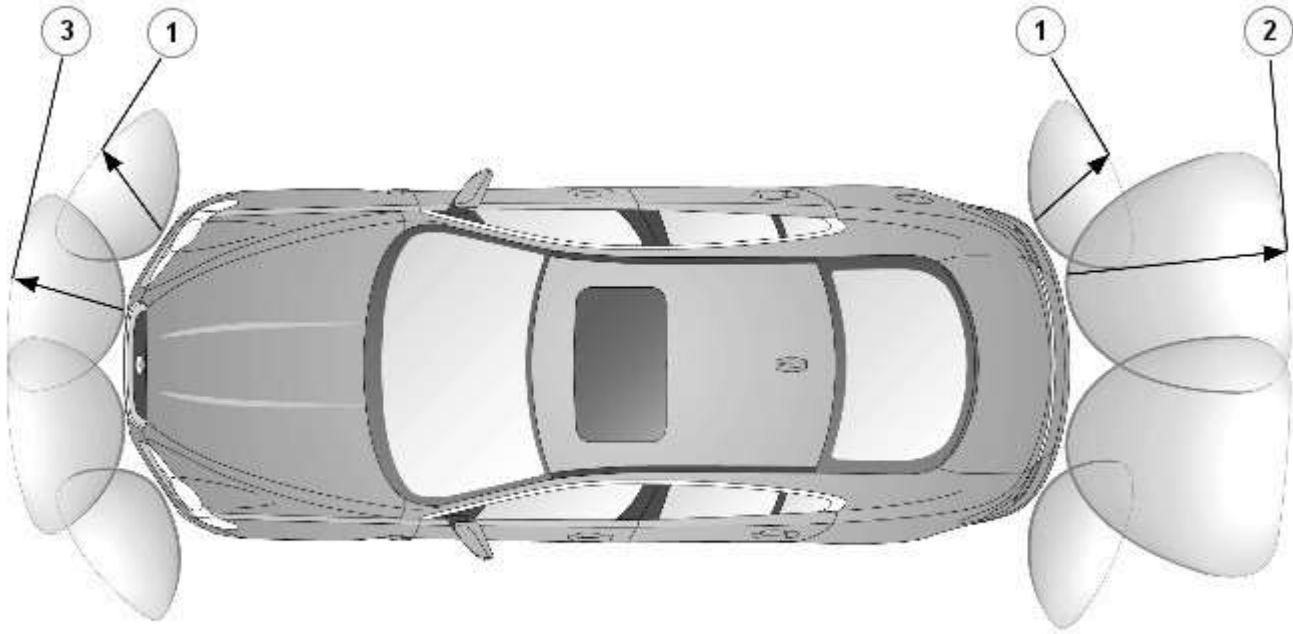
The volume output of the parking aid audible tones can be adjusted by selecting the 'Vehicle Settings' menu and selecting 'Parking' from the menu on the TSD. The volume can be adjusted using the + or - selections on the TSD.

The system can detect when a trailer is connected to the vehicle by a message output on the medium speed [CAN](#) bus from the trailer module. When the parking aid module detects that a trailer is connected to the vehicle, the rear sensors are disabled to prevent constant warnings due to the close proximity of the trailer.



NOTE: The ignition needs to be cycled once the trailer has been disconnected to activate the rear parking aid system.

Distance Calculation



E99385

The detection ranges of the sensors are shown in the table below.

Item Number	Sensor Location	Maximum Detection Range	Audio Tone	Continuous Audio Tone
1	Rear/Front Outer	Approximately 600 mm (24 inches)		Approximately 300 mm (12 inches)
2	Rear Inner	Approximately 1800 mm (71 inches)		Approximately 300 mm (12 inches)
3	Front Inner	Approximately 800 mm (31 inches)		Approximately 300 mm (12 inches)

PARKING AID CAMERA

The parking aid camera receives an ignition power mode 6 power supply from the [RJB](#). It also has a [LIN \(local interconnect network\)](#) bus connection from the [RJB](#) which is not used at the moment but installed for a later enhancement of the parking aid camera.

A shielded co-axial cable connection between the camera and the Touch Screen Display (TSD) is used for the video image transmission.

The camera receives power at all times when the ignition is in power mode 6. When reverse gear is selected, the [RJB](#) transmits a reverse selected signal on the medium speed [CAN](#) bus message to the entertainment system control module. This message is transferred on the MOST to the TSD which displays the parking aid camera video input from the camera in preference to the parking aid alert screen.

If the driver does not require the camera image in the TSD, a single touch on the screen will revert the display to the parking aid alert screen. The camera view can be reselected by pressing the 'Rear Camera' softkey on the TSD.

When reverse gear is deselected, the camera image remains on the TSD for 10 seconds after the transmission has been put into drive 'D'. This is to prevent the TSD switching between screens if the vehicle is being manoeuvred into a parking space. If the vehicle forward speed exceeds 16 km/h (10 mph) within the 10 second period, the camera image is removed from the TSD.

If the TSD display is switched off, the camera image will be automatically displayed when reverse gear is selected. When reverse gear is deselected and the 10 second period has expired, the TSD will revert back to its switched off state.

Component Description

PARKING AID

Parking Aid Module

The parking aid module is located on the [LH](#) side of the luggage compartment.

The parking aid module has three connectors which provide for power, ground and [CAN](#) bus connections, front parking aid sensors and rear parking aid sensors. The medium speed [CAN](#) bus connections provide for the receipt of the following

information from other systems:

- **ABS (anti-lock brake system)** module - Road speed signal
- **TCM (transmission control module)** - Reverse gear engaged signal
- Trailer module - Trailer attached to vehicle

The module also outputs messages on the medium speed **CAN** bus which are received by the integrated audio module. The integrated audio module processes these messages and converts them into Media Orientated System Transport (MOST) signals which are passed to the audio system power amplifier. These signals are then used by the power amplifier to emit the applicable warning tones from the front or rear audio speakers when an object is detected by the front or rear parking aid sensors. A warning tone can also be emitted to alert the driver to a fault in the parking aid system.

The control module has a diagnostic connection via the medium speed CAN bus to enable faults to be retrieved using the Jaguar approved diagnostic equipment. Additionally an on-board diagnostic routine within the control module constantly monitors the system and alerts the driver to a system fault by emitting a 3 second continuous tone through the rear audio system speakers when the ignition is switched on. If front parking aid sensors are fitted, the control switch LED will also flash 6 times.

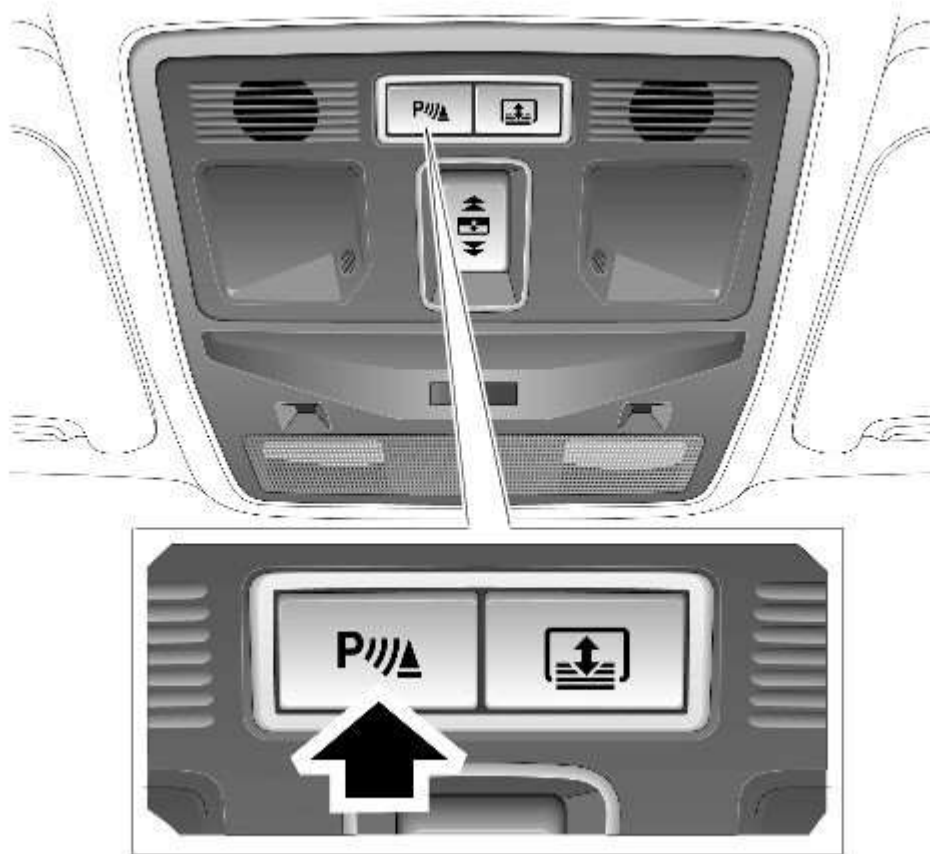
Parking Aid Sensors

Four ultrasonic sensors are located in the front (if fitted) and rear bumpers.

Each sensor has a three pin connector which mates with a bumper harness, which in turn is connected to the main body harness. Three pins provide for power supply, ground and signal lines to and from the parking aid module.

The parking aid module controls the operation of each sensor using a digital output on the signal line. The module controls the sensor in one of two modes; combined transmitter and receiver mode or receiver mode only.

Parking Aid Switch



E99386

The parking aid switch is located in the instrument panel switch pack, above the touch screen. The switch is the **LH** switch with an integral **LED**.

The switch is a non-latching push switch which allows the driver to select the parking aid system on or off. When pressed, the switch momentarily connects a ground to the parking aid module.

The **LED** indicates when the parking aid system is active. The **LED** is controlled by the parking aid module.



NOTE: The control switch allows the driver to activate/deactivate the parking aid system if operation is required or not required.

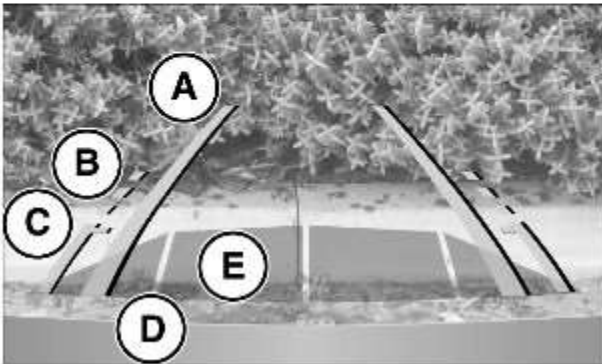
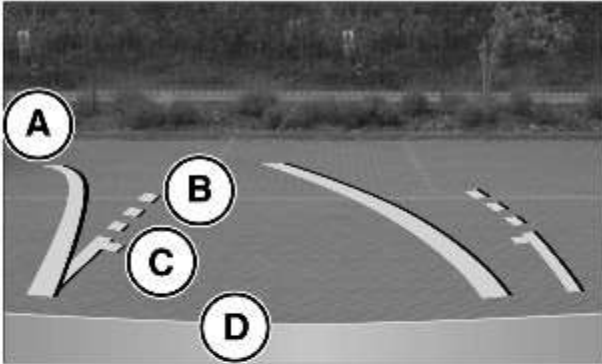
PARKING AID CAMERA

The parking aid camera receives an ignition power mode 6 power supply from the [RJB](#). It also has a [LIN](#) bus connection with the [RJB](#), which is used as a gateway.

A shielded co-axial cable connection between the camera and the TSD is used for the video image transmission.

The camera receives power at all times when the ignition is in power mode 6. When reverse gear is selected, the [RJB](#) transmits a reverse selected message on the medium speed [CAN](#) bus. The information and entertainment module transfers the message on the MOST ring to the TSD, which displays the video input from the parking aid camera in preference to the parking aid alert screen.

The display from the camera incorporates graphic overlays, indicating vehicle direction, width and proximity to surrounding objects.



E137441

Item	Description
A	Solid line: The projected wheel trajectory
B	Dotted line: The safe working width of the vehicle (including exterior mirrors)
C	Luggage compartment access guideline: Do not reverse beyond this point if luggage compartment access is required
D	Bumper inclusion
E	Parking sensor activation: A colored area appears, to indicate which rear sensors have been activated

A single touch on the screen will revert the display to the parking aid alert screen. The camera view can be reselected by pressing the Rear Camera soft key on the TSD.



NOTE: This can only be activated when reverse gear is selected.

When reverse gear is deselected, the camera image remains on the TSD for 2 seconds after the transmission has been put into D (drive). If the vehicle forward speed in D exceeds 16 km/h (10 mph) the camera image is removed from the TSD.

If the TSD is switched off, the camera image will be automatically displayed when reverse gear is selected. When reverse gear is deselected, after 10 seconds the TSD will revert back to its switched off state.

Parking Aid - Parking Aid

Diagnosis and Testing

Principles of Operation

For a detailed description of the parking aid system, characteristics and limitations refer to the relevant description and operation section in the workshop manual.

REFER to: [Parking Aid](#) (413-13 Parking Aid, Description and Operation).

Parking Aid System On-Board Self-Test

As part of the strategy of the system if any DTCs are detected, a long high-pitched tone approx 3 seconds will sound and the parking aid switch (where fitted) indicator LED will flash 6 times at ignition on

- If a fault is present when the parking aid system is activated then the parking aid switch (where fitted) status LED will flash 6 times indicating an issue with front or rear parking aid sensors, wiring switch, parking aid control module or hard wired sounders
- The rear parking aid sounder/rear audio system will emit an error tone for approx 3 seconds at ignition on if a fault is detected with the front or rear sensors, the switch, or if there is a controller area network (CAN) bus error
- (Only applicable to vehicles fitted with front parking aid and a hard wired rear parking aid sounder). If there is a fault with the rear parking aid sounder the error tone will come from the front parking aid sounder unit (integral with the instrument cluster)

Audible and Visual Warnings when Parking Aid System is in Error State

Rear Parking Aid System Fitted and No Parking Aid System Switch Fitted	Rear Parking Aid System Fitted and Parking Aid System Switch Fitted	Front and Rear Parking Aid System Fitted with Parking Aid System Switch Fitted
A long high-pitched error tone will sound at Ignition On for approx 3 seconds	<ul style="list-style-type: none"> • A long high-pitched error tone will sound at ignition on for approx 3 seconds and the parking aid switch indicator LED will flash 6 times at ignition on. Every time the parking aid system is activated within the same ignition cycle, parking aid switch indicator LED will flash 6 times 	<ul style="list-style-type: none"> • A long high-pitched error tone will sound at ignition on for approximately 3 seconds and the parking aid switch indicator LED will flash 6 times at ignition on. Every time the parking aid system is activated within the same ignition cycle the parking aid switch indicator LED will flash 6 times

Inspection and Verification

CAUTIONS:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle



Do not apply any grease based products to any parking aid system connector or pins



NOTE: Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage
3. Ensure that the parking aid sensor face is clear of contamination that could affect the performance of the sensor

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Parking aid sensor condition/damaged • Parking aid sensor installation and holder • Parking aid sensor alignment • Parking aid sensor contamination • Bumper cover(s) • Vehicle ride height • Non standard/non manufacturer approved accessories fitted 	<ul style="list-style-type: none"> • Battery • Fuse(s) • Relays • Wiring harness • Electrical connector(s) • Front parking aid sensor(s) • Rear parking aid sensor(s) • Parking aid switch and LED

Mechanical	Electrical
	<ul style="list-style-type: none"> • Parking aid control module • Parking aid sounder • Audio system

- If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
- If the cause is not visually evident, check for diagnostic trouble codes (DTCs) and refer to the DTC index

Symptom Chart



CAUTION: Do not apply any grease based products to any parking aid system connector or pins

NOTES:



Please note if this diagnosis is being carried out on a vehicle without a hard wired parking aid speaker, ensure the in car infotainment system is fully functional and configured correctly



Parking aid sensors that are painted incorrectly and not to the manufacturer standards, will not be considered in any warranty claim

Symptom	Possible Causes	Action
NOTE: Permanent/Intermittent fault Parking aid system not functioning correctly. (No DTCs displayed)	<ul style="list-style-type: none"> • Front or rear parking aid sensors dirty • Front or rear parking aid sensor position incorrect • Front or rear parking aid sensor incorrectly installed • Front or rear parking aid sensor coupling rings not installed/incorrectly installed • Parking aid control module or parking aid sensor connector not fully latched • Parking aid sensors painted without being removed from the bumper assembly or not painted to the manufacturer specification 	<ul style="list-style-type: none"> • Clean front or rear parking aid sensors • Check the front or parking aid rear sensor position • Check the front or rear parking aid sensor are correctly installed • Check front or rear parking aid sensor coupling rings are installed/installed correctly • Ensure all parking aid system connectors are correctly latched • Remove parking aid sensor and ensure correctly painted parking aid sensor is installed <ul style="list-style-type: none"> - Parking aid sensors that are painted incorrectly and not to the manufacturer standards, will not be considered in any warranty claim
NOTE: Permanent/Intermittent fault Parking aid system not functioning correctly. (No DTCs displayed). System characteristics or environmental effects	<ul style="list-style-type: none"> • Parking aid sensors incorrectly mounted • Incorrect vehicle ride height • Dirty parking aid sensor face. Ice/snow covered sensor. Debris trapped between parking aid sensor and parking aid sensor body. Heavy rain or water splash from the ground • Non standard, bumper, exhausts/tailpipes, tow bar or external spare wheel mounting • Area around vehicle is not clear of obstacles such as channels, gutters or other items on the ground • Exhaust gas and warm air clouds creating ghost echoes • Vehicle not on level ground or next to a gradient • Parking aid sensors painted without being removed from the bumper assembly or not painted to the manufacturer specification 	<ul style="list-style-type: none"> • Ensure the sensors are a tight fit in the holder and locked. Ensure the sensors are central in the holder and bumper and at the correct angle • Ensure vehicle ride height is within the specified limits. Rectify as required • Clean the sensor face as required. Defrost the sensor and dry as required. Clear any debris from the sensor and holder as required. Water flowing over the sensor is a system limitation. (no action required) • Check for non standard, bumper, exhausts/tailpipe, tow bar or external spare wheel mounting that may be being detected by the parking aid system. Rectify as required • Ensure the area around the vehicle is clear of any obstacles, move the vehicle to a suitable area before continuing diagnosis • Ensure no exhaust gas or warm area clouds are in the area around the parking aid sensor detection range • Ensure the vehicle is on level ground and clear of any ramps, potholes or speed bumps, move the vehicle to a suitable area before continuing diagnosis • Remove parking aid sensor and ensure correctly painted parking aid sensor is installed <ul style="list-style-type: none"> - Parking aid sensors that are painted incorrectly and not to the manufacturer standards, will not be considered in any warranty claim

Symptom	Possible Causes	Action
Parking aid sensors are being returned with no faults found or signs of water ingress/corrosion	Possible issue with sensor connectors not latched correctly	<ul style="list-style-type: none"> When either no/intermittent operation has been reported the following action should be taken 1. Using Datalogger, identify the position of the suspect parking aid sensor within the bumper 2. Visually locate the position of the suspect parking aid sensor. Inspect and provide details in claim if the sensor has any sign of physical damage 3. Remove the bumper. Disconnect the wiring at the main harness connector. Inspect the main harness connectors and terminals for signs of damage, backed out pins, corrosion and water ingress, or damage to the seals. Provide details in claim if any of the above symptoms are present 4. Attempt to remove the harness connector from the suspect parking aid sensor without using the connector latch i.e. lightly pull back on ALL wires together, ensuring the harness is held close to the back of the connector, not elsewhere on the wiring harness. DO NOT apply excessive force. If the connector can be removed without using the latch, provide details in claim if connector is loose. If the connector is fully latched, disconnect it from the sensor 5. Inspect and provide details in claim if the suspect sensor harness connector has any sign of water ingress/corrosion 6. Inspect and provide details in claim if the suspect parking aid sensor harness connector shows any sign that the terminals have backed-out of the connector or for any damage to the terminal seals. Replace/repair the harness as required and proceed 7. Remove the suspect parking aid sensor from the bumper. Inspect the parking aid sensor connector for signs of water ingress/corrosion. Provide details in claim if corrosion/water ingress is present 8. Exchange the suspect parking aid sensor with another parking aid sensor within the bumper that is performing correctly. Reconnect all sensors and reconnect the bumper main harness connector. Repeat step 1. Confirm if the original fault now appears at the new position of the suspect parking aid sensor; if so, proceed to step 10 9. If not, carry out the appropriate open circuit and short circuit checks between the original suspect parking aid sensor harness connector and the parking aid control module 10. Refit the parking aid sensors to their original position in the bumper 11. Reconnect the parking aid sensor to the bumper harness connector. Reconnect main harness connector and refit the bumper 12. Repeat Step 1. If fault is still present, replace only the faulty sensor

PINPOINT TEST A : PARKING AID SYSTEM NOT FUNCTIONING CORRECTLY WITH NO DTCS LOGGED	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: PERMANENT FAULT	
	<p>1 When the parking aid system is activated, there is a vibration on the parking aid sensor membrane. This can be verified by touching the parking aid sensor face with a hard item such as a pencil, ball-pen, small screwdriver, or fingernail. Ensure no damage is caused to sensor painted surface</p> <p>Are the parking aid sensor(s) vibrating? Yes GO to A2. No GO to A5.</p>
A2: SENSORS VIBRATING WITH PARKING AID FAULT	
	<p>1 Clean the parking aid sensor face</p> <p>Parking aid system functioning correctly? Yes No further action required No</p>

	GO to A3.
A3: SENSORS VIBRATING WITH PARKING AID FAULT	
1	Check parking aid sensors correctly mounted. Parking aid sensor holder correctly mounted. Parking aid sensor decoupler ring fitted or fitted correctly. Parking aid sensor positioning correct. Parking aid sensor painted without being removed from the bumper assembly or not painted to manufacturer specification. Rectify as required
	Parking aid system functioning correctly? Yes No further action required No GO to A4.
A4: SENSORS VIBRATING WITH PARKING AID FAULT	
1	Carry out speaker test. Only applicable to vehicles with rear hard wired parking aid speakers. Check the parking aid speaker wiring circuit and connector. Rectify as required. Check and install a new parking aid speaker as required. Vehicles with audio parking aid system. Confirm audio system is functioning correctly. Refer to the relevant section of the workshop manual
	Parking aid system functioning correctly? Yes No further action required
A5: SENSORS NOT VIBRATING WITH PARKING AID FAULT	
1	Isolate the fault to front or rear parking aid sensors
	Are all rear parking aid sensors vibrating? Yes GO to A6. No GO to A10.
A6: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
1	Check the parking aid control module is correctly configured. Check and update the car configuration file as required
	Parking aid system functioning correctly? Yes No further action required No GO to A7.
A7: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
1	Check the correct parking aid control module is installed to the vehicle
	Parking aid system functioning correctly? Yes No further action required No GO to A8.
A8: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
1	If all 4 front parking aid sensors are not vibrating, carry out harness test on common ground, power supply. Check main parking aid harness connector to bumper harness connector. Rectify as required
	Parking aid system functioning correctly? Yes No further action required No GO to A9.
A9: FRONT SENSORS NOT VIBRATING WITH PARKING AID FAULT	
1	Check and install a new parking aid control module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component
	Parking aid system functioning correctly? Yes No further action required
A10: REAR SENSORS NOT VIBRATING WITH PARKING AID FAULT	
1	Check the parking aid control module is correctly configured. Check and update the car configuration file as required
	Parking aid system functioning correctly? Yes No further action required No GO to A11.
A11: REAR SENSORS NOT VIBRATING WITH PARKING AID FAULT	
1	If all 4 rear parking aid sensors are not vibrating, carry out harness test on common ground, power supply. Check main parking aid harness connector to bumper harness connector. Rectify as required
	Parking aid system functioning correctly? Yes No further action required No GO to A12.
A12: REAR SENSORS NOT VIBRATING WITH PARKING AID FAULT	
1	Check and install a new parking aid control module as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

	Parking aid system functioning correctly Yes No further action required
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PINPOINT TEST B : PARKING AID SYSTEM NOT FUNCTIONING CORRECTLY WITH NO DTCS LOGGED

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Clean the parking aid sensor face. Check for any damage to the parking aid sensor face. Rectify as required. Snow, water or ice on sensor face. Parking aid sensor face has been repainted to the incorrect thickness. Rectify as required
	Parking aid system functioning correctly? Yes No further action required No GO to B2.
B2: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Ensure the vehicle ride height is within manufacturer specified limits. Rectify as required
	Parking aid system functioning correctly? Yes No further action required No GO to B3.
B3: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Check for any non standard accessories are not fitted, such as tow bar, bike rack, body kit, modified exhaust, lighting or licence plate holder
	Parking aid system functioning correctly? Yes No further action required No GO to B4.
B4: PARKING AID SYSTEM GIVES WARNING SIGNAL WITHOUT OBSTACLE	
	1 Limitations or characteristics of the parking aid system such as vehicle on a gradient, exhaust gas vapour, signal reflection
	Parking aid system functioning correctly? Yes No further action required No For a detailed description of the parking aid system, refer to the relevant description and operation section in the workshop manual. REFER to: Parking Aid (413-13 Parking Aid, Description and Operation).

DTC Index



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If the control module is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.



When carrying out repair/diagnosis of the system, on removal of the front or rear bumper inspect the sensor connectors to ensure they were correctly latched and check fly leads for signs of chaffing or trapped wires



Physical damage to the sensor (impact damage or scratched sensor surface) must NOT be changed under warranty.

DTC	Description	Possible Causes	Action
B1B36-01	Front Right Outer Sensor - General electrical failure	<ul style="list-style-type: none"> • Wiring harness fault • Front Right Outer Sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B36-12	Front Right Outer Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Wiring harness fault 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage. Check sensor circuit for short circuit to power. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test
B1B36-96	Front Right Outer Sensor - Component internal failure	<ul style="list-style-type: none"> • Wiring harness fault • Front Right Outer Sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor
B1B38-01	Front Right Inner Sensor - General electrical failure	<ul style="list-style-type: none"> • Wiring harness fault • Front Right Inner Sensor - Component internal failure 	<ul style="list-style-type: none"> • Refer to electrical wiring diagrams and check the front bumper harness for damage/corrosion. Check sensor circuit for short circuit to ground, short circuit to power, open circuit. Repair or replace any wiring harness as required • Check the connector for integrity and damage, then re-connect sensor to confirm connection • Using the manufacturers approved diagnostic system clear the DTC and run the on demand self test • If the problem persists remove the suspect sensor from the bumper. Inspect the sensor connector for signs of water ingress/corrosion. Exchange the suspect sensor with another sensor within the bumper that is not reporting a fault. Clear the DTC and run the on demand self test to confirm if the fault code now appears for the new position of the suspect sensor. Renew the faulty sensor

Parking Aid - Proximity Camera

Diagnosis and Testing

Principles of Operation

For a detailed description of the rear view camera system, refer to the relevant Description and Operation section of the workshop manual.

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.


1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Touch screen • Rear view camera 	<ul style="list-style-type: none"> • Fuses • Wiring harnesses and connectors • Touch screen • Rear view camera

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required




Symptom Chart

Symptom	Possible Cause	Action
Rear view camera image slow to react	<ul style="list-style-type: none"> • System operation within specification 	 <p>NOTE: After selecting reverse, it may take up to 20 seconds for the image to be displayed.</p> <ul style="list-style-type: none"> • No further action necessary
Blank screen	<ul style="list-style-type: none"> • Rear view camera not functioning 	<ul style="list-style-type: none"> • GO to Pinpoint Test A.
Blue screen	<ul style="list-style-type: none"> • Video in signal absent 	<ul style="list-style-type: none"> • GO to Pinpoint Test B.
No tracking lines	<ul style="list-style-type: none"> • Missing/invalid reverse gear signal • LIN fault 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system, check the central junction box for related DTCs and refer to the relevant DTC index • GO to Pinpoint Test C.


Symptom	Possible Cause	Action
Frozen tracking lines	<ul style="list-style-type: none"> LIN data gateway fault 	<ul style="list-style-type: none"> GO to Pinpoint Test D.

Pinpoint Tests

PINPOINT TEST A : PERMANENT BLANK SCREEN TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: PERMANENT BLANK SCREEN TEST 1	
	NOTE: A blank screen is the default display when the rear view camera is not transmitting an image.
	<ol style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the rear view camera
	Are the power and ground circuits within specification? Yes GO to A2. No Repair power or ground circuit as necessary
A2: PERMANENT BLANK SCREEN TEST 2	
	CAUTION: Do not probe the coaxial cable connectors as they are prone to damage.
	NOTE: A DC resistance measurement is not a reliable test method as the system operates at low voltage and high frequency.
	<ol style="list-style-type: none"> Check the integrity of the rear view camera coaxial cable connectors (at rear view camera, the touch screen and in-line connectors)
	<ol style="list-style-type: none"> Check the coaxial cable for excessive bending, clamping and insulation damage
	Is the rear view camera coaxial cable disconnected or damaged? Yes Reconnect or install a new coaxial cable as necessary No Install a new rear view camera

PINPOINT TEST B : BLUE SCREEN TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: BLUE SCREEN TEST 1	
	NOTE: A blue screen is the default display when the video in signal is absent.
	<ol style="list-style-type: none"> Select reverse gear and observe the touch screen
	Is the touch screen blue? Yes Check the integrity of the rear view camera coaxial cable connectors (at rear view camera, the touch screen and in-line connectors), and retest No GO to Pinpoint Test A .

PINPOINT TEST C : ABSENT TRACKING LINES TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: ABSENT TRACKING LINES TEST 1	
	<ol style="list-style-type: none"> Refer to the electrical circuit diagrams and check the rear view camera LIN bus circuit for short circuit to ground, short circuit to power, open circuit, high resistance
	Is a LIN bus circuit fault present? Yes Repair the LIN bus circuit as necessary No Install a new rear view camera

PINPOINT TEST D : FROZEN TRACKING LINES TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: FROZEN TRACKING LINES TEST 1	



NOTE: The vehicle may take 30 seconds (or 100m) to learn the steering centre position after starting the engine. This is normal.

	1	Start the engine
	2	Wait at least 30 seconds
	3	Select reverse gear
	4	Turn the steering wheel and observe the touch screen
		Do the tracking lines react to steering input?
	Yes	No fault present
	No	Potential LIN data gateway fault

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

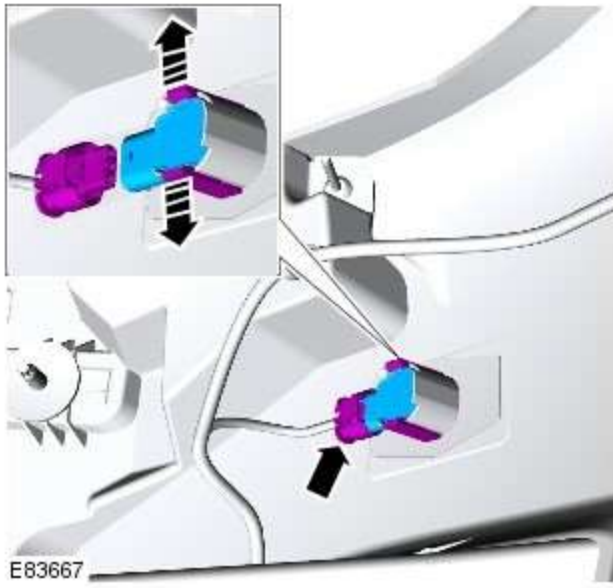
Parking Aid - Front Inner Parking Aid Sensor

Removal and Installation


Removal

1. Refer to: [Front Bumper Cover](#) (501-19 Bumpers, Removal and Installation).

2.

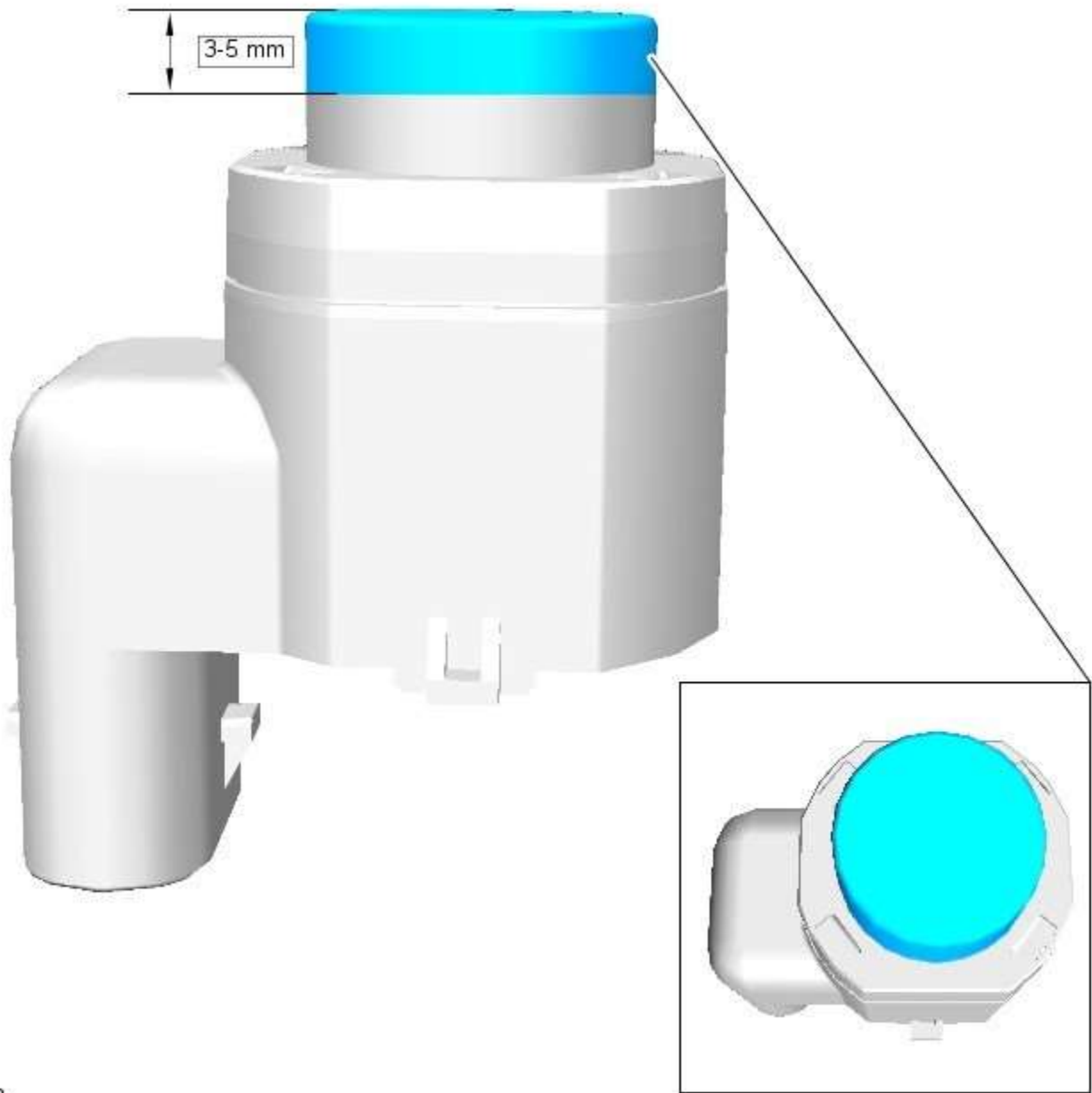


Installation

1.  CAUTION: If a new sensor is installed, make sure that the area illustrated is the **only** area painted. Failure to follow this instruction may result in the component malfunctioning.



NOTE: On vehicles that are equipped with black or unpainted bumpers, the sensor(s) do not require painting.



E153132

2. To install, reverse the removal procedure.

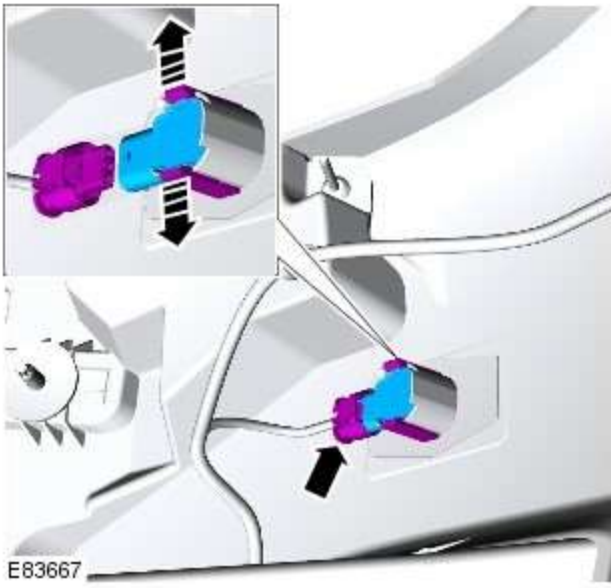
Parking Aid - Front Outer Parking Aid Sensor

Removal and Installation


Removal

1. Refer to: [Front Bumper Cover](#) (501-19 Bumpers, Removal and Installation).

2.

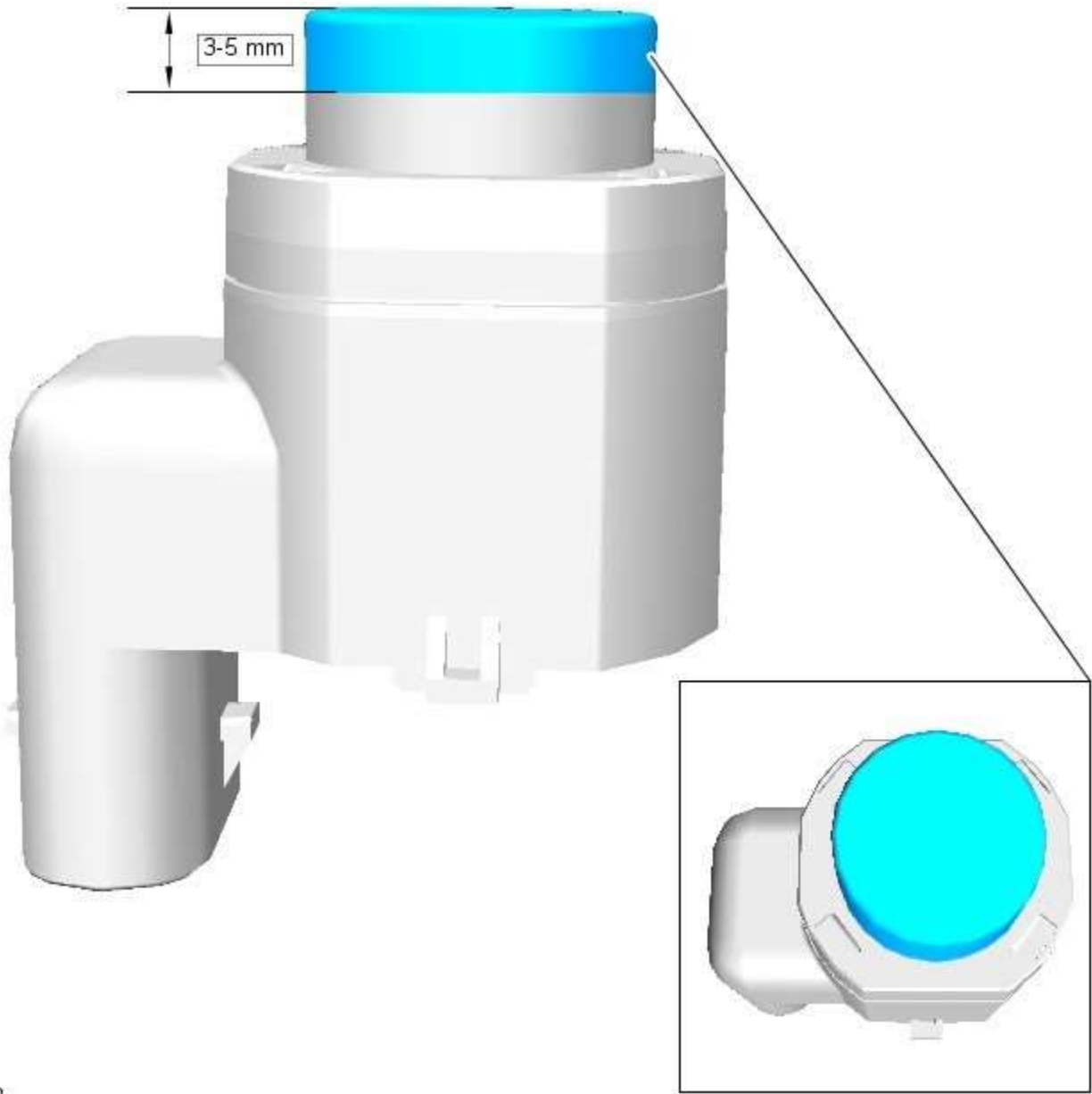


Installation

1.  CAUTION: If a new sensor is installed, make sure that the area illustrated is the **only** area painted. Failure to follow this instruction may result in the component malfunctioning.



NOTE: On vehicles that are equipped with black or unpainted bumpers, the sensor(s) do not require painting.



E153132

2. To install, reverse the removal procedure.

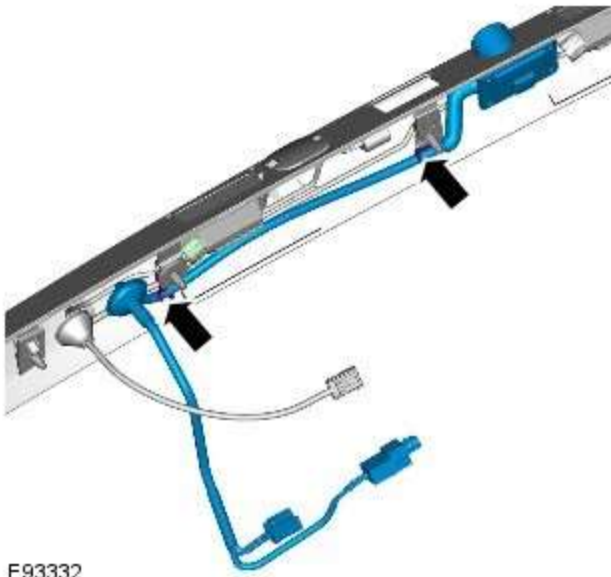
Parking Aid - Parking Aid Camera

Removal and Installation

Removal

1. Refer to: [Luggage Compartment Lid Moulding](#) (501-08 Exterior Trim and Ornamentation, Removal and Installation).

2.



E93332

Installation

1. To install, reverse the removal procedure.

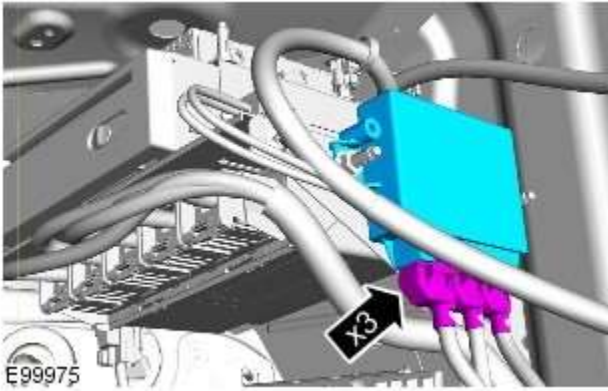
Parking Aid - Parking Aid Module

Removal and Installation

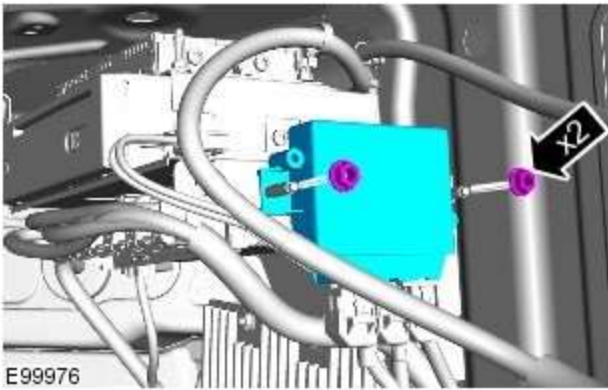
Removal

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Loadspace Trim Panel LH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3.



4.



Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

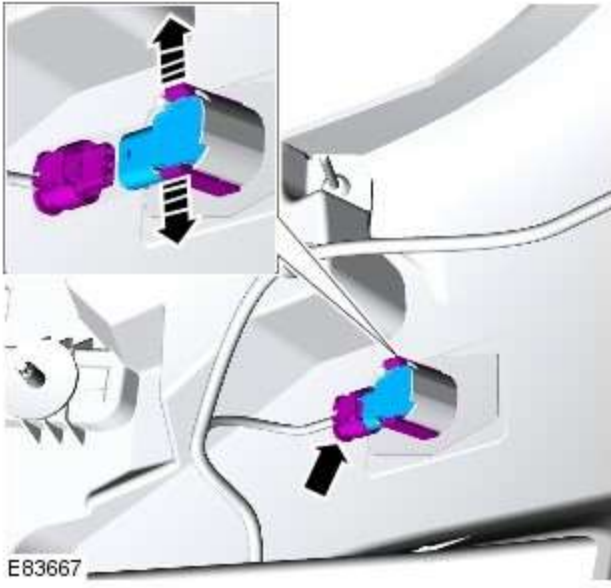
Parking Aid - Rear Parking Aid Sensor

Removal and Installation

Removal

1. Refer to: [Rear Bumper Cover](#) (501-19 Bumpers, Removal and Installation).

2.



Installation

1. To install, reverse the removal procedure.

Battery and Charging System - General Information - Battery Care Requirements

Description and Operation

1. INTRODUCTION

This document defines the requirements for care and maintenance of batteries, and the standard of battery care at dealers and retailers for new vehicles.

This applies to all types of 12 Volt Lead Acid Batteries used in Jaguar and Land Rover vehicles whether they are conventional flooded technology or Absorbed Glass Mat (AGM – also known as Valve Regulated Lead Acid (VRLA)) technology and also applies to both Primary, Secondary and Auxiliary Batteries. AGM batteries offer improved resistance to cycling as seen in stop start applications.

In order to prevent damage to the battery and ensure a satisfactory service life, all processes detailed within this document must be rigorously adhered to.

It is equally important therefore to note the following key points:

- All new vehicles leave the factory with either a transit relay installed and/or have a transit mode programmed into the vehicle control modules. The transit relay must be removed and the transit mode disabled (where applicable) using an approved diagnostic system, **NOT MORE THAN 72 HOURS** before the customer takes delivery.
- The battery can be discharged by the following mechanisms:
 - **Self Discharge:** - A lead acid battery will very slowly discharge itself due to its own internal chemical processes whether it is connected to a vehicle or not.
 - **Quiescent Discharge:** - The vehicle electrical systems when connected to the battery will draw charge from the battery.

12 Volt Lead Acid Batteries rely on internal chemical processes to create a voltage and deliver current. These processes and the internal chemical structure of the battery can be damaged if the battery is allowed to discharge over a number of weeks / months, or is left in a discharged state for a lengthy time period.

- **On vehicles with conventional ignition keys**, these must not be left in the ignition lock barrel when the transit relay has been removed, otherwise quiescent current will increase and the battery will discharge more rapidly.
- **For keyless vehicles**, the Smart Key must be stored at least 5m (16 ft) away from the vehicle when the vehicle is parked or stored.
- **AGM Batteries are fully sealed and cannot have the electrolyte level topped up.**



NOTE: Dealers and retailers involved in the storage / handling of vehicles and replacement batteries have a responsibility to ensure that only a fully charged battery may be processed through the distribution selling chain.

2. GENERAL RULES FOR BATTERY CARE

2.1 Dealer Demonstration Vehicles

Vehicles used as dealer demonstrator(s), in a showroom, must be connected to a JLR approved showroom conditioner capable of delivering 50 Amps. This will prevent the battery from being damaged.

2.2 Software Reflash, SDD work or Ignition On related workshop activities

Due to the high electrical current demand and high depth of discharge that can occur during vehicle software re-flash activities, SDD work or ignition on (power mode 6) related work in the workshop, vehicles that are undergoing such activities **MUST** have a JLR approved power supply capable of delivering 50 Amps or more.

2.3 Extended Vehicle Rework

For any extended vehicle rework that results in consuming vehicle power, either the battery should be disconnected or a JLR approved power supply connected.

2.4 Jump Starting New vehicles before they have been delivered to the customer

- It is the dealer / retailers responsibility to make sure the battery is not allowed to discharge by following the instructions and processes defined in this manual.
- However, if circumstances dictate that a new vehicle must be jump started due to a discharged battery whilst the vehicle is in the dealer / retailers care, **the battery on this vehicle must be replaced with a new one** prior to delivery to the customer at the dealer / retailers liability.
- The vehicle should also undergo investigation as to why the battery became discharged.
- Do not connect the jump starting cable to the negative (-) terminal of the battery. Always connect to the recommended earth point. As defined in the owners handbook or service documentation for that vehicle.

2.5 AGM Batteries

- **AGM batteries must not be charged above 14.8 Volts. Doing so will damage them.**
- AGM Batteries must be tested with a capable battery tester as **detailed in the Equipment section (Section 5) of this**

procedure.



NOTE: Under no circumstances should the battery be disconnected with the engine running because under these conditions the generator can give a very high output voltage. This high transient voltage will damage the electronic components in the vehicle. Loose or incomplete battery connections may also cause high transient voltage.

3. HEALTH AND SAFETY PRECAUTIONS

WARNINGS:



BATTERY CELLS CONTAIN SULPHURIC ACID AND EXPLOSIVE MIXTURES OF HYDROGEN AND OXYGEN GASES. IT IS THEREFORE ESSENTIAL THAT THE FOLLOWING SAFETY PRECAUTIONS ARE OBSERVED.



Batteries emit highly explosive hydrogen at all times, particularly during charging. To prevent any potential form of ignition occurring when working in the vicinity of a battery:

- Do not smoke when working near batteries.
- Avoid sparks, short circuits or other sources of ignition in the battery vicinity.
- Switch off current before making or breaking electrical connections.
- Ensure battery charging area is well ventilated.
- Ensure the charger is switched off when: a) connecting to a battery; b) disconnecting from the battery.
- Always disconnect the ground cable from the battery terminal first and reconnect it last.



Batteries contain poisonous and highly corrosive acid. To prevent personal injury, or damage to clothing or the vehicle, the following working practices should be followed when topping up, checking electrolyte specific gravity, removal, refitting or carrying batteries:

- Always wear suitable protective clothing (an apron or similar), safety glasses, a face mask and suitable gloves.
- If acid is spilled or splashed onto clothing or the body, it must be neutralized immediately and then rinsed with clean water. A solution of baking soda or household ammonia and water may be used as a neutralizer.
- In the event of contact with the skin, drench the affected area with water. In the case of contact with the eyes, bathe the affected area with cool clean water for approximately 15 minutes and seek urgent medical attention.
- If battery acid is spilled or splashed on any surface of a vehicle, it should be neutralized and rinsed with clean water.
- Heat is generated when acid is mixed with water. If it becomes necessary to prepare electrolyte of a desired specific gravity, SLOWLY pour the concentrated acid into water (not water into acid), adding small amounts of acid while stirring. Allow the electrolyte to cool if noticeable heat develops. With the exception of lead or lead-lined containers, always use non-metallic receptacles or funnels. Do not store acid in excessively warm locations or in direct sunlight.



Due to their hazardous contents, the disposal of batteries is strictly controlled. When a battery is scrapped, ensure it is disposed of safely, complying with local environmental regulations. If in doubt, contact your local authority for advice on disposal facilities.

4. BATTERY CARE REQUIREMENTS

4.1 RECEIPT OF A NEW VEHICLE

Within 24 hours of receipt of a new vehicle, a battery condition check must be carried out in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.



NOTE: The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: [New Vehicle Storage Form](#) (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.2 NEW VEHICLE STORAGE

If the vehicle is to be stored the transit relays MUST be refitted and / or the vehicle put into transport mode.

Transit relay removal / vehicle placed in normal mode should only be completed a maximum of 72 hours prior to handover to customer

For vehicles without either a transit mode or transit relay the battery negative cable must be DISCONNECTED from the battery.

The battery must be tested and/or re-charged every 30 days and MUST be re-charged after every 90 day period.



NOTE: The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: [New Vehicle Storage Form](#) (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.3 PDI / DELIVERY TO CUSTOMER

Before the vehicle is handed over to the customer and as part of the PDI, the condition of the battery needs to be confirmed. The battery condition must be checked in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.



NOTE: The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: [New Vehicle Storage Form](#) (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.4 REPLACEMENT BATTERIES FOR SERVICE

All service replacement batteries must have the battery condition checked within 24 hours of receipt and controlled on a 'First In First Out' basis to ensure batteries are not allowed to age unnecessarily.

For batteries in storage and not yet fitted to a vehicle, they must be stored in a dry environment, not in direct sunlight or under any direct heat source. Any batteries exhibiting any forms of damage or corrosion must not be fitted to any vehicle. Any batteries which are dropped must be scrapped, this applies even if no external damage is apparent.

The battery condition must be checked every 30 days in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: [New Vehicle Storage Form](#) (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4.5 BATTERY MAINTENANCE

Any battery whether it is in a vehicle or a replacement part must be tested and/or re-charged every 30 days and MUST be re-charged after every 90 day period.

4.6 BATTERY TEST PROCESS

It is recommended that this test is conducted at least 24 hours after the vehicle engine has been run or the battery charged to avoid the need of surface charge removal. If time constraints make this unacceptable then the surface charge must be removed.

Surface Charge Removal

A vehicle which has had its battery charged or been driven in a 24 hour period before the test, must have its surface charge removed.

- Turn on the ignition (power mode 6) but do not start the vehicle
- Switch on the headlamps on high beam for a minimum 3 minutes
- Switch off the headlamps
- Wait a minimum of 5 minutes before recording test results for any battery measurements

Battery Test

The battery may be tested either on a bench or on the vehicle.

The battery condition must be checked in accordance with the battery test process utilizing a JLR approved tester as outlined in **the Equipment section (Section 5) of this procedure**.



NOTE: The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure**. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: [New Vehicle Storage Form](#) (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).



CAUTION: DO NOT connect the tester to any other circuit or chassis point other than the battery negative terminal.

5. EQUIPMENT

All equipment used must be functionally capable of meeting the compliance requirements. Please refer to the approved equipment document (JLR 000015).

In the case of batteries fitted to a new vehicle at the dealership, battery condition should be measured using the appropriate hand-held Midtronics tester as follows:

Battery Type	Battery Tester	Battery Tester
	Jaguar	Land Rover
AGM & Flooded	Midtronics EXP1080, GRX 3080	Midtronics EXP1080, GRX 3080

The test results must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document. For additional information, refer to: [New Vehicle Storage Form](#) (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).



NOTE: All equipment must be calibrated

6 DETERMINING BATTERY CONDITION

TESTER RESULTS	ACTION
GOOD BATTERY	Return to service.
GOOD RE-CHARGE	Fully charge battery and return to service.
CHARGE AND RE-TEST	Fully charge battery. Remove surface charge. Re-test battery. If same result replace battery.
REPLACE BATTERY OR BAD CELL BATTERY	Verify surface charge removed. Disconnect battery from vehicle and re-test. If result repeats after surface charge removal, replace battery. DO NOT RECHARGE.
UNABLE TO DO TEST	Disconnect battery from vehicle and re-test.

7 BATTERY CHARGING

It is essential that a suitably ventilated defined area exists in each dealership / retailer for battery charging.



CAUTION: It is very important that when charging batteries using the traction charger or other stand-alone chargers that the charger is set for the correct type of battery before charging commences. If the wrong switch is selected the result would be a battery that is not charged fully and / or overheating can occur. Follow the manufacturers operating instructions.

Batteries **MUST BE** tested and if necessary charged every 30 days and charged after 90 days irrespective of any test. It is recommended that dealers / retailers always have fully charged batteries ready for use.



CAUTION: Do not charge AGM batteries with voltages over 14.8 Volts as this will damage the battery.

A designated controlled area must be allocated for scrap batteries and clearly controlled as such.

To bring a discharged but serviceable battery back to a fully charged condition proceed as follows:

- Check and if necessary top-up the battery electrolyte level. (Flooded maintainable batteries only)
- Charge the battery using a JLR approved charger as detailed in the approved equipment document following the manufacturers operating instructions.



NOTE: When using the Midtronics Diagnostic Charger, automatic mode must always be used. After charging and analysis, the charger may display 'Top-Off Charging', Hit STOP To End. Do not stop charging until the current falls to 5A or less, otherwise the battery will not be fully charged.

Following charging, a post charge battery condition test must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure.**



NOTE: The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the **Determining Battery Condition section (Section 6) of this procedure.** The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: [New Vehicle Storage Form](#) (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

8 BATTERY REPLACEMENT

If it is determined that a battery requires replacement, always refer to the appropriate section of the workshop manual for instructions on removing and installing the battery from the vehicle.

On in service vehicles fitted with a Battery Monitoring System (BMS), the BMS control module must be reset following the installation of a new battery. The BMS control module reset procedure must be performed using an approved diagnostic

system.

9 CONFIRMING ELECTROLYTE LEVEL

WARNINGS:



BEFORE CHECKING AND TOPPING-UP THE BATTERY ELECTROLYTE, REFER TO THE HEALTH AND SAFETY PRECAUTIONS SECTION.



AGM TECHNOLOGY BATTERIES ARE FULLY SEALED FOR LIFE AND NO ATTEMPT SHOULD BE MADE TO CHECK OR TOP UP THE ELECTROLYTE LEVEL.

On certain types of battery the electrolyte level may need to be checked.

- Make sure the battery is of a type suitable for topping up. These types of batteries will have cell plugs visible on the top face of the battery or a removable access panel to allow access to the cells.
- On batteries with a clear or opaque case and level marks, check the electrolyte level by visual inspection of the maximum level indicator mark on the battery casing indicating adequate level above the battery separators.
- On batteries with black cases, remove the cell plugs or access panel and ensure the electrolyte level is level with the indicator in the cell hole. A flashlight may be required to see the electrolyte level on this type of battery.
- If the electrolyte level is low, top-up using distilled water.



NOTE: Maintenance free and Valve Regulated (AGM) batteries are sealed and therefore cannot be topped up.



CAUTION: **DO NOT** overfill.

Battery and Charging System - General Information - Quiescent Drain

Description and Operation

VEHICLE QUIESCENT CURRENT TESTING

On vehicles fitted with a Battery Monitoring System (BMS), the diagnostic routine for quiescent drain testing in the approved Jaguar or Land Rover diagnostic system should be utilized.

If a customer complains of a vehicle battery that discharges continuously or when left for a prolonged period of time, it is recommended that a quiescent drain test is performed as described below.

The battery drain should be measured using the approved Jaguar or Land Rover diagnostic system or a Digital Multi-Meter (DVOM). A procedure for quiescent drain measurement using the diagnostic system is available in the Diagnosis and Testing section of the Workshop Manual. The vehicle should be in the locked/armed state (for example vehicle alarm fully armed), all doors, engine and luggage compartment lids are open and latched (so as to appear closed from an electrical point of view). The test should take place after the vehicle has entered shutdown mode. The time taken for this to occur after the ignition is switched off varies according to model (Refer to the Topix On line resource for details).

When the vehicle is armed, the effect of the security system Light Emitting Diode (LED) flashing is to cause a pulsation in the measured current drain. In this case, either the average current should be taken (using a Digital Multi-Meter (DVOM) with an averaging system) or the current reading taken, ignoring the brief high current peaks.

EQUIPMENT

Approved Jaguar or Land Rover diagnostic system with current probe **OR** Digital Multi-Meter (DVOM) with current probe.

METHOD OF MEASUREMENT

Using an Approved Jaguar or Land Rover Diagnostic System.

1. Switch off all electrical loads and ensure that the ignition is off
2. Connect the current probe to the approved Jaguar or Land Rover diagnostic system
3. Calibrate the probe
4. Install a clamp around the battery lead/junction box lead
5. Go to the Quiescent Current Testing section in this procedure

Using a digital multimeter

Do not use an in-line DVOM to measure the quiescent drain on vehicles fitted with an electronic throttle (for example XK 2006 onwards). The current exceeds the maximum amount the fuse in the DVOM is capable of handling.

1. Switch off all electrical loads and ensure that the ignition is off
2. Connect the current probe to the digital multimeter
3. Calibrate the probe
4. Install a clamp around the battery lead/junction box lead
5. Go to the Quiescent Current Testing section in this procedure

QUIESCENT CURRENT TESTING

1. Switch ignition to 'on' or select ignition mode in keyless vehicles and switch to 'off' (do not crank)
2. Remove key from ignition switch (if equipped)
3. Open and latch all doors, hood and luggage compartment lid
4. Lock the vehicle using the remote function on the remote handset. (Single lock only to avoid volumetric alarm arming)
5. Remove any other potential electrical drains such as accessories plugged into accessory sockets
6. Record the amperage readings after the shutdown period referenced in the Topix on line resource for details. Note all cars from 10MY onwards and XK from 07MY and XF from 08MY should be less than 30mA after 30 minutes
7. Record the final reading on the battery report form

The preferred method of testing following an excessive current consumption figure is to use a current probe around individual junction box leads to the various suspected circuits to identify a potential cause. This is in preference to the old method of removing fuses for the following reasons:

The drain may be caused by a module remaining active and preventing the quiescent drain from reducing to normal levels

The drain may be caused by a relay winding that is activated. Pulling the fuse can allow this to 'reset' and the drain will be lost and go un-diagnosed

QUIESCENT DRAIN - TYPICAL VALUES



NOTE: The quiescent drain after the initial shutdown period should not exceed the value shown in the table.

Jaguar Quiescent Drain Values

MODEL	SHUT DOWN PERIOD (minutes)	TYPICAL VALUES BATTERY DRAIN (mA)
XJS 3.2	60	<30
Sovereign 3.2	60	<37.3

MODEL	SHUT DOWN PERIOD (minutes)	TYPICAL VALUES BATTERY DRAIN (mA)
XJ6 4.0	60	<38.6
XJS	60	<43.9
XJ6 (X300) (1995MY)	60	<43
XJ8 (X300)	60	<30
XK8 (X100)	60	<30
S-Type (X200)	60	<30
X-Type (X400)	30	<30
XJ6 (X350)	40	<30
XJ8 (X350)	40	<30
XK (X150) - From 2006MY	<20 (after lock/arm condition) ²	<30
	33 (unlocked)	<30
XF (X250) - From 2008MY	<20 (after lock/arm condition) ²	<30
	33 (unlocked)	<30
XF (X250) - From 2013MY	<10 (after lock/arm condition) ²	<25
XF SportBrake (X250) - From 2013MY	<10 (after lock/arm condition) ²	<25
	<20 (unlocked)	<25
XJ (X351) - From 2010MY - 2012MY	10 (afterlock/arm condition) ²	<20
	30 (unlocked)	<20
XJ (X351) - From 2013MY	10 (afterlock/arm condition) ²	<20
	<20 (unlocked)	<20
F - Type (X152) - From 2013MY	10 (afterlock/arm condition) ²	<20
	<20 (unlocked)	<20



NOTE:

1. The total current drain will be higher if certain approved accessories are fitted (for example: tracker, trailer module, etc.)
2. Applies to vehicles without Tire Pressure Monitoring System (TPMS). Vehicle shut-down period with TPMS is approximately 15 minutes.

Battery and Charging System - General Information - Battery Report Form - In Service Batteries Only

Description and Operation



NOTE: Fields marked with * are mandatory and must be completed.

General Information								
*Vehicle Identification Number (VIN):				Vehicle Model:	Engine type:			
*Mileage:				*Repair Date:				
Customer Questions								
*1: What is the customer's reason for dealer visit? (tick symptoms as appropriate)				Non crank	Crank but non start	Warning message	Other:	
*2: How long was the vehicle left prior to issue.				*				
*3: How was the car left (Locked/unlocked)				*				
*4: How did you access to the vehicle				Key fob	Manual key	Handle pull		
*5: Has the vehicle required assistance for battery issues previously?				Yes		No		
*6: Is the vehicle used? (tick symptoms as appropriate)				Daily	Every other day	Weekly	Less than weekly	
*7: Average journey length				*				
*8: How many starts do you typically do in a day				*				
*9: Did the customer see any instrument pack warnings prior to the issue?				*				
*10: Have any of the features been used without the engine running in the last 3 days (if fitted?)		Radio	Power point accessory	CD	DVD	USB or IPOD connection	TV	Rear seat entertainment
11: Customer comments:- Please add any additional comments that are relevant.				*				
Diagnostics (Battery Testing)								
1: Loose battery clamps				Yes	*	No	*	
2: Loose hold down clamps				Yes	*	No	*	
3: Corroded terminal posts				Yes	*	No	*	
4: Physical damage/leaks				Yes	*	No	*	
5: Low electrolyte (Flooded batteries only)				Yes	*	No	*	
6: Battery Date Code				*				
7: FEAD belt tension				OK	*	Not OK	*	
8: Quiescent Drain				mA	*			
9: Vent tube correctly installed				Yes	*	No	*	
10: Number of Times Battery Charged:				*				
10: Vent tube correctly installed				Yes		No		
11: Remove the Surface (414-00 battery care requirements)				Yes	*	No	*	
12: Battery voltage				*				
13: Midtronics test code before charging (EXP-1080)				*				
13a: If Midtronics indicates that the battery needs re-charging, charge the battery following instructions on the recommended battery charger				*				
13b: Midtronics test code after charge				*				
13c: Midtronics test code result after charge				*				
13d: If "good and re-charge" charge the battery following instructions on the recommended battery charger				*				
13e: If "charge and re-test" for both before and after the charge renew the battery				*				
13f: Only renew the battery if "renew battery", "bad cell" or charge and re-test has been displayed twice.				*				
Technician Comments:- Please add any additional comments that are relevant.								
*								
*								
*								
*								
*								

Battery and Charging System - General Information - Charging System

Diagnosis and Testing

For additional information.

REFER to: Battery (414-01, Diagnosis and Testing).

Battery, Mounting and Cables -

Battery Specification

Engine Specification	Vehicle Specification			Rest of world
	Europe			
	Vehicles fitted without electrical optional extras	Vehicles fitted with electrical optional extras		
Vehicles fitted with 2.7L diesel engine	90 Ahr	90 Ahr	90 Ahr	
Vehicles fitted with 3.0L petrol engine	80 Ahr	90 Ahr	90 Ahr	
Vehicles fitted with 4.2L petrol engine	90 Ahr	90 Ahr	90 Ahr	

Battery cold cranking Specification

Item	Specification
90 Ahr	800 Amps
80 Ahr	700 Amps

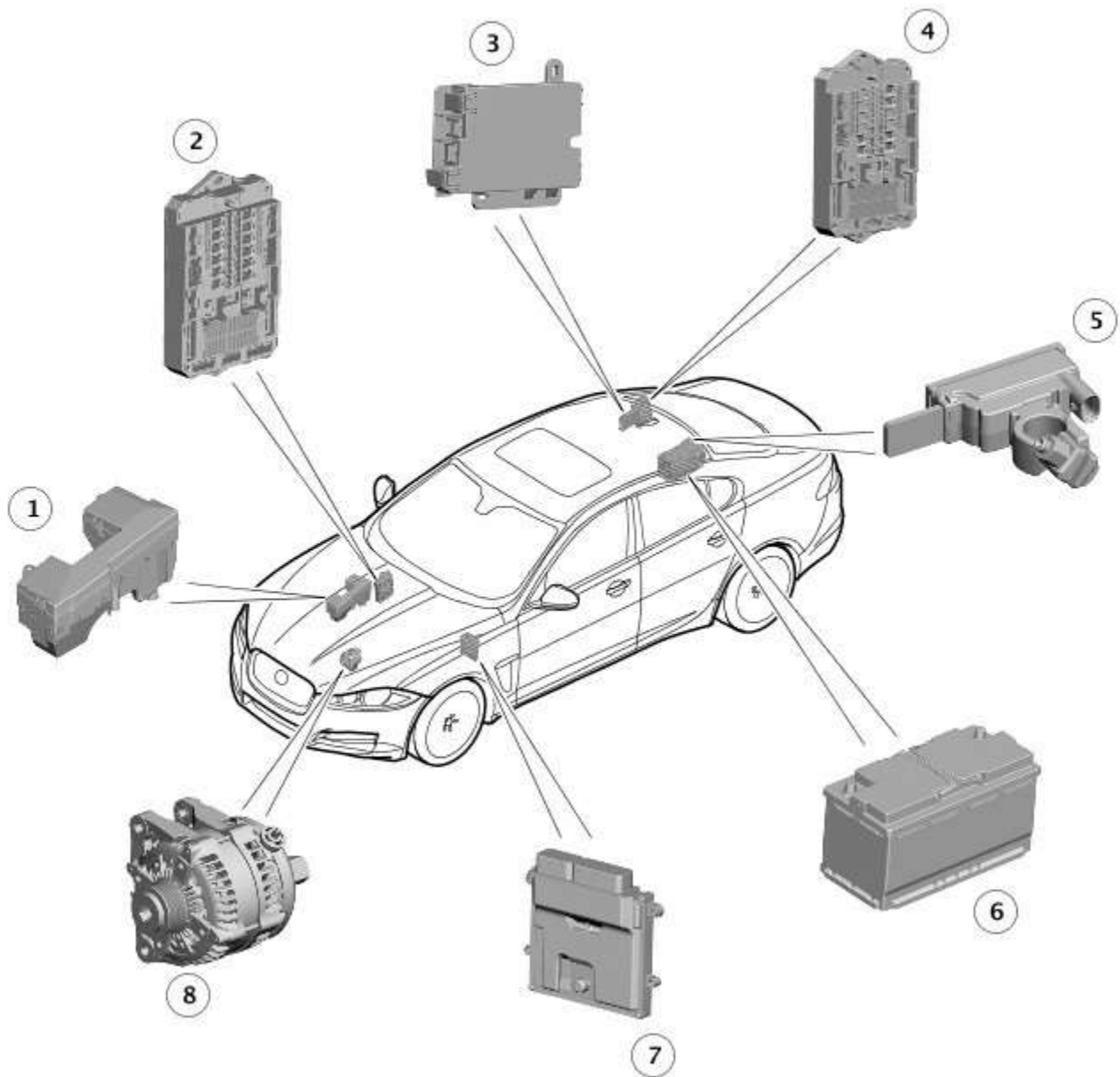
Torque Specifications

Description	Nm	lb-ft	lb-in
Battery positive cable to rear junction box retaining nut	12	9	-
Battery monitoring system retaining nut to battery positive terminal	5	-	44
Battery ground cable to body retaining bolt	12	9	-
Battery tray	10	-	89
Battery cable terminal	6	-	53
Battery clamp bolt	8	-	71

Battery, Mounting and Cables - Battery and Cables - Component Location

Description and Operation

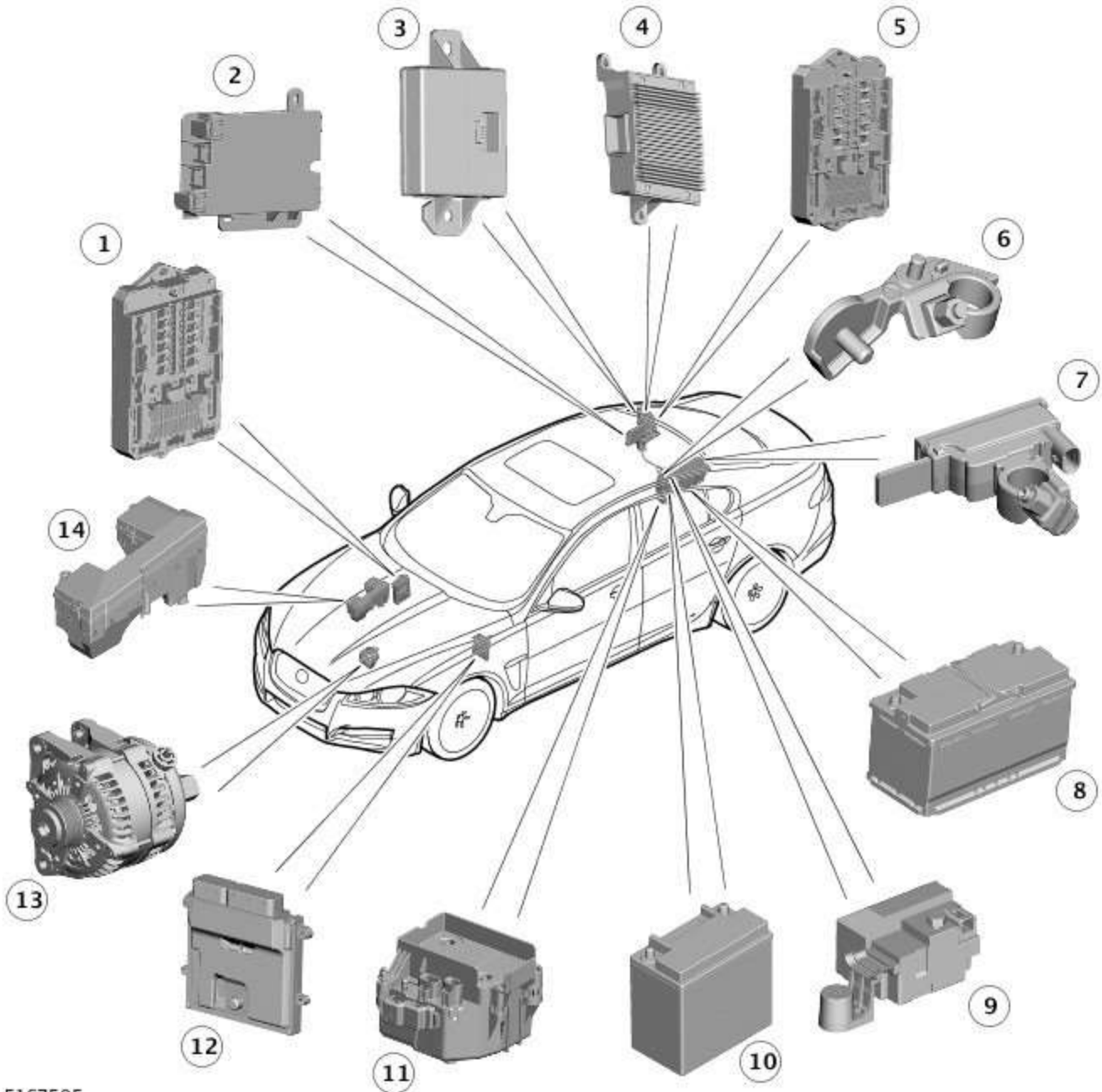
COMPONENT LOCATION - SINGLE BATTERY VEHICLES



E167504

Item	Description
1	EJB (engine junction box)
2	CJB (central junction box)
3	BJB (battery junction box)
4	RJB (rear junction box)
5	BMS (battery monitoring system)
6	Battery
7	ECM (engine control module)
8	Generator

COMPONENT LOCATION - DUAL BATTERY VEHICLES



E167505

Item	Description
1	CJB Generator
2	BJB Starter motor
3	GWM (gateway module)
4	DBM (dual battery module)
5	RJB Dual battery module
6	Battery to BJB terminal
7	BMS (battery monitoring system) Dual battery fuse box
8	Primary battery
9	Transit relay
10	Secondary battery
11	DBJB (dual battery junction box)
12	ECM
13	Generator
14	EJB

Battery, Mounting and Cables - Battery and Cables - Overview

Description and Operation

OVERVIEW

Single Battery Vehicles

Mounted on the battery negative terminal is a BMS (battery monitoring system) module. The BMS module is integral with the battery negative cable and is controlled by the [ECM \(engine control module\)](#).



CAUTION: To avoid damaging the battery monitoring system module, always use a suitable body ground point rather than the battery negative terminal when connecting a slave power supply to the vehicle.

If a new battery is fitted to the vehicle, the BMS module will require re-calibrating using the Jaguar approved diagnostic system.

Fitted on the battery positive terminal is a transit relay. The transit relay must be removed from the vehicle during the Pre-Delivery Inspection (PDI). For additional information, refer to the PDI Manual.

The vehicle battery provides power to the [BJB \(battery junction box\)](#). The [BJB](#) contains 3 megafuses, delivering power to the [RJB \(rear junction box\)](#), the [CJB \(central junction box\)](#) and the [EJB \(engine junction box\)](#). In addition to containing fuses and relays, the [RJB](#) and [RJB](#) contain software to control a number of vehicle systems. These functions are covered in the appropriate sections of this manual.

Dual Battery System Vehicles - TD42.2L Engine Variants Only

Two batteries are fitted to accommodate the dual battery system used for the Stop/Start system.

A primary battery is located in the luggage compartment floor in a plastic molded tray and secured with a metal rod. The secondary battery is located in the [DBJB \(dual battery junction box\)](#).

- The primary battery is a 90Ahr, 850A CCA AGM Battery.
- The secondary battery is a 14Ahr, 200A CCA Absorbed Glass Mat (AGM) Battery.

A BMS (battery monitoring system) control module is mounted on the primary battery negative terminal. The BMS control module is integral with the battery negative cable and is controlled by the [GWM \(gateway module\)](#).



CAUTION: To avoid damaging the BMS control module, always use the ground (negative (-)) terminal stud point on the right side top mount. Never connect directly to the primary battery negative terminal when connecting a slave power supply to the vehicle, the BMS control module can be damaged.

If a new primary battery is fitted to the vehicle, the BMS control module will require re-calibrating using a Jaguar approved diagnostic system.

When the vehicle leaves the factory, a transit relay is fitted to the battery positive terminal. The transit relay is connected to the [CJB](#) which limits the electrical functions to essential items only, to reduce loads on the primary battery. The transit relay must be removed from the vehicle during the PDI (Pre-Delivery Inspection). For additional information, refer to the PDI.

The primary battery provides power to the [BJB](#). The [BJB](#) contains three megafuses, delivering power to the [RJB](#), the [EJB](#) and the starter motor and generator. In addition to containing fuses and relays, the [RJB](#) and [CJB](#) contain software to control a number of vehicle systems. These functions are covered in the appropriate sections of this manual.

A jump start terminal is located adjacent to the [EJB](#). A cover protects the terminal when not in use. If jump starting is required, the cover must be removed and the positive (+) jump lead attached securely. The negative (-) jump lead is attached to a stud located on the right side top mount in the engine compartment. The cover must be fitted to the positive terminal when not in use.

Dual Battery System

The dual battery system is used on vehicles with the stop/start system. The dual battery system prevents the vehicle electrical systems being subjected to undesirably low voltages during repeated engine restarts. If the electrical systems are subject to low voltages the customer may notice degraded performance of components and systems and incorrect fault [DTC \(diagnostic trouble code\)](#)'s may be stored.

The dual battery system isolates all electrical components and systems sensitive to low supply voltage from the primary battery while an engine start is in progress, and supplies them from the secondary battery. Without the dual battery system, the electrical power required by the [TSS \(Tandem Solenoid Starter\)](#) motor to crank the engine for each start would cause a voltage drop across the entire vehicle electrical network, and cause control modules to function incorrectly and in some cases reset and/or record [DTC](#)'s.

If the dual battery system is unable to prevent electrical supplies to the vehicle systems being subjected to low voltage levels during engine stop/start operations, due to the condition of the primary and/or secondary batteries or a system fault, the stop/start feature is disabled.

The dual battery system comprises the following components:

- Dual Battery Module (DBM).
- Dual Battery Junction Box (DBJB).
- Gateway Module (GWM).
- Primary battery.
- Secondary battery.

The GWM hosts most of the software required to control the dual battery system and components. The GWM monitors the components and can store fault related DTC's.

The GWM also controls the charging system software in conjunction with the [ECM](#), RJB, CJB and [ABS \(anti-lock brake system\)](#) control module via the high speed and medium speed [CAN \(controller area network\)](#) bus. The GWM software will monitor the status of the stop/start system and determine when a stop/start event can occur. It can also intervene to maintain vehicle systems by keeping the engine running or initiating a restart due to, for example, climate control system requirements or request for restart from the ECM. A brake pressure signal is received from the ABS control module which will indicate to the GWM that an engine restart is required from driver operation of the foot brake.

The GWM contains the intelligent power management system and the BMS software. Monitoring of the primary battery condition for stop/start is controlled by the GWM and the BMS control module.

Battery, Mounting and Cables - Battery and Cables - System Operation and Component Description

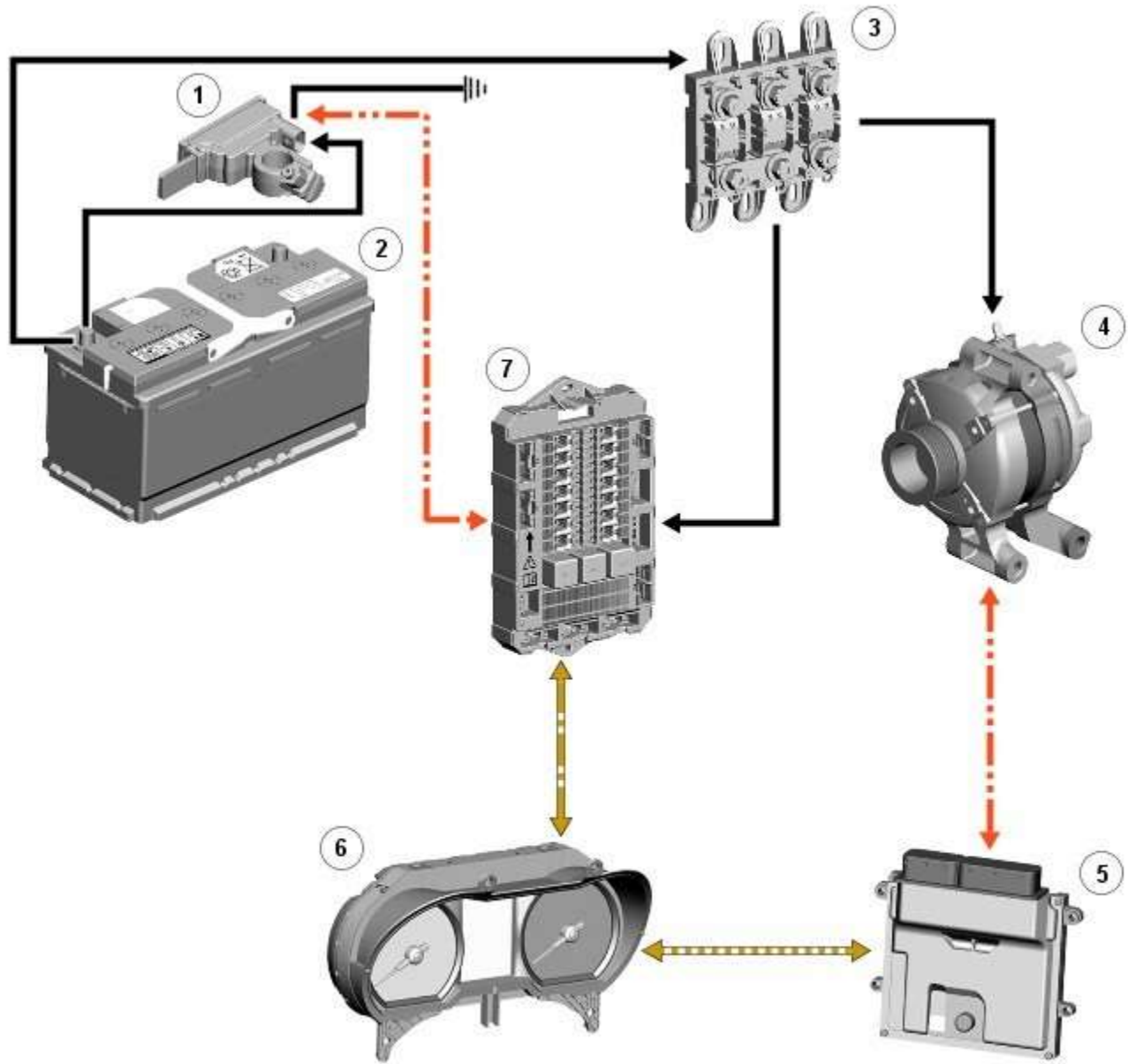
Description and Operation

Control Diagram



NOTE: A = Hardwired, D = High speed CAN (Controller Area Network) bus, N = Medium speed CAN bus, O = LIN (Local Interconnect Network) bus.

CONTROL DIAGRAM - SINGLE BATTERY VEHICLES



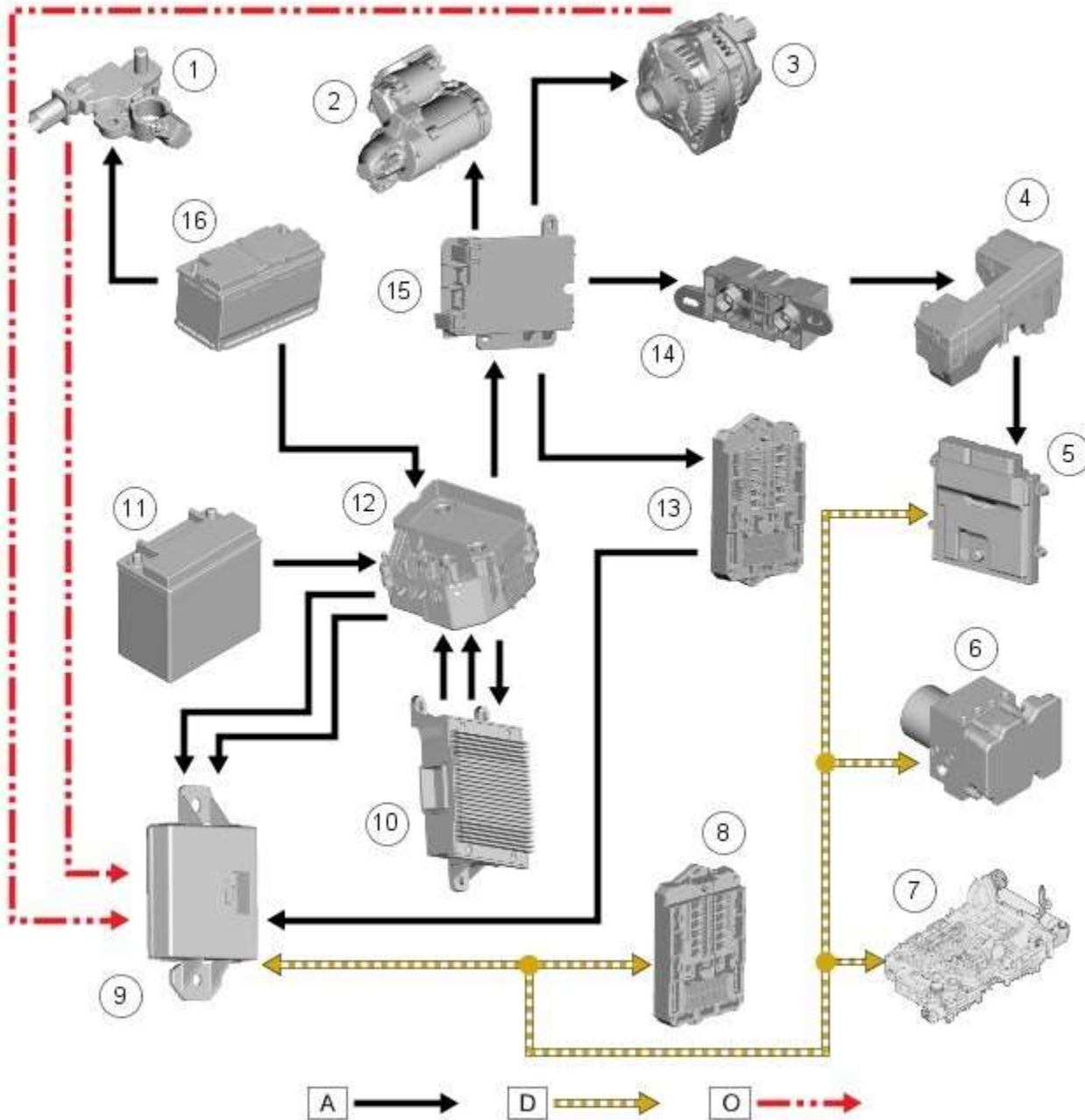
E96985



Item	Description
1	Battery Monitoring System (BMS) control module
2	Battery
3	Battery junction box (BJB)
4	Generator

5	ECM (engine control module)
6	Instrument Cluster
7	Rear Junction Box (RJB)

CONTROL DIAGRAM - DUAL BATTERY SYSTEM VEHICLES



E152679

Item	Description
1	Battery Monitoring System (BMS) control module
2	Tandem Solenoid Starter (TSS) motor
3	Generator
4	Engine Junction Box (EJB)
5	Engine Control Module (ECM)
6	Anti-lock Brake System (ABS) control module
7	Transmission Control Module (TCM)
8	Central Junction Box (CJB)
9	Gateway Module (GWM)
10	Dual Battery Module (DBM)

11	Secondary battery
12	Dual Battery Junction Box (DBJB)
13	Rear Junction Box (RJB)
14	Megafuse
15	Battery Junction box (BJB)
16	Primary battery

System Operation

BATTERY MONITORING SYSTEM - TD4 2.2L DIESEL VEHICLES ONLY

Periodically the battery monitoring system module will instigate a self-calibration routine. To self calibrate, the battery monitoring system first charges the battery to its full condition.



NOTE: If the vehicle is only driven for short periods the charging process could take a number of days to complete.

Once the battery is fully charged, the battery monitoring system will discharge the battery to approximately 75% of its full state of charge, but never lower than 12.2 V. The time taken to complete this part of the routine is dependent on the electrical load on the vehicle.

When the second part of the routine has been successfully completed, the battery monitoring system will return the battery to its optimum level of charge. The optimum level of charge will be between 12.6 V and 15 V, depending on battery condition, temperature and loading.

The battery monitoring system module also monitors the battery condition with the engine switched off. If a low voltage condition is detected the module can request the infotainment system is switched off to protect battery voltage. Once the infotainment system has been switched off, the vehicle must be run for at least 5 minutes to charge the battery before the infotainment system can be operated with the engine switched off.

BATTERY MONITORING SYSTEM - SINGLE AND DUAL BATTERY SYSTEM VEHICLES

When the ignition is off (power mode 0), the BMS control module records the primary battery state of charge and begins to monitor the battery condition from this point.

If the battery state of charge falls by 7%, the BMS control module will monitor the primary battery for 5 minutes. If after the 5 minute monitoring period, the primary battery charge has continued to fall due to the quiescent drain current being too high, the BMS control module will determine that some control modules are still 'awake'. The BMS control module sends a shutdown message on the LIN (local interconnect network) bus to the GWM (Gateway Module). The GWM sends a CAN (controller area network) bus message on both the medium and high speed networks to all control modules, requesting them to shutdown.

The BMS control module will monitor the primary battery state of charge for a further 5 minutes and determine if the primary battery state of charge is still dropping. If a quiescent drain current continues, the primary battery state of charge will continue to drop. If the state of charge falls to 12% of the initial monitoring value, the BMS control module determines that one or more control modules are still awake and a failure to respond to the shutdown request may indicate an error state within the control module(s).

BMS Low Battery Warning and Energy Management Messages

The BMS continuously monitors the condition of the primary vehicle battery. If excessive battery discharge occurs, the system will begin to shut down non-essential electrical systems in order to protect the battery.

If the BMS calculates that battery condition is not within set parameters, there are 3 messages that can be displayed, 2 on the touch screen and 1 on the message center. These inform the user that the battery is either at a low level of charge or the engine-off power consumption limit has been exceeded.

- **Low Battery - Please switch engine on or system will shutdown in 3 minutes:** is displayed as a **Warning** on the touch screen if the engine is not running. This indicates that the battery has fallen below a predefined threshold. As soon as the battery is charged back above this threshold then the message will be removed.
- **Low Battery - Please start your engine** is displayed on the message center if the engine is not running. This indicates that the battery has fallen below a predefined threshold. As soon as the battery is charged back above this threshold then the message will be removed or it can be manually removed by pressing 'OK'.
- **System will shut down in 3 minutes:** is displayed as an **Energy management** on the touch screen if the engine is not running, and system features are causing excessive battery discharge. After 3 minutes the BMS will begin shutting down vehicle systems. Normal system operation will resume when the engine is started.

This is based on a percentage of battery capacity available for the customer to use with the engine off. The percentage can change based upon several factors.

Once triggered, the resetting of this message will not occur until the vehicle is driven for 10 minutes with the engine running (to allow the battery to recoup any lost charge). However, if the engine is run for less than 10 minutes, the message will only be displayed after an additional 5 minutes with the ignition on but engine off.

BMS Control Module Self Calibration

Periodically the BMS control module will instigate a self-calibration routine. To self calibrate, the battery monitoring system

first charges the battery to its full condition.



NOTE: If the vehicle is only driven for short periods the charging process could take a number of days to complete.

Once the battery is fully charged, the BMS control module will discharge the battery to approximately 75% of its full state of charge, but never lower than 12.2 V. The time taken to complete this part of the routine is dependent on the electrical load on the vehicle.

When the second part of the routine has been successfully completed, the BMS control module will return the battery to its optimum level of charge. The optimum level of charge will be between 12.6 V and 15 V, depending on battery condition, temperature and loading.

The BMS control module also monitors the primary battery condition with the engine switched off. If a low voltage condition is detected the BMS control module can request the infotainment system is switched off to protect battery voltage.

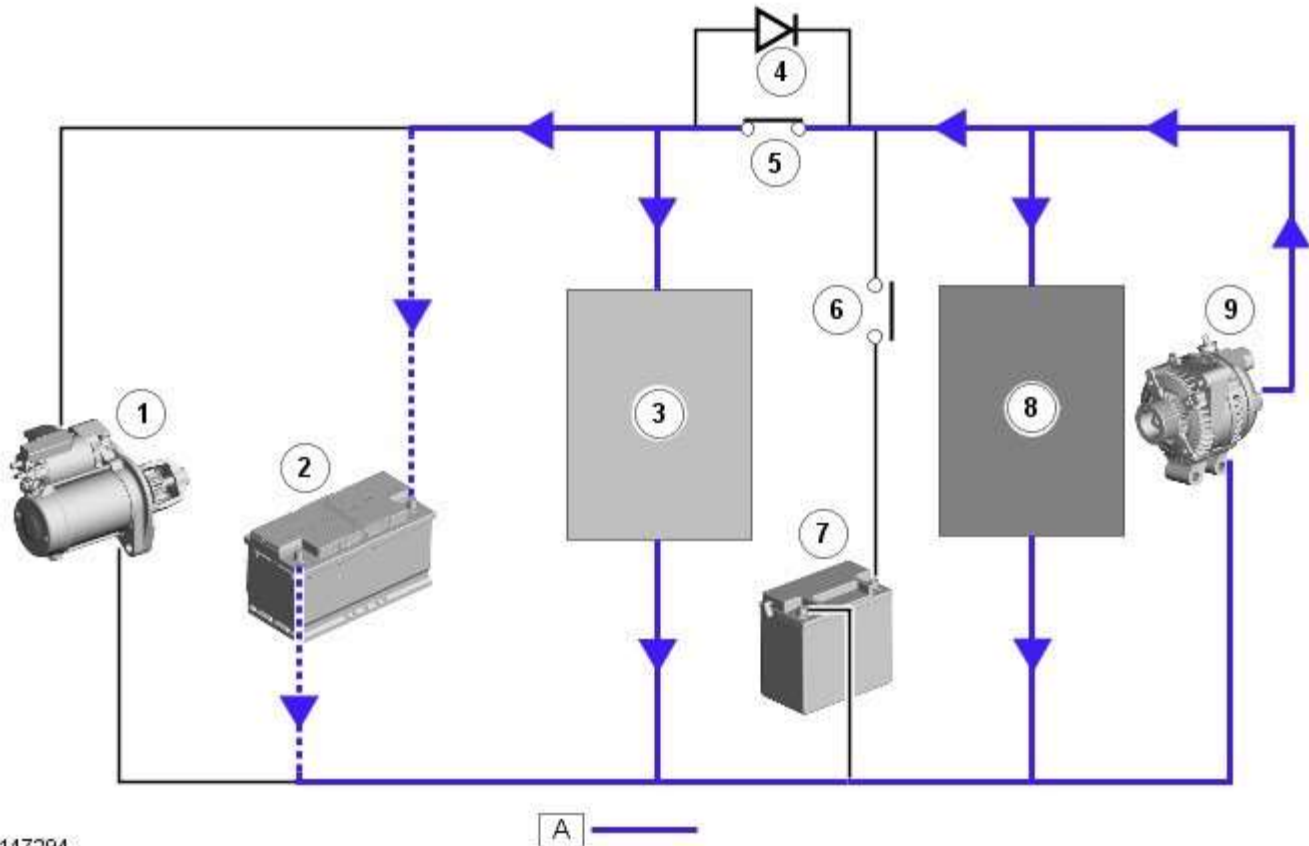
DUAL BATTERY SYSTEM - DUAL BATTERY SYSTEM VEHICLES ONLY

The dual battery system prevents electrical loads on the vehicle being subjected to low voltage levels during an ECO (stop/start system) engine start. Low voltage can occur due to the power demand of the TSS (Tandem Solenoid Starter) motor and could result in degraded performance of components and/or system control modules. The GWM contains the software to control the dual battery system and electrical load management system to ensure that ECO engine starts do not affect other vehicle systems.

The dual battery system isolates all power supply sensitive electrical components which may be affected by low voltage from the primary battery due TSS motor operation, and supplies them with power from the secondary battery when an engine start is in progress.

The DBJB (Dual Battery Junction Box) contains two contactors, which operate to change the power supply into two separate circuits when an ECO engine start is required. Sensitive electrical components are supplied from the secondary battery. The primary battery power is used exclusively to supply the TSS motor and maintain essential power loads to the engine management system required for engine starting. The contactors are operated by the DBM (Dual Battery Module) on receipt of LIN bus information from the GWM.

Dual Battery System - Normal State (Engine Running)



E147294

Item	Description
1	Tandem Solenoid Starter (TSS) motor
2	Primary battery
3	Power and engine management system loads

4	Field Effect Transistor (FET)
5	Contactor 1 - closed
6	Contactor 2 - open
7	Secondary battery
8	Sensitive loads
9	Generator

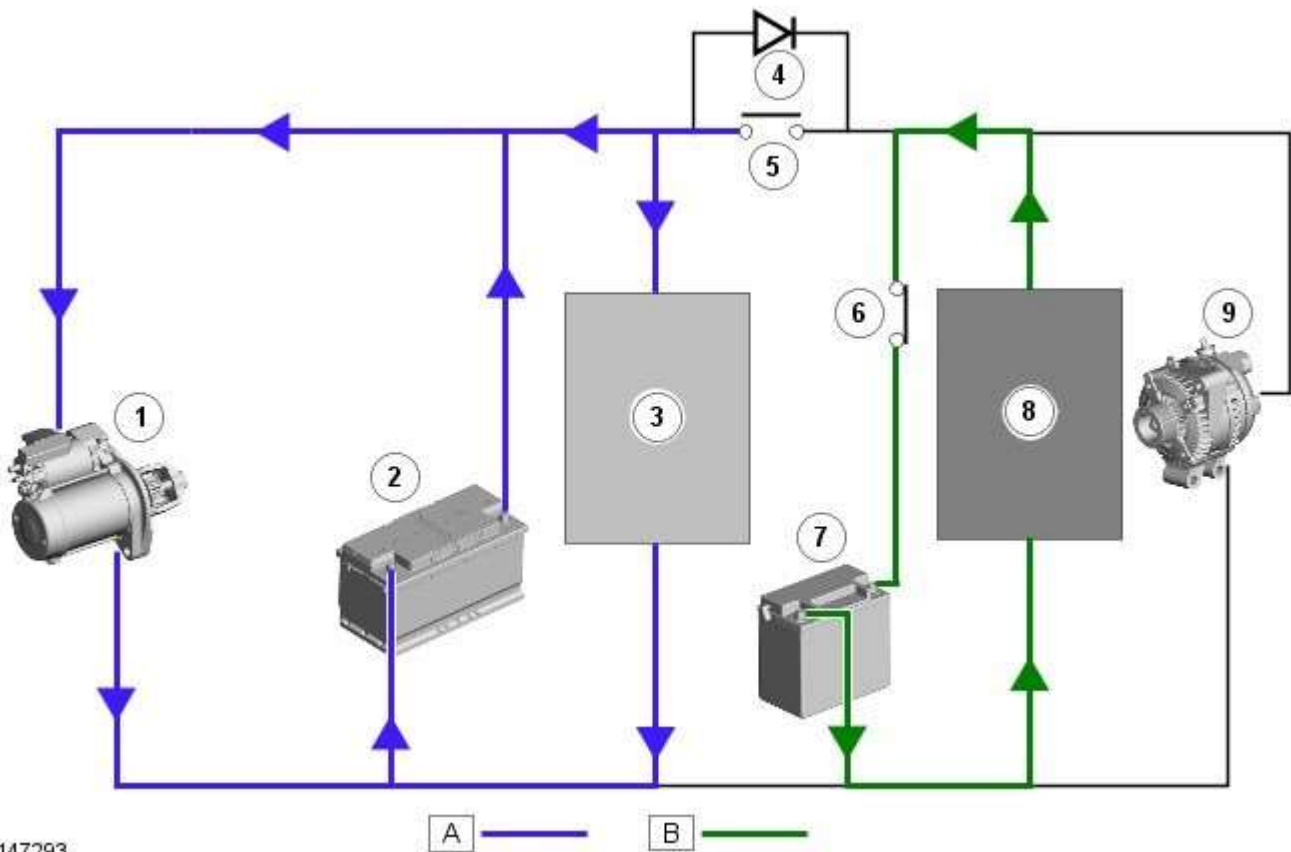


NOTE: A = Primary battery supply

When the engine is running, the electrical systems are powered from the primary battery and the generator. The GWM and the DBM communicate via the LIN bus and the DBM controls the DBJB contactors to isolate the secondary battery from the system by opening its contactor.

The GWM monitors the state of charge of both the primary and secondary batteries to ensure that sufficient voltage is available for the next ECO engine start. The GWM can apply charging to the secondary battery via the DBM and the DBJB if required.

Dual Battery system - ECO Engine Stop/Start State



E147293

Item	Description
1	Tandem Solenoid Starter (TSS) motor
2	Primary battery
3	Power and engine management system loads
4	Field Effect Transistor (FET)
5	Contactor 1 - open
6	Contactor 2 - closed
7	Secondary battery
8	Sensitive loads
9	Generator



NOTE: A = Primary battery supply, B = Secondary battery supply

When an ECO engine start is required, the DBJB must change the battery supply via the two contactors before the TSS motor

is operated to crank the engine. The GWM is connected to the ABS (Anti-lock Brake System) control module via the high speed CAN bus. With the vehicle stationary and the engine off after an ECO engine stop, when the driver releases the brake pedal the ABS control module senses the reduction in brake pressure. This change of brake pressure state is sent as a high speed CAN message which is received by the GWM and the ECM. The GWM reacts within 105ms to instruct the DBM via the LIN bus to operate the two contactors in the DBJB to supply the sensitive loads from the secondary battery and supply the TSS motor direct from the primary battery.

When the engine is running and the generator is supplying power to the vehicle systems, the GWM again instructs the DBM to operate the two contactors in the DBJB to supply all vehicle systems from the primary battery and the generator and to isolate the secondary battery.

Secondary Battery Charging

The DBM also controls the charging of the secondary battery. The GWM contains electrical load management software and monitors both batteries for their state of charge. The primary battery is monitored by the BMS control module which is connected to the DBM via the LIN bus. The DBM communicates the primary battery condition to the GWM via a LIN bus connection. The GWM sends a signal to the DBM via the LIN bus to instruct it to apply charging from the generator to the secondary battery when required. The contactor 2 is closed by the DBJB to complete the secondary battery circuit, and the generator output is applied to the secondary battery to charge it.

The generator output is controlled by the GWM which monitors and controls the electrical load management system. The generator is connected to the GWM by a LIN bus allowing the GWM to control the output of the generator to maintain electrical system load requirements and battery charging.

Electrical Load Management

The electrical load management is controlled by the GWM and the BMS control module.

The GWM will monitor the vehicle system power loads before and during an ECO engine stop.

Before an ECO engine stop, the GWM will transmit a signal to system control modules on the CAN bus to request a power save on all electrical loads and set a minimum electrical value override. The GWM monitors the vehicle electrical loads and will inhibit a ECO engine stop until the load current is at a value low enough to be supported by the secondary battery.

If the electrical loads cannot be reduced sufficiently, the GWM will inhibit the ECO engine stop.

When the engine is stopped after an ECO engine stop, the GWM will continue to monitor the primary battery state of charge. If the primary or secondary battery voltage falls below 11.0V, a level which will result in degraded starting performance or possible primary battery damage, the GWM will initiate an engine start.

System Inhibits

The ECO stop/start system is inhibited if the dual battery system is not be capable of preventing electrical loads on the vehicle being subject to unacceptably low voltage levels during ECO stop/start operations due to a fault.

ECO stop/start inhibit monitoring of the primary battery is performed by the BMS control module. If the primary battery voltage is too low to support an ECO stop/start, then the BMS control module will send a message to the GWM on the LIN bus to suspend ECO stop/start.

The GWM monitors the secondary battery and the dual battery system components. Any fault found will cause the GWM to inhibit ECO stop/start and the GWM will record a DTC (diagnostic trouble code).

Fault Diagnosis

The GWM performs passive and active diagnostics on the dual battery system to determine the status of the system components.

Passive diagnostics can detect faults in the DBJB and can check for stuck open or closed contactors and failure of DBM contactor command signals.

Active diagnostics is a routine to test the capability of the contactors to respond to open or close command signals sent from the GWM to the DBM. This routine also checks the FET's (Field Effect Transistors) activate as required. (Refer to Dual Battery Junction Box below for description of FET operation)

The GWM will also check the dual battery system components for faults in a controlled environment when the generator is providing a charging output. This will ensure that the detection of a fault will not result in sensitive electrical loads being subjected to low voltage which may occur during an ECO stop/start with a fault present.

The GWM will illuminate the charge warning indicator in the instrument cluster if fault is detected in the dual battery system which will result in a degraded power supply.

If a fault is detected the GWM transmits a CAN message to inhibit ECO stop/start operation. In some cases it will record a DTC, display a warning message in instrument cluster and also illuminate charge warning indicator.

Component Description

PRIMARY BATTERY - ALL VEHICLES

The primary battery is located in a plastic tray under the luggage compartment floor in the right side of the luggage compartment, adjacent to the spare wheel. The battery is vented via a tube which is connected with a T piece to the vent from

the secondary battery (if fitted) and passes through a grommet in the floorpan.

On new vehicles the primary battery positive terminal is fitted with a transit relay. The transit relay must be removed using the correct process detailed in the Pre Delivery Inspection (PDI) manual.

The battery negative terminal is fitted with a BMS control module. The control module is integral with the battery negative cable and communicates with the GWM via a LIN bus connection. The battery condition information is passed to the GWM which controls the generator output accordingly.



CAUTION: To avoid damage to the BMS control module, always use the body ground point in the engine compartment and not the battery negative terminal when connecting a slave power supply.

Failure to use the recommended ground point will lead to the setting of a DTC. Incorrect information of battery condition will be retained by the BMS control module due to the unmonitored current flow into the battery. The system will however, recognize and compensate for the change in battery status after a period of time.

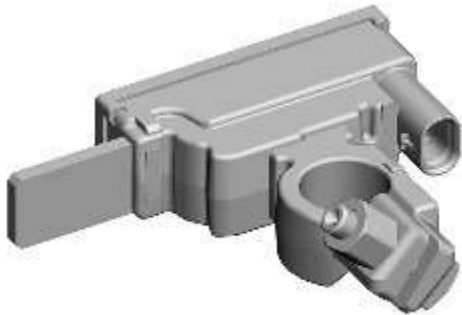
If a new battery is fitted, the BMS control module will require re-calibration using a Jaguar approved diagnostic system. Replacement of the BMS control module requires no action as the control module will re-calibrate automatically.

SECONDARY BATTERY - DUAL BATTERY VEHICLES ONLY

The secondary battery is located in a tray on the next of the primary battery and is secured to the DBJB with a bracket. The battery negative (-) terminal is connected via a cable to the vehicle body. The positive (+) terminal is connected by a cable to the DBJB. The battery is vented via a tube which is connected with a T piece to the vent from the primary battery and passes through a grommet in the floorpan.

The state of charge of the secondary battery is monitored by the Gateway Module (GWM).

BATTERY MONITORING SYSTEM (BMS)



E167509

The BMS (battery monitoring system) control module is located on the primary battery negative (-) terminal. The module is located on the battery post and is clamped to the post with a bolt and nut.

The primary battery negative ground cable is connected to the BMS control module and is attached to a ground stud on the vehicle body.

The BMS control module is connected into the vehicle wiring harness via a multiplug. The BMS control module receives a 12V power supply direct from the primary battery positive terminal. A LIN (local interconnect network) bus connection provides communication between the BMS control module and the ECM for control and monitoring of the primary battery current drain and state of charge.

The BMS control module measures battery current and voltage, which it communicates to ECM.



CAUTION: Due to the self-calibration routine, it is recommended that all power supply diagnostic testing is carried out using the Jaguar approved diagnostic system rather than a digital multimeter.

The BMS control module is able to generate DTC (diagnostic trouble code)'s to help diagnose primary battery or generator power supply issues. These DTC's can be read using the Jaguar approved diagnostic system. The Jaguar approved diagnostic system can also be used to implement a primary battery and generator self test routine. For additional information, refer to the Diagnosis and Testing section of the workshop manual.

If a fault is detected, the GWM (gateway module) will override the BMS control module.

The BMS control module DTC's can be used to help diagnose battery or generator power supply faults. The DTC's are stored in GWM. The Jaguar approved diagnostic system has a process for an automated power supply diagnostic procedure. The procedure provides a menu driven process to locate a fault in a logical sequence. The procedure uses the capability of the BMS control module and generator LIN bus controlled functions to provide current flow information and will detect if the BMS control module or generator are functioning correctly.

GATEWAY MODULE (GWM)



E147297

The GWM (gateway module) is located at the rear of the right wheel arch in the luggage compartment, adjacent to the DBM (dual battery module). The GWM is attached to a bracket, which is attached to a second bracket secured to the vehicle body.

The GWM contains software to control the following functions:

- Determine condition of primary and secondary batteries
- Control the output from the generator using load management software
- Controls ECO stop/start using power management to inhibit unnecessary electrical loads
- Control the DBJB (dual battery junction box) via the DBM to enable the switching of the contactors.

The GWM communicates with other system modules on the high speed and medium speed [CAN \(controller area network\)](#) buses.

The GWM communicates with the BMS (battery monitoring system) control module and the DBM via a [LIN](#) bus.

DUAL BATTERY MODULE (DBM)



E147298

The DBM (dual battery module) is located at the rear of the right wheel arch in the luggage compartment, adjacent to the GWM (gateway module) and the [RJB \(rear junction box\)](#). The DBM is attached to a bracket, which is attached to a second bracket secured to the vehicle body.

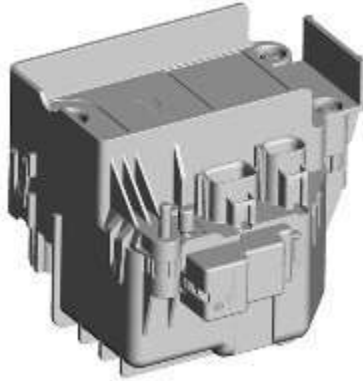
The DBM is connected by two hardwired connections to the DBJB (dual battery junction box). The DBM uses these two connections to apply battery voltage to the contactor coils in the DBJB. A [LIN](#) bus connection from the GWM passes contactor operation signals to the DBM which operates the contactors as applicable.

The GWM will also instruct the DBM to apply charging to the secondary battery via a LIN bus message. The GWM instructs the DBM of the charging current required for the secondary battery and the DBM applies the requested stabilized current to the secondary battery via a dedicated connection direct to the secondary battery.

The DBM diagnoses the coils of the contactors and will report a fault via the LIN bus to the GWM.

The DBM receives a fused power supply from the RJB.

DUAL BATTERY JUNCTION BOX (DBJB)



E147299

The DBJB (dual battery junction box) is located adjacent to the primary battery. The DBJB houses two contactors which are controlled by the DBM (dual battery module) and the GWM (gateway module) for switching power supplies during ECO stop/starts and also for charging the secondary battery.

FET's (field effect transistor's) are also located in the DBJB. The FET's are connected in parallel with contactor 1 and allow the primary battery power to flow to the sensitive loads during the contactor switching process to ensure there is no interruption in power supply to the sensitive loads. The FET's also act as a secondary path to allow power to be supplied to the sensitive loads should a fault occur and the contactor 1 becomes stuck open. The FET's will allow a current of up to 200A to flow through them.

The DBJB receives a battery supply direct from the primary battery to contactor 1 and a battery supply from the secondary battery to contactor 2. Two connections from the DBM are used for contactor coil control. A third connection from the DBM applies a stabilized voltage to the secondary battery for charging when requested by the GWM.

Battery, Mounting and Cables - Battery

Diagnosis and Testing

Principles of Operation

For a detailed description of the battery system and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: [Battery and Cables](#) (414-01 Battery, Mounting and Cables, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

NOTES:



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer-approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Generator • Drive belt • Drive belt tensioner • Generator pulley • Check the security of the generator fixings 	<ul style="list-style-type: none"> • Generator • Battery • Battery connections • Starter motor • Harnesses and connectors • Fuses • Charge warning lamp function • Engine Control Module (ECM)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart

Symptom	Possible Causes	Action
<ul style="list-style-type: none"> • Battery power to vehicle interrupted 	<ul style="list-style-type: none"> • High resistance between battery terminals and clamps 	<ul style="list-style-type: none"> • GO to Pinpoint Test A.


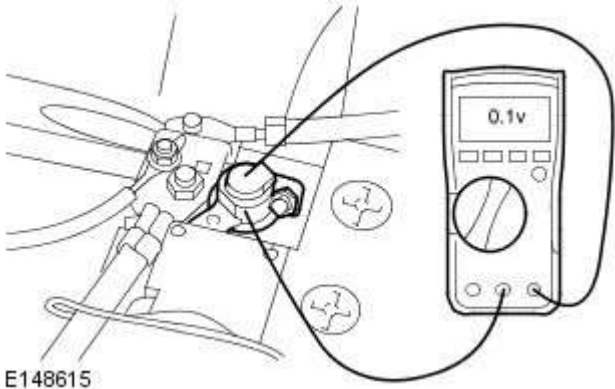

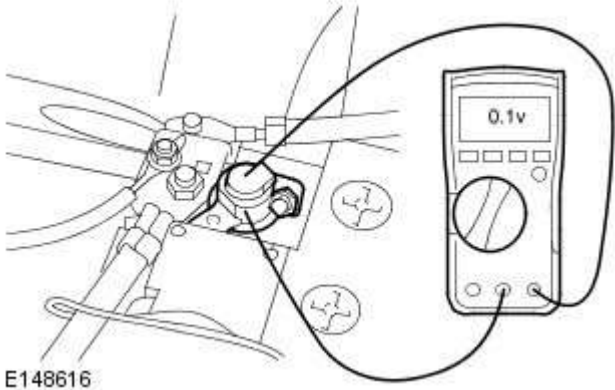
Midtronics EXP-1080 User Guide

Carry out the following: -

Surface Voltage Removal Process

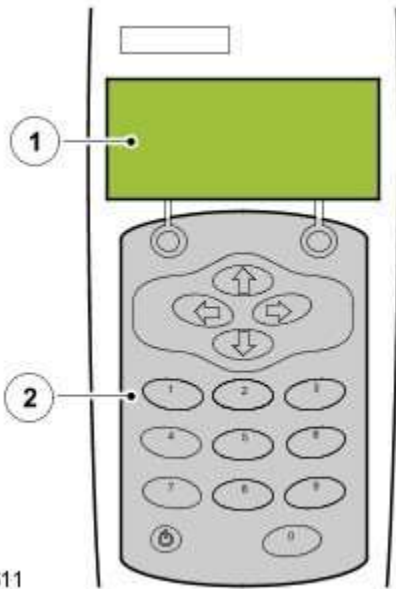
A vehicle which has had its battery charged or been driven in a **24** hour period before the test, must have its surface charge removed

- 1. Turn on the ignition but do not start the vehicle
- 2. Switch on the headlamps on high beam for a minimum 3 minutes
- 3. Switch off the headlamps
- 4. Wait a minimum of 5 minutes before recording test results for any battery measurements

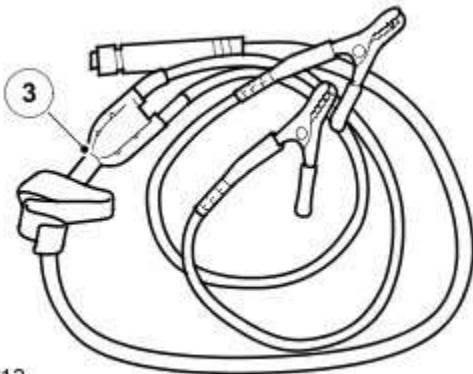
PINPOINT TEST A : VOLTAGE DROP	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: GROUND CIRCUIT	
 NOTE: This test checks for high resistance between the battery terminal and the battery clamp	
 E148615	1 Start the engine, turn on the following: <ul style="list-style-type: none"> • (1) Air conditioning • (2) Blower fan on full speed • (3) Headlights on main beam • (4) Heated screen - rear • (5) Heated screen - front (if installed) • (6) Heated seats (if installed)
	2 Connect the multimeter between the battery negative terminal and the battery clamp as shown in picture below (do not disconnect the battery at this stage)
	3 Set the multimeter to read DC voltage and record the reading Is reading equal to or below 0.1 volts? Yes GO to A2. No Switch all electrical loads and engine off, return the vehicle to an ignition off condition. Disconnect the battery negative clamp, clean clamp and terminal then reconnect and repeat test GO to A1.
A2: POWER CIRCUIT	
 NOTE: This test checks for high resistance between the battery terminal and the battery clamp	
 E148616	1 Start the engine, turn on the following: <ul style="list-style-type: none"> • (1) Air conditioning • (2) Blower fan on full speed • (3) Headlights on main beam • (4) Heated screen - rear • (5) Heated screen - front (if installed) • (6) Heated seats (if installed)
	2 Connect the multimeter between the battery positive terminal and the battery clamp as shown in picture below (do not disconnect the battery at this stage)
	3 Set the multimeter to read DC voltage and record the reading Is reading equal to or below 0.1 volts? Yes Carry out midtronics battery test procedure No Switch all electrical loads and engine off, return the vehicle to an ignition off condition. Disconnect the battery power clamp,

clean clamp and terminal then reconnect and repeat test [GO to A2.](#)

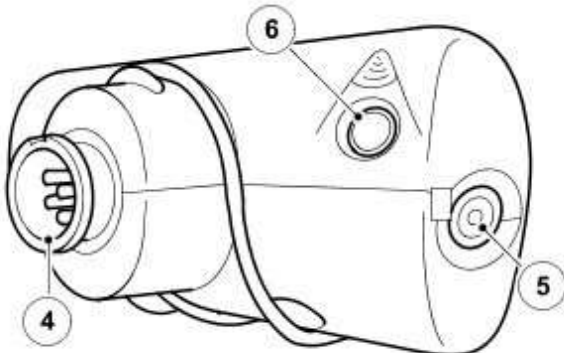
Reference	Description
1	LCD screen with main menu
2	Control panel (key board and power button)
3	Positive and negative fly leads
4	Fly leads connection
5	Temperature sensor
6	Infra-red sensor (data transfer for printer)
7	Amp hour
8	Battery rating (CCA)
9	Rating units
10	Battery type



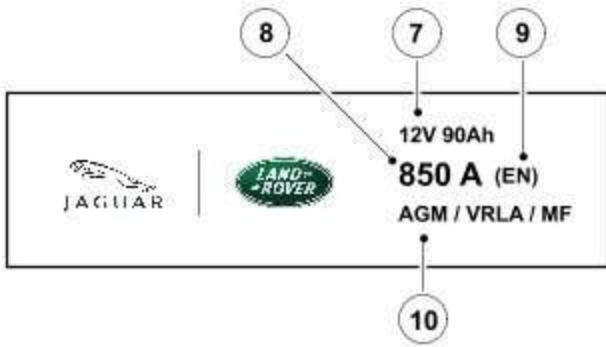
E148611



E148612



E148613



E148614

NOTE: Flooded batteries does not have AGM on the label

The following steps must be carried out to ensure correct operation of the EXP-1080 during the battery test procedure

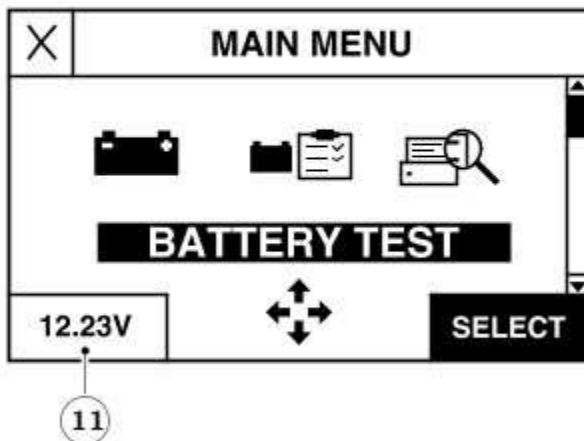
Checks	Action
Battery fluid leakage, check for battery fluid leaks or damage to the battery casing	NOTE: If visible damage to the case is evident do not return battery under warranty Replace the battery if there is any battery fluid leaks evident
Battery vent pipe routing	Check for routing, ensure there are no kinks
EXP-1080 fly lead, condition of clamps	Clean or replace as required
EXP-1080 fly lead connection	Confirm secure connection

NOTE: The Midtronics EXP-1080 is suitable for testing flooded and absorbed glass mat (AGM) type batteries including Primary and Secondary batteries

Midtronics Battery Test Procedure

This midtronics battery test procedure will confirm the serviceability of the battery

- 1. Connect the fly-lead to the midtronics EXP-1080
- 2. Connect the fly-leads to the battery terminals
 - **Black lead to negative terminal**
 - **Red lead to positive terminal**
 - Confirm the connections are secure
- 3. The EXP-1080 will power on automatically when connected to a battery, screen below is displayed



E164365

NOTE: MAIN MENU SCREEN

- 4. **Main Menu.** Select **Battery test** and press **SELECT**

X	BATT. LOCATION	
1	<input checked="" type="radio"/> IN VEHICLE	
2	<input type="radio"/> OUT OF VEHICLE	
BACK	↑↓	NEXT

E164366



NOTE: BATTERY LOCATION

- 5. **Battery Location**
- Select **Next**
- 6. **VIN**. When **IN VEHICLE** selected, enter the last six of the **VIN** using the key pad

X	VIN	
ENTER LAST 6 DIGITS OF VIN		
<input type="text"/>		
BACK	←→	NEXT

E164367




NOTE: BATTERY RATING

- 7. **Battery Type.** Select the correct battery type (Regular or AGM)



NOTE: ALL AGM batteries are marked (Refer to battery label) Flooded batteries have no reference to being Flooded.

- Select **Next**

X	BATTERY TYPE	
1	<input checked="" type="radio"/>	REGULAR/ FLOODED
2	<input type="radio"/>	AGM
BACK  NEXT		

E164368

X	RATING UNITS				
1	<input checked="" type="radio"/>	SAE	4	<input type="radio"/>	JIS
2	<input type="radio"/>	EN			
3	<input type="radio"/>	DIN			
BACK  NEXT					

E164369

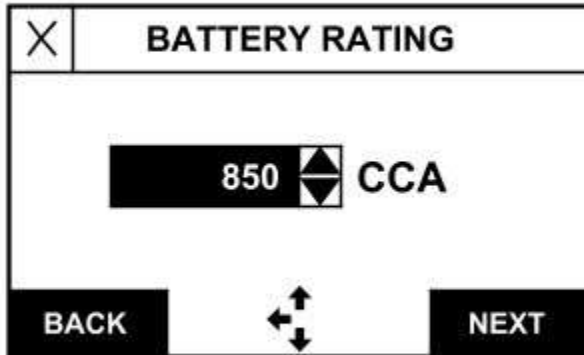


NOTE: BATTERY TYPE

- 8. **Battery Units.** Select the correct battery rating from the battery label in brackets (number 9). Scroll using the arrow on the Midtronics panel and select **Next**



NOTE: UNITS

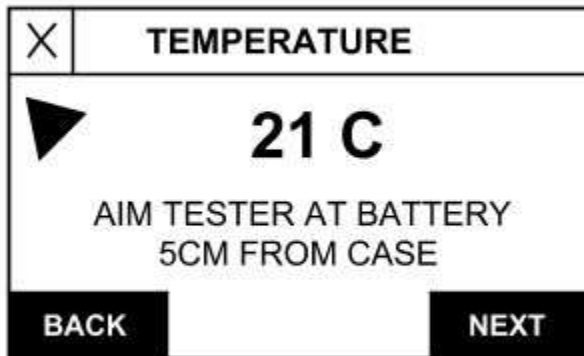


E164370



NOTE: BATTERY RATING


- 9. **BATTERY RATING.** Scroll using the arrow keys on the midtronics panel, select the correct **CCA** rating (For CCA refer to battery label)
- Select **Next**



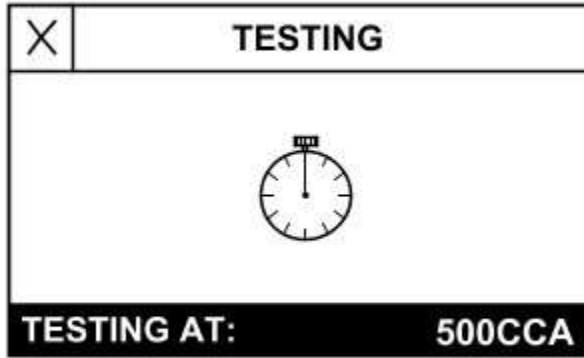
E164371

NOTES:


 TEMPERATURE

 Ensure that the temperature sensor does not touch any part of the battery or vehicle, this will cause damage not be covered under the midtronics warranty and will require the unit to be returned to a service center

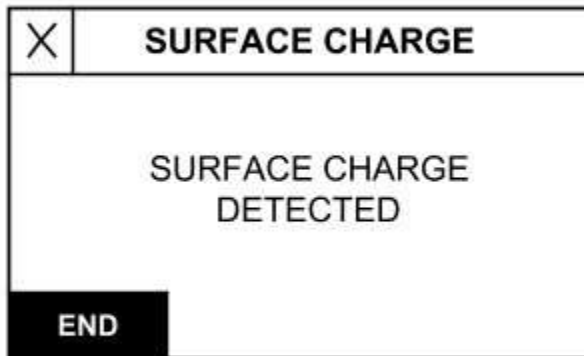
- 10. **Temperature.** Aim the temperature sensor towards the battery casing (Maintain distance of 5cm)
- Select **Next**



E164372

 NOTE: TESTING

- 11. **Testing.** The screen displays clock hand's rotating, the EXP-1080 will automatically advance when test has completed



E164373

NOTES:

 SURFACE CHARGE

 If there is no surface charge this step will not show. **Go to next step**


- 11a. **Surface Charge.** This next step is an additional surface charge test required if the voltage is above 12.4v with a low CCA measured. Ensure the **ignition state is on**. Switch on the headlights (high beam) until EXP-1080 shows **Turn off headlights** then return ignition state to off

X	BATTERY CHARGE	
1	<input checked="" type="radio"/> BEFORE CHARGING	
2	<input type="radio"/> AFTER CHARGING	
BACK	↑↓	NEXT


E164374


NOTES:

 BATTERY CHARGE

 If the state of charge is sufficient this step will not show. **Go to next step**

- 11b. **Battery Charge.** Select **Before Charging** if battery has not been on a recommended mains charger for the recommended time shown on the results screen
- Select **After Charging** if battery has been on a recommended mains charger for the recommended time shown on the results screen

 NOTE: For a warranty claim you must supply both before and after test codes in the technical comments box when submitting the claim

X	TESTING
DEEP SCAN TECHNOLOGY	
	
PLEASE WAIT.....	

E164375



NOTE: DEEP SCAN TECHNOLOGY

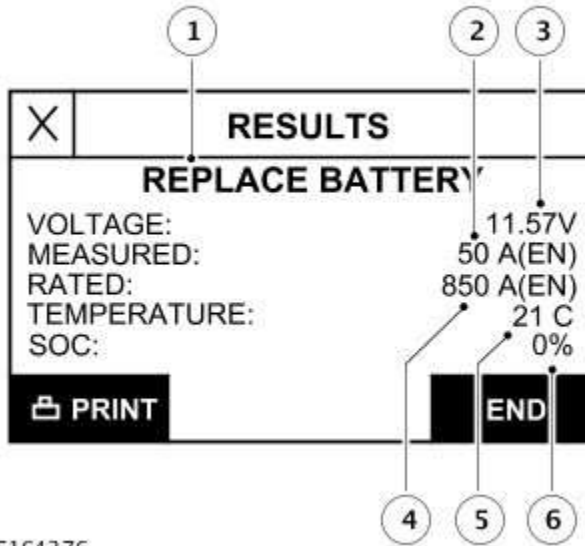
- This may not pop up on the screen and is automated program within the unit



NOTE: This test is automated and will show if required. **Go to next step**

- 12. **Testing.** The EXP-1080 will carry out the deep scan test, then automatically advance when test has completed

Number	Description
1	Battery test result
2	CCA (Measured capacity rating)
3	Voltage
4	CCA (Manually entered)
5	Temperature
6	State Of Charge (SOC)



E164376



NOTE: RESULTS

Test Result	Action
GOOD BATTERY	Test complete no action required
CHARGE AND RE-TEST	Charge battery using a recommended mains charger (minimum 50 amp) until charging complete. Retest. If the result is the same replace battery
REPLACE BATTERY / BAD CELL BATTERY	Replace battery. Do Not Recharge
UNABLE TO COMPLETE TEST	Disconnect battery from vehicle and re-test

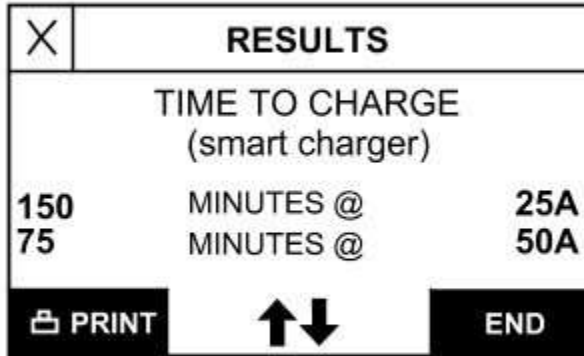


E164377

NOTES:

 TEST CODE

 Battery test code, must be given if a battery, starter motor or generator is exchanged under warranty



E164378

- 12b. If test result equals "Charge and Re-test" scroll down using the arrow keys to **Time To Charge** screen and follow the **50AMP** charge time for all vehicles apart from **Defender** which can be charged with a 25Amp charger
- **Results.** From the result display use the arrow keys on the control panel to view the test code
- The test code **must** be quoted with every battery claim under warranty

Flooded Battery Care Point

If the vehicle is equipped with a flooded battery, ensure the replacement battery is a flooded battery of the same specification (cold cranking amperage (CCA) / amp hour rating (Ah)) as the original battery

Under no circumstances should you fit a flooded battery to a vehicle that originally had an AGM battery, unless formally instructed by Jaguar/Land Rover

AGM Battery Care Point

If the vehicle is equipped with an absorbed glass mat (AGM) battery, ensure the replacement battery is a AGM battery of the same specification (cold cranking amperage (CCA) / amp hour rating (Ah)) as the original battery, unless formally instructed by Jaguar/Land Rover

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Battery, Mounting and Cables - Battery Disconnect and Connect

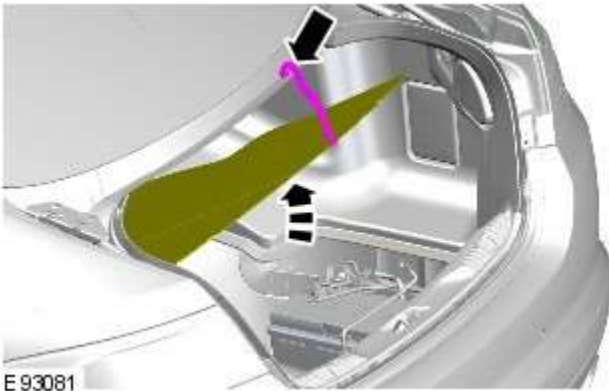
General Procedures


Disconnect

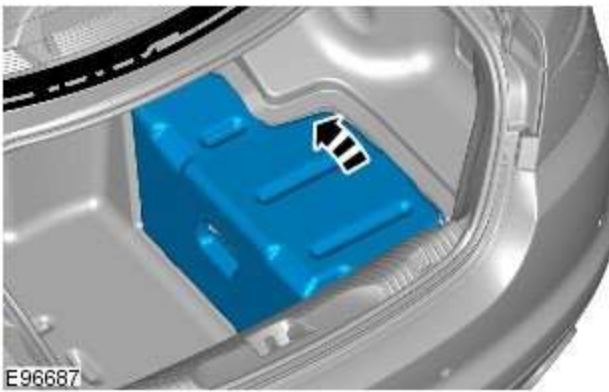
1. Refer to: [Battery and Battery Charging Health and Safety Precautions](#) (100-00 General Information, Description and Operation).

2. Obtain and record the audio unit preset radio frequencies.

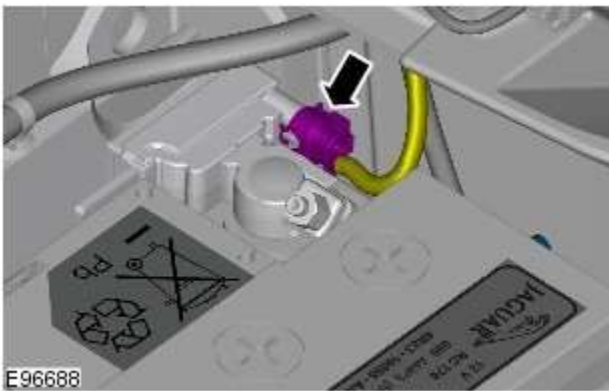
3.

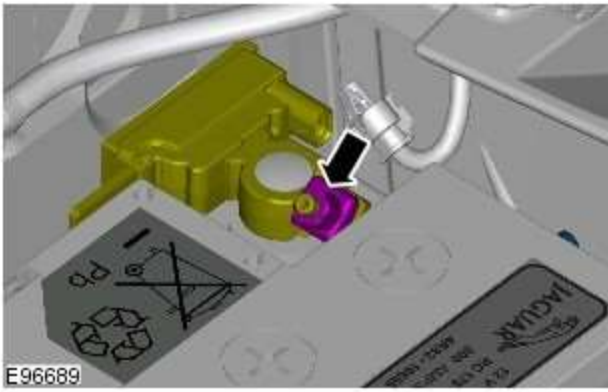


4.  NOTE: Where fitted.

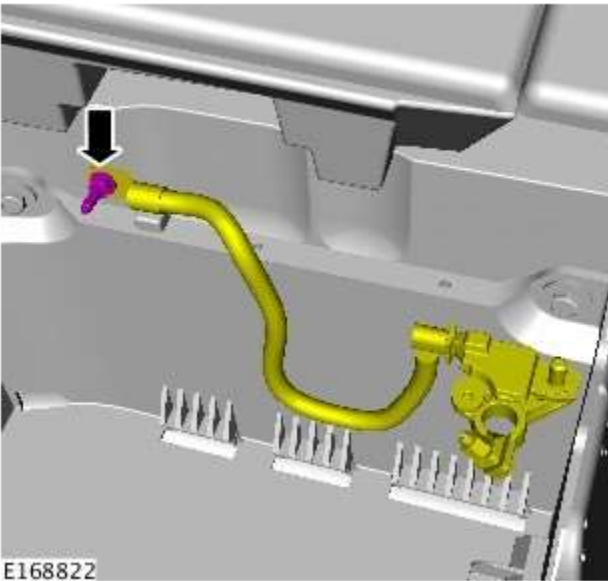



5.  CAUTION: Take extra care not to damage the wiring harness.

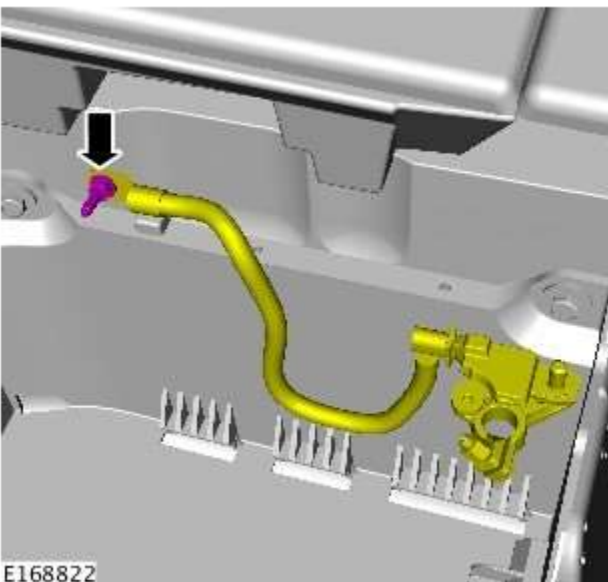





6.



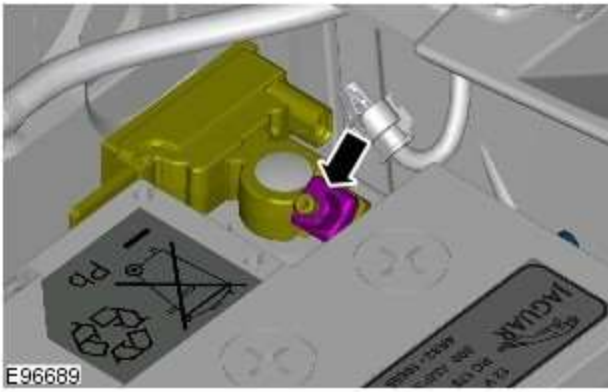
7.  CAUTION: Make sure that the battery negative cable does not move when detaching the negative terminal from the battery.



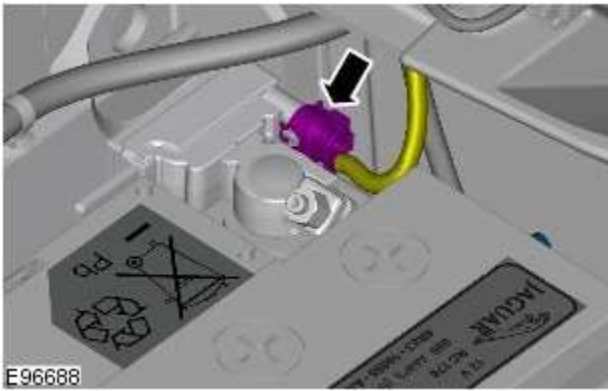
Connect

1.  CAUTION: Make sure that the battery negative cable to the body retaining bolt is not loose and fully tightened.

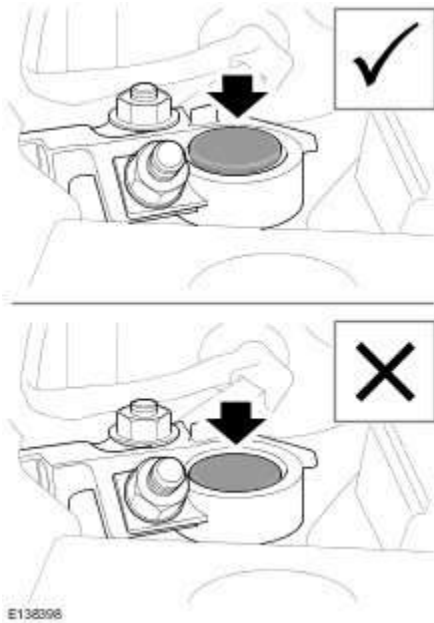
Torque: 9 Nm




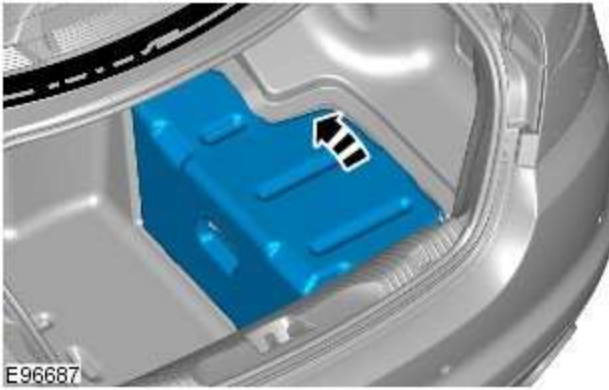
2. Torque: 6 Nm




3.



4.  NOTE: Make sure that both the positive and negative battery terminals are correctly located.



5.  NOTE: Where fitted.

6. NOTE: This step is only necessary when installing a new component.

Using the Jaguar approved diagnostic equipment, reset the battery monitoring system.

7. Refer to: [Door Window Motor Initialization](#) (501-11 Glass, Frames and Mechanisms, General Procedures).

8. Enter the audio unit preset radio frequencies.

9. Reset the clock to the correct time.

10. Start the engine and allow to idle until the engine reaches normal operating temperature.

11. Switch the engine off.

Battery, Mounting and Cables - Battery

Removal and Installation

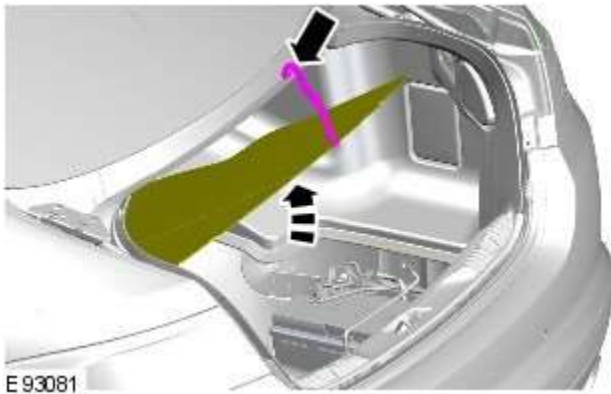
Removal




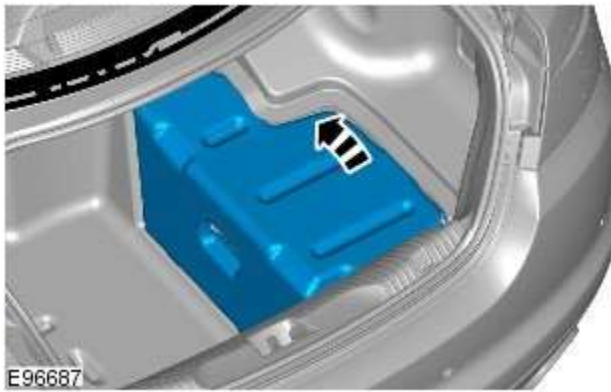
NOTE: Removal steps in this procedure may contain installation details.

1. Obtain and record the audio unit preset radio frequencies.

- 2.

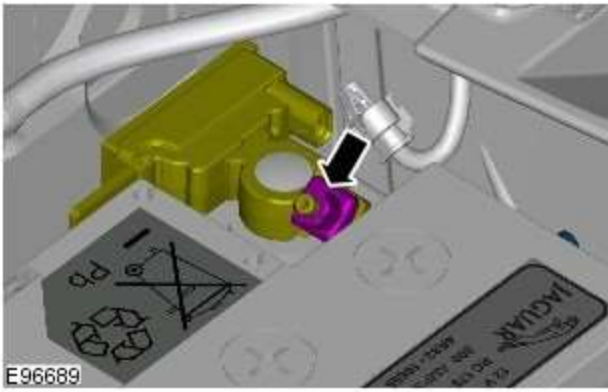


3.  NOTE: Where fitted.

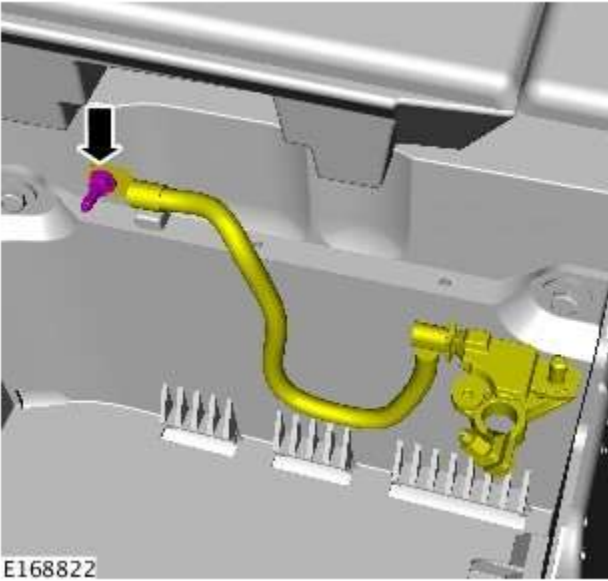



- 4.

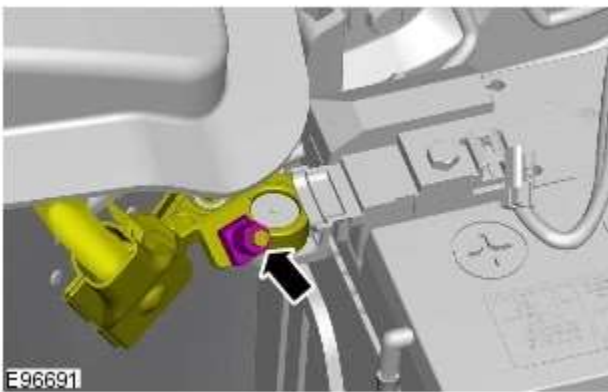




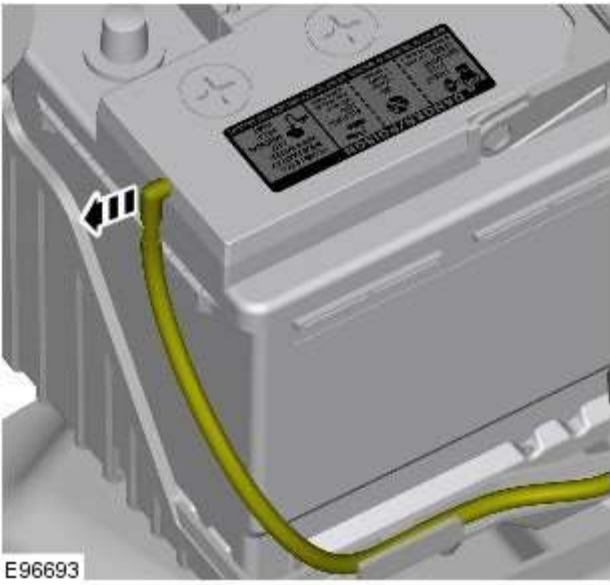
5. Torque: 6 Nm



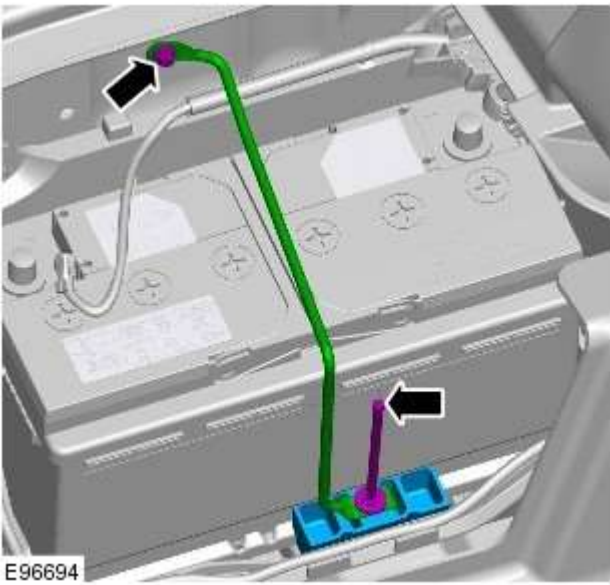
6.  CAUTION: Make sure that the battery negative cable does not move when detaching the negative terminal from the battery.



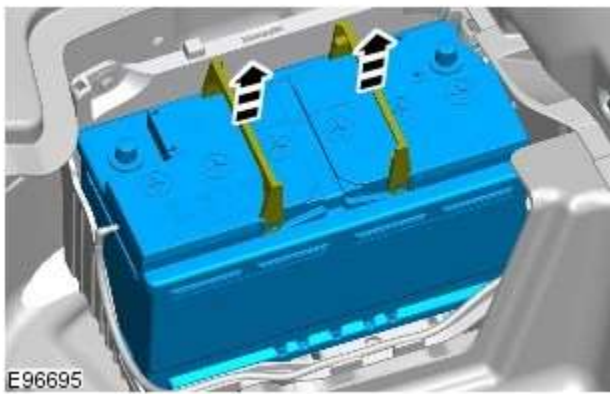
7. Torque: 6 Nm



8.

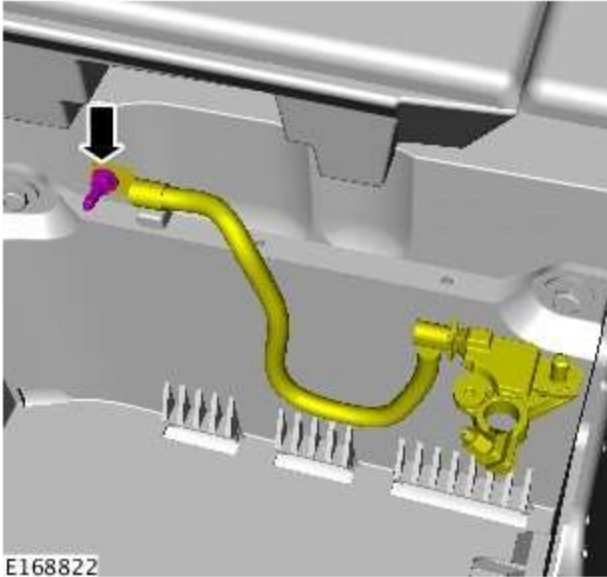



9. Torque: 13 Nm



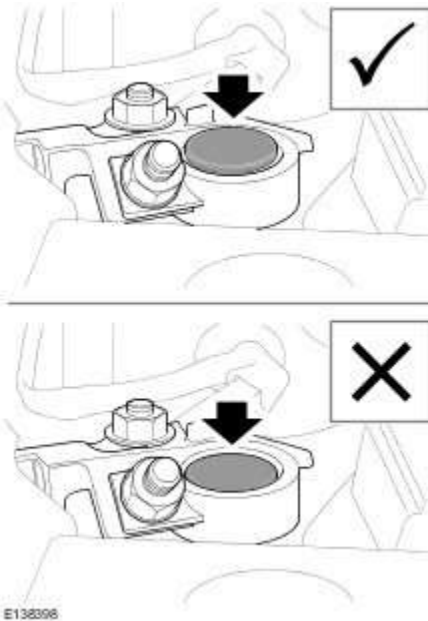
10.


Installation




1.  **CAUTION:** Make sure that the battery negative cable to the body retaining bolt is not loose and fully tightened.

Torque: 9 Nm



2.  **NOTE:** Make sure that both the positive and negative battery terminals are correctly located.

To install, reverse the removal procedure.

3.  **NOTE:** This step is only necessary when installing a new component.

Using the Jaguar approved diagnostic equipment, reset the battery monitoring system.

4. Refer to: [Door Window Motor Initialization](#) (501-11 Glass, Frames and Mechanisms, General Procedures).

5. Enter the audio unit preset radio frequencies.

6. Reset the clock to the correct time.

7. Start the engine and allow to idle until the engine reaches normal operating temperature.

8. Switch the engine off.

Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol -

Description	Nm	lb-ft	lb-in
Generator retaining bolts	47	35	-
Battery positive cable retaining nut	12	9	-

Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Generator -

Component Location

Description and Operation

COMPONENT LOCATION



E118331

Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Generator -

Overview

Description and Operation

OVERVIEW

On 5.0L V8 vehicles (naturally aspirated and supercharger), the charging system consists of a 150 Amp output generator and regulator assembly. The generator and regulator assembly generates electrical power for the vehicle electrical system and maintains the battery in a charged state.

When the engine is running the generator produces an alternating current, which is converted to a direct current internally. The output from the generator is controlled by the voltage regulator (located inside the generator) and then supplied to the battery through the main battery positive cable. The generator is mounted on the front right side of the engine and driven at approximately 3 times engine speed by the accessory drive belt.

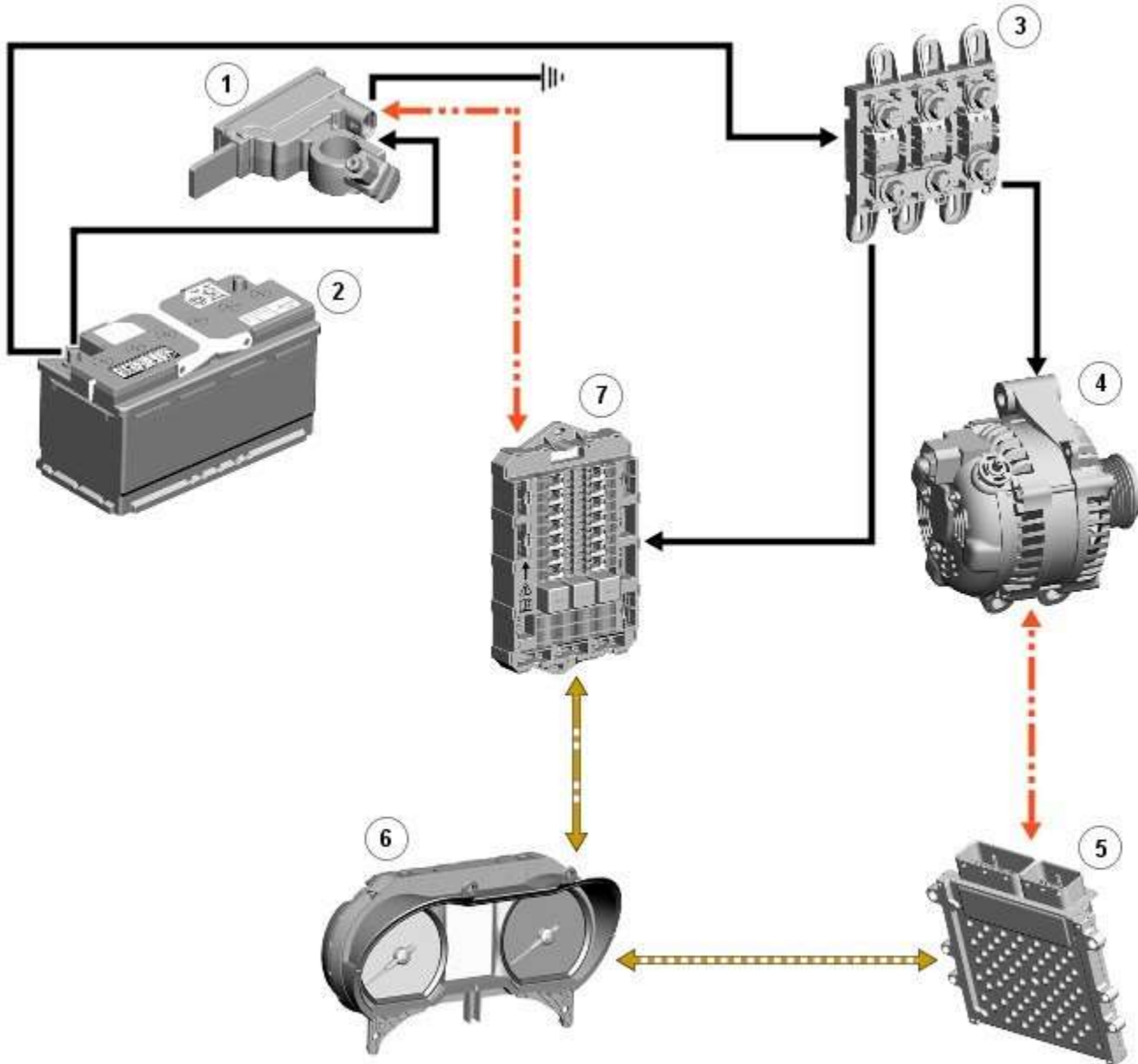
Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Generator - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus; **N** = Medium speed CAN bus; **O** = LIN (local interconnect network) bus

D

E118332



Item	Description
1	Battery monitoring system module
2	Battery
3	BJB (battery junction box)
4	Generator and regulator
5	ECM (engine control module)
6	Instrument cluster
7	RJB (rear junction box)

System Operation

GENERAL

The output voltage required from the generator and regulator is calculated by the battery monitoring system. For additional information refer to Battery, Mounting and Cables 414-01.

The battery monitoring system signals the calculated voltage to the [ECM](#) via the [RJB](#) and the instrument cluster. The [ECM](#) then transmits the calculated voltage to the generator and regulator on the [LIN](#) bus connection.

The [ECM](#) will over-ride the voltage value requested by the battery monitoring system if it detects a fault in the generator and regulator. The [ECM](#) also signals the instrument cluster to display a warning message if it detects a fault with the generator and regulator. For additional information refer to Instrument Cluster 413-01.

Component Description

GENERATOR AND REGULATOR

The regulator provides a controlled variable voltage output from the generator. Two electrical terminals are provided on the outer casing of the generator. One terminal supplies the [DC \(direct current\)](#) voltage output from the generator to the battery positive terminal. The second terminal provides the [LIN](#) bus connection between the regulator and the [ECM](#).

Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Generator V8 S/C 5.0L Petrol

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

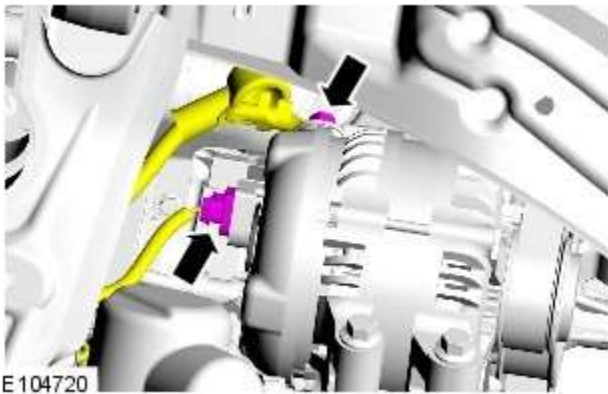
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



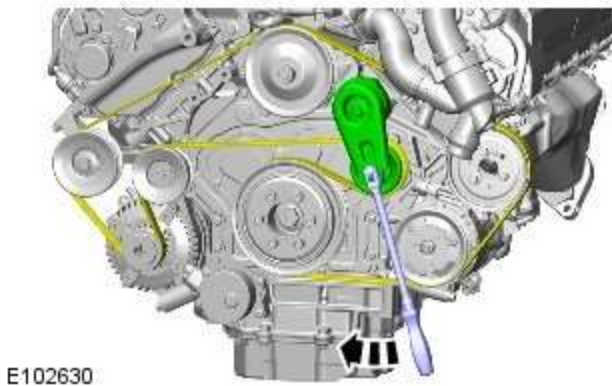
2. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

4. Torque: 12 Nm



- 5.





6.  NOTE: Tighten the bolts in the indicated sequence.
Torque: 48 Nm

Installation

1. To install, reverse the removal procedure.

Information and Entertainment System - General Information - Navigation System Map Updates

Description and Operation

Map Update Applicability - DVD/USB

Vehicle	Pre - 10MY	10 MY	11 MY	12MY	13MY	14MY
XK	DVD	DVD	DVD	DVD	DVD	DVD
F-Type	-	-	-	-	-	USB
XF	DVD	DVD	DVD	USB	USB	USB
XJ	-	USB	USB	USB	USB	USB
Freelander	DVD	DVD	DVD	DVD	USB	USB
Discovery 3	DVD	-	-	-	-	-
Discovery 4	-	External HD Service Tool	External HD Service Tool	USB	USB	USB
Range Rover Evoque	-	-	-	USB	USB	USB
Range Rover Sport (L320)	DVD	External HD Service Tool	External HD Service Tool	USB	USB	USB
Range Rover Sport (L494)	-	-	-	-	-	USB
Range Rover (L322)	DVD	External HD Service Tool	External HD Service Tool	External HD Service Tool	-	-
Range Rover (L405)	-	-	-	-	USB	USB



NOTE: For vehicles using SD card navigation updates refer to SD Card Navigation Updates (Asia Navigation) below.

Mapping Regions

Region	Mapping Area
1	North America (USA, Canada and Mexico)
2	Western and Eastern Europe
3	Japan
4	Middle East (Bahrain, Jordan, Kuwait, Oman, Qatar, Saudi Arabia and UAE)
5	South Africa
6	South America (Brazil and Argentina)
7	Russia
8	Pacific (Australia and New Zealand)
9	South East Asia (Malaysia and Singapore)

DVD Map Updates



E 142913

Vehicles equipped with the 'remote' navigation module are supplied with a DVD map update which is loaded into and left in the navigation module. Map data is read directly from the DVD. This update can be carried out by the customer.

External HD Service Tool Map Updates



E142915

Discovery 4, Range Rover Sport and Range Rover vehicles, equipped with a HDD (hard disc drive) integrated into the touch screen, are updated at point of service. Dealers are supplied with a set of master pack map update DVD's which are loaded onto the dealer Jaguar/Land Rover approved diagnostic equipment. The map data is then loaded from the diagnostic equipment onto the navigation tool hard drive. The map data is loaded to the touch screen from the navigation tool hard drive.

The following process should be used to update the map data:



NOTE: The navigation update tool does not need the map data loading every time. This is only necessary when a new map update DVD is released.

- Using the approved Jaguar/Land Rover diagnostic equipment select the navigation update tool.



E142966

- Select **Setup** on the navigation update tool.



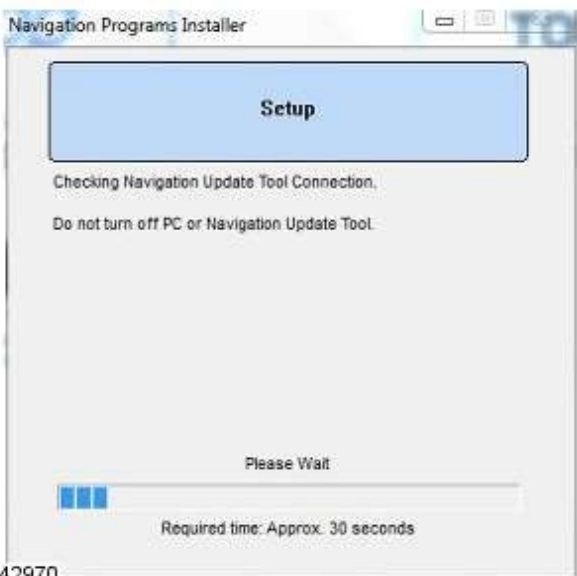
E142967

- Connect the navigation update tool to the Jaguar/Land Rover approved diagnostic equipment using the USB cable and press **Continue** proceed.



E142969

- The navigation update tool will then check the connection.



E142970

- Select your preferred language from the drop down menu then press **Save and Continue Setup** to proceed.



- When the navigation update tool confirms the initial setup is complete, press **Continue** to proceed.



- The navigation update tool will return to the main menu screen, select **Load Map Data** to proceed.



E142968

- Disconnect then reconnect, the USB cable connecting to the navigation update tool to the Jaguar/Land Rover approved diagnostic equipment, press **Continue** proceed.



E142973

- The navigation update tool will then check the connection.



E142974

- Insert map update disk 1 into the DVD drive of the Jaguar/Land Rover approved diagnostic equipment and press **Continue** proceed



E142975

- The navigation update tool will then read the map data



- Map data will then be copied from disk 1 to the Jaguar/Land Rover approved diagnostic equipment.



- Insert map update disk 2 into the DVD drive and press **Continue** proceed



E142978

- Map data will then be copied from disk 2 to the Jaguar/Land Rover approved diagnostic equipment.



E142979

- Map data is now ready to be uploaded onto the navigation update tool, press **Continue** proceed.



E142980

- The map data is now being uploaded onto the navigation update tool.



E142981

- Map data upload is now complete.



E142982

- Disconnect the navigation update tool from Jaguar/Land Rover approved diagnostic equipment.
- Connect the navigation update tool to the vehicle using the firewire cable.
- Select **Navigation** using the touch screen display soft key.



E 142956

- Select **Navigation Setup** using the touch screen soft key.



E 142957

- Select **Map Change** using the touch screen.



E 142958

- Select map region using the touch screen display and press **Map Data Update** to continue.



E 142959

- The current map data version and the proposed update map data versions will now be shown, Select the relevant region, using the related touch screen key to proceed.



E 142960

- Select **OK** to input the licence key using the touch screen.



E 142961

- Input the licence key using the touch screen display and press **OK** to continue.



E142962

- Select **OK** using the touch screen.



E142963

- The map update will begin.



E142964

- When the map update is complete a message will be shown in the touch screen, select **OK** to continue using the touch screen display soft key. The navigation system will restart with the new map data.



E142965

- Disconnect the navigation update tool from the vehicle.

USB Map Updates



E 142914

All Gen 2.1 equipped vehicles are supplied with a USB map updates, these updates can be carried out by the customer.

The following process should be used to update the map data:

- Start the engine.
- Navigate to the touch screen **Home Menu** screen.



E 142916

- Insert the USB memory stick containing the map data into the vehicle USB port.



E 142914

- Press **Continue** on the touch screen to proceed with the installation of the map update.




E 142917

- using the touch screen enter the licence code and press **OK** to proceed.



E 142918

- 
 NOTE: Selecting 'Cancel' returns to the 'Home Menu' screen, the map update will continue to run in the background. The map update will begin and a message will be displayed in the touch screen display advising that navigation is unavailable.



E142919

- Map update progress can be viewed as a percentage of the completed download in the **Home Menu** screen.



E142920

- When the update is complete a message is displayed informing the user.



E142921

- The navigation will restart upon completion of the map update.



NOTE: Remove USB stick immediately



E142922

- Turn off the engine.
- Exit, lock the vehicle and leave for at 15 minutes before using the navigation system.

Japanese Navigation

The Japanese satellite navigation system uses a separate navigation computer module.

The HDD in the ACM/IAM is not used for navigation downloads in this market.

Map updates are supplied in DVD format. The DVD is loaded into the navigation module. Map data is read directly from the DVD.

SD Card Navigation Updates (Asia Navigation)

The Asia market navigation system is an aftermarket unit.

Map updates are supplied in an SD card format. The SD card is loaded into the navigation module. Map data is read directly from the SD card.



NOTE: The following countries use SD card navigation updates.

Country
ANGOLA
ARGENTINA
AZERBAIJAN
BAHAMAS
BARBADOS
BENIN
BOTSWANA
BRAZIL
BRUNEI
BURUNDI
CAYMAN ISLANDS
CHILE
CHINA
COLOMBIA
EGYPT
FIJI
GHANA
HONG KONG
INDIA
INDONESIA
ISRAEL
JAMAICA
KENYA
LEBANON
LESOTHO
MALAWI
MALI
MAURITIUS
MONGOLIA
MOROCCO
MOZAMBIQUE
NAMIBIA
NIGER

Country
NIGERIA
PERU
PHILIPPINES
RWANDA
SENEGAL
SOUTH AFRICA
SRI LANKA
SAINT LUCIA
SWAZILAND
TAIWAN
TANZANIA
THAILAND
TOGO
TUNISIA
UGANDA
URUGUAY
VENEZUELA
VIETNAM
ZAMBIA
ZIMBABWE

Information and Entertainment System - General Information - Information and Entertainment System

Diagnosis and Testing

Principle of Operation

For a detailed description of the Information and Entertainment System, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (415-01A Information and Entertainment System)

[Audio System](#) (Description and Operation),
[Audio System](#) (Description and Operation),
[Audio System](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Information and entertainment module • Audio amplifier module • Integrated audio module • Portable audio interface module • Digital audio broadcast module • Integrated control panel • Touch screen display • Satellite radio module • Television module • Navigation system module • Telephone module • Compact disc player jammed, not loading • Scratched/dirty compact discs • Speakers 	<ul style="list-style-type: none"> • Fuses • Loose or corroded connector(s) • Information and entertainment module • Audio amplifier module • Integrated audio module • Portable audio interface module • Digital audio broadcast module • Integrated control panel • Touch screen display • Satellite radio module • Television module • Navigation system module • Telephone module • Speakers

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the relevant DTC Index.

Symptom Chart

Symptom	Display	Possible Causes	Action
Poor audio quality (all sources)	Display normal	<ul style="list-style-type: none"> • MOST harness connections loose • MOST harness connections contaminated • MOST harness misrouted <ul style="list-style-type: none"> - Too many bends - Bend radius less than 25mm 	<ul style="list-style-type: none"> • Check MOST harness connectors for security • Check MOST harness connectors for contamination • Check the routing of the MOST harness
Information and entertainment system inoperative	Touch screen blank or displaying a flashing logo	<ul style="list-style-type: none"> • MOST network fault 	<ul style="list-style-type: none"> • REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: (100-00 General Information)

[Diagnostic Trouble Code \(DTC\) Index - DTC: Audio Amplifier Module \(AAM\)](#) (Description and Operation),
[Diagnostic Trouble Code \(DTC\) Index - DTC: Integrated Audio Module \(IAM\)](#) (Description and Operation),
[Diagnostic Trouble Code \(DTC\) Index - DTC: Infotainment Control Module \(ICM\)](#) (Description and Operation),
[Diagnostic Trouble Code \(DTC\) Index - DTC: Integrated Control Panel \(FCIMB\)](#) (Description and Operation),
[Diagnostic Trouble Code \(DTC\) Index - DTC: Satellite Digital Audio Radio System Module \(SARM\)](#) (Description and Operation),
[Diagnostic Trouble Code \(DTC\) Index - DTC: Digital Audio Broadcast Module \(DABM\)](#) (Description and Operation),
[Diagnostic Trouble Code \(DTC\) Index - DTC: Hybrid Digital Radio Control Module \(HDRCM\)](#) (Description and Operation),
[Diagnostic Trouble Code \(DTC\) Index - DTC: Touch Screen Display \(FCDIM\)](#) (Description and Operation),
[Diagnostic Trouble Code \(DTC\) Index - DTC: Television Module \(TVM\)](#) (Description and Operation),
[Diagnostic Trouble Code \(DTC\) Index - DTC: Portable Audio Interface Control Module \(PAICM\)](#) (Description and Operation).

Information and Entertainment System - General Information - Cellular Phone

Diagnosis and Testing

Principle of Operation

For a detailed description of the Cellular Phone System, refer to the relevant Description and Operation sections in the workshop manual.

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Microphone • Bluetooth antenna 	<ul style="list-style-type: none"> • Electrical connectors • Wiring harness for damage or corrosion • Fuses

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the relevant DTC Index.

Symptom Chart

Symptom	Action
Unable to pair	<ul style="list-style-type: none"> • GO to Pinpoint Test A.
Not Auto Connecting	<ul style="list-style-type: none"> • GO to Pinpoint Test B.
No Audio to 3rd Party	<ul style="list-style-type: none"> • GO to Pinpoint Test C.
No Audio from 3rd Party	<ul style="list-style-type: none"> • GO to Pinpoint Test D.
No Audio	<ul style="list-style-type: none"> • GO to Pinpoint Test E.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B1A5613	Antenna	<ul style="list-style-type: none"> Bluetooth antenna circuit - open circuit 	Refer to the electrical circuit diagrams and check blue tooth antenna circuit for open circuit
B1D7984	Microphone Input	<ul style="list-style-type: none"> Signal amplitude < minimum 	Refer to the electrical circuit diagrams and test microphone input circuit for short/open circuit. Check integrated audio module for related DTCs and refer to relevant DTC Index
U1A0088	Private Communication Network	<ul style="list-style-type: none"> Bluetooth phone module internal communications failure 	Suspect the module. Check and install a new telephone module as required, refer to the new module/component installation note at the top of the DTC Index
U210000	Initial Configuration Not Complete	<ul style="list-style-type: none"> Initial configuration not complete 	Re-configure the RJB using the manufacturer approved diagnostic system. If DTC remains, carry out CAN network integrity tests using the manufacturer approved diagnostic system
U210100	Control Module Configuration Incompatible	<ul style="list-style-type: none"> Configuration incompatible 	Re-configure the RJB using the manufacturer approved diagnostic system. If DTC remains, suspect the telephone module. Check and install a new telephone module as required, refer to the new module/component installation note at the top of the DTC Index
U300044	Control Module	<ul style="list-style-type: none"> Data memory failure 	Re-configure the telephone module. If the DTC remains, suspect the telephone module. Check and install a new telephone module as required, refer to the new module/component installation note at the top of the DTC Index
U300045	Control Module	<ul style="list-style-type: none"> Program memory failure 	Re-configure the telephone module. If the DTC remains, suspect the telephone module. Check and install a new telephone module as required, refer to the new module/component installation note at the top of the DTC Index
U300055	Control Module	<ul style="list-style-type: none"> Incorrect car configuration data received 	Re-configure the RJB using the manufacturer approved diagnostic system. Clear DTC and re-test. If the DTC remains suspect the telephone module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U300098	Control Module	<ul style="list-style-type: none"> Component or system over temperature 	Check for additional DTCs and refer to DTC Index. Clear DTC and re-test/monitor condition for re-occurrence
U300362	Battery Voltage	<ul style="list-style-type: none"> Mis-match in battery voltage, of 2 volts or more, between telephone module and RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

Pinpoint Tests

PINPOINT TEST A : UNABLE TO PAIR	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: 'NO PHONE FITTED' DISPLAY	
NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the bluetooth function is activated and the telephone handset is placed within the vehicle cabin area.	
1	Carry out checks to determine if 'No Phone Fitted' is shown on vehicle display.
	Is 'No Phone Fitted' displayed? Yes GO to A2. No Locate the connected telephone and if not Customer telephone, disconnect from the system.
A2: TELEPHONE BLUETOOTH DEVICE SEARCH	
1	Carry out Bluetooth device search using Customer handset.

	<p>Is 'Jaguar' identified in Bluetooth device list?</p> <p>Yes Select device from list, then continue with diagnosis.GO to A3.</p> <p>No Carry out further Bluetooth device search, to a maximum of 4 times, waiting approximately 20 seconds between searches. If 'Jaguar' still not identified in Bluetooth device list, set ignition status to OFF, wait approximately 30 seconds and set ignition status to ON. Carry out further Bluetooth device search, to a maximum of 4 times, waiting approximately 20 seconds between searches. If 'Jaguar' still not identified in Bluetooth device list, contact your local in market support for further assistance.</p>
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A3: TELEPHONE HANDSET ERROR

	<p>1 Check for any error shown on the telephone handset when 'Jaguar' is selected from the Bluetooth device list.</p>
	<p>Was an error immediately shown on the telephone handset?</p> <p>Yes Wait approximately 10 seconds then re-attempt selection, to a maximum of 4 times, waiting approximately 10 seconds between each attempt. If error still being displayed, contact your local in market support for assistance.</p> <p>No Enter PIN '1313' then continue with diagnosis.GO to A4.</p>


A4: PIN ENTRY STATUS


	<p>1 Check for successful PIN entry.</p>
	<p>Was PIN entry successful?</p> <p>Yes GO to A5.</p> <p>No Wait approximately 10 seconds then re-attempt PIN entry, to a maximum of 4 times, waiting approximately 10 seconds between each attempt. If PIN entry is still un-successful, contact your local in market support for assistance.</p>


A5: 'NO PHONE FITTED' DISPLAY

	<p>1 Carry out checks to determine if 'No Phone Fitted' is still shown on vehicle display.</p>
	<p>Is 'No Phone Fitted' still displayed?</p> <p>Yes From the telephone handset, select the connect option for the 'Land Rover' device identified in the Bluetooth device list. If 'No Phone Fitted' is still displayed, suspect a telephone handset fault. Carry out Pinpoint test again using known good telephone handset.</p> <p>No The telephone is paired and connected to the system. No further action is required for this symptom.</p>

PINPOINT TEST B : NOT AUTOMATICALLY CONNECTING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: BLUETOOTH MODULE PAIRED DEVICE LIST	
 <p>NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the bluetooth and auto connect functions are activated and the telephone handset is placed within the vehicle cabin area.</p>	
	<p>1 Carry out checks to determine if the Customer telephone is shown in the Bluetooth Module paired device list.</p>
	<p>Is the Customer telephone in the Bluetooth Module paired device list?</p> <p>Yes GO to B2.</p> <p>No Carry out Unable to Pair Pinpoint Test.GO to A.</p>
B2: CUSTOMER HANDSET PAIRED DEVICE LIST	
	<p>1 Carry out checks to determine if the Bluetooth Module is shown in the Customer telephone paired device list.</p>
	<p>Is the Bluetooth Module in the Customer telephone paired device list?</p> <p>Yes GO to B3.</p> <p>No Carry out Unable to Pair Pinpoint Test.GO to A.</p>
B3: CUSTOMER TELEPHONE IN POSITION 1	
	<p>1 Carry out checks to determine if the Customer telephone is in position 1 in the Bluetooth Module paired device list.</p>
	<p>Is the Customer telephone in position 1?</p> <p>Yes GO to B4.</p> <p>No Advise Customer that auto connection will only be attempted with the device that is shown in position 1 in Bluetooth Module paired device list.</p>
B4: CHECK FOR DTC B1A56-13	
	<p>1 Using Manufacturer approved diagnostic system, check for DTC B1A56-13.</p>

	<p>Is DTC B1A56-13 logged?</p> <p>Yes Carry out remedial actions as outlined in DTC Index. If symptom remains, contact your local in market support for assistance.</p> <p>No GO to B5.</p>
B5: BLUETOOTH CONNECTION	
	<p>1 Carry out checks to determine if Bluetooth connection icon is shown on Customer Bluetooth telephone screen but shows 'No Phone Fitted' on vehicle screen.</p>
	<p>Is Bluetooth connection icon shown on the Customer handset but 'No Phone Fitted' displayed on vehicle screen?</p> <p>Yes GO to B9.</p> <p>No GO to B6.</p>
B6: 'LAND ROVER' AUTHORISATION	
<p> NOTE: Some handsets may require operator intervention to manually authorise connection.</p>	
	<p>1 Carry out checks to determine if 'Land Rover' is authorised in the Customer Bluetooth telephone device list menu.</p>
	<p>Is 'Land Rover' authorised in the Customer Bluetooth telephone device list menu?</p> <p>Yes GO to B7.</p> <p>No Advise customer that 'Land Rover' needs to be authorised in the Customer Bluetooth telephone device list menu, or operator intervention may be required to manually authorise connection.</p>
B7: SEARCH FOR DEVICES SCREEN	
	<p>1 Select the search for devices button on the vehicle display.</p>
	<p>Does pressing the search for devices button bring up the searching screen on the vehicle display?</p> <p>Yes Contact your local in market support for assistance.</p> <p>No GO to B8.</p>
B8: CYCLE IGNITION AND CHECK SEARCH FOR DEVICES SCREEN	
	<p>1 Lock vehicle (wait 60s) before unlocking and turning Ignition status back to ON.</p>
	<p>Does pressing the search for devices button bring up the searching screen on the vehicle display?</p> <p>Yes No further action required for this Symptom. Possible intermittent fault.</p> <p>No Contact your local in market support for assistance.</p>
B9: PAIRED DEVICE	
	<p>1 Check Customer telephone paired device list to establish which device the Customer telephone is connected to.</p>
	<p>Is the Customer telephone connected to the vehicle?</p> <p>Yes Lock vehicle (wait 60s) before unlocking and turning Ignition status back to ON. If Not Automatically Connecting, contact you local in market support for assistance.</p> <p>No Using the Customer telephone controls, disconnect from the currently connected device and delete from paired device list. Lock vehicle (wait for 60s) before unlocking and turning Ignition status to ON. If Not Automatically Connecting, contact your local in market support for assistance.</p>

PINPOINT TEST C : NO AUDIO TO THIRD PARTY	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: MICROPHONE DIAGNOSTIC TROUBLE CODES (DTCS)	
<p> NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.</p>	
	<p>1 Using the Manufacturer approved diagnostic system, check for any logged microphone DTCs in Audio Front Control module.</p>
	<p>Is DTC B1D79-01 logged?</p> <p>Yes Carry out diagnosis of electrical failure as advised in Action column of DTC Index.</p> <p>No Contact your local in market support for assistance.</p>

PINPOINT TEST D : NO AUDIO FROM THIRD PARTY	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: 'IN CALL' DISPLAY	



NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.

	1 Carry out checks to determine if 'In Call' is shown on the vehicle display.
	Is vehicle display showing 'In Call'?
	Yes Contact your local in market support for assistance.
	No Call has ended. No further action is required for this symptom.

PINPOINT TEST E : NO AUDIO

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: AUDIO FROM THIRD PARTY	



NOTE: Prior to continuing with any diagnosis, ensure that the Customer telephone and level of software is included on the JLR approved list, the telephone battery is fully charged and in a serviceable condition, the telephone is placed within the vehicle cabin area and is connected to the vehicle via bluetooth.

	1 Establish from Customer feedback/symptom if there is Audio from the Third Party.
	Is there Audio from the Third Party?
	Yes GO to E2.
	No Refer to the 'No Audio From Third Party' Pinpoint test. GO to D.

E2: AUDIO TO THIRD PARTY

	1 Establish from Customer feedback/symptom if there is Audio to the Third Party.
	Is there Audio to the Third Party?
	Yes GO to E3.
	No Refer to the 'No Audio To Third Party' Pinpoint test. GO to C.

E3: CD OR RADIO AUDIO

	1 Establish from Customer feedback/symptom if there is Audio from the CD or Radio.
	Is there Audio from the CD or Radio?
	Yes GO to E4.
	No Suspect MOST ring fault, refer to electrical circuit diagrams and check/rectify MOST ring as necessary.

E4: TELEPHONE HANDSET AUDIO

	1 Establish from Customer feedback/symptom if there is Audio from the telephone handset.
	Is there Audio from the telephone handset?
	Yes Ensure vehicle is parked. Disconnect and reconnect handset. If issue not resolved, contact your local in market support for assistance.
	No Contact you local in market support for assistance.

Information and Entertainment System - General Information - Navigation System

Diagnosis and Testing

Principle of Operation

For a detailed description of the Navigation System, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (415-01 Information and Entertainment System)

Navigation System (Description and Operation),
 Navigation System (Description and Operation),
 Navigation System (Description and Operation),
 Video System (Description and Operation),
 Video System (Description and Operation),
 Video System (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Information and entertainment module • Audio amplifier module • Integrated audio module • Portable audio interface module • Digital audio broadcast module • Integrated control panel • Touch screen display • Satellite radio module • Television module • Navigation system module • Telephone module • Compact disc player jammed, not loading • Scratched/dirty compact discs • Speakers 	<ul style="list-style-type: none"> • Fuses • Loose or corroded connector(s) • Information and entertainment module • Audio amplifier module • Integrated audio module • Portable audio interface module • Digital audio broadcast module • Integrated control panel • Touch screen display • Satellite radio module • Television module • Navigation system module • Telephone module • Speakers

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the relevant DTC Index.

DTC Index

Navigation System Module



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B1A8911	Satellite Antenna	<ul style="list-style-type: none"> Satellite antenna circuit - short to ground 	Check satellite antenna connections. Refer to the electrical circuit diagrams and check satellite antenna circuit for short to ground
B1A8913	Satellite Antenna	<ul style="list-style-type: none"> Satellite antenna circuit - open circuit 	Check satellite antenna connections. Refer to the electrical circuit diagrams and check satellite antenna circuit for open circuit
B1A891B	Satellite Antenna	<ul style="list-style-type: none"> Satellite antenna - circuit resistance above threshold 	Suspect navigation module. Check and install a new navigation system module as required, refer to the new module/component installation note at the top of the DTC Index
B1D5514	Antenna #2	<ul style="list-style-type: none"> TMC/VICS FM antenna circuit - open circuit 	Check TMC/VICS FM antenna connections. Refer to the electrical circuit diagrams and check TMC/VICS FM antenna circuit for open circuit
B1D5614	Antenna #3 Circuit	<ul style="list-style-type: none"> VICS antenna circuit - open circuit 	Check VICS antenna connections. Refer to the electrical circuit diagrams and check VICS antenna circuit for open circuit
U200531	Vehicle Speed	<ul style="list-style-type: none"> Missing vehicle speed message 	Check ABS module and Instrument Cluster for speed related DTCs and refer to relevant DTC Index
U300049	Control Module	<ul style="list-style-type: none"> Internal electronic failure 	Suspect the navigation module. Check and install a new navigation system module as required, refer to the new module/component installation note at the top of the DTC Index
U300055	Control Module	<ul style="list-style-type: none"> Incorrect car configuration data received 	Using the manufacturer approved diagnostic system check/amend the Car Configuration File parameter in block 2, byte 127 to match vehicle market/specification. If the DTC remains check navigation system module part number and ensure the correct component is installed to vehicle market/specification
U300087	Control Module	<ul style="list-style-type: none"> Missing message 	Re-configure the RJB using the manufacturer approved diagnostic system. Check navigation module for DTCs and refer to the DTC Index. Check CAN network integrity using the manufacturer approved diagnostic system
U300098	Control Module	<ul style="list-style-type: none"> Component or system over temperature 	Check for additional DTCs and refer to DTC Index. Clear DTC and re-test/monitor condition for re-occurrence
U300317	Battery Voltage	<ul style="list-style-type: none"> Circuit voltage above threshold 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U300362	Battery Voltage	<ul style="list-style-type: none"> Mis-match in battery voltage, of 2 volts or more, between navigation module and RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

Touch Screen Display (TSD)



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

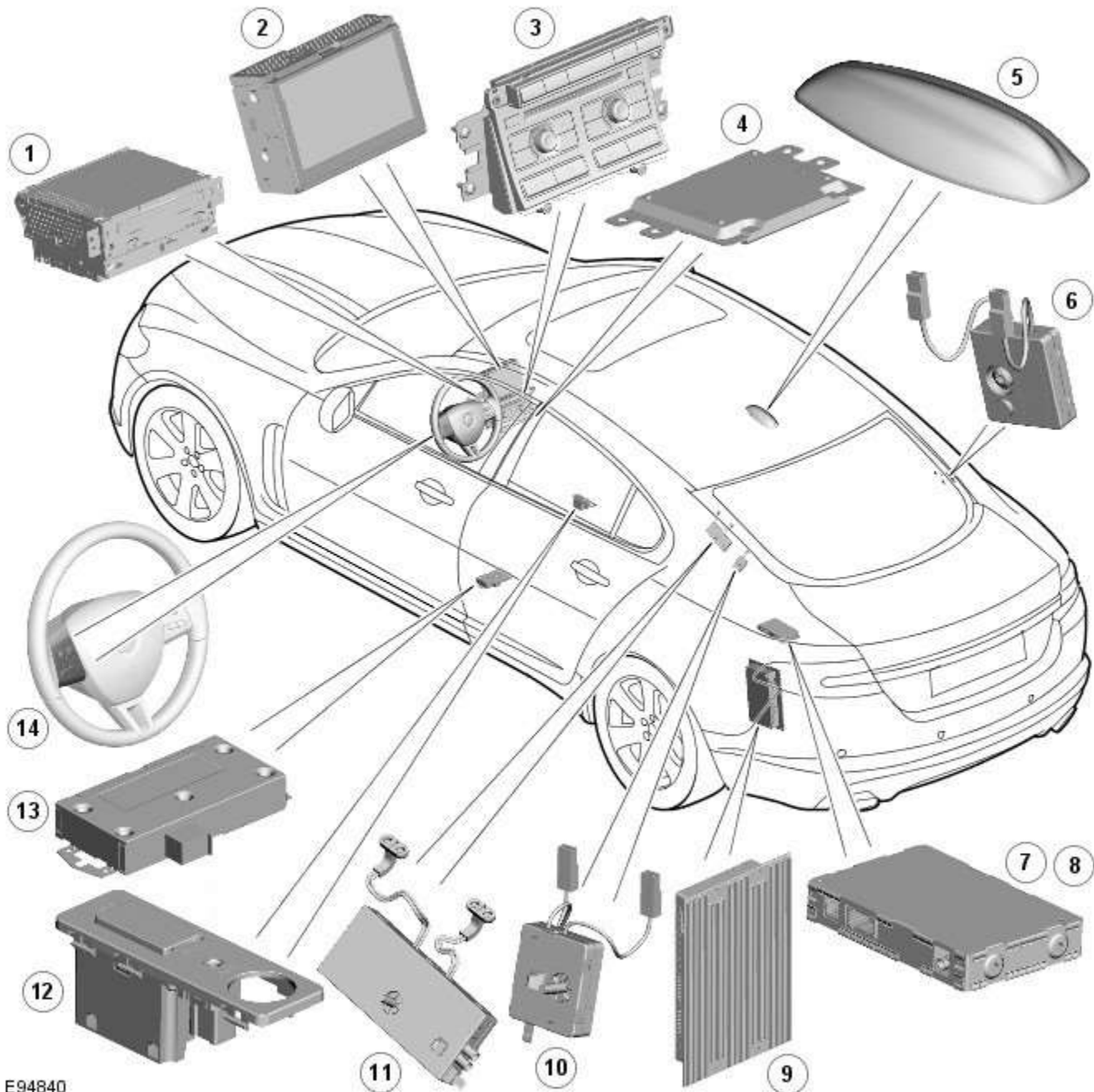
DTC	Description	Possible Cause	Action
B100E25	Video Input 'A'	<ul style="list-style-type: none"> • ODST Only - TV video synch mis-match 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B100F25	Video Input 'B'	<ul style="list-style-type: none"> • ODST Only - Reverse Camera video synch mis-match 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U1A0101	Communication Link	<ul style="list-style-type: none"> • ODST Only - cable from navigation module not correctly installed 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check electrical harness from navigation module is correctly installed
U1A0115	Communication Link	<ul style="list-style-type: none"> • TSD to navigation module circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check TSD to navigation module circuit for short to power, open circuit
U1A4B48	Control Module Processor B	<ul style="list-style-type: none"> • Supervision software failure 	Re-configure the TSD using the manufacturer approved diagnostic system
U300044	Control Module	<ul style="list-style-type: none"> • EEPROM, External RAM access failure 	Suspect the TSD, check and install a new TSD as required, refer to the new module/component installation note at the top of the DTC Index
U300048	Control Module	<ul style="list-style-type: none"> • Supervision software failure 	Re-configure the TSD using the manufacturer approved diagnostic system
U30004B	Control Module	<ul style="list-style-type: none"> • Touch panel backlight - high temperature detected 	Allow the system to cool, clear the DTC and check/monitor system for re-occurrence. If DTC re-occurs suspect the TSD. Check and install a new TSD as required, refer to the new module/component installation note at the top of the DTC Index
U300055	Control Module	<ul style="list-style-type: none"> • Incorrect Car Configuration Parameters received 	Check/amend the Car Configuration File using the manufacturer approved diagnostic system
U300087	Control Module	<ul style="list-style-type: none"> • Car Configuration File not received 	Check RJB for related DTCs and refer to relevant DTC Index. Check CAN and MOST networks, carry out the CAN and MOST network tests using the manufacturer approved diagnostic system
U300098	Control Module	<ul style="list-style-type: none"> • TSD internal temperature over limit 	Allow the system to cool, clear the DTC and check/monitor system for re-occurrence. If DTC re-occurs suspect the TSD. Check and install a new TSD as required, refer to the new module/component installation note at the top of the DTC Index
U300316	Battery Voltage	<ul style="list-style-type: none"> • Circuit voltage below threshold 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U300317	Battery Voltage	<ul style="list-style-type: none"> • Circuit voltage above threshold 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

Information and Entertainment System -

Description	Nm	lb-ft	lb-in
Audio antenna unit to "D" pillar retaining bolts	9	-	80
Digital Radio antenna pod retaining nuts	5	-	48
Amplifier retaining nuts	7	-	62
Information and entertainment display retaining bolts	2	-	17
Information and entertainment display mounting bracket to Information and entertainment display retaining bolts	3	-	26
Information and entertainment module retaining bolts	3	-	26
Instrument panel speaker retaining screws	2	-	18
Steering wheel audio control switch retaining screws	3	-	26
Subwoofer amplifier retaining nuts	7	-	62
Subwoofer speaker retaining bolts	6	-	53

Information and Entertainment System - Audio System - Component Location

Description and Operation



E94840

Item	Description
1	IAM (integrated audio module)
2	Touch-screen
3	ICP (integrated control panel)
4	ICM (information control module)
5	Roof pod antenna module (DAB band L and satellite radio receiver antennas)
6	RF filter
7	DAB (digital audio broadcasting) radio receiver (Optional - Europe only)
8	Satellite radio digital receiver (Optional - NAS only)
9	Power amplifier (Not fitted to the Jaguar Sound System)
10	RF filter

11	Diversity antenna module (AM/FM and DAB band III antennas)
12	Portable audio interface console (Optional)
13	Portable audio module (Optional)
14	Steering wheel remote audio controls

Information and Entertainment System - Audio System - Overview

Description and Operation

OVERVIEW

The audio system is available in three versions.

- Jaguar Sound System
- Jaguar 320W Premium Sound System
- Bowers & Wilkins 440W Surround Sound System

The audio systems are instrument panel mounted and combine the radio tuner with a slot loading single or 6 disc [CD \(compact disc\)](#) player. All units have AM/FM diversity reception, through the diversity antenna module, which receives signals from antennas located in the heated rear window. The audio systems have various levels of user control through the Touch-screen, ICP (integrated control panel) and steering wheel control panel. The Jaguar Sound System (base audio unit) with single [CD](#) player is only compatible with standard [CD](#)'s. All other versions of [CD](#) player are compatible with standard [CD](#)s and [CD](#)s with MP3 or WMA (windows media audio) files.

A portable audio module allows for the connection of a range of portable audio devices to the car's audio system. The portable audio module is controlled through the IAM (integrated audio module) and Touch-screen with play back through the car's speaker system. The introduction of this system allows the user to import their personal portable media player to interface with the car, including iPod and other MP3 players, or USB mass storage devices such as memory sticks. MP3 players can also be controlled through the Touch-screen if they are configured as mass storage devices. Details of how to do this will be contained in the manufacturers instructions.

The chosen audio device can be plugged into the car using an interface panel located in the floor console between the front seats. The interface includes a 3.5mm auxiliary jack-plug socket, a 12-volt power supply, a dedicated iPod connector with charging function, plus a USB2 connector which allows connectivity for a wide variety of USB devices. The USB port also provides a charging function although it **does not** support a USB hub. The maximum charging current supplied is 500ma. The user can connect an iPod and USB device at the same time, changing the source via the Touch-screen. The non selected source will still charge.

The Jaguar Sound System is the basic audio system which comprises of an IAM (integrated audio module) with no external amplifier and 8 speakers.

The Jaguar 320W Premium Sound System has the addition of an AUD 8 power amplifier and a 9 speaker system.

The Bowers & Wilkins 440w Surround Sound System additions include an AUD 12 power amplifier, a Dolby Pro-Logic 2 7.1 Surround Sound System, and 14 speakers.

DAB (digital audio broadcasting) is available for most European markets and gives access to digital radio channels for better sound quality and enhanced functionality depending on local service availability. The DAB (digital audio broadcasting) module is located in the luggage compartment. The system receives reception signals from the following sources to ensure optimum signal strength.

- DAB band L antenna located in the roof pod antenna module
- DAB band III antenna located in the heated rear window.

For NAS vehicles the digital format adopted is satellite radio which specifically links to the Sirius network. The system operates in the S-band frequency range, and as a result of the use of satellite transmission, has the ability to provide [CD](#) quality audio broadcasts over very large areas (typically continents). The satellite radio receiver is located in the luggage compartment. The system receives reception signals from the satellite radio antenna located in the roof pod module.

Primary user control of the audio system is via the ICP (integrated control panel) and the Touch-screen which are located in the center of the instrument panel. Control signals from the ICP (integrated control panel) are relayed on the medium speed [CAN \(controller area network\)](#) bus to the ICM (information control module). The ICM (information control module) relays the control signals to the rest of the audio system on the MOST (media oriented systems transport) ring. The ICM (information control module) is the timing master for the MOST (media oriented systems transport) ring and also hosts a gateway function between the medium speed [CAN](#) bus and the MOST (media oriented systems transport) ring. Audio output signals on the Jaguar 320W Premium Sound System and Bowers & Wilkins 440W Surround Sound System are sent on the MOST (media oriented systems transport) ring from the IAM (integrated audio module) to the power amplifier for speaker output.

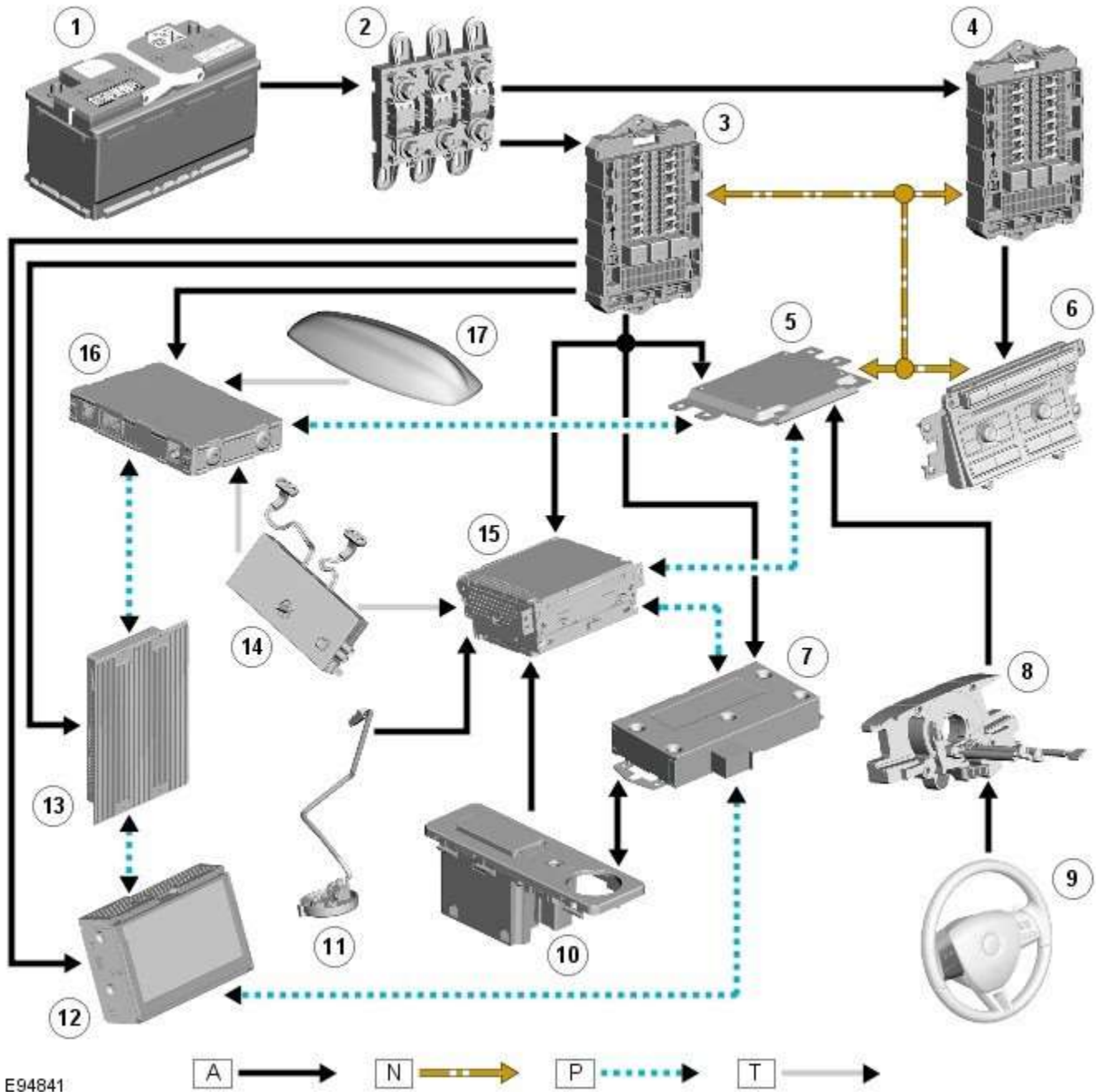
Information and Entertainment System - Audio System - System Operation and Component Description

Description and Operation

Control Diagram



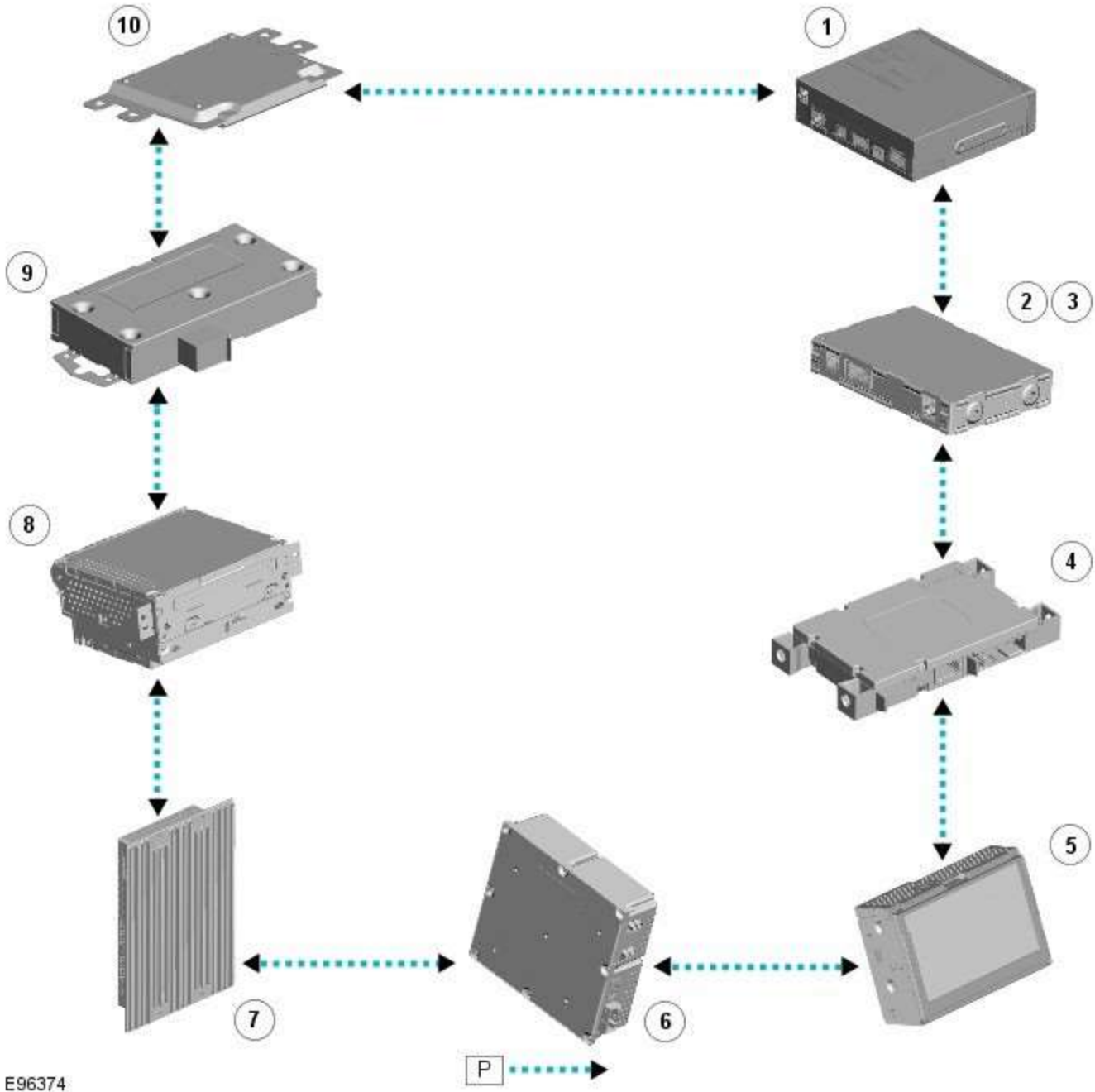
NOTE: A = Hardwired; N = Medium Speed CAN (controller area network) bus; O = LIN bus; P = MOST ring; T = Coaxial



E94841

Item	Description
1	Battery
2	BJB (battery junction box)
3	RJB (rear junction box)
4	CJB (central junction box)
5	ICM (information control module)
6	ICP (integrated control panel)

7	Portable audio module
8	Clock spring
9	Steering wheel remote audio controls
10	Portable audio interface panel
11	Microphone
12	Touch-screen
13	Power amplifier
14	Diversity antenna module
15	IAM (integrated audio module)
16	DAB receiver/Satellite Radio receiver (Note: There is no co-axial link from the diversity antenna module to the satellite radio receiver)
17	Roof pod



E96374

Item	Description
1	Navigation computer (Optional)
2	DAB (digital audio broadcasting) radio receiver (Optional - Europe only)

3	Satellite Radio digital receiver (Optional - NAS only)
4	Telephone control module (Optional)
5	Touch-screen
6	TV tuner (Optional)
7	Power amplifier (Not fitted to the Jaguar Sound System)
8	IAM (integrated audio module)
9	Portable audio module (Optional)
10	ICM (information control module)

System Operation

AUDIO SYSTEM OPERATION

The components of the audio/infotainment system are all connected on the MOST (media orientated systems transport) ring. The MOST (media orientated systems transport) ring is a fibre optic communications bus for multimedia applications. Audio and control information is passed around the MOST (media orientated systems transport) ring and can be picked up by any of the systems units. For example, radio station tuning/selection input by the vehicle user into the Touch-screen is sent along the MOST (media orientated systems transport) ring and collected by the IAM (integrated audio module) which then selects the requested radio station.

MOST (media orientated systems transport) technology uses a plastic optical fibre which forms a network connecting the audio and multimedia system components. Each component in the ring is connected to the plastic optical fibre through a device known as a FOT (fibre optical transceiver). Each FOT (fibre optical transceiver) has two optical connections; one connection is sensitive to light and is the input, the second connection forms the light source and is the output. The system operates by connecting the output from one FOT (fibre optical transceiver) to the input of another FOT (fibre optical transceiver).

The light signals are sent in one direction only and are formed in the following way:

- Electrical signals are converted into an electrical current
- The current then drives an **LED (light emitting diode)** in the FOT (fibre optical transceiver) to produce a high intensity red light
- The **LED** transmits the light through a fibre optic cable
- A photo diode in the FOT (fibre optical transceiver) at the opposite end of the fibre optic cable detects the light.

The following components may be connected to the MOST ring dependant on the vehicle equipment level:

- IAM (integrated audio module)
- Touch-screen
- ICM (information control module)
- DAB (digital audio broadcasting) radio receiver (Optional - Europe only)
- Satellite radio digital receiver (Optional - NAS only)
- Power amplifier (Not fitted to the Jaguar Sound System)
- Portable audio module (Optional)
- Telephone control module (Optional)
- Navigation computer (Optional)
- TV tuner (Optional)



NOTE: Do not view the red light directly

MOST is a synchronous network. A timing master supplies the clock information and all other devices on the network synchronize their operation to this clock. The timing master for the MOST (media orientated systems transport) network on this vehicle is the ICM (information control module). This unit also controls and manages the MOST (media orientated systems transport) ring and the system components.

An Optical Bus tester is used in conjunction with the Jaguar diagnostic system to diagnose the MOST (media orientated systems transport) system. The Optical Bus tester emits a visible, high intensity red light which can be connected into the ring at any point to test the ring integrity. Disconnecting a MOST (media orientated systems transport) connector will reveal if the high intensity red light is visible.

If a break occurs in the MOST (media orientated systems transport) ring fault codes are stored in the ICM (information control module) which can be retrieved using the Jaguar diagnostic system equipment.

With reference to the audio system information and signal transfer the instrument cluster is the gateway between the high and medium speed **CAN** bus communication protocols. The ICM (information control module) is the gateway between medium speed **CAN** and the MOST (media orientated systems transport) systems.

A typical example of information transfer is vehicle speed information from the **ABS (anti-lock brake system)** module used to control the automatic volume control function. The vehicle speed information from the **ABS** module is sent on the high speed **CAN** network and collected by the instrument panel gateway. The signal is passed to the medium speed **CAN** and onto the ICM (information control module) gateway. The ICM (information control module) calculates the volume adjustment required. The corrected audio volume level signal is sent on the MOST (media orientated systems transport) network to the IAM (integrated audio module) or Power amplifier (dependant on vehicle equipment level) for output to the speaker system.

AUDIO SYSTEM GATEWAY FUNCTIONS

With reference to the audio system information and signal transfer the instrument cluster is the gateway between the high and medium speed [CAN](#) bus communication protocols. The ICM is the gateway between medium speed [CAN](#) and the MOST systems.

A typical example of information transfer is vehicle speed information from the ABS (anti-lock brake system) module used to control the automatic volume control function. The vehicle speed information from the ABS module is sent on the high speed [CAN](#) network and collected by the instrument panel gateway. The signal is passed to the medium speed [CAN](#) network and onto the ICM gateway. The ICM calculates the volume adjustment required. The corrected audio volume level signal is sent on the MOST network to the IAM or Power amplifier (dependant on vehicle equipment level) for output to the speaker system.

AUDIO SYSTEM USER CONTROLS

Touch-Screen



E96378

Item	Description
1	Touch-screen
2	Home menu button
3	Touch-screen on/off button

The Touch-screen forms the basis of the audio system. It communicates with the rest of the audio/infotainment system on the MOST ring and allows control of the audio system and other infotainment systems from a single point.

The Touch-screen communicates with the IAM on the MOST ring and provides the primary user interface and display of the audio system controls. No configuration procedure is required if the touch-screen is replaced.

Calibration of the Touch-screen using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

The touch-screen provides user control of the following systems:

System	Functions
Audio	Radio display AM/FM or DAB, auxiliary and portable audio, digital TV or CD (compact disc)
Climate control	Air conditioning, distribution, seats, heated steering wheel, automatic air recirculation
Telephone	Digit dialer, phone book, last ten calls (made, received, missed)
Navigation	Destination, stored locations, navigation setup, route options
Vehicle	Security, parking, valet mode, trip computer, clock, brightness, contrast, system settings, vehicle settings, display settings

Integrated Control Panel



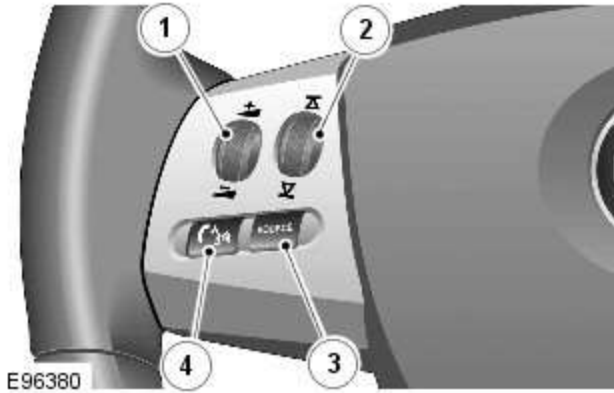
E96379

Item	Description
1	Touch-screen
2	CD load
3	CD load and eject slot
4	Seek up
5	Settings button
6	Audio system on/off and volume control
7	Audio source
8	Seek down
9	Eject

The ICP duplicates many of the touch-screen audio user control features. Any volume setting made whilst in audio, TV, phone, navigation or voice activation mode will be memorized for that system. The ICP communicates with the ICM on the medium speed [CAN](#). The ICM converts control/command signals from the ICP and then distributes the information onto the MOST system to the audio system and other information and entertainment systems.

No configuration procedure is required if the ICP is replaced. There is no option to calibrate the ICP using the Jaguar approved diagnostic equipment.

Steering Wheel Controls



Item	Description
1	Volume adjustment
2	Change pre-set radio stations or CD tracks
3	Select audio source
4	Audio mute control/JaguarVoice control

Additional control of the audio system is available in the form of steering wheel mounted switches which are located on the left hand side of the steering wheel. The four switches provide for volume adjustment, change pre-set radio stations or [CD](#) tracks, select audio source and finally audio mute control. The mute control is also used for JaguarVoice control.

The steering wheel audio control switches are hardwired through the clock spring to the ICM. The ICM processes the analogue signals from the switches into digital signals. The digital signals are then passed from the ICM onto the MOST system to control the requested audio functions.

AVC (automatic volume control) controls the audio volume in relation to vehicle speed. As vehicle speed increases the audio level is adjusted to compensate for extra road and vehicle noise. There are three settings for AVC:

- Low
- Medium
- High

Setting of the AVC level is made using the audio controls. The default setting is medium.

The vehicle speed signal is used to enable the ICM to calculate the volume adjustment required. The vehicle speed signal is received over the [CAN](#). The signal is an average of the four wheel speed sensor signals. Should an invalid speed signal be received the AVC will not alter the output volume.

Component Description

INTEGRATED AUDIO MODULE



The IAM is located in the center console behind the ICP faceplate, and combines the radio tuner and [CD](#) player. The head unit controls which of the two sources is routed to the speakers. All tuner versions have AM/FM reception. Each audio system features auto-store, with a press and hold function to store selected channels as pre-sets. The standard search facility finds the nine strongest channels currently available, while search and manual tuning allow channels to be stored as above.

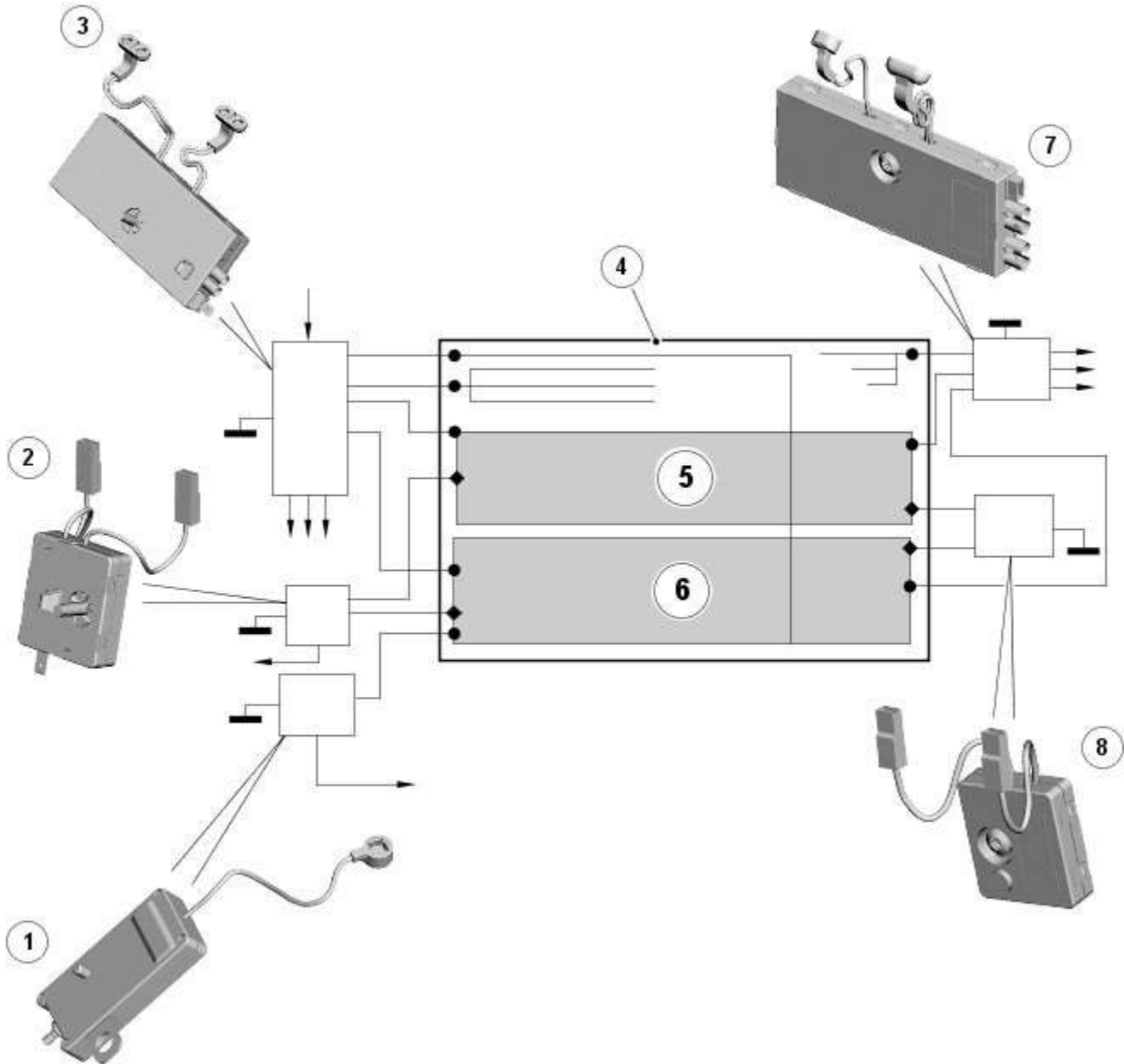
The Jaguar Sound System IAM uses an internal amplifier which directly drives the system speakers. The Jaguar 320W Premium Sound System and Bowers & Wilkins 440W Surround Sound System differs from the Jaguar Sound System with the addition of an external amplifier. Audio output signals from the IAM are sent on the MOST system to the external amplifier which drives the system speakers.

Depending on audio specification the slot-loading [CD](#) unit is either a single-disc type or six-disc auto-changer. The system automatically detects the [CD](#) format of the source (standard [CD](#), MP3 or WMA files) and offers a full range of options, presenting folders on the touch-screen, listed by albums and tracks, to browse as on a PC. Both versions have mix and repeat functions and the six-disc version displays disc names.

The IAM communicates on the MOST system with the rest of the audio system. If the IAM is replaced it must be configured as a new module using the Jaguar approved diagnostic equipment.

Calibration of the IAM using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

Audio Antennas



E96376

Item	Description
1	Single TV antenna module
2	RF filter
3	Diversity antenna module
4	Heated rear window
5	Heated rear window upper section

6	Heated rear window lower section
7	Triple TV antenna module
8	RF filter

The diversity antenna module, located on the left hand side of the heated rear window, receives signals from four antennas located in the heated rear window, where one antenna is dedicated as an AM antenna.

The diversity tuning system ensures that the strongest signals are used by the radio system to ensure the best possible FM reception. Using the three remaining receiving antennas serves to eliminate multipath signal distortion. Typically, the signal from the antenna with the least noise is chosen, and the other antennas are ignored.

The diversity antenna module is an interface between the antenna aerials in the heated rear window and audio system modules/tuners. It provides antenna signals to the AM/FM tuner in the IAM, to the DAB receiver and to the VICS (vehicle information and communication systems) or TMC (traffic message channel) in the navigation computer.

There are three different types of diversity antenna module fitted depending on the vehicle market and infotainment equipment specification:

- AM/FM with one co-axial output
- AM/FM and VICS/TMC with two co-axial outputs
- AM/FM, VICS/TMC and DAB band III with three co-axial outputs

The diversity antenna module receives a power supply from the IAM.

Vehicle or other component generated electromagnetic interference may cause unwanted disturbances in the radio and TV reception signals. The disturbance may interrupt, obstruct, or otherwise degrade or limit the effective performance of the circuit. It frequently affects the reception of AM radio in urban areas and can also affect FM radio and television reception, although to a lesser extent.

The RF filters, which act as RF isolators, are located on both sides of the heated rear window and are used to reduce the electromagnetic interference. The left hand side RF filter is connected across the heated rear window power supply and used to separate the DC (direct current) interference from the RF signals. The right hand side RF filter is used in conjunction with the TV antenna module (if fitted). If the TV system is not fitted the filter is linked directly to ground.

INFORMATION CONTROL MODULE



E96377

The ICM is located beneath the IAM in the center console. The unit performs a range of infotainment and some climate-control functions.

The ICM, which is the timing master of the MOST system; supplies clock information to all other devices on the network which synchronize their operation to this clock.

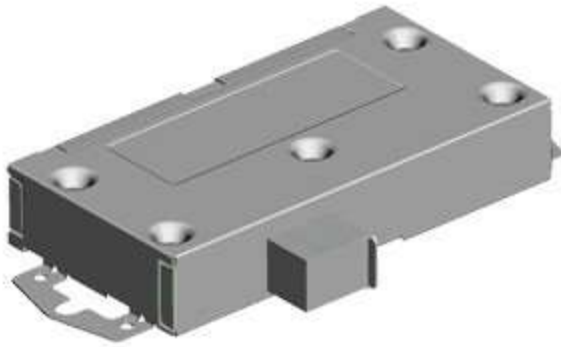
The unit also controls and manages the MOST ring and provides the allocations of channels, system power management, functionality and co-ordination of the other system components.

The system becomes operational when the vehicle is unlocked and a 'wake up' signal is received by the ICM on the medium speed [CAN](#). The ICM 'wakes up' all the control modules on the MOST system ready for immediate operation by the vehicle user.

If the ICM is replaced it must be configured as a new module using the Jaguar approved diagnostic equipment.

Calibration of the ICM using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

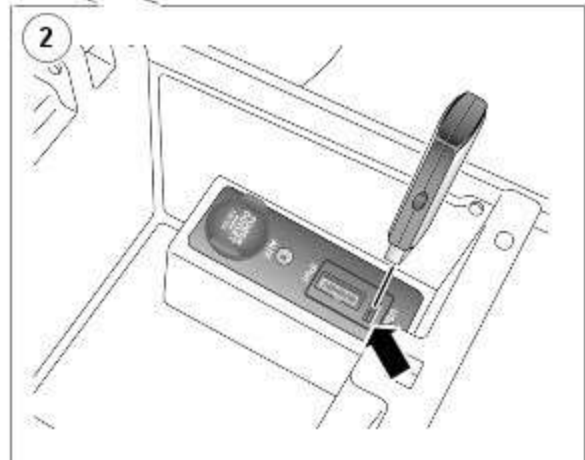
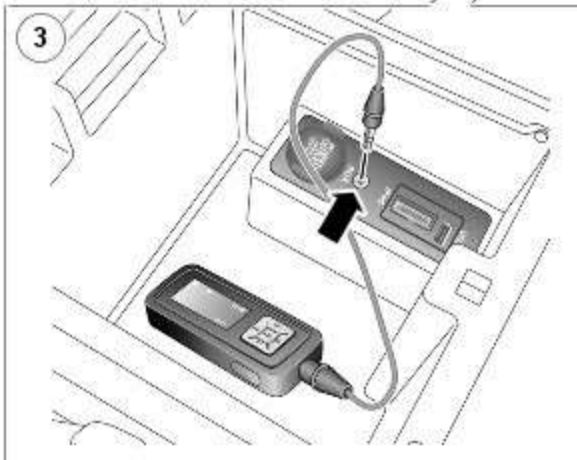
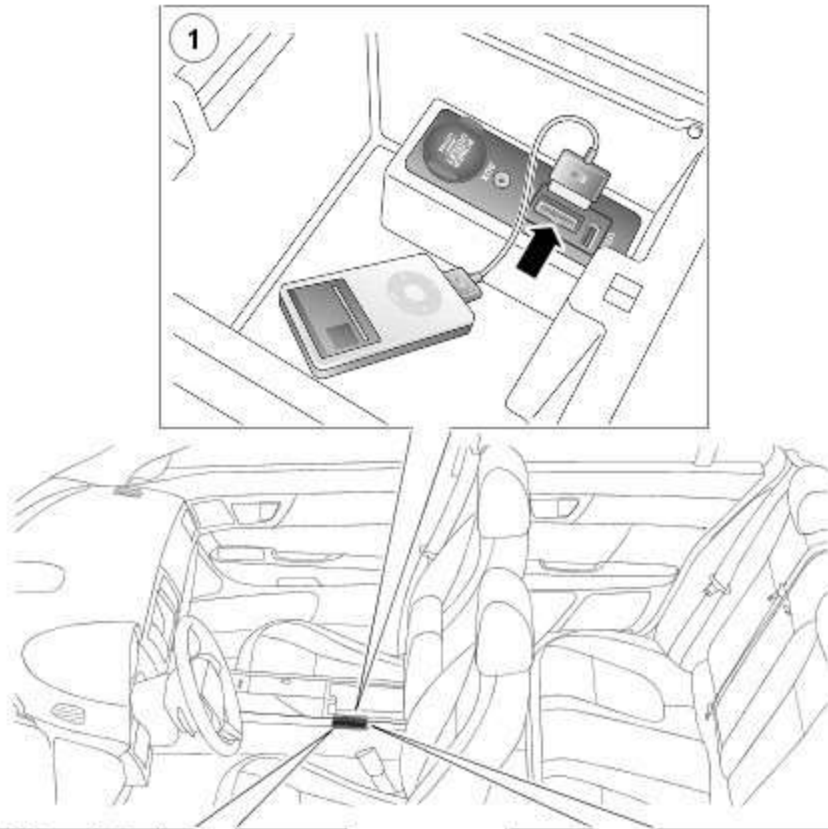
PORTABLE AUDIO MODULE



E96381

The portable audio module, located under the left hand front seat, allows for the connection, control and playback of a range of portable audio devices through the car's audio system.

No configuration procedure is required if the portable audio module is replaced. Calibration of the portable audio module using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.



E96382

Item	Description
1	iPod connection
2	USB connection
3	Auxiliary connection

The chosen audio device is plugged into the car using the interface panel located in the center console between the front seats. Vehicles with the optional iPod function are supplied with a bespoke iPod lead in the vehicle delivery pack .

A menu option is available through the Touch-screen audio section when selecting a portable audio device for operation through the vehicle audio system.

After the connection of an iPod or USB mass storage device the Touch-screen is used to operate and search the connected device. Due to safety regulations, the normal control interfaces of either the iPod or USB device are disabled when it is plugged into the interface panel.



NOTE: Some MP3 players have their own file system that is not supported by this system. To use the MP3 player it must be set to USB Removable Device or Mass Storage Device mode. The manufacturer's information should include details of this procedure. Only music that has been added to the device in this mode can be played via the vehicle's portable audio system.

Conversely, connection of any devices through the auxiliary connection cannot be controlled through the touch-screen and are

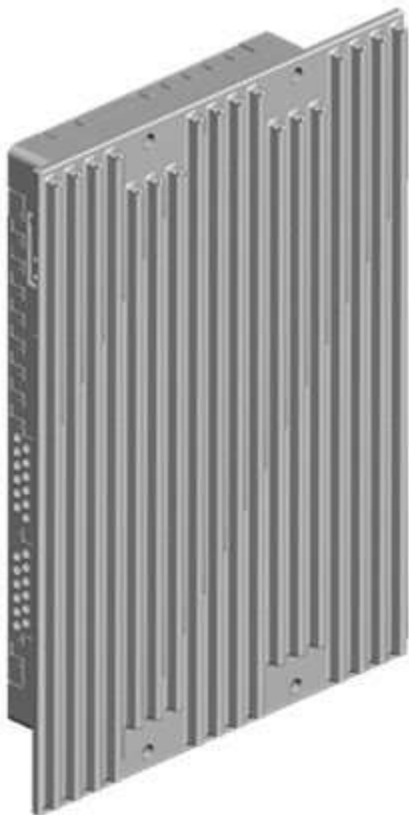
controlled through the device itself.



NOTE: The system will support devices with a storage capacity up to 256 GB which is approximately 65,000 audio tracks.

The wiring link harness between the portable audio module and interface panel consists of hardwired and digital connections for data and signal exchange. The MOST carries the communication signals and information between the portable audio module to the IAM and touch-screen. Audio output to the speaker system is controlled by the IAM or power amplifier depending on the audio system specification.

POWER AMPLIFIER



E96383

The audio system has three amplification options dependant on the audio system specification:

- IAM internal amplifier
- Alpine AUD 8
- Alpine AUD 12

The power amplifier is located in the left hand side of the luggage compartment and is connected to the audio system via the MOST bus. Speaker connections are hardwired.

If the power amplifier is replaced it must be configured as a new module using the Jaguar diagnostic equipment.

Calibration of the power amplifier using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

DIGITAL AUDIO BROADCASTING

DAB is a digital radio network designed to provide reliable, multi-service broadcasting for reception by mobile, portable and fixed receivers.

DAB provides a clear signal with minimal interference, hiss or fading. After a channel (or station) has been tuned and stored, it does not need retuning.



NOTE: Radio signals travel in a straight line so large obstacles, such as tall buildings, can shield the vehicle from the signal causing temporary loss of reception (known as dead spots).

Digital radio is transmitted from regional terrestrial transmitters. Some local digital radio channels are not available outside the range of a transmitter. To receive new local channels during vehicle movement around a country, the auto-tune function is used to build new channel lists.



NOTE: When the vehicle DAB radio is first used the system will not receive any digital stations until the auto-tune function has been completed.

Digital radio channels are organized into groups called ensembles (also known as multiplexes). Some individual channels may also provide a number of subchannels. For example, if several sports events are being held simultaneously, the channel may temporarily choose to broadcast each different event on a separate subchannel.

DAB is broadcast across Europe, Canada and parts of Asia. System transmission is via a terrestrial network, on two separate broadcasting bands:

- DAB band-L
- DAB band III

The DAB system requires additional components to be added to the audio system. DAB antennas and a receiver are fitted to allow reception of the service.

Operation of the DAB system is the same as the radio operation with selections made through the touch-screen and ICP to access and navigate the system functions.

The DAB receiver is a dedicated tuner which is controlled by the ICM on the MOST ring. The receiver processes the signals from the DAB antennas. Information is transmitted on the MOST ring and processed by the ICM. The processed information is sent out to the power amplifier or IAM (with internal amplifier) and broadcast through the speaker system.

No configuration procedure is required if the DAB receiver is replaced. Calibration of the DAB receiver using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

Digital Audio Broadcasting Antennas



E96385

Item	Description
1	Roof pod
2	Diversity antenna module

The DAB band III antenna is located in the heated rear window and is part of the diversity antenna module circuit. The two antenna circuits each have a co-axial connection to the DAB module.

DAB signals are transmitted on either DAB band III (174 - 240 MHz) or DAB band-L (1452 - 1492 MHz). Some countries may only use the band III signals, while others may only use the band-L signals. Some countries use both frequency ranges within the same geographical area. The type of DAB signal received depends on the vehicle market location.

The DAB antennas are designed with 50 ohm output impedance. The DAB receiver is fitted with 50 ohm fakra II connectors to ensure compatibility with the antenna. For optimum performance 50 ohm low loss coaxial cable is used between the antenna and receiver.

SATELLITE RADIO (NAS VEHICLES ONLY)



E96386

The digital radio format adopted for NAS vehicles is satellite radio. Satellite service providers transmit a signal from their up-link facility (which is the original point of transmission of data, voice or other information through an antenna system) to a satellite where the signal is then down linked to both the terrestrial repeater network and the individual satellite car radios. The radio switches between the satellite signal and the repeater network signal depending on the strength of the signal at any given time.

The Sirius satellite system comprises:

- Satellites
- Ground repeaters
- Up-link ground stations
- Radio receiver systems

The Sirius satellite radio system uses three satellites on an inclined elliptical orbit. This ensures that each satellite spends approximately 16 hours a day over the continent of the USA, with at least one satellite over the country at any one time.

The satellites beam their signals down to the ground where the signal is picked up by receivers or is transmitted to repeater stations to cover built up areas where the signal is obscured. The satellite service comprises over 100 channels of digital entertainment which is provided by subscription requiring a monthly payment.

Operation of the satellite radio system is the same as the radio operations with selections made through the Touch-screen and ICP to access and navigate the system functions.

The satellite radio receiver is a dedicated tuner which is controlled by the ICM on the MOST ring. The receiver filters the signals from the satellite radio antenna. Information is transmitted on the MOST ring and processed by the ICM. The processed information is sent out to the power amplifier or IAM (with internal amplifier) and broadcast through the speaker system.

No configuration procedure is required if the satellite radio receiver is replaced. Calibration of the satellite radio receiver using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

Satellite Radio Antenna



E96387

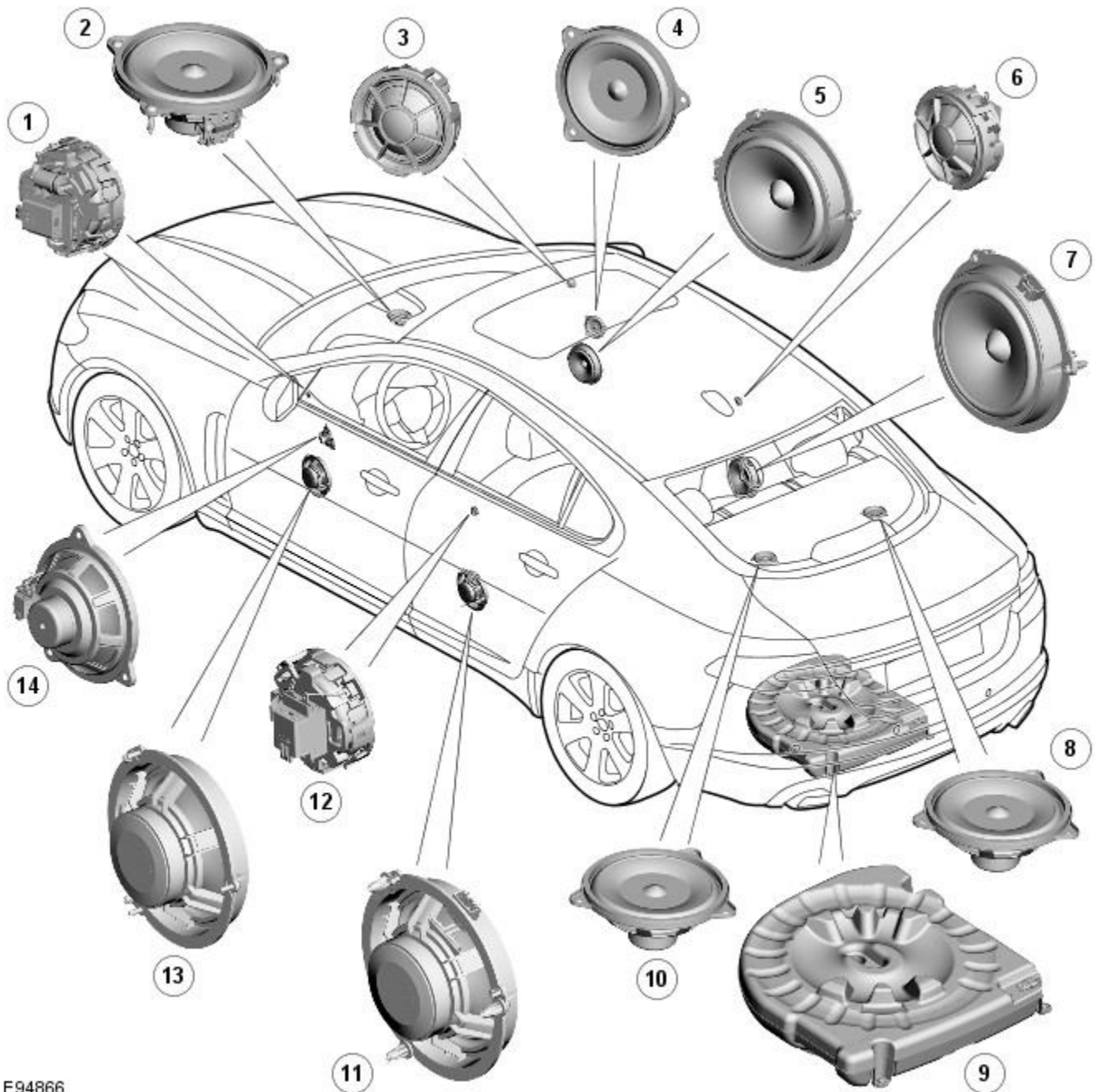
The satellite radio antenna is located in the roof pod and is shared with the navigation system [GPS \(global positioning system\)](#) antenna where fitted. The roof pod is located externally in a central position towards the rear of the roof.

Similar to the DAB system the satellite radio antenna is designed with 50 ohm output impedance. The satellite radio receiver is fitted with 50 ohm fakra II connectors to ensure compatibility with the antenna. For optimum performance 50 ohm low loss coaxial cable is used between the antenna and receiver.

The antenna is designed to receive one of two signals, using the strongest signal with the least distortion to process for audio output. For example, if the vehicle drives into a tunnel, the signal received will change from a satellite signal to a repeater station signal maintaining the strongest signal.

Information and Entertainment System - Speakers - Component Location

Description and Operation



E94866

ItemDescription

1	LH (left-hand) front tweeter speaker (All models)
2	Front center speaker (Bowers & Wilkins 440W Surround Sound System only)
3	RH (right-hand) front tweeter speaker (All models)
4	RH front mid-range speaker (Bowers & Wilkins 440W Surround Sound System only)
5	RH front mid-bass speaker (All models)
6	RH rear tweeter speaker (All models)
7	RH rear mid-bass speaker (All models)
8	RH rear full range speaker (Bowers & Wilkins 440W Surround Sound System only)
9	Subwoofer enclosure (Not fitted to Jaguar Sound System)
10	LH rear full range speaker (Bowers & Wilkins 440W Surround Sound System only)
11	LH rear mid-bass speaker (All models)
12	LH rear tweeter speaker (All models)
13	LH front mid-bass speaker (All models)
14	LH front mid-range speaker (Bowers & Wilkins 440W Surround Sound System only)

Information and Entertainment System - Speakers - Overview

Description and Operation

Overview

The vehicle has three levels of audio system available:

- Jaguar Sound System
- Jaguar Premium Sound System
- Bowers & Wilkins Surround Sound System

The Jaguar Sound System has 8 speakers, comprising an identical mid-bass and tweeter combination in each door. All speaker domes in this system are of standard textile construction. The speakers are driven directly by the IAM (integrated audio module) internal amplifier.

The Jaguar 320W Premium Sound System has 9 speakers including mid-bass and tweeters in the doors, adding a sub-woofer in the spare wheel well. The speakers are driven by an Alpine AUD 8 amplifier located in the [LH \(left-hand\)](#) side of the luggage compartment.

The Bowers & Wilkins 440W Surround Sound System uses an Alpine AUD 12 amplifier, a Dolby Pro-Logic 2 7.1 Surround Sound System and has 14 speakers. This layout adds a mid-range speaker to each front door while retaining a mid-bass and tweeter in each rear door. It also adds an instrument panel center speaker, 2 surround-effect speakers in the rear parcel shelf, and has the luggage compartment-mounted sub-woofer as the Jaguar 320W Premium Sound System. The speakers are driven by an AUD 12 power amplifier located in the luggage compartment.

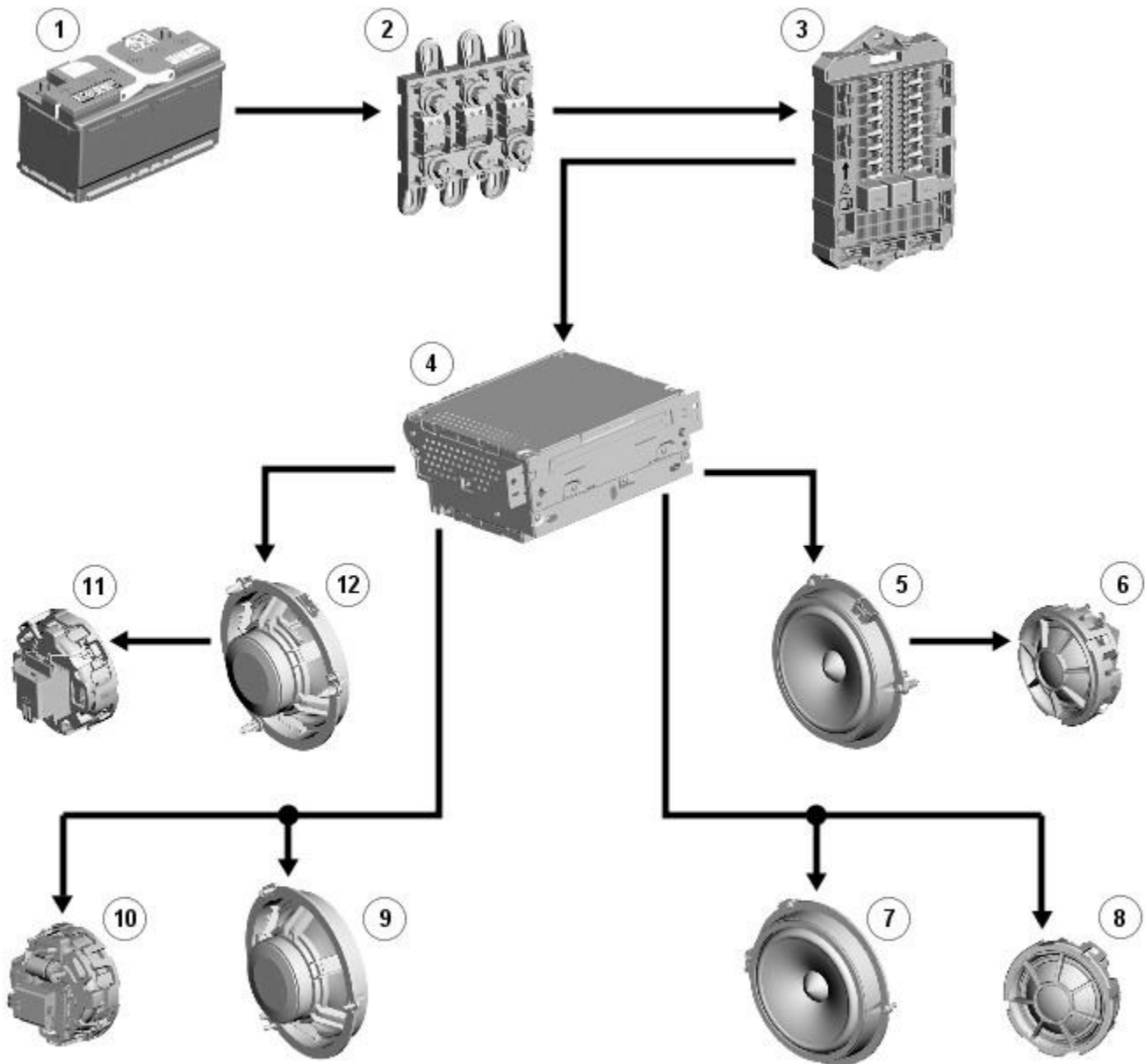
The main speakers on the Jaguar 320W Premium Sound System and the Bowers & Wilkins 440W Surround Sound System are identified by the bright yellow Kevlar constructed domes which are visible through the speaker grilles. The tweeter speaker domes are an aluminum construction. The sub-woofer speakers are a textile dome construction.

Information and Entertainment System - Speakers - System Operation and Component Description

Description and Operation

Control Diagram

• NOTE: A = Hardwired



E94867

A →

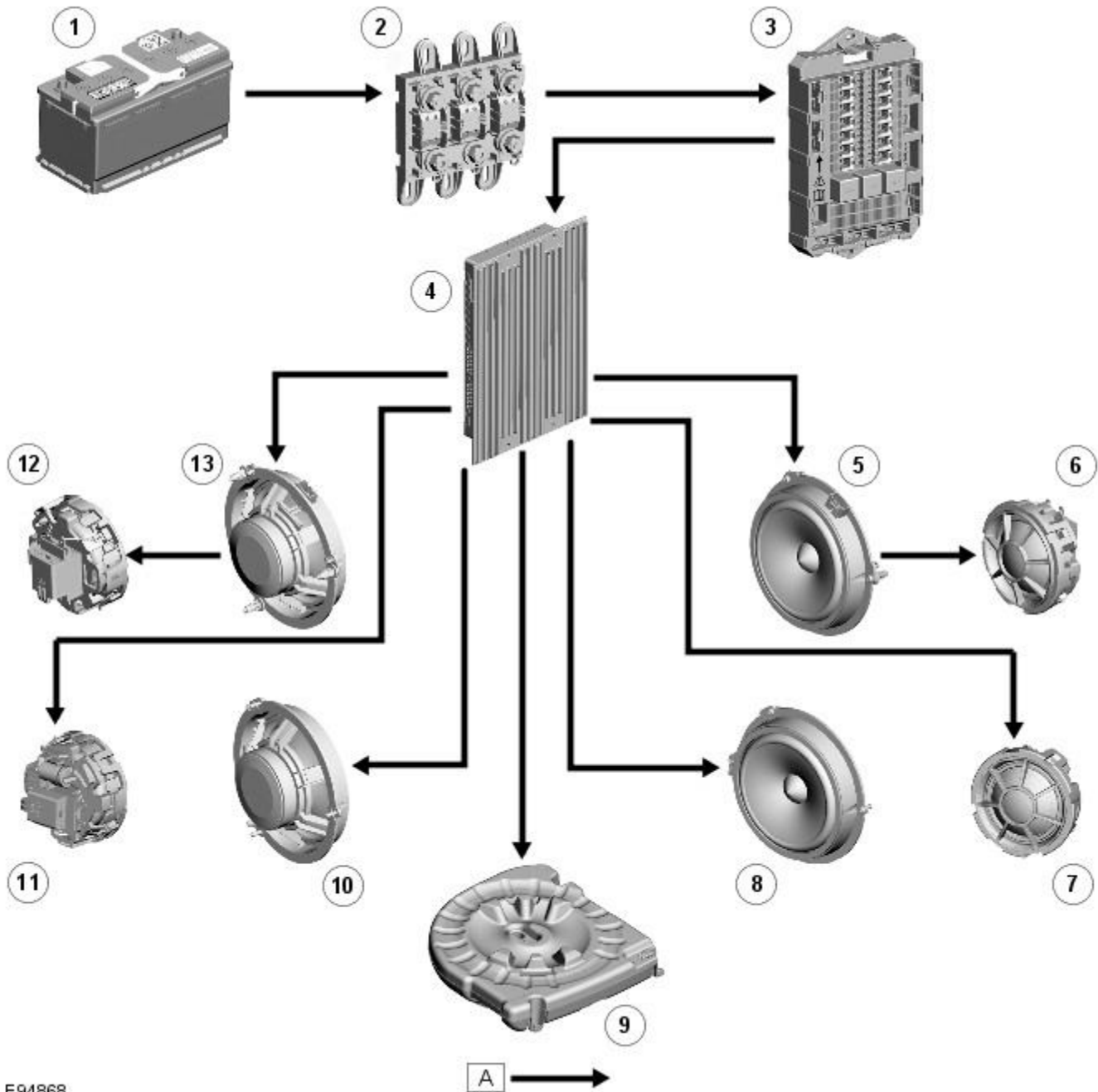
ItemDescription

1	Battery
2	BJB (battery junction box)
3	RJB (rear junction box)
4	IAM (integrated audio module)
5	RH (right-hand) rear mid-bass speaker
6	RH rear tweeter speaker
7	RH front mid-bass speaker
8	RH front tweeter speaker
9	LH (left-hand) front mid-bass speaker
10	LH front tweeter speaker

11 [LH](#) rear tweeter speaker

12 [LH](#) rear mid-bass speaker

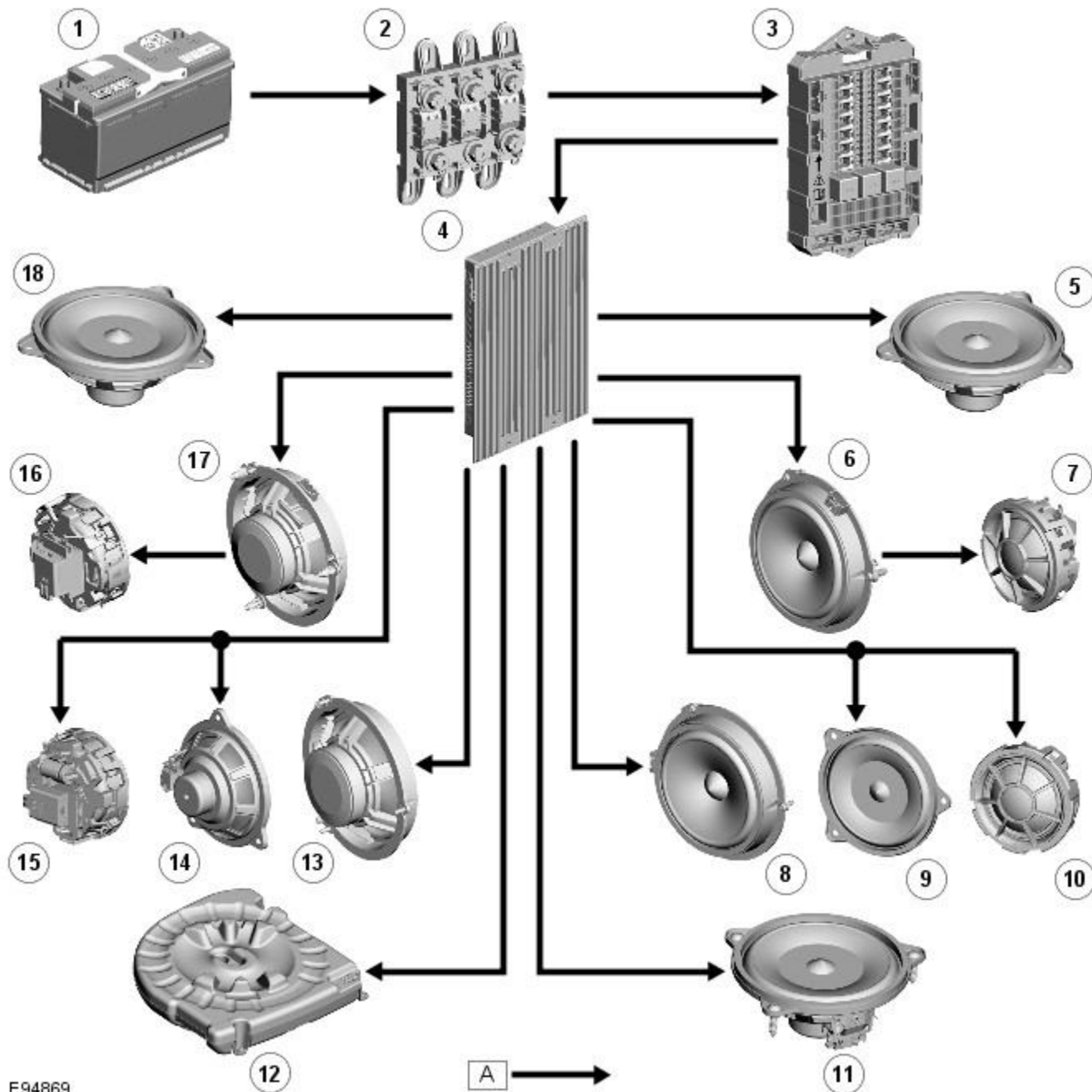
CONTROL DIAGRAM - JAGUAR 320W PREMIUM SOUND SYSTEM



E94868

ItemDescription

1	Battery
2	BJB
3	RJB
4	Power amplifier
5	RH rear mid-bass speaker
6	RH rear tweeter speaker
7	RH front tweeter speaker
8	RH front mid-bass speaker
9	Subwoofer enclosure
10	LH front mid-bass speaker
11	LH front tweeter speaker
12	LH rear tweeter speaker
13	LH rear mid-bass speaker



E94869

ItemDescription

1	Battery
2	BJB
3	RJB
4	Power amplifier
5	RH rear full range speaker
6	RH rear mid-bass speaker
7	RH rear tweeter speaker
8	RH front mid-bass speaker
9	RH front mid-range speaker
10	RH front tweeter speaker
11	Front center speaker
12	Subwoofer enclosure
13	LH front mid-bass speaker
14	LH front mid-range speaker
15	LH front tweeter speaker
16	LH rear tweeter speaker
17	LH rear mid-bass speaker
18	LH rear full range speaker

System Operation

The Jaguar Sound System has 8 speakers, comprising an identical mid-bass and tweeter combination in each door. All speaker domes in this system are of standard textile construction. The speakers are driven directly by the IAM (integrated audio module) internal amplifier.

The Jaguar 320W Premium Sound System has 9 speakers including mid-bass and tweeters in the doors, adding a sub-woofer in the spare wheel well. The speakers are driven by an Alpine AUD 8 amplifier located in the [LH](#) side of the luggage compartment.

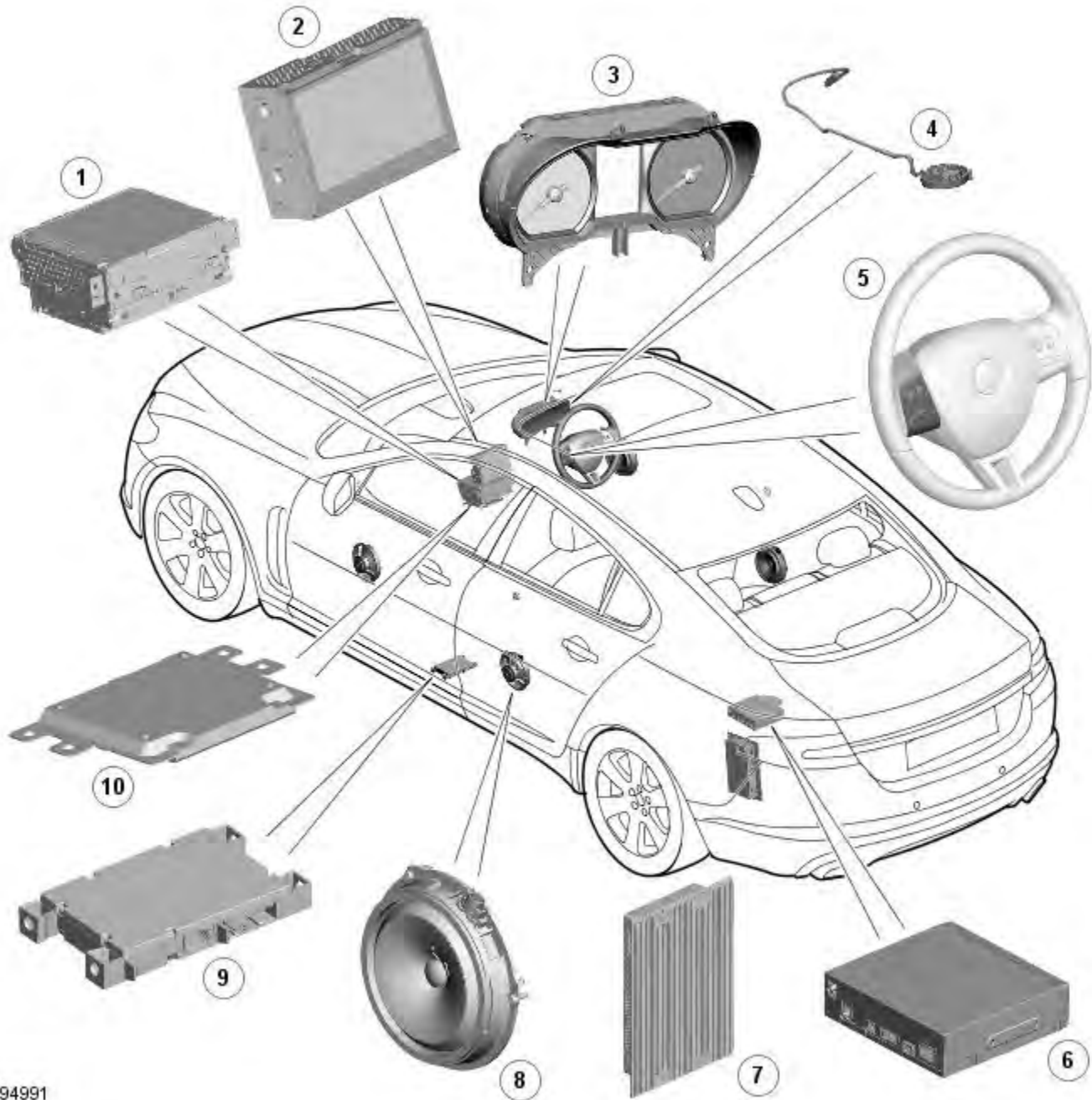
The Bowers & Wilkins 440W Surround Sound System uses an Alpine AUD 12 amplifier, a Dolby Pro-Logic 2 7.1 Surround Sound System and has 14 speakers. This layout adds a mid-range speaker to each front door while retaining a mid-bass and tweeter in each rear door. It also adds an instrument panel center speaker, 2 surround-effect speakers in the rear parcel shelf, and has the luggage compartment-mounted sub-woofer as the Jaguar 320W Premium Sound System. The speakers are driven by an AUD 12 power amplifier located in the luggage compartment.

The main speakers on the Jaguar 320W Premium Sound System and the Bowers & Wilkins 440W Surround Sound System are identified by the bright yellow Kevlar constructed domes which are visible through the speaker grilles. The tweeter speaker domes are an aluminum construction. The sub-woofer speakers are a textile dome construction.

Information and Entertainment System - Cellular Phone - Component

Location

Description and Operation



E94991

ItemDescription

1	IAM (integrated audio module)
2	Touch-screen
3	Instrument cluster
4	Microphone
5	Steering wheel controls
6	Navigation Computer
7	Power amplifier
8	Speakers
9	Telephone control module
10	ICM (information control module)

Information and Entertainment System - Cellular Phone - Overview

Description and Operation

Authoring Template

OVERVIEW

The cellular phone system uses the customer's own Bluetooth® capable handset in conjunction with the vehicle information and entertainment system. The telephone control module is located under the left-hand front seat, and has a Bluetooth® antenna integrated into the unit. Telephone handsets must be paired with the telephone control module, requiring input of a PIN (personal identification number) before they can be used with the vehicle system. Once paired, any phone can be docked to the car without re-entering a PIN (personal identification number). In addition to this, the last connected device will dock automatically the next time it is placed in the vehicle and the ignition is in power mode (ignition on).

The system has the ability to pair and dock telephone handsets from the telephones themselves. By supplying a fixed PIN (personal identification number), a user will be able to use their telephone or other telephone related Bluetooth® device and pair with it without using the touch screen. This enables devices such as Blackberry's and other secure PDA's (personal digital assistants) to pair and dock with the vehicle system.

Up to 5 telephone handsets can be paired with the vehicle, but only 1 telephone can be used at a time. The Touch-screen displays phone functionality, including dialing, and (if compatible) the handset's phone book. The Touch-screen also displays the phone's signal strength and battery meter (if supported by the phone). These functions allow the user to view the displays on the Touch-screen and not have to use the handset.

• **NOTE:** There is no physical connection (cradle) between the phone handset and the telephone control module. Communications between the 2 components are purely Bluetooth®. This can limit the available functions dependant on the handset used.

The system allows the driver to make, receive and end phone calls using the Touch-screen, steering wheel switches and voice recognition system (if fitted).

Phone dialing is achieved using one of the following methods:

- Dialing a number using the Touch-screen keypad
- Selecting a number from the handsets (automatically or manually downloaded) phonebook on the Touch-screen
- Selecting a number from the handsets (automatically or manually downloaded) phonebook in the instrument cluster message center
- Selecting from the handsets (downloaded) call register, typically the last 10 calls made, received and missed

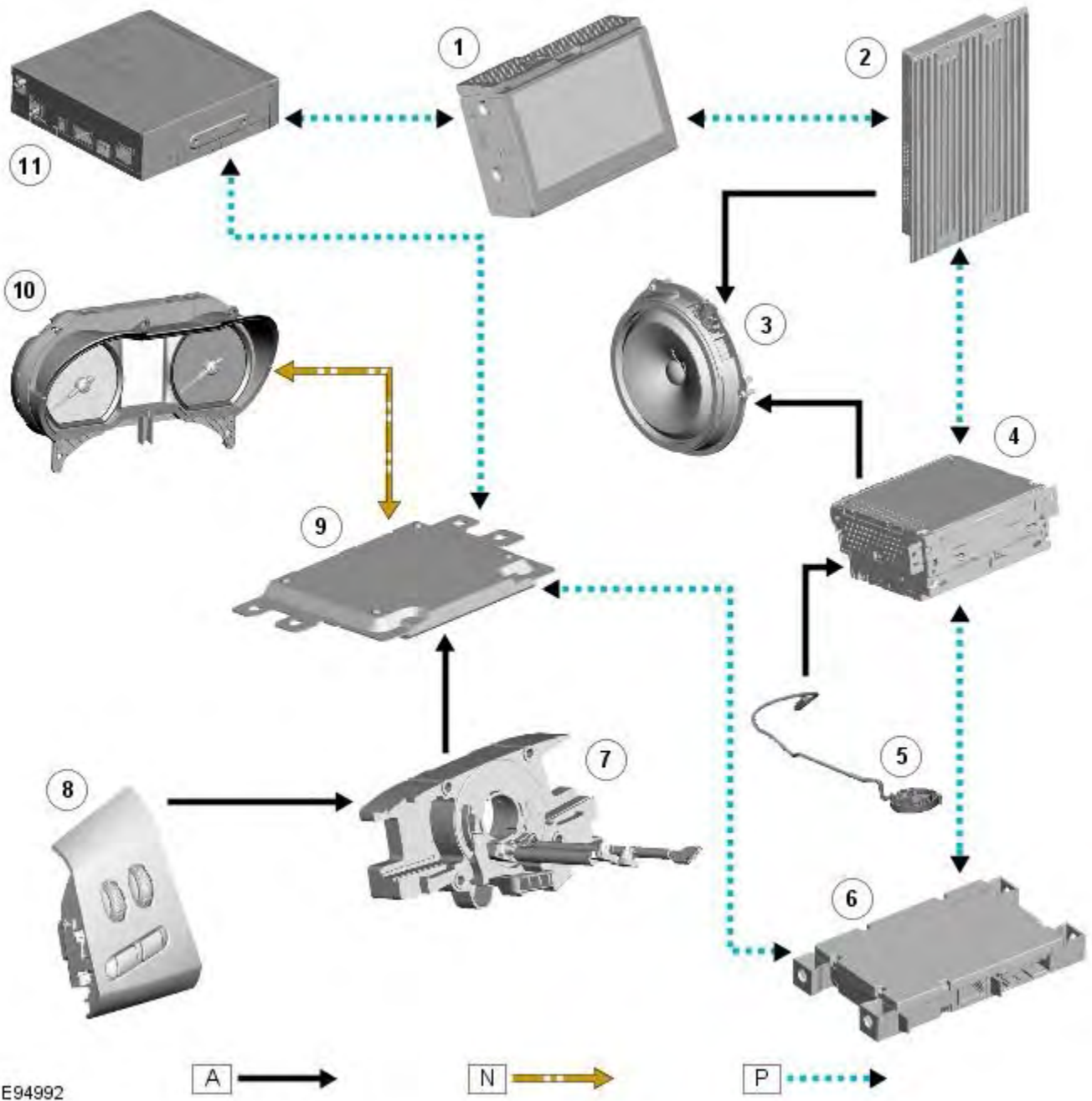
The telephone control module is connected to the information and entertainment system on the MOST (media oriented systems transport) ring. This allows audio and control signals to be routed to and from the telephone control module.

Information and Entertainment System - Cellular Phone - System Operation and Component Description

Description and Operation

Control Diagram

• NOTE: A = Hardwired; N = Medium Speed CAN (controller area network) bus; O = LIN bus; P = MOST ring



E94992

ItemDescription

1	Touch-screen
2	Power amplifier
3	Speakers
4	IAM (integrated audio module)
5	Microphone
6	Telephone control module
7	Clock spring
8	Steering wheel controls
9	ICM (information control module)
10	Instrument cluster
11	Navigation computer

System Operation

PRINCIPLES OF OPERATION

Primary user control of the phone system is via the Touch-screen and JaguarVoice control switch. Selection of 'phone/comms' on the Touch-screen home menu sends a control signal to the telephone control unit on the MOST (media orientated systems transport) ring, opening the phone submenu options.

When making an outgoing phone call using the JaguarVoice function the ICM (information control module) processes the analogue signal from the switch into a digital signal. The digital signal is passed from the ICM (information control module) onto the MOST (media orientated systems transport) system to the JaguarVoice control unit which is integral with the navigation computer.

The navigation computer sends an instruction via MOST (media orientated systems transport) to the IAM (integrated audio module) to turn on the microphone facility.

The voice command signals are relayed from the IAM (integrated audio module) via the MOST (media orientated systems transport) ring to the navigation computer for processing.

The processed voice command is relayed on the MOST (media orientated systems transport) ring from the navigation computer to the phone control module.

Speech output information is transferred from the phone control module via the Bluetooth® connection to the cell phone.

Incoming calls are received from the Bluetooth® phone by the phone control module. The information is processed by the phone control module and transferred on the MOST (media orientated systems transport) ring to the power amplifier or IAM (integrated audio module) for audio output through the vehicle's audio speaker system.

A number of responses by the telephone and voice systems are reinforced by messages appearing in the instrument cluster message center display. Information is relayed to the message center from the phone control module and navigation computer on the MOST (media orientated systems transport) ring to the ICM (information control module).

The ICM (information control module) is the gateway from the MOST (media orientated systems transport) ring to the medium speed [CAN](#). The ICM (information control module) transfers the message center information onto the medium speed [CAN](#) which is received and processed for display on the instrument cluster message center.

Users can pair & dock their handset using their phone or the touch screen. If there is no phone already docked with the system, a user can use their phone to search for Bluetooth Devices. If the vehicle's Bluetooth system has been successfully discovered, the phone will display "Jaguar" as a device to pair & connect to. Using this method requires the user to enter the Jaguar PIN of 1313. Alternatively, after accessing the phone menu from the Touch-screen home menu, selecting 'Search New' searches for the Bluetooth® enabled handsets within range, displays their identities on screen, and allows the user to pair and dock the phone ready for use, using a random four-digit security code displayed on screen. The system will normally try to dock (automatically) to the last phone docked, but if a different Bluetooth® enabled phone enters the car it will become available on the screen's list of handsets once the search has been completed.

Once a phone is paired and docked a digit dial screen is displayed, including phonebook options. With a Bluetooth® compatible handset and software version there is the option, through the settings menu, to automatically download the contents of the handset's phonebook to the vehicle system. Because there is no industry standard for arranging the phonebook, the downloaded lists from individual handsets may vary.

Cell phone handset manufacturers continually update hardware and software to standard specifications laid down by the Bluetooth® Special Interest Group (SIG), which defined how Bluetooth® would work in an automotive environment. However, because different makes and models may use different software, not all handsets are fully compatible with Jaguar, but through testing individual handset models Jaguar has produced a list of compatible handsets and the appropriate software version for Jaguar Bluetooth® connectivity. Referral to the list also describes how to check the software version of each individual cell phone manufacturer. This list must be consulted by users, sales & service teams to confirm whether customer's handsets are compatible or not.

Jaguar is continually validating compatible handset and software combinations. The most up-to-date compatibility list will always be available on-line from Jaguar.

• **NOTE:** To achieve full Bluetooth® handset functionality it is crucial that the phone software level matches the version detailed in the list of compatible handsets.

The upgraded hands free profile of this system allows the display of the network signal strength, network operator and phone battery level indication on the vehicle display. Also, if applicable, the phone handset will show a "car" or "headset" symbol to indicate it is in handsfree profile.

BLUETOOTH®

Bluetooth® is a short-range RF (radio frequency) technology that operates at 2.4 GHz and is capable of transmitting voice and data wirelessly. The effective range of Bluetooth® devices is 32 feet (10 meters) with a data transfer rate of 1 Mbps.

Bluetooth® is essentially a wireless connection which operates with the user's own mobile handset, does not have to be fixed into the car and is designed to function without an external aerial. The handset can be located anywhere within the cabin, even in a bag, or jacket pocket. It could work from the luggage compartment, although the signal could be compromised. The handset can be charged from the 12 volt power socket or USB (if supported) while in use.

Component Description

Touch-Screen

The Touch-screen communicates with the telephone control module on the MOST (media orientated systems transport) ring and provides the primary user interface and display of the phone system.



E96378

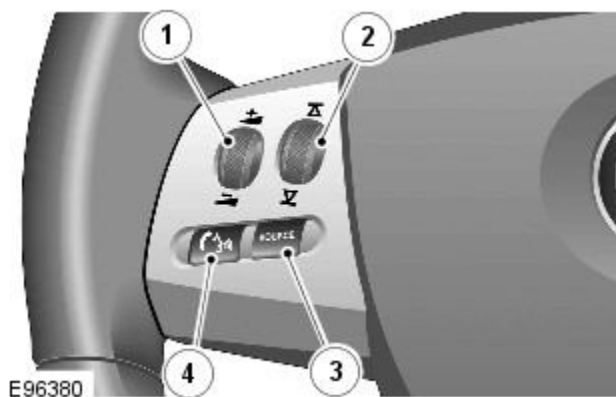
ItemDescription

1	Touch-screen
2	Touch-screen on/off button
3	Home menu button

The following functions are available on the phone menu:

- Digit dial
- Phone book
- Last ten calls (made, received, missed)
- Voicemail

Steering Wheel Controls



E96380

ItemDescription

1	Volume adjustment
2	Scroll up/down to next/previous memory location.
3	Audio source (Long press for instrument cluster message center phonebook access)
4	JaguarVoice button. Briefly press to initiate or end a call. This is also used for voice control functions

Additional control of the phone system is available in the form of steering wheel mounted switches which are located on the left hand side of the steering wheel. The switches provide for volume adjustment, scroll up/down to next/previous memory location, instrument cluster message center phonebook access and finally JaguarVoice/call control.

The steering wheel control switches are hardwired through the clock spring to the ICM (information control module). The ICM (information control module) processes the analogue signals from the switches into digital signals. The digital signals are then passed from the ICM (information control module) onto the MOST (media orientated systems transport) system for control unit processing and operation of the requested functions.

JaguarVoice

JaguarVoice enables activation of several voice activated functions of the infotainment and climate control systems without the need to touch any controls manually. The following systems include JaguarVoice functionality;

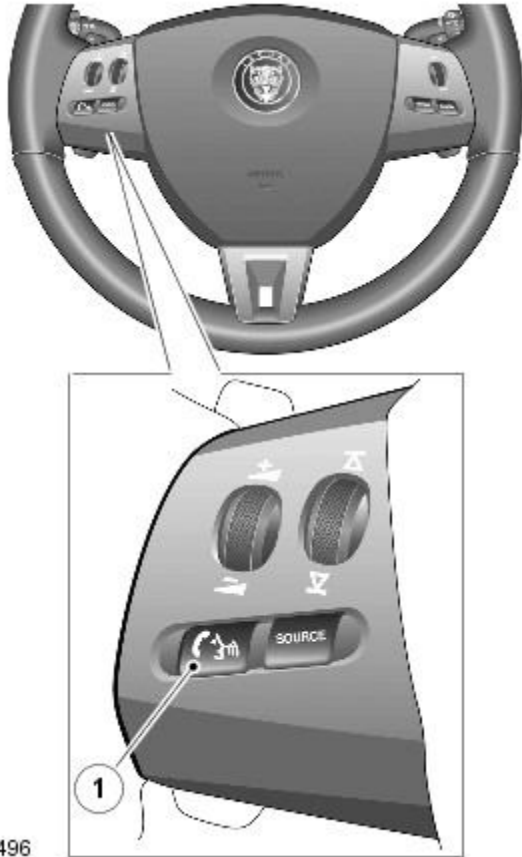
- Navigation system
- Phone system
- Climate control system
- Vehicle display system
- Vehicle notepad

The 'notepad' facility allows voice notes to be recorded. Nametags for phone dialing and navigation locations allow the system to be personalized and there is a help and tutorial function to provide advice on using the system.

The system allows the vehicle user to concentrate fully on driving the vehicle, without any need to divert their eyes from the road ahead in order to check information read outs on the vehicle instrument panel information units. The voice control system also feeds back audible information to the vehicle user.

JaguarVoice is a key component of the phone system, allowing hands free control and use of the Bluetooth® enabled phone.

The system is controlled by the voice button on the left hand side of the steering wheel. Voice commands are picked by the dedicated microphone. When giving a voice command audible feedback will be heard through the vehicle's audio speakers. Received call voice/speech is also broadcast on the vehicle audio speaker system. All speakers are used for voice/speech output with the exception of the front center speaker (only fitted on the Bowers & Wilkins 440W Surround Sound System) due to echo return picked up by the microphone.



E96496

ItemDescription

1 JaguarVoice button

Efficient operation of JaguarVoice is reliant on the user understanding some of the following basic operating conditions;

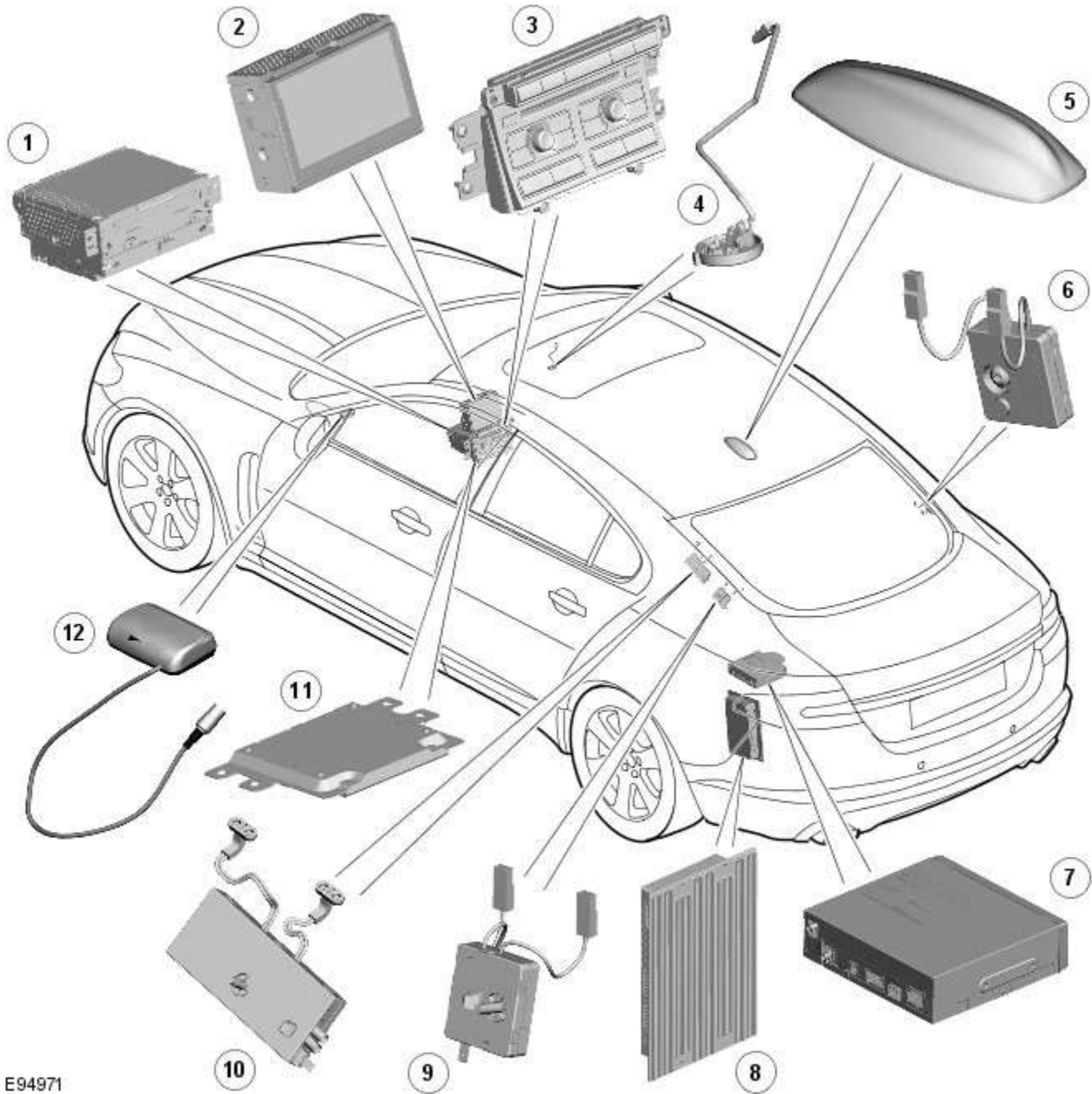
- Face forwards, sitting in a normal driving position
- After pressing the voice button, always wait for the end of the audible tone before speaking.
- Speak naturally, as if you were talking to a passenger or on the phone without pausing between words
- When the system asks for more information, always wait for the end of the tone before responding
- Always say numbers correctly
- Excessive noise, for example while driving with windows open, may cause voice command mis-recognition. If it is too noisy to use the phone, it is likely that voice commands will not be recognized

Most accents are understood without difficulty, but if the system does not recognize the command it will respond "SORRY" and allow two more attempts to say the command.

Voice feedback is given in the same language as the command recognition. It is possible to change the language of the speech control system.

Information and Entertainment System - Navigation System - Component Location

Description and Operation



E94971

Item	Description
1	IAM (integrated audio module)
2	Touch-screen
3	ICP (integrated control panel)
4	Microphone
5	Roof pod antenna module (GPS antenna)
6	RF filter
7	Navigation computer
8	Power amplifier
9	RF filter

10	Diversity antenna module (VICS/TMC antenna)
11	ICM (information control module)
12	VICS (vehicle information and communication system) beacon antenna - Japan only

Information and Entertainment System - Navigation System - Overview

Description and Operation

OVERVIEW

The navigation system provides audible and visual route guidance information to enable the driver to reach a desired destination. The system allows the driver to choose the desired route using minor or major roads and will present 3 routes to the driver based on user preferences. Directions to hospitals, museums, monuments and hotels are also available. The navigation computer uses map information stored on a DVD (digital versatile disc) to determine the best route for the journey and provide the driver with details of directions and approaching junctions.

The navigation system has various levels of user control through the Touch-screen and JaguarVoice system. System volume adjustment can be made using the ICP (integrated control panel), Touch-screen and steering wheel controls.

There are 3 navigation system variants specific to various markets. On all systems the GPS (global positioning system) signal is received by the GPS (global positioning system) antenna located in the roof pod antenna module.

The European navigation system includes the TMC (traffic messaging channel) function, which receives traffic information from an FM antenna integrated into the heated rear window. On a pre-selected route the system will offer re-routing options depending on traffic conditions.

The Japanese navigation system includes the VICS (vehicle information and communication systems) function. The VICS (vehicle information and communication systems) supplies information to enable the navigation computer to re-route the navigation guidance or to inform the vehicle driver of traffic conditions in the vehicles vicinity. Information is provided to the system through an FM antenna integrated into the heated rear window and a VICS beacon located in the LH upper side of the instrument panel.

The NAS (North American specification) variant does not include any additional traffic information systems.

The navigation system is primarily controlled from the Touch-screen which is located in the center of the instrument panel. Control signals from the Touch-screen are sent on the MOST (media oriented systems transport) ring to the navigation computer. The navigation computer uses a dedicated GVIF (gigabit video interface) bus to transmit video signals to the Touch-screen.

Depending upon the audio system version fitted the navigation audio output signals are sent on the MOST (media oriented systems transport) ring to the IAM (integrated audio module) or the power amplifier for speaker output.

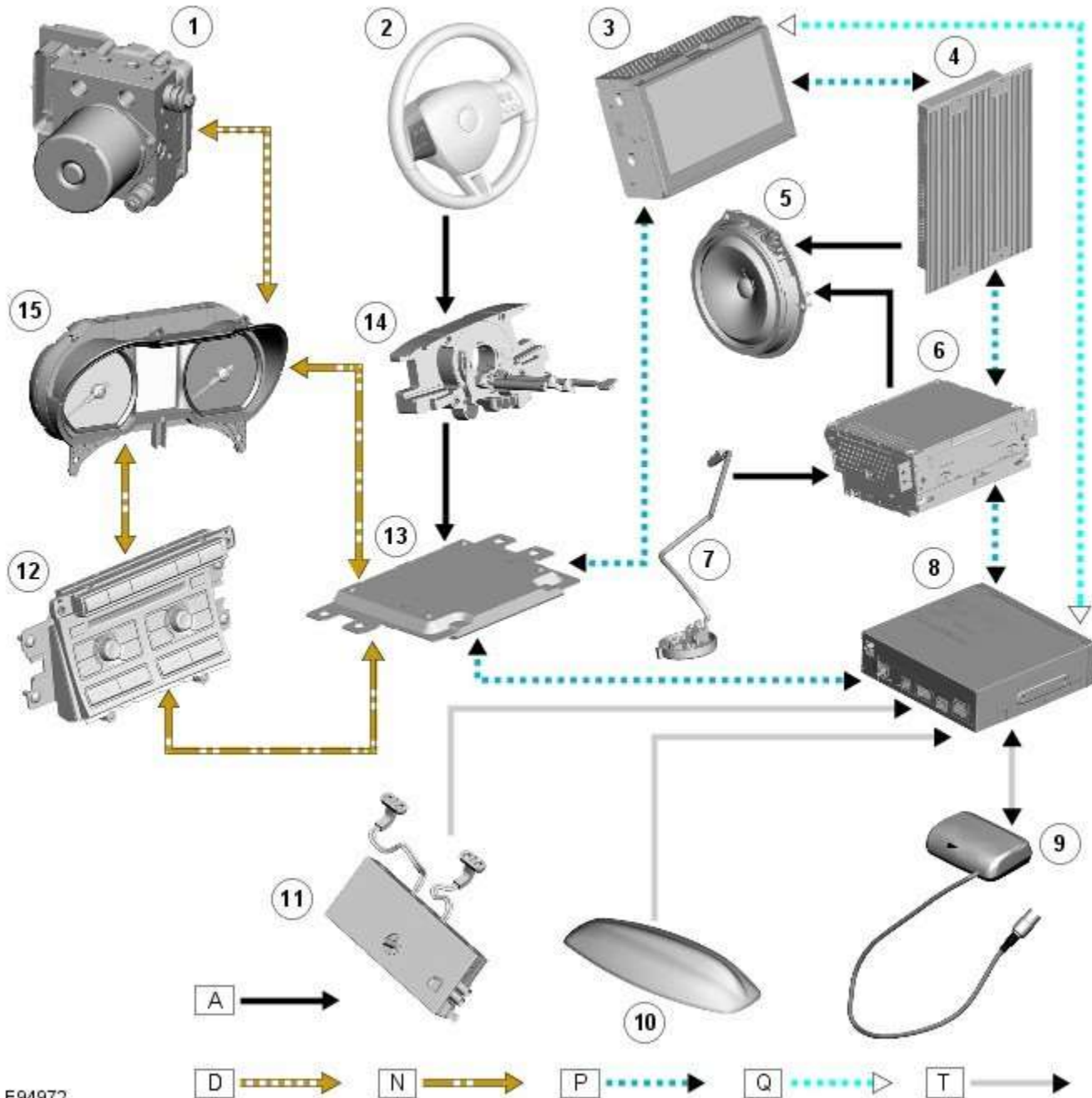
Information and Entertainment System - Navigation System - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired; D = High Speed CAN bus; N = Medium Speed CAN bus; O = LIN bus; P = MOST ring; Q = GVIF; T = CoAxial



E94972

Item	Description
1	ABS (anti-lock brake system) module
2	Steering wheel remote audio controls
3	Touch-screen
4	Power amplifier
5	Speakers

6	IAM (integrated audio module)
7	Microphone
8	Navigation computer
9	VICS (vehicle information and communication system) beacon antenna - Japan only
10	Roof pod antenna module (GPS (global positioning system) antenna)
11	Diversity antenna module (VICS/TMC antenna)
12	ICP (integrated control panel)
13	ICM (information control module)
14	Clock spring
15	Instrument cluster

System Operation

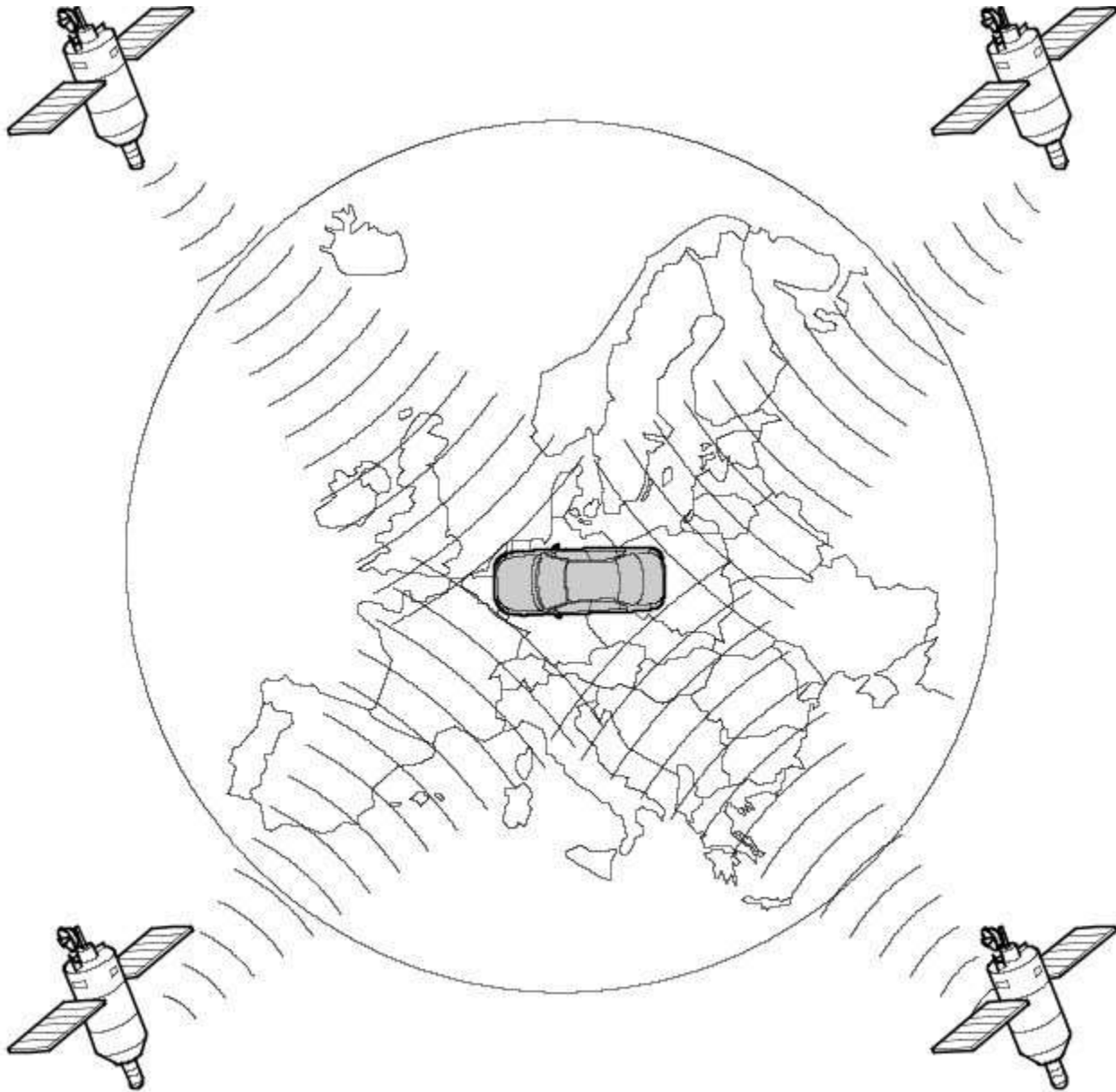
Authoring Template

INTRODUCTION TO THE GLOBAL POSITIONING SYSTEM

The system used to calculate the current position of the vehicle is called the [GPS](#). The system utilizes satellites which are owned by the United States Department of Defense. A total of 24 satellites circular orbit the earth every 12 hours at a height of 20,000 km (12500 miles), and between 5 and 11 of these satellites can be seen from a single point at any given time. The orbits are tilted to the earth's equator by 55 degrees to ensure coverage of polar regions. Each satellite transmits radio signals to provide information about the satellite position i.e. latitude, longitude, altitude, almanac data and an accurate time signal generated by an on-board atomic clock. Each satellite contains four atomic clocks.

The vehicle needs to receive data from at least four different satellites to give a three dimensional fix on its current position.

As the vehicle moves, this information is continually being updated. The computer determines which satellites are 'visible' to the system and their current position and relationship to each other. Using this information the computer can account for positional deviations of the satellites and compensate to enhance the accuracy of the navigation system.



E51822

The [GPS](#) signal is also known as the PPS (precision positioning signal).

PPS (precision positioning signal) predictable accuracy is:

- 22 meters horizontal accuracy
- 27.7 meters vertical accuracy
- 200 nanoseconds time accuracy

The navigation system receives [GPS](#) information via the [GPS](#) antenna. The [GPS](#) signals are used by the navigation computer to calculate the vehicles position. Once the driver has input a desired destination the navigation computer can calculate a route, based on the driver's pre-determined preferences or the default settings in the navigation computer.

The navigation system is accessed from the Touch-screen home menu.

Navigation is initiated by the driver inputting a destination. This can be achieved by:

- Entering an address using the Touch-screen
- Entering a post code
- Choosing a previous destination
- Choosing a point of interest from the map disc database
- Choosing the home location
- Choosing a memory stored location

The driver is then guided to the destination by a scrolling map display and voice guidance. The display can be varied by scale and display type.

In addition to the standard navigation system there are two market dependant systems that supply extra information to the navigation system and the driver. These are:

- TMC (traffic message channel) (Europe only)
- VICS (vehicle information and communication system) (Japan only)

The TMC (traffic message channel) is a function of the [FM \(frequency modulation\)RDS \(radio data system\)](#). The system broadcasts real-time traffic and weather information. Data messages are received and decoded by the TMC (traffic message channel) integral receiver and processed by the navigation computer. TMC (traffic message channel) messages can be filtered by the navigation computer so that only those relevant to the current journey are displayed, allowing the navigation system to offer dynamic route guidance - alerting the driver of a problem on the planned route and calculating an alternative route to avoid the incident. All TMC (traffic message channel) events on the map can be viewed not just the ones on the calculated route.

TMC (traffic message channel) traffic information systems conform to a global standard that has been adopted by traffic data gatherers, information service providers, broadcasters and vehicle/receiver manufacturers.

All TMC (traffic message channel) receivers use the same list of event codes, while the location database (on the map disc) contains both a country-specific set of location codes for the strategic European road network.

TMC (traffic message channel) traffic data is currently broadcast in many European countries.

The VICS (vehicle information and communication system) is broadcast in the Japanese market.

The VICS (vehicle information and communication system) supplies information to enable the navigation computer to re-route the navigation guidance or to inform the vehicle driver of traffic conditions in the vehicles vicinity. Information is provided to the system through 3 routes:

- RF (radio frequency) transmission
- Infra-red transmission
- [FM](#) multiplex transmissions

The RF (radio frequency) transmissions are generally transmitted from road side beacons mainly on expressways. The information transmitted is as follows:

- Traffic congestion
- Travel time to next intersection
- Traffic conditions in surrounding areas and expressway turn offs
- Traffic accidents
- Speed limits
- Lane regulations
- Tire change
- Parking availability at expressway service areas and parking areas

Infra-Red transmissions are transmitted from road side beacons on major trunk roads. The information transmitted is:

- Traffic congestion and travel time
- Traffic accidents
- Breakdowns
- Road works restrictions
- Parking availability

[FM](#) transmissions are broadcast as part of the [FM](#) multiplex broadcasting system from NHK [FM](#) stations. Information transmitted is:

- Traffic congestion and travel time for wide areas
- Traffic accidents, road works, speed limits and lane restrictions for a wide area
- Parking availability information

The traffic data is split from the normal [FM](#) transmissions by the diversity antenna module.

Selection of 'Navigation' on the Touch-screen home menu and subsequent sub-menu selection sends a control request signal to the navigation computer on the MOST (media orientated systems transport) ring. The requested control information is processed by the navigation computer.

If voice guidance is operational the voice signal information is relayed from the navigation computer on the MOST (media orientated systems transport) ring to either the IAM (integrated audio unit) or Power Amplifier, dependant on equipment level, for output on the speaker system. The navigation audio output is through the front speakers whilst the background audio, for example radio or [CD \(compact disc\)](#), is played at a reduced volume on the rear speakers.

The [GPS](#) signal is available to the navigation system at all times when the vehicle ignition is switched on.

Navigation user voice commands are made using the JaguarVoice system. The ICM (information control module) processes the analogue signal from the JaguarVoice switch into a digital signal. The digital signal is passed from the ICM (information control module) onto the MOST (media orientated systems transport) system to the JaguarVoice control unit which is integral with the navigation computer.

The navigation computer sends an instruction via the MOST (media orientated systems transport) ring to the IAM (integrated audio module) to turn on the microphone facility.

The microphone is hardwired to the IAM (integrated audio module). The spoken voice command signals are relayed from the IAM (integrated audio module) via the MOST (media orientated systems transport) ring to the navigation computer for

processing.

The processed voice command is relayed from the navigation computer to the Touch-screen.

Traffic data from TMC (traffic message channel) or VICS (vehicle information and communication system) is processed by the navigation computer, distributed to the Touch-screen with any supporting voice instruction relayed through the MOST (media orientated systems transport) ring to either the IAM (integrated audio unit) or Power Amplifier, dependant on equipment level, for output on the speaker system.

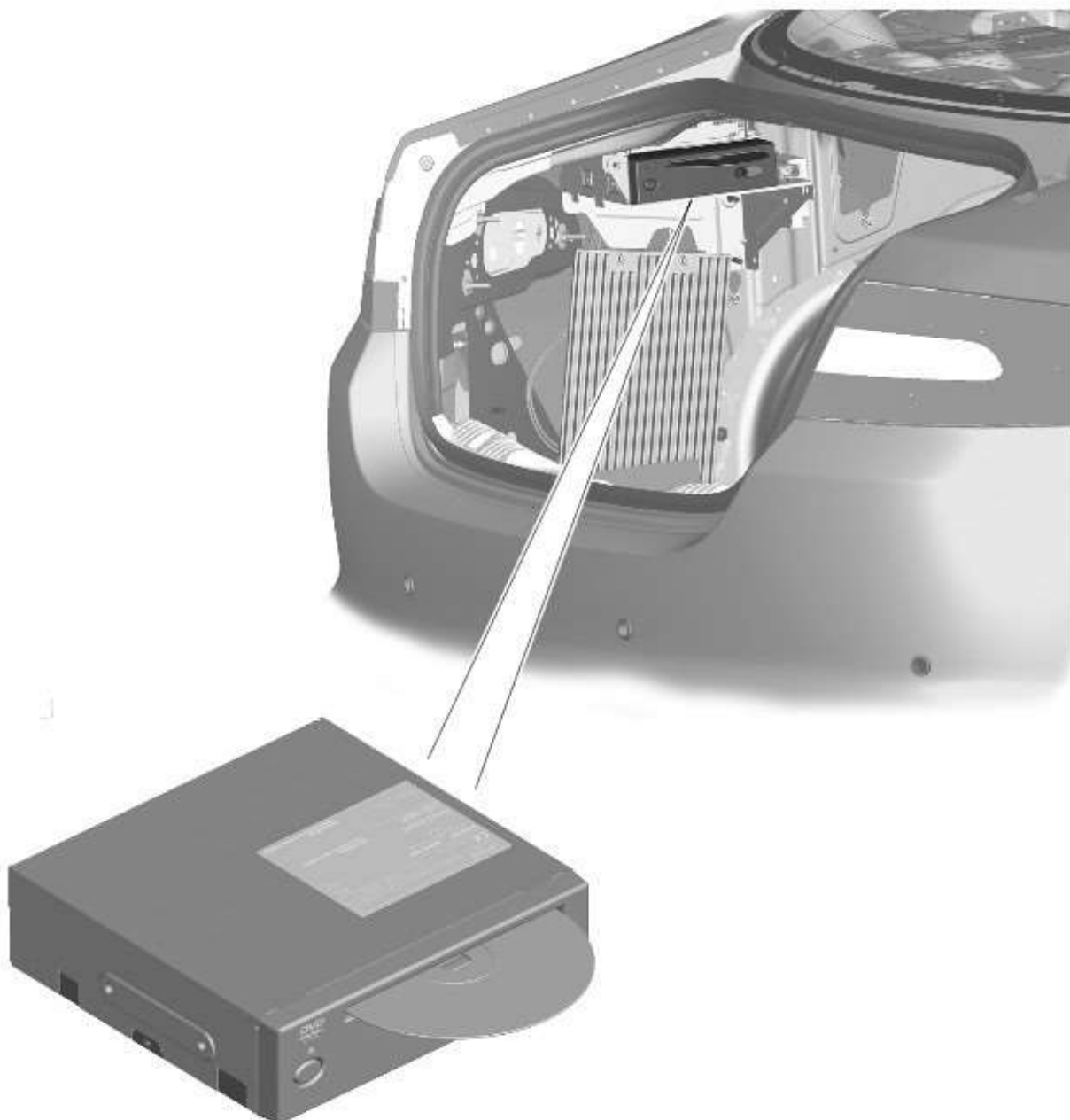
A number of actions, when using the navigation voice system, are reinforced by messages appearing in the instrument cluster message center display. Information is relayed to the message center from the navigation computer on the MOST (media orientated systems transport) ring to the ICM (information control module).

The ICM (information control module) is the gateway from the MOST (media orientated systems transport) ring to the medium speed [CAN \(controller area network\)](#). The ICM (information control module) transfers the message center information onto the medium speed [CAN](#) which is received and processed for display on the instrument cluster message center.

Component Description

NAVIGATION COMPUTER

The navigation computer is located in the left hand side of the luggage compartment.



The navigation computer incorporates the following:

- [GPS](#) receiver
- VICS (vehicle information and communication system) receiver (Japan only)
- TMC (traffic message channel) receiver (Europe only)
- JaguarVoice control module

The navigation computer contains a solid state piezo gyro which measures the motion of the vehicle around its vertical axis. The gyro operates on the principle known as the coriolis force. The coriolis force is the force that appears to accelerate a body moving away from its rotational axis against the direction of rotation of the axis.

Using inputs from the [ABS](#) module, the [GPS](#) antenna and the gyro sensor, the computer calculates the vehicle's current position, direction and speed.

The navigation computer houses the [DVD \(digital versatile disc\)](#) drive. The drive is used to read map data from region specific [DVD](#)'s. The number of [DVD](#)'s issued per region varies depending on the amount of information available. The regions are as follows:

- Europe (2 versions, Western Europe and Whole of Europe)
- NAS (North American specification)
- Japan, Middle East, Australia and South Africa

A button, located adjacent to the [DVD](#) slot, is provided to eject the [DVD](#) from the unit. Prior to ejecting the disc the slot protection has to be slid to the side. If the ignition is on, or the entertainment system is in 1-hour mode, one press of the button will eject the [DVD](#).

The navigation computer uses non-volatile memory to store settings and configuration information when it is powered down. This process takes place just before the computer turns off.

No configuration procedure is required if the navigation computer is replaced. There is no option to calibrate the navigation computer using the Jaguar approved diagnostic equipment; however in some regions a software download, contained in the [DVD](#) disc, is required before the navigation system becomes operational.

MICROPHONE



E96495

A single microphone is used for hands-free operation using the JaguarVoice system. The microphone has an integrated noise suppression system for hands-free use. The microphone is a standard directional type and is located in the front roof overhead console. The microphone is hardwired to the IAM (integrated audio module). When replacing the microphone extra care must be taken to make sure it is fitted into its securing clips for correct positioning and orientation.

GPS Antenna



E96387

The [GPS](#) antenna passes signals from the [GPS](#) satellites to the navigation computer for processing. The antenna is located in

the roof pod and is shared with the DAB (digital audio broadcasting) band L antenna or satellite radio antenna where fitted. The roof pod is located externally in a central position towards the rear of the roof.

The [GPS](#) antenna is designed with 50 ohm output impedance. The navigation computer is fitted with 50 ohm fakra II connectors to ensure compatibility with the antenna. For optimum performance 50 ohm low loss coaxial cable is used between the antenna and navigation computer.

It is possible for the [GPS](#) antenna to lose the signal from the [GPS](#) satellites;

- In hilly or tree lined areas
- Built up areas with tall buildings
- In multi storey car parks
- In garages
- In tunnels
- On bridges
- During heavy rain or thunderstorms

When the signal is lost the navigation computer will continue to give guidance using memory mapped data from the [DVD](#) map until the signal is restored.

TMC/VICS FM Antenna

Data messages for both TMC (traffic message channel) and VICS (vehicle information and communication system) are received through the [FM](#) antennas and diversity antenna module located in the heated rear window.

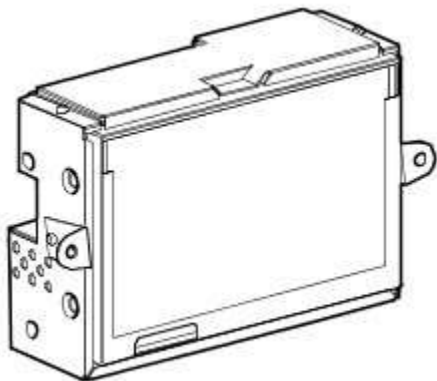
VICS Beacon Antenna (Japan Only)



E96572

The VICS (vehicle information and communication system) beacon antenna receives infra red and RF (radio frequency) traffic data signals from road side transmitters. The antenna is connected to the navigation computer which incorporates a VICS (vehicle information and communication system) receiver.

Touch Screen Display



E73867

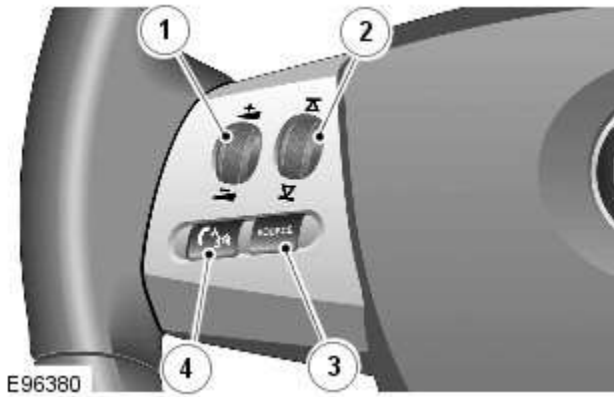
The Touch-screen is the control interface for the following vehicle systems;

System	Functions
Audio	Radio display AM/ FM or DAB (digital audio broadcast), auxiliary and portable audio, digital TV or CD
Climate control	Air conditioning, distribution, seats, heated steering wheel, automatic air recirculation
Telephone	Digit dialer, phone book, last ten calls (made, received, missed)

System	Functions
Navigation	Destination, stored locations, navigation setup, route options
Vehicle	Security, parking, valet mode, trip computer, clock, brightness, contrast, system settings, vehicle settings, display settings

The screen is a touch sensitive 7 inch LCD (liquid crystal display) VGA screen containing 800 x 480 pixels in a 15:9 format. The screen processes its own video for system operation but receives the navigation graphics from the navigation computer.

Steering Wheel Controls



Item	Description
1	Volume adjustment
2	Scroll wheel (No navigation functionality)
3	Audio source (No navigation functionality)
4	JaguarVoice control

Additional control of the navigation system is available in the form of steering wheel mounted switches which are located on the left hand side of the steering wheel. 2 switches are used for navigation functions;

- Volume adjustment
- JaguarVoice control

JaguarVoice enables operation of several voice activated functions of the infotainment and climate control systems without the need to touch any controls manually. The following systems include JaguarVoice functionality;

- Navigation system
- Phone system
- Climate control system
- Vehicle display system
- Vehicle notepad

The 'notepad' facility allows voice notes to be recorded. Nametags for phone dialing and navigation locations allow the system to be personalized and there is a help and tutorial function to provide advice on using the system.

The system allows the vehicle user to concentrate fully on driving the vehicle, without any need to divert their eyes from the road ahead in order to check information read outs on the vehicle instrument panel information units. The voice control system also feeds back audible information to the vehicle user.

JaguarVoice is a key component of the navigation system, allowing hands free control when issuing navigation commands.

The system is controlled by the voice button on the left hand side of the steering wheel. Voice commands are picked up by a dedicated microphone. When giving a voice command audible feedback will be heard through the vehicle's audio speakers.



E96496

Item	Description
1	JaguarVoice button

Efficient operation of JaguarVoice is reliant on the user understanding some of the following basic operating conditions;

- Face forwards, sitting in a normal driving position
- After pressing the voice button, always wait for the end of the tone before speaking.
- Speak naturally, as if you were talking to a passenger or on the phone without pausing between words
- When the system asks for more information, always wait for the end of the tone before responding
- Always say numbers correctly
- Excessive noise, for example while driving with windows open, may cause voice command mis-recognition. For example if it is too noisy to use the phone, it is likely that voice commands will not be recognized.

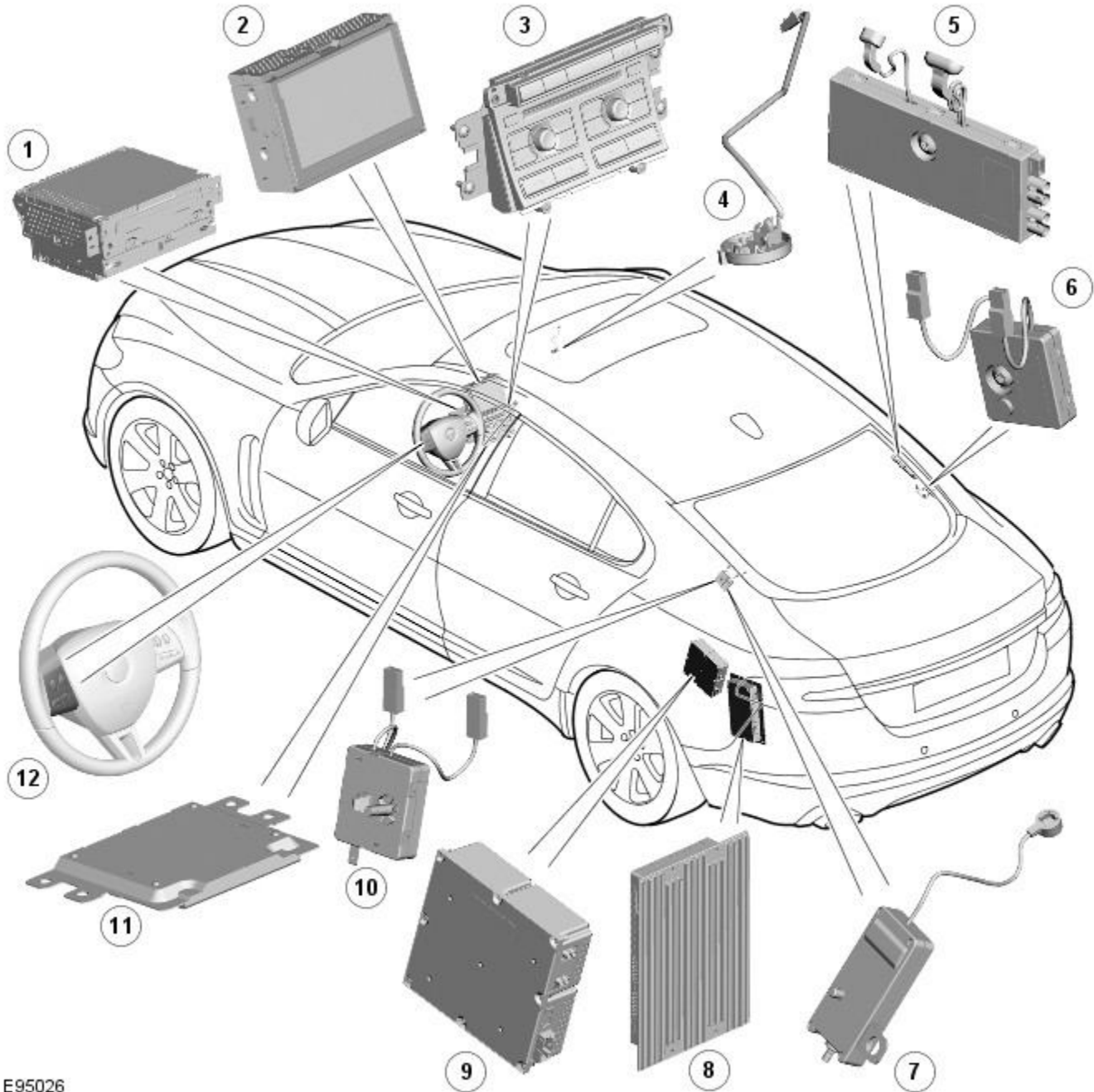
Most accents are understood without difficulty, but if the system does not recognize the command it will respond "SORRY" and allow two more attempts to say the command.

Voice feedback is given in the same language as the command recognition. It is possible to change the language of the speech control system.

Information and Entertainment System - Video System - Component

Location

Description and Operation



E95026

ItemDescription

1	IAM (integrated audio module)
2	Touch-screen
3	ICP (integrated control panel)
4	Microphone
5	Triple TV (television) antenna module
6	RF filter
7	Single TV (television) antenna module
8	Power amplifier
9	TV (television) tuner
10	RF filter
11	ICM (information control module)
12	Steering wheel remote controls

Information and Entertainment System - Video System - Overview

Description and Operation

OVERVIEW

The Television system combines digital and analogue reception. The digital element is similar to the home based freeview system, and displays information such as current channel detail. The Japanese market uses the analogue signal as the digital format is not compatible.

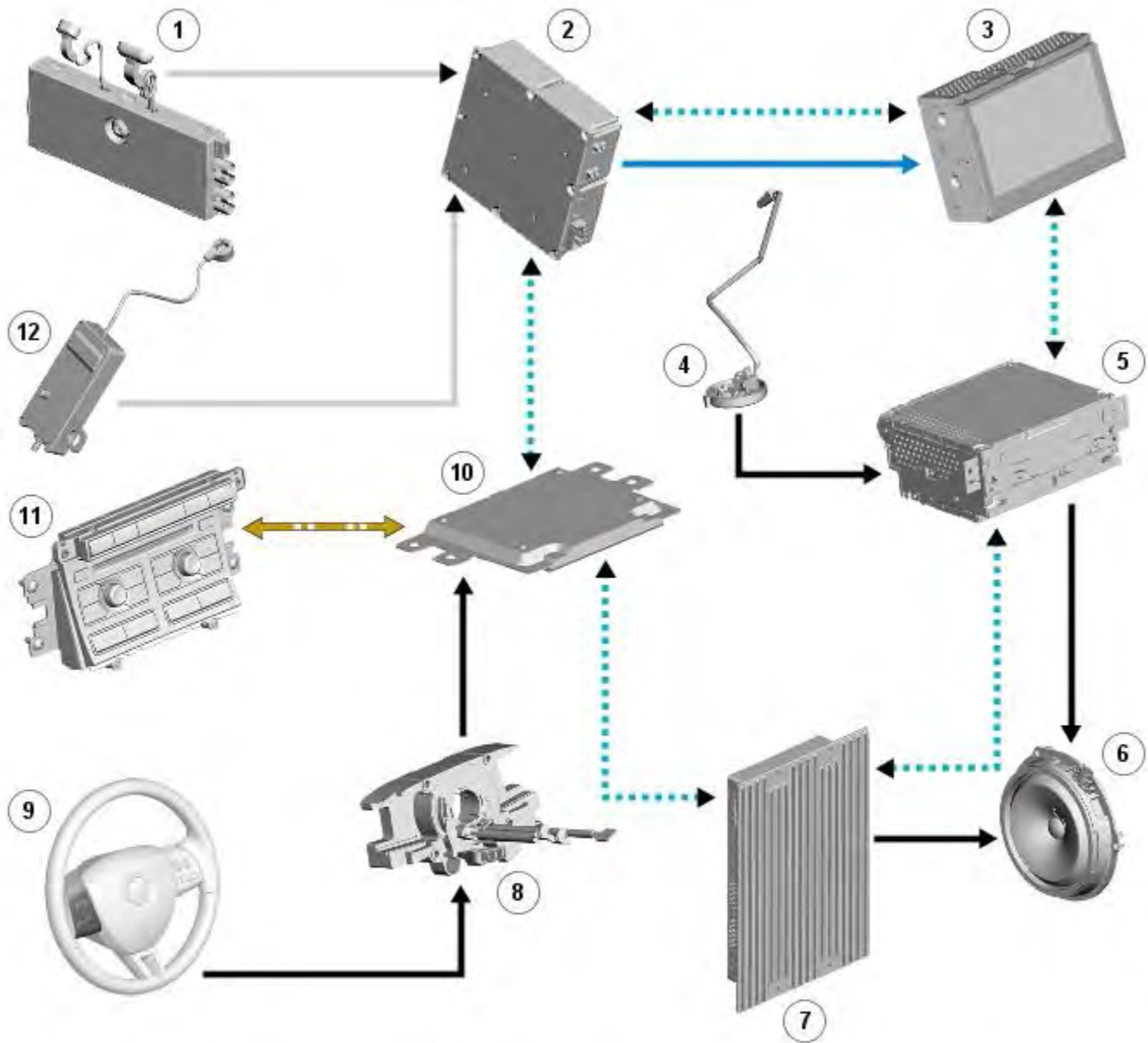
For legal reasons, the Touch-screen Television image can only be displayed when the vehicle is at rest, however the system is configured not to constantly switch on and off in stop-start traffic. It is possible to listen to Television sound as the vehicle is moving.

Information and Entertainment System - Video System - System Operation and Component Description

Description and Operation

Control Diagram

• NOTE: A = Hardwired; N = Medium Speed CAN (controller area network) bus; O = LIN bus; P = MOST ring; T = CoAxial; I = Composite video signal



E95027



ItemDescription

1	Triple TV (television) antenna module
2	TV (television) tuner
3	Touch-screen
4	Microphone
5	IAM (integrated audio module)
6	Speakers
7	Power amplifier
8	Clock spring
9	Steering wheel remote controls
10	ICM (information control module)
11	ICP (integrated control panel)
12	Single TV (television) antenna module

System Operation

The Television system has various levels of user control through the Touch-screen, ICP (integrated control panel) and steering wheel control panel. The system includes nine analogue and nine digital channel pre-sets. As with the audio system, the user can search up or down and store by a long press of the selected channel button. The system offers a choice of screen aspect ratios similar to a typical domestic receiver, giving options between the standard 4:3 format, wide screen 16:9 format and zoom to fill the screen.

To provide the strongest possible signal the Television tuner receives signals from 4 antenna sources located in the heated rear window. Unlike domestic systems this system gives a more progressive picture loss if the signal is lost. The signal loss is indicated to the user by a 'loss of reception' screen message.

The Television system is primarily controlled from the Touch-screen and the ICP (integrated control panel) which are located in the center of the instrument panel. Control signals from the Touch-screen display are sent on the MOST (media oriented systems transport) ring to the Television tuner. The Television tuner uses a dedicated CVBS (composite video signal) bus to transmit video signals to the Touch-screen.

Control signals from the ICP (Integrated control panel) are relayed on the medium speed CAN bus to the ICM (information control module). The ICM (information control module) relays the control signals to the Television tuner on the MOST (media oriented systems transport) ring. The ICM (information control module) is the timing master for the MOST (media oriented systems transport) ring and also hosts a gateway function between the medium speed CAN bus and the MOST (media oriented systems transport) ring.

Depending upon the audio system version fitted the Television tuner audio output signals are sent on the MOST (media oriented systems transport) ring to the IAM (integrated audio module) or the power amplifier for speaker output.

Component Description

TELEVISION TUNER



E96676

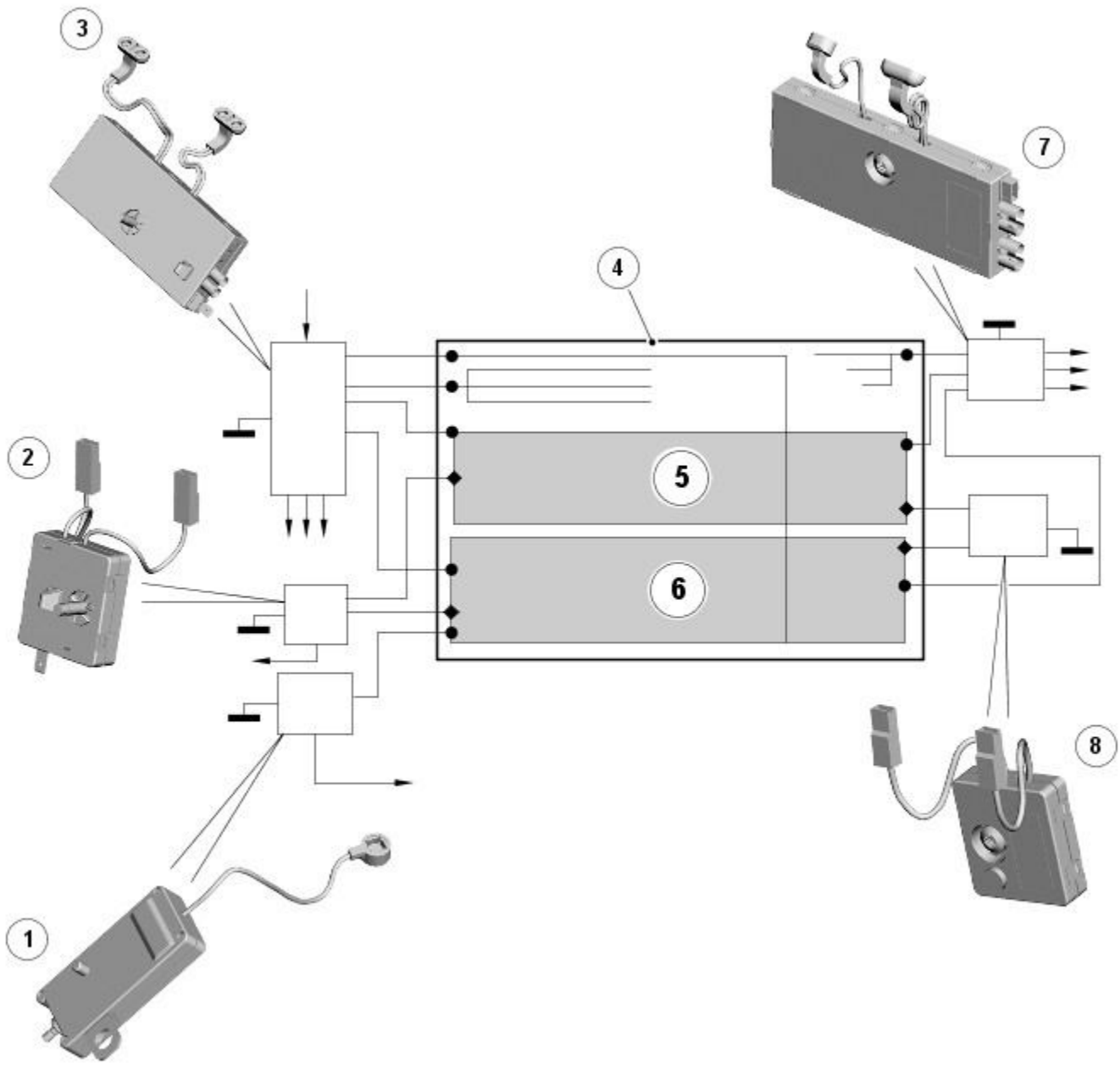
The television tuner is a DVB-T (digital video broadcasting - terrestrial) receiver and consists of a 'front end' which is made up of a tuner and a demodulator. Following pre-filtering, the tuner converts the signal from the antenna to an intermediate frequency. In the demodulator, the signal is first converted to a basic frequency, so that a signal from a transponder can be forwarded to the MPEG decoder as a transport stream. The transport stream usually contains several television channels along with relevant auxiliary services such as teletext, subtitles and electronic program guides.

- **NOTE:** Not all digital features such as text and programme listings are currently available.

Control signals from the Touch-screen display are sent on the MOST (media oriented systems transport) ring to the television tuner. The television tuner uses the dedicated CVBS (composite video signal) bus to transmit its video signals to the Touch-screen. The CVBS (composite video signal) system utilizes a single wire transmission system and is limited in bandwidth to less than 6MHz.

No configuration procedure is required if the television tuner is replaced. Calibration of the television tuner using the Jaguar approved diagnostic equipment enables updates to be downloaded as new technology becomes available or any fault concerns require software updates.

Television Antennas



E96376

ItemDescription

1	Single TV (television) antenna module
2	RF filter
3	Diversity antenna module
4	Heated rear window
5	Heated rear window upper section
6	Heated rear window lower section
7	Triple TV (television) antenna module
8	RF filter

The television tuner receives digital and analogue television signals through 4 antennas located in the heated rear window. 3 of the antennas are connected to the triple antenna amplifier/module located on the **RH** (right-hand) side of the heated rear window. A fourth antenna is connected to the single antenna amplifier/module located on the **LH** (left-hand) side of the heated rear window.

The combination of signals from several antennas is known as 'diversity' reception. For example using two or more antennas can reduce the signal error rate by 50%, which is of critical importance for mobile receivers.

Vehicle or other component generated electromagnetic interference may cause unwanted disturbance in the television reception signals. The disturbance may interrupt, obstruct, or otherwise degrade or limit the effective performance of the circuit.

Double coil RF (radio frequency) filters, which act as RF (radio frequency) isolators, are located on both sides of the heated rear window and are used to reduce any electromagnetic interference. The **LH** side RF (radio frequency) filter is connected across the heated rear window power supply and used to separate the DC (direct current) interference from the RF (radio

frequency) signals. The positive filter is present on all vehicle types and markets.

The right hand side double coil RF (radio frequency) filter is only used in conjunction with the television antenna modules and is connected across the heated rear window ground circuit. If a television system is not fitted a filter is used which is linked directly to ground.

Touch-Screen



E96378

ItemDescription

1	Touch-screen
2	Touch-screen on/off button
3	Home menu button

The Touch-screen is the primary user interface for the television system. From the 'Home' screen menu television is a sub-menu of 'Audio'. The Touch-screen communicates with the television tuner. Video signals to the Touch-screen are transmitted from the television tuner.

Integrated Control Panel



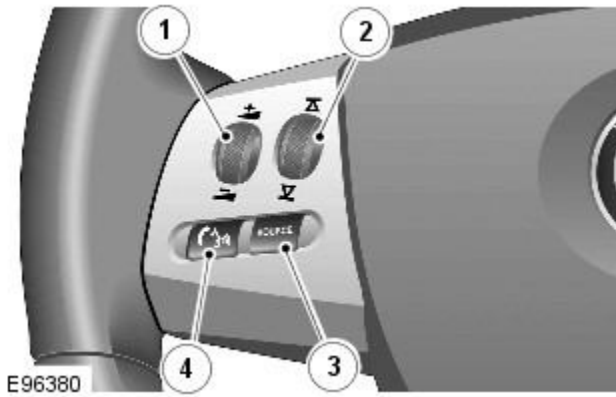
E96677

ItemDescription

1	Touch-screen
2	Seek up button
3	Settings button
4	On/off and volume control
5	Source button
6	Seek down button

The ICP (integrated control panel) duplicates many of the Touch-screen television user control features. The ICP (integrated control panel) communicates with the television system through the medium speed [CAN](#) and MOST (media orientated systems transport) bus systems.

Steering Wheel Controls



ItemDescription

1	Volume adjustment
2	Change pre-set TV (television) stations
3	Select source
4	Audio mute control/JaguarVoice control

Additional control of the television system is available in the form of steering wheel mounted switches which are located on the left hand side of the steering wheel. The 4 switches provide for volume adjustment, change pre-set television stations, select media source and finally audio mute control. The mute control is also used for JaguarVoice control.

Information and Entertainment System - Information and Entertainment System

Diagnosis and Testing

For additional information. REFER to: (415-00 Information and Entertainment System - General Information)

[Information and Entertainment System](#) (Diagnosis and Testing),
[Cellular Phone](#) (Diagnosis and Testing),
[Navigation System](#) (Diagnosis and Testing).

Information and Entertainment System - Audio Unit

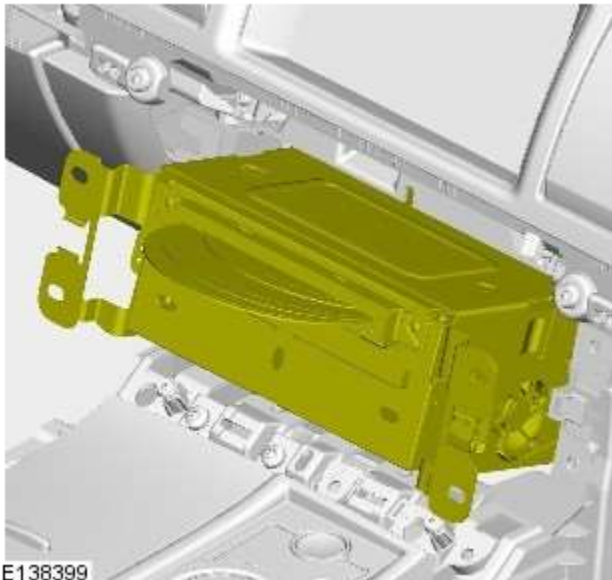
Removal and Installation

Removal

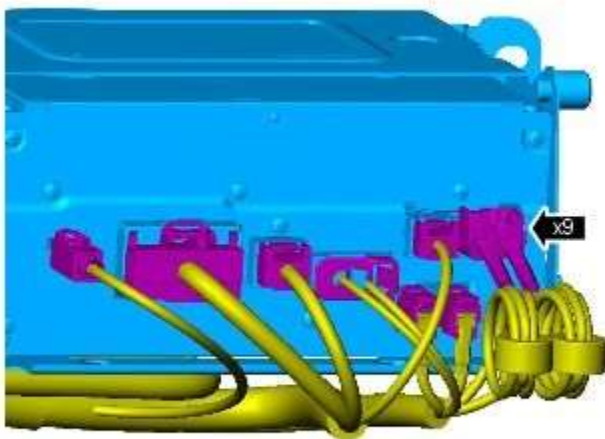


NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Audio and Climate Control Assembly](#) (415-01A Information and Entertainment System, Removal and Installation).



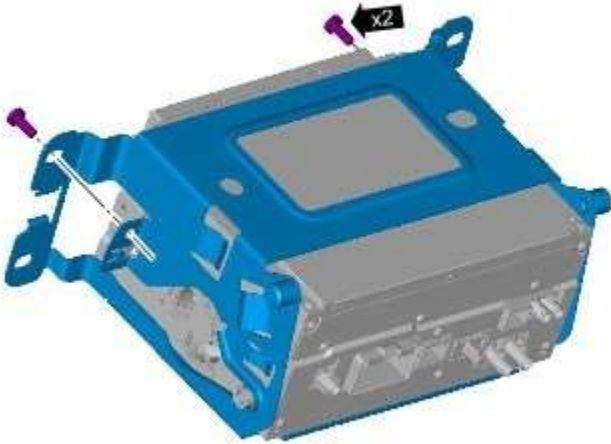
3. CAUTION: Protect the surrounding trim to avoid damage.



4. CAUTION: Cover fiber optic cable connectors to minimize dust ingress and avoid bending the cables in a radius of less than 30 mm.

5.  NOTE: Do not disassemble further if the component is removed for access only.

Torque: 3 Nm



E138278

Installation

1. To install, reverse the removal procedure.

Information and Entertainment System - Audio Unit Antenna Amplifier

Removal and Installation

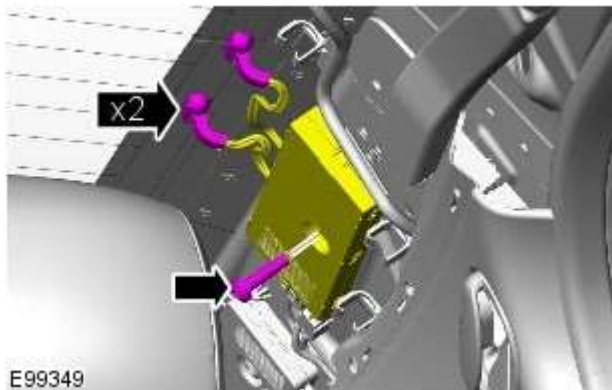
Removal



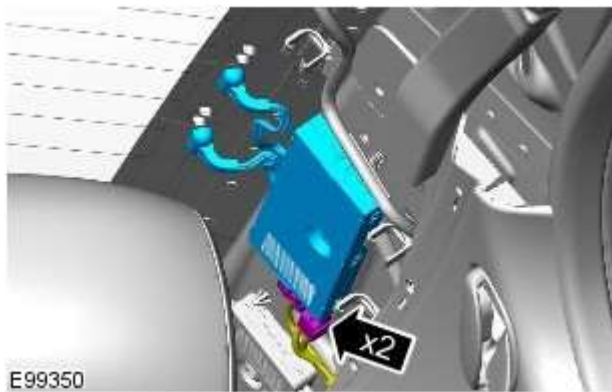
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [C-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Torque: 10 Nm



4.



Installation

1. To install, reverse the removal procedure.

Information and Entertainment System - Audio and Climate Control

Assembly

Removal and Installation

Removal

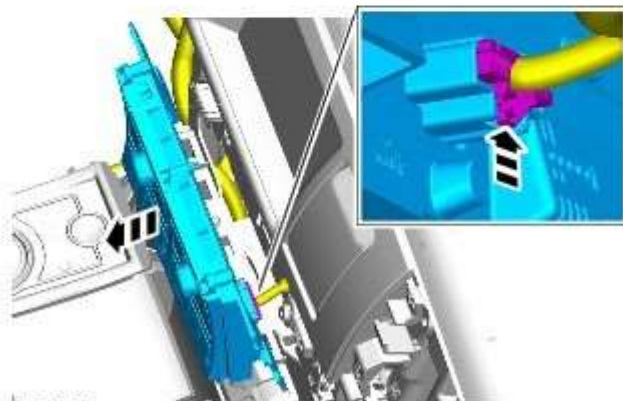
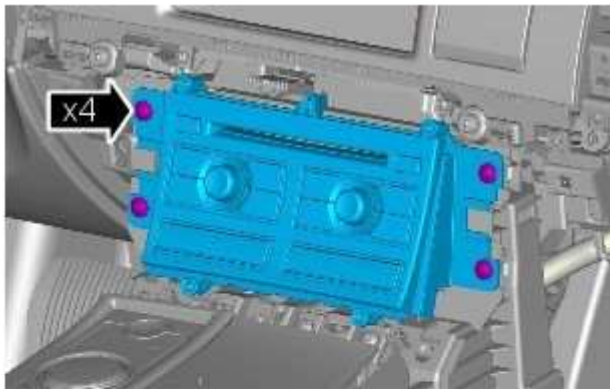


NOTE: Removal steps in this procedure may contain installation details.

1. Remove both floor console side trim panels.

Refer to: [Floor Console Side Trim Panel](#) (501-12 Instrument Panel and Console, Removal and Installation).

2. Torque: 4 Nm



E95125

Installation

1. To install, reverse the removal procedure.

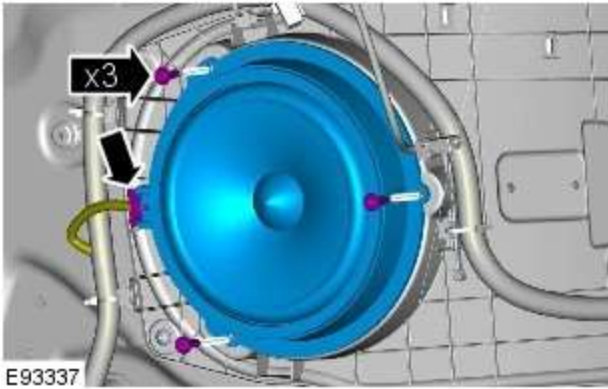
Information and Entertainment System - Front Door Speaker

Removal and Installation

Removal

1. Refer to: Front Door Trim Panel (501-05, Removal and Installation).

2.



Installation

1. To install, reverse the removal procedure.

Information and Entertainment System - Information and Entertainment Display

Removal and Installation

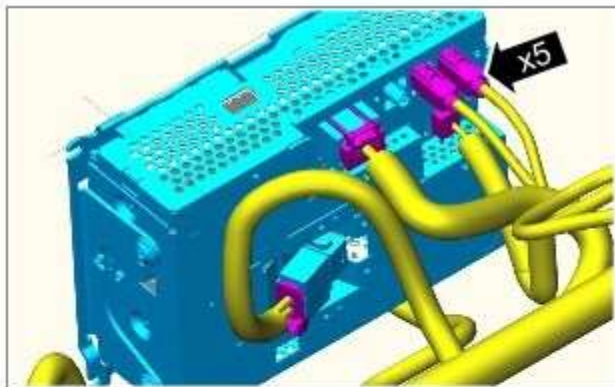
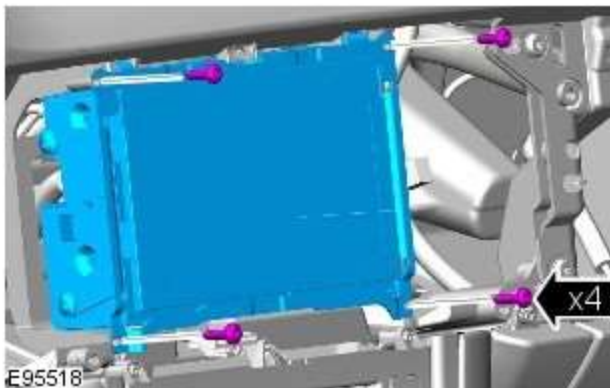
Removal




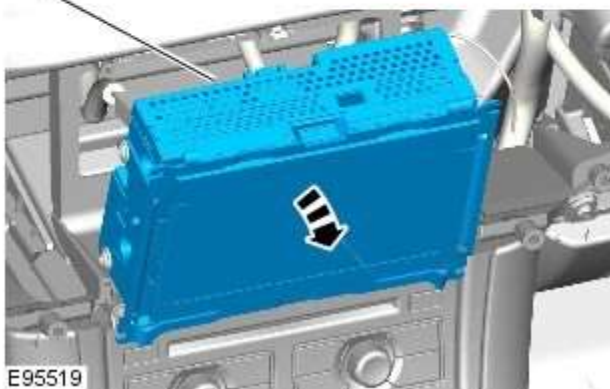
NOTE: Removal steps in this procedure may contain installation details.

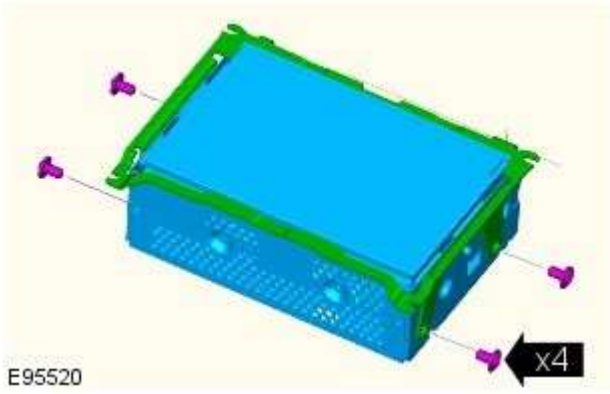
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Center Registers](#) (412-01 Climate Control, Removal and Installation).


3. Torque: 2 Nm



4.  CAUTION: Cover fiber optic cable connectors to minimize dust ingress and avoid bending the cables in a radius of less than 30 mm.





5.  NOTE: Do not disassemble further if the component is removed for access only.

Torque: 3 Nm

Installation

1. To install, reverse the removal procedure.

Information and Entertainment System - Information and Entertainment Module

Removal and Installation

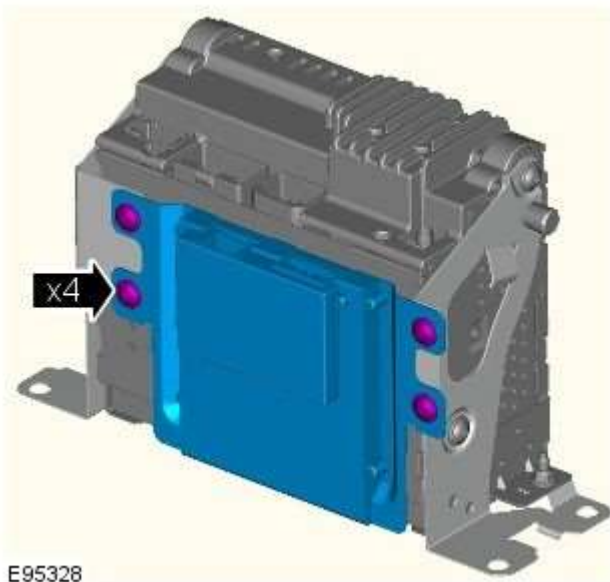
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Audio Unit](#) (415-01A Information and Entertainment System, Removal and Installation).

3. Torque: 3 Nm



E95328

Installation

1. NOTE: New units must be configured using the Programmable Module Installation Routine in the diagnostic tool.

To install, reverse the removal procedure.

Information and Entertainment System - Instrument Panel Speaker

Removal and Installation

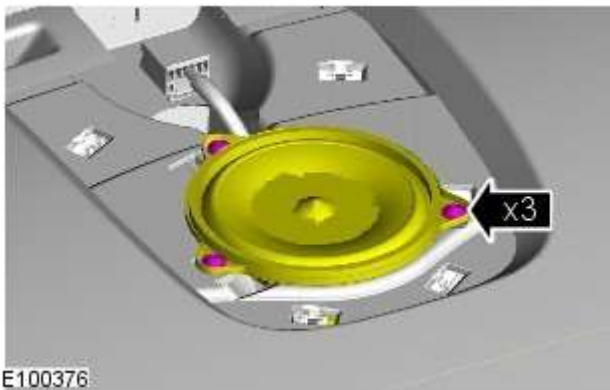
Removal



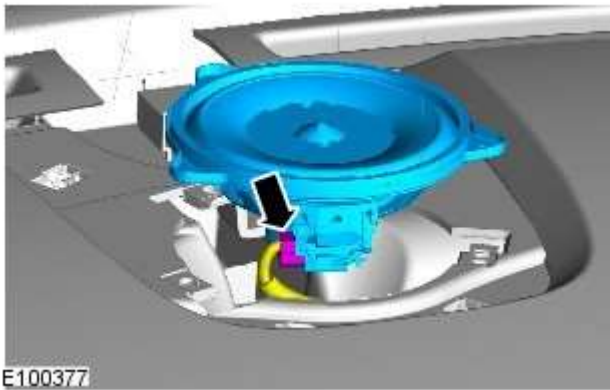
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Instrument Panel Speaker Grille](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Torque: 2 Nm



4.



Installation

1. To install, reverse the removal procedure.

Information and Entertainment System - Rear Door Speaker

Removal and Installation

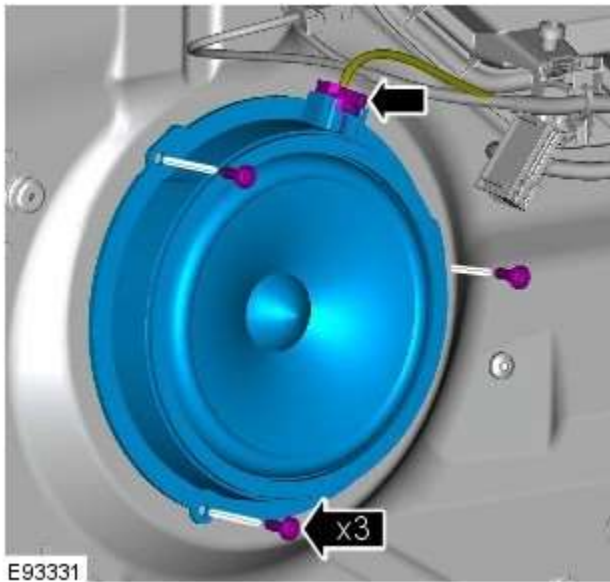
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Rear Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



Installation

1. To install, reverse the removal procedure.

Information and Entertainment System - Steering Wheel Audio Controls

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Make the SRS system safe.

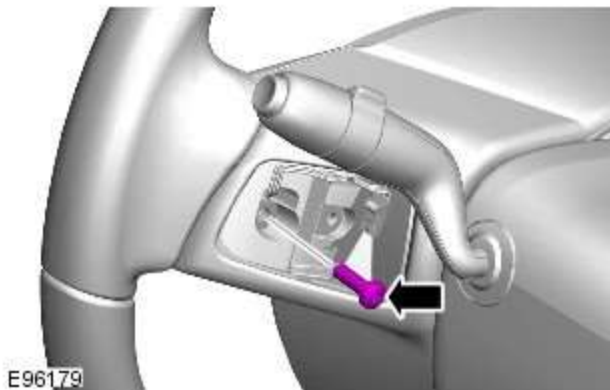
Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

2. Refer to: [Driver Air Bag Module](#) (501-20B Supplemental Restraint System, Removal and Installation).

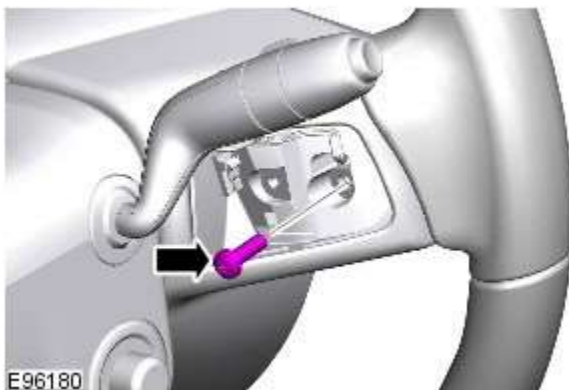
3. Refer to: [Upshift Paddle Switch](#) (307-05A Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol, Removal and Installation).

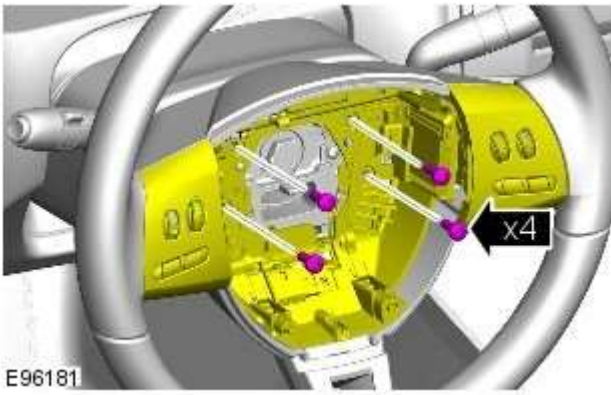
4. Refer to: [Downshift Paddle Switch](#) (307-05A Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol, Removal and Installation).

5. Torque: 3 Nm

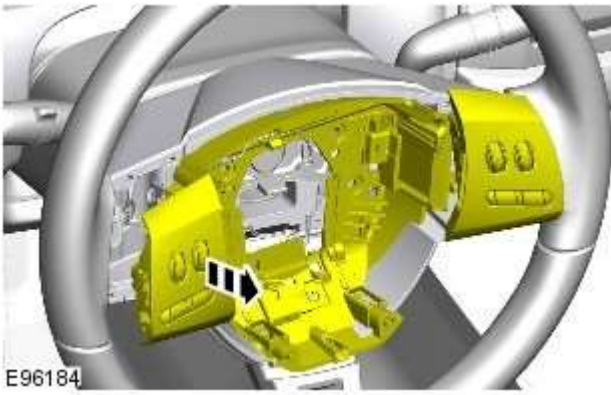


6. Torque: 3 Nm

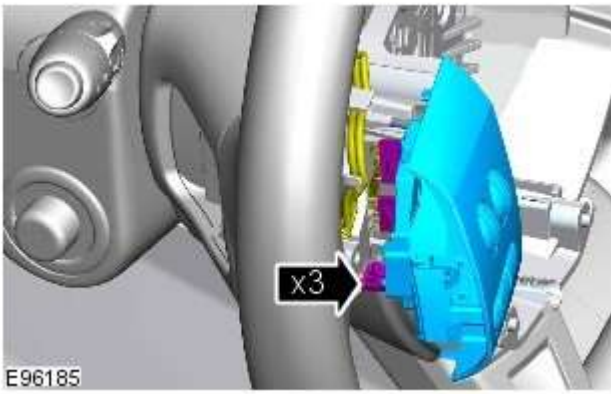




7. Torque: 6 Nm



8.



9.

Installation

1. To install, reverse the removal procedure.

Information and Entertainment System - Subwoofer Amplifier

Removal and Installation

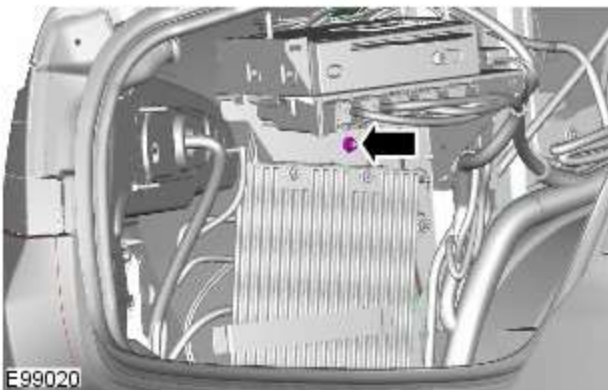
Removal



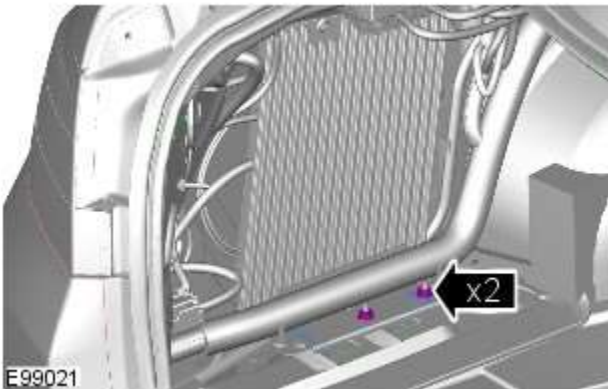
NOTE: Removal steps in this procedure may contain installation details.

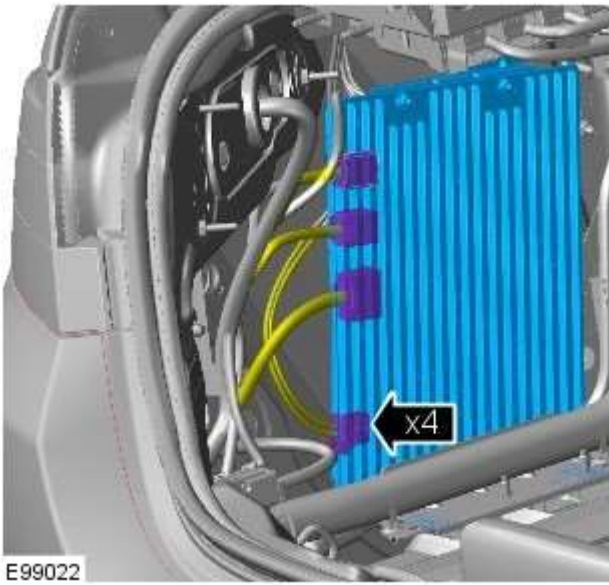
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Loadspace Trim Panel LH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Torque: 7 Nm



4. Torque: 7 Nm





5.



6.  NOTE: Do not disassemble further if the component is removed for access only.

Torque: 7 Nm



7. Torque: 7 Nm

Installation

1. To install, reverse the removal procedure.

Information and Entertainment System - Subwoofer Speaker

Removal and Installation

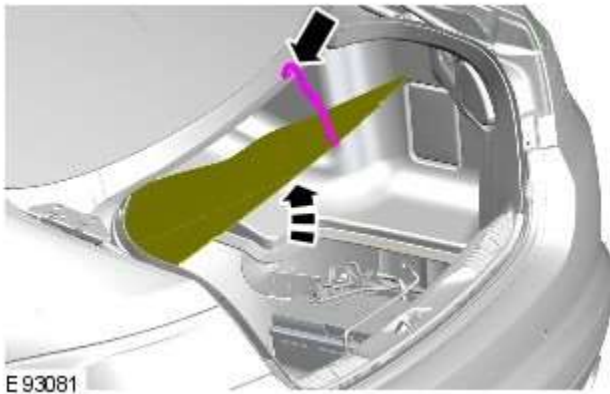
Removal



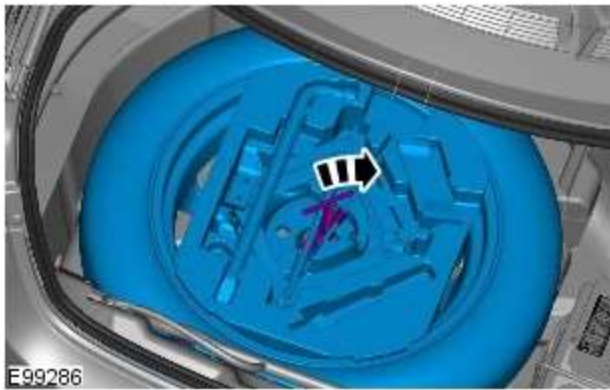
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

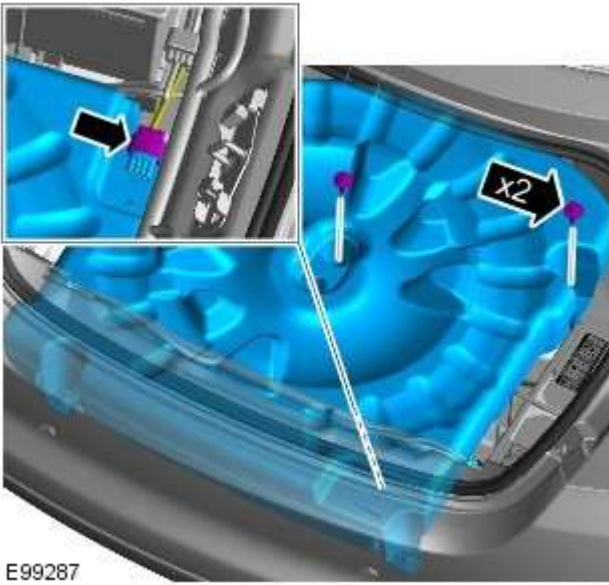
2.



3. Torque: 6 Nm



4. Torque: 6 Nm



Installation

1. To install, reverse the removal procedure.

Information and Entertainment System - Satellite Radio Tuner

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.

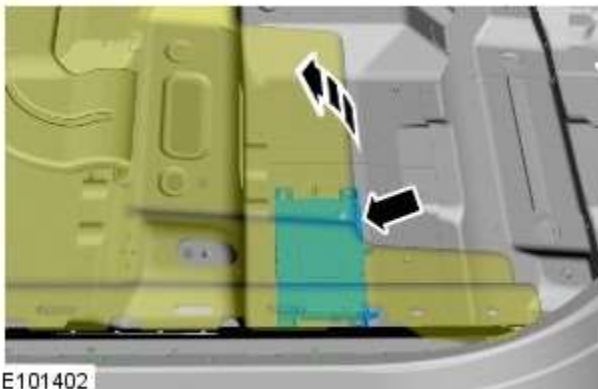


Some variation in the illustrations may occur, but the essential information is always correct.

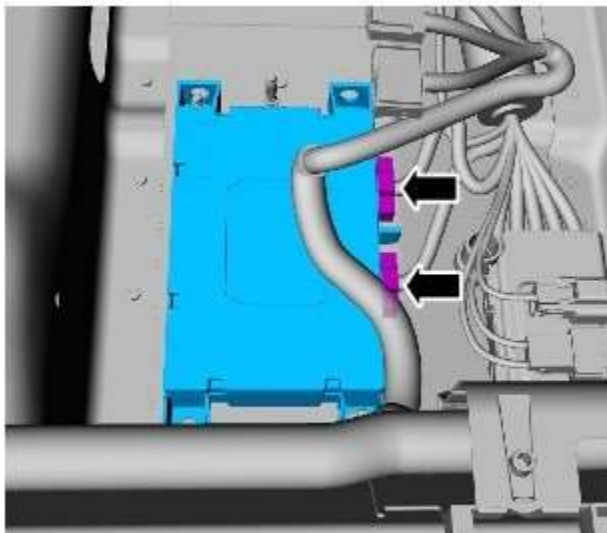
1. Disconnect the battery ground cable.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

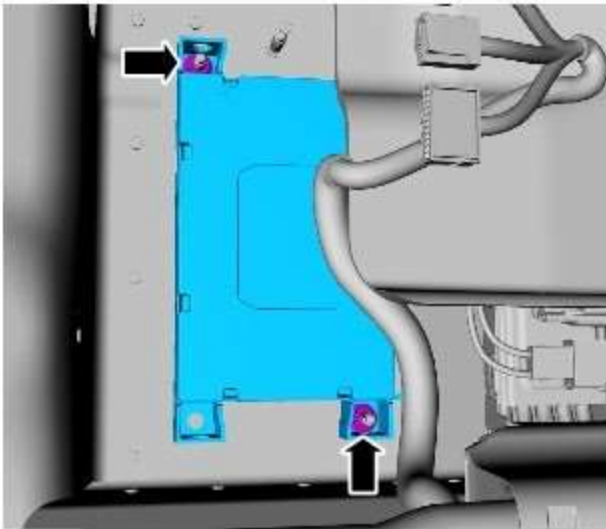
2. Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).




- 3.

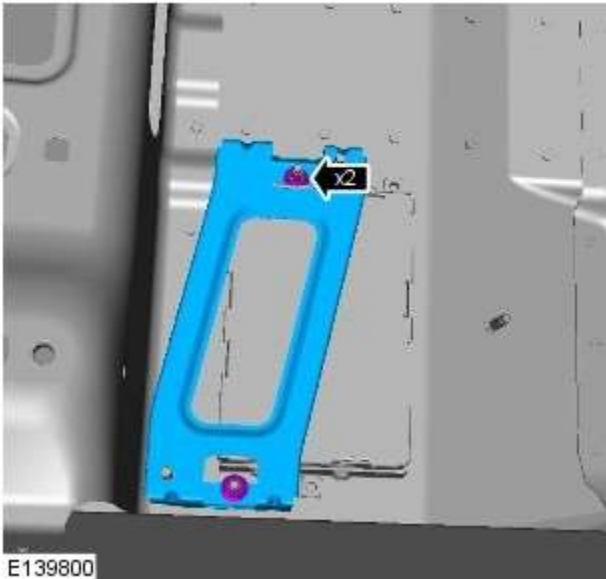


4. NOTE: If equipped.



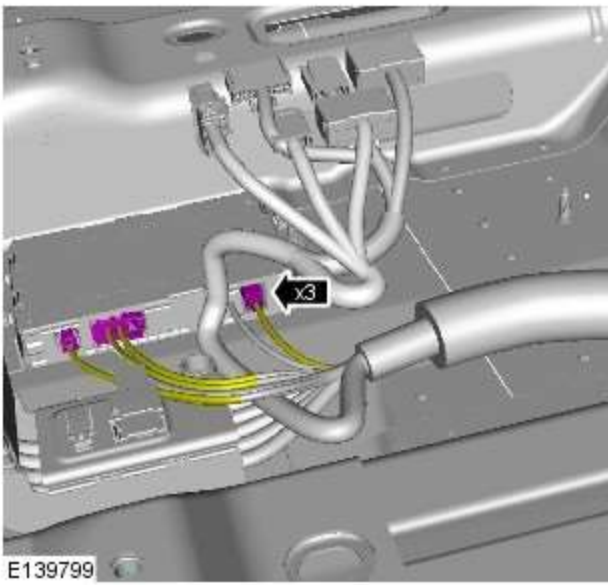
E101403

5.  NOTE: If equipped.
Torque: 10 Nm



E139800

6. Torque: 10 Nm



7.

Installation



1. NOTE: If a new component is installed, a link lead must be installed to the module in the position shown.

2. To install, reverse the removal procedure.

Information and Entertainment System - DTC: Audio Input Control Module - Audio Input Control Module

Diagnosis and Testing

Principle of Operation

This section of the manual concerns diagnostic procedures for the Denison audio input control module. For a detailed description of the information and entertainment system, refer to the relevant description and operation sections in the workshop manual

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Audio input control module • Audio amplifier module • Integrated audio module • Integrated control panel • Touch screen display • Loudspeakers 	<ul style="list-style-type: none"> • Fuses • Loose or corroded connector(s) • Audio amplifier module • Integrated audio module • Integrated control panel • Touch screen display • Loudspeakers

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, check for diagnostic trouble codes and refer to the relevant diagnostic trouble codes index

Audio Input Control Module Diagnostics



NOTE: If problems are reported with the audio input control module, prior to further diagnostic checks or replacement of components, first perform a hardware reset by depressing the reset button for a minimum of two seconds. If problems persist, refer to the symptom charts below

Performing A Hardware Reset



E141500

Symptom Chart - Intermittent Fault With iPod® Playback

Symptom	Possible Cause	Action
Intermittent fault with iPod® playback	<ul style="list-style-type: none"> • The connected iPod® unit has crashed or frozen 	<ul style="list-style-type: none"> • See diagnostic procedures as specified in pinpoint test A1 "Check The Operation Of The iPod®" below GO to Pinpoint Test A.

Symptom	Possible Cause	Action
	<ul style="list-style-type: none"> The connected iPod® unit's battery is not holding charge and requires replacement 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A2 "Check The iPod® Battery" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The iPod® dock cable is not securely installed The iPod® dock cable is faulty 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A3 "Check The iPod® Is Charging When Connected To The Audio Input Control Module" below GO to Pinpoint Test A.

Symptom Chart - Intermittent Fault With Playback From USB Device

Symptom	Possible Cause	Action
Intermittent fault with USB playback	<ul style="list-style-type: none"> The USB memory stick is damaged or faulty The USB memory stick is incompatible with the audio input control module 	<ul style="list-style-type: none"> Check for correct operation by connecting another working USB memory stick loaded with a compatible test file (files may be downloaded from Denison website). If fault clears, then the original USB stick should be replaced. If problem persists, suspect a fault with the USB extension cable
	<ul style="list-style-type: none"> The USB extension cable is not securely installed The USB extension cable is faulty 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test B3 "Check The USB Extension Cable Is Operational And Securely Installed" below GO to Pinpoint Test B.
	<ul style="list-style-type: none"> The audio input control module power harness is not securely installed The audio input control module power harness is faulty 	<ul style="list-style-type: none"> Ensure all connectors of the audio input control module power harness are correctly secured If problem persists, check and install a new audio input control module power harness
Not all sound files on the USB are played	<ul style="list-style-type: none"> Sound files may be saved in an incompatible file format 	<ul style="list-style-type: none"> Check that affected sound file is encoded in a compatible file format - Compatible file formats: AAC (up to 320 kbit/s); MP3 (up to 320 kbit/s); MP3 variable bit rate (up to 320 kbit/s); WAV - uncompressed files; OGG (up to 320 kbit/s); WMA - except DRM protected files (up to 320 kbit/s)
	<ul style="list-style-type: none"> Sound files may be corrupted 	<ul style="list-style-type: none"> Check integrity of affected files and remove any damaged files from the memory stick

Symptom Chart - No Response From CDC Button

Symptom	Possible Cause	Action
No response when the CDC button is pressed	<ul style="list-style-type: none"> USB input or iPod® input faulty 	<ul style="list-style-type: none"> First check operation of iPod® playback. If iPod® operates normally but USB playback is faulty, then follow diagnostic procedures as specified in pinpoint test B GO to Pinpoint Test B. If iPod® playback is faulty but USB playback operates normally, then follow diagnostic procedures as specified in pinpoint test A GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The auxiliary input may be switched to bypass mode 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A5: "Check If The Bypass Switch On The Auxiliary Input Unit Is Activated" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The audio input control module power harness is not securely installed The audio input control module power supply/harness is faulty 	<ul style="list-style-type: none"> Ensure all connectors of the audio input control module power harness are correctly secured See diagnostic procedures as specified in pinpoint tests C1: "Check The Integrity Of Power Supply From Vehicle" and C2: "Check The Integrity And Operation Of The Audio Input Control Module Power Harness" below GO to Pinpoint Test C.
	<ul style="list-style-type: none"> Optical cables/connectors (if fitted) are not securely installed Optical cables/connectors (if fitted) are faulty 	<ul style="list-style-type: none"> Ensure the optical cables are routed appropriately to avoid pinching the cable and with no excessive bends or kinks. Ensure all connectors of the optical cables are correctly secured. Replace any damaged or faulty optical cables and/or connectors as required If no CD changer is fitted, ensure that the optical cables are configured in a closed loop so that the optical circuit is intact

Symptom Chart - iPod® Related Faults

Symptom	Possible Cause	Action
iPod® inoperative	<ul style="list-style-type: none"> iPod® configured or connected incorrectly 	<ul style="list-style-type: none"> If iPod® playback is faulty but USB playback operates normally, then follow diagnostic procedures as specified in pinpoint test A GO to Pinpoint Test A.
iPod® does not operate and in-car display shows "99" on the screen	<ul style="list-style-type: none"> The connected iPod® unit has crashed or frozen 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A1 "Check The Operation Of The iPod®" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The connected iPod® unit's battery is flat and requires charging The connected iPod® unit's battery is not holding charge and requires replacement 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A2 "Check The iPod® Battery" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The iPod® unit is not compatible with the audio input control module 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A4 "Check The iPod® Is Compatible With The Audio Input Control Module" below GO to Pinpoint Test A.
iPod® playback drops out and system reverts to radio input	<ul style="list-style-type: none"> USB input or iPod® input faulty 	<ul style="list-style-type: none"> First check operation of iPod® playback. If iPod® operates normally but USB playback is faulty, then follow diagnostic procedures as specified in pinpoint test B GO to Pinpoint Test B. If iPod® playback is faulty but USB playback operates normally, then follow diagnostic procedures as specified in pinpoint test A GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The connected iPod® unit has crashed or frozen 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A1 "Check The Operation Of The iPod®" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The connected iPod® unit's battery is flat and requires charging The connected iPod® unit's battery is not holding charge and requires replacement 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A2 "Check The iPod® Battery" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The auxiliary input unit is faulty 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A6 "Check The Operation Of The Auxiliary Input Unit" below GO to Pinpoint Test A.
iPod® unit will not charge when connected to the audio input control module	<ul style="list-style-type: none"> The iPod® unit is not compatible with the audio input control module 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A4 "Check The iPod® Is Compatible With The Audio Input Control Module" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The iPod® dock cable is not securely installed The iPod® dock cable is faulty 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A3 "Check The iPod® Is Charging When Connected To The Audio Input Control Module" below GO to Pinpoint Test A.
iPod® unit keeps cutting out and rebooting	<ul style="list-style-type: none"> The iPod® unit is not compatible with the audio input control module 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A4 "Check The iPod® Is Compatible With The Audio Input Control Module" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The iPod® dock cable is not securely installed The iPod® dock cable is faulty 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A3 "Check The iPod® Is Charging When Connected To The Audio Input Control Module" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The connected iPod® unit's battery is flat and requires charging The connected iPod® 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A2 "Check The iPod® Battery" below GO to Pinpoint Test A.

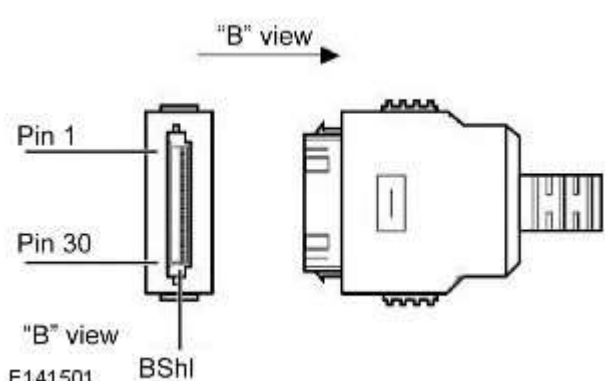


Symptom	Possible Cause	Action
	unit's battery is not holding charge and requires replacement	
Unable to select specific content on the iPod® (ie: an individual artist, album or song)	<ul style="list-style-type: none"> Content/sound files corrupted or incompatible with the iPod® 	<ul style="list-style-type: none"> Check if files/content can be accessed by iPod® when it is disconnected from the audio input control module. If fault persists, advise customer to renew or replace the affected files
iPod® not recognised when connected	<ul style="list-style-type: none"> The connected iPod® unit has crashed or frozen 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A1 "Check The Operation Of The iPod®" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> USB input or iPod® input faulty 	<ul style="list-style-type: none"> First check operation of iPod® playback. If iPod® operates normally but USB playback is faulty, then follow diagnostic procedures as specified in pinpoint test B GO to Pinpoint Test B. If iPod® playback is faulty but USB playback operates normally, then follow diagnostic procedures as specified in pinpoint test A GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The auxiliary input may be switched to bypass mode 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A5: "Check If The Bypass Switch On The Auxiliary Input Unit Is Activated" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The auxiliary input unit is faulty 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A6 "Check The Operation Of The Auxiliary Input Unit" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The connected iPod® unit's battery is flat and requires charging The connected iPod® unit's battery is not holding charge and requires replacement 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A2 "Check The iPod® Battery" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The iPod® unit is not compatible with the audio input control module 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A4 "Check The iPod® Is Compatible With The Audio Input Control Module" below GO to Pinpoint Test A.
iPod® connector pins are misaligned	<ul style="list-style-type: none"> The iPod® dock cable is faulty 	<ul style="list-style-type: none"> Replace dock cable as required. To ensure optimum compatibility, the cable with the white mini-DIN connector - Part No C2S51762 - should be used
iPod® not working at all. If reset, the system will work for 6 songs then cuts out again. CDC button inoperative and CD sometimes cuts off for 2-3 seconds	<ul style="list-style-type: none"> Optical cables/connectors (if fitted) are not securely installed Optical cables/connectors (if fitted) are faulty 	<ul style="list-style-type: none"> Ensure the optical cables are routed appropriately to avoid pinching the cable and with no excessive bends or kinks. Ensure all connectors of the optical cables are correctly secured. Replace any damaged or faulty optical cables and/or connectors as required If no CD changer is fitted, ensure that the optical cables are configured in a closed loop so that the optical circuit is intact
iPod® inoperative. Display shows no magazine	<ul style="list-style-type: none"> The auxiliary input may be switched to bypass mode 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A5: "Check If The Bypass Switch On The Auxiliary Input Unit Is Activated" below GO to Pinpoint Test A.
iPod® inoperative. Display shows menu for CD6 and has to load all the tracks	<ul style="list-style-type: none"> Audio input control module software requires updating 	<ul style="list-style-type: none"> Download and install the latest system software. Software releases are available on the Denison website - http://www.denison.com/jaguar/

Symptom Chart - USB Memory Stick/Storage Device Related Faults

Symptom	Possible Cause	Action
No playback from memory stick/storage device	<ul style="list-style-type: none"> Memory stick/storage device configured or connected incorrectly 	<ul style="list-style-type: none"> If iPod® operates normally but USB playback is faulty, then follow diagnostic procedures as specified in pinpoint test B GO to Pinpoint Test B.

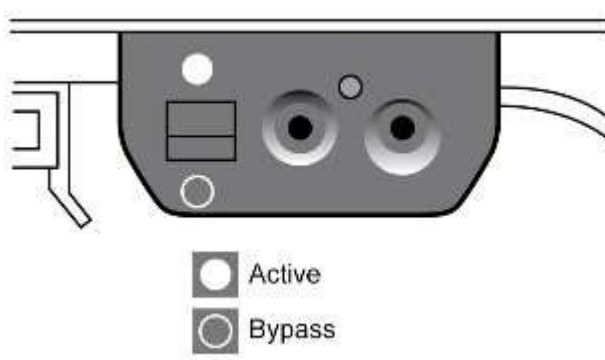
Symptom Chart - System Faults

Symptom	Possible Cause	Action
System defaults to Audio/CD Changer	<ul style="list-style-type: none"> The auxiliary input unit may be switched to bypass mode 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A5: "Check If The Bypass Switch On The Auxiliary Input Unit Is Activated" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The auxiliary input unit is faulty 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A6 "Check The Operation Of The Auxiliary Input Unit" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The memory stick/storage device is not correctly formatted 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test B1 "Check For Correct Formatting" below GO to Pinpoint Test B.
	<ul style="list-style-type: none"> The USB extension cable is not securely installed The USB extension cable is faulty 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test B3 "Check The USB Extension Cable Is Operational And Securely Installed" below GO to Pinpoint Test B.
	<ul style="list-style-type: none"> The USB memory stick is damaged or faulty The USB memory stick is incompatible with the audio input control module 	<ul style="list-style-type: none"> Check for correct operation by connecting another working USB memory stick loaded with a compatible test file (files may be downloaded from Dension website). If fault clears, then the original USB stick should be replaced. If problem persists, suspect a fault with the USB extension cable
	<ul style="list-style-type: none"> The storage capacity of the memory stick/storage device is close to or exceeds 8 Gigabytes 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test B4 "Check The Capacity Of The Memory Stick/Storage Device" below GO to Pinpoint Test B.
	<ul style="list-style-type: none"> The connected iPod® unit's battery is flat and requires charging The connected iPod® unit's battery is not holding charge and requires replacement 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A2 "Check The iPod® Battery" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The iPod® unit is not compatible with the audio input control module 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A4 "Check The iPod® Is Compatible With The Audio Input Control Module" below GO to Pinpoint Test A.
	<ul style="list-style-type: none"> The connected iPod® unit has crashed or frozen 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A1 "Check The Operation Of The iPod®" below GO to Pinpoint Test A.
<ul style="list-style-type: none"> No sound from speakers (either front/rear or left/right) during playback from iPod®/memory stick Audio system loses connection to iPod®/memory stick during playback iPod® and radio playback skips after unit has been operating for 4 minutes 	<ul style="list-style-type: none"> The audio input control module power harness is not securely installed The audio input control module power supply/harness is faulty 	<ul style="list-style-type: none"> Ensure all connectors of the audio input control module power harness are correctly secured See diagnostic procedures as specified in pinpoint tests C1: "Check The Integrity Of Power Supply From Vehicle" and C2: "Check The Integrity And Operation Of The Audio Input Control Module Power Harness" below GO to Pinpoint Test C.
	<ul style="list-style-type: none"> Optical cables/connectors (if fitted) are not securely installed Optical cables/connectors (if fitted) are faulty 	<ul style="list-style-type: none"> Ensure the optical cables are routed appropriately to avoid pinching the cable and with no excessive bends or kinks. Ensure all connectors of the optical cables are correctly secured. Replace any damaged or faulty optical cables and/or connectors as required If no CD changer is fitted, ensure that the optical cables are configured in a closed loop so that the optical circuit is intact
	<ul style="list-style-type: none"> The iPod® dock cable is not securely installed The iPod® dock cable is faulty 	<ul style="list-style-type: none"> See diagnostic procedures as specified in pinpoint test A3 "Check The iPod® Is Charging When Connected To The Audio Input Control Module" below GO to Pinpoint Test A.

PINPOINT TEST A : IPOD® INOPERATIVE	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK THE OPERATION OF THE IPOD®	
1	Check if the iPod® has crashed or frozen (it is unresponsive to any control commands)
	Has the iPod® crashed or frozen? Yes Reset the iPod® or refer to Apple service procedures No GO to A2.
A2: CHECK THE IPOD® BATTERY	
1	Check the charge state of the iPod® battery
	Is the iPod® battery flat? Yes Charge the iPod® battery for at least 10 minutes either by connecting to the charger supplied with the iPod® or by connecting to the audio input control module. If iPod® will not charge when connected to the audio input control module and with the ignition on then GO to A3. No GO to A3.
A3: CHECK THE IPOD® IS CHARGING WHEN CONNECTED TO THE AUDIO INPUT CONTROL MODULE	
iPOD® Dock Connector - Pin Configuration	
 <p>The diagram shows two views of the iPod dock connector. On the left is a side view labeled 'B' view, with Pin 1 at the top and Pin 30 at the bottom. Below it is the part number E141501 and the code BShl. On the right is a top-down view of the connector, with an arrow pointing to it from the label 'B' view' above.</p>	
1	Check that the iPod® is charging when connected to the audio input control module
2	Ignition switch in position II.
3	Ensure the iPod® dock cable is securely connected
	Does the iPod® charge up while connected to the audio input control module? Yes GO to A4. No Check the integrity of the iPod® dock cable and its connections. Disconnect the iPod® and check the voltage readings of the iPod® dock cable using a multimeter (Pin B8: 5 volts/Pin B15: GND). If a fault is noted, replace dock cable as required. To ensure optimum compatibility, the cable with the white mini-DIN connector - Part No C2S51762 - should be used. If iPod® will not charge after replacement, then GO to A4.
A4: CHECK THE IPOD® IS COMPATIBLE WITH THE AUDIO INPUT CONTROL MODULE	
NOTES:	
 <p>Some of the earlier (pre-2004) iPod® models may not be compatible with the audio input control module. In order to optimise functionality the audio input control module may require a firmware update and/or connection via the latest iPod® dock cable with the white mini-DIN connector - Part No C2S51762. See the manufacturer website for further details - http://www.dension.com/jaguar/</p>	
 <p>Some of the earlier (pre-2004) iPod® models may not be compatible with the audio input control module. In order to optimise functionality the audio input control module may require a firmware update and/or connection via the latest iPod® dock cable with the white mini-DIN connector - Part No C2S51762. See the manufacturer website for further details - http://www.dension.com</p>	
1	Determine whether the iPod® model being used is compatible with the audio input control module installed in the vehicle
2	Ensure the latest firmware updates are installed and an appropriate iPod® dock cable is securely connected
3	For advice, check details on the Dension website - http://www.dension.com/jaguar/

	<p>Is the iPod® compatible with the audio input control module?</p> <p>Yes GO to A5.</p> <p>No Advise customer that an alternative device is required</p>
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A5: CHECK IF THE BYPASS SWITCH ON THE AUXILIARY INPUT UNIT IS ACTIVATED

	<p>Auxiliary Input Unit - Bypass Switch</p>  <p>E141502</p>
	<p>1 Check the status of the bypass switch on the auxiliary input unit</p>

	<p>Is the switch on the auxiliary input unit to the active mode position?</p> <p>Yes GO to A6.</p> <p>No Toggle the switch on the auxiliary input unit to the active mode position. Turn off the ignition and wait two minutes until the blue LED on the auxiliary input unit is extinguished. Switch ignition back on the complete the switching process</p>
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A6: CHECK THE OPERATION OF THE AUXILIARY INPUT UNIT


	1 Check the operation of the auxiliary input unit
	2 Disconnect the auxiliary input unit from the audio input control module.
	3 Ignition switch in position 0.
	4 Wait two minutes
	5 Install a new auxiliary input unit
	6 Ignition switch in position II.

	<p>Is the iPod® now working?</p> <p>Yes No further action required</p> <p>No Check the integrity of the iPod® dock cable and its connections GO to A3.</p>
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PINPOINT TEST B : USB/STORAGE DEVICE DOES NOT POWER UP WHEN CONNECTED

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
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B1: CHECK FOR CORRECT FORMATTING

	<p> NOTE: The storage device needs to be configured to FAT16 or FAT32 format</p>
	<p>1 Check if the memory stick/storage device is correctly formatted</p>
	<p>Is the storage device/memory stick configured to the FAT16 or FAT32 format?</p> <p>Yes GO to B2.</p> <p>No Reformat the storage device as required</p>

B2: CHECK FOR FAULTY OR INCOMPATIBLE MEMORY STICK/STORAGE DEVICE

	<p> NOTE: Test files may be downloaded from Dension website</p>
	<p>1 Check the operation of the USB port on the auxiliary input unit by connecting another working USB memory stick/storage device loaded with a compatible test file</p>
	<p>Does the system operate normally when another USB memory stick/storage device is connected?</p> <p>Yes Replace the original USB memory stick/storage device</p> <p>No GO to B3.</p>

B3: CHECK THE USB EXTENSION CABLE IS OPERATIONAL AND SECURELY INSTALLED

	<p>1 Check the integrity of the USB extension cable and its connections</p>
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	Is the USB extension cable securely pushed into the USB connection port on the audio input control module Yes Replace the USB extension cable No Secure connections and retest
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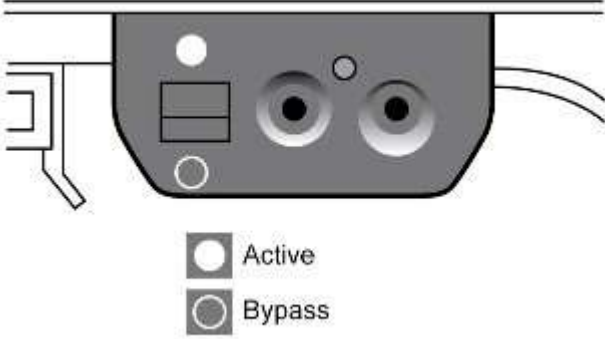
B4: CHECK THE CAPACITY OF THE MEMORY STICK/STORAGE DEVICE

 **NOTE:** The higher the capacity of the memory stick is the longer it takes to register with the audio input control module and power up. The maximum permitted capacity is 8 Gigabytes

	1 Check the storage capacity of the memory stick/storage device does not exceed 8 Gigabytes
	Is the storage capacity of the memory stick/storage device 8 Gigabytes or less? Yes High capacity devices may require longer to register and should be allowed up to two minutes to power up following connection to the USB port. If memory stick fails to power up after two minutes, suspect a faulty memory stick GO to B2. or USB extension cable GO to B3. No The memory stick/storage device exceeds the maximum permitted capacity. Replace with a device with a capacity of 8 Gigabytes or less

B5: CHECK IF THE BYPASS SWITCH ON THE AUXILIARY INPUT UNIT IS ACTIVATED

Auxiliary Input Unit - Bypass Switch



E141502

	1 Check the status of the bypass switch on the auxiliary input unit
	Is the switch on the auxiliary input unit to the active mode position? Yes GO to B6. No Toggle the switch on the auxiliary input unit to the active mode position. Turn off the ignition and wait two minutes until the blue LED on the auxiliary input unit is extinguished. Switch ignition back on the complete the switching process

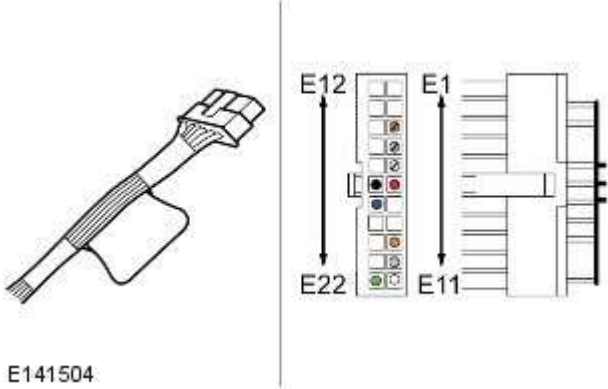
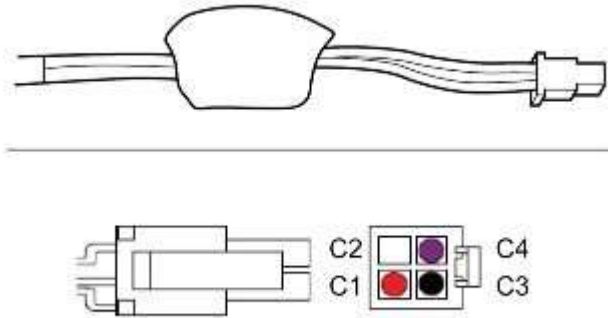
B6: CHECK THE OPERATION OF THE AUXILIARY INPUT UNIT

- 1** Check the operation of the auxiliary input unit
- 2** Disconnect the auxiliary input unit from the audio input control module.
- 3** Ignition switch in position 0.
- 4** Wait two minutes
- 5** Replace auxiliary input unit
- 6** Ignition switch in position II.

	Is the USB memory stick/storage device now powering up? Yes No further action required No Check the integrity of the USB extension cable and its connections GO to B3.
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PINPOINT TEST C : POWER SUPPLY CIRCUIT/POWER HARNESS CHECKS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK THE INTEGRITY OF PRIMARY POWER SUPPLY	
	1 Remove the retrofitted audio input control module power harness
	2 Reconnect the original power harness
	Are the standard infotainment components on the vehicle operating normally? Yes GO to C2. No Check power and ground connections to the affected modules. Check for related power or lost communications DTCs and refer to the relevant DTC index. Check fuses and battery charging system. Rectify as necessary

C2: CHECK THE INTEGRITY AND OPERATION OF THE AUDIO INPUT CONTROL MODULE POWER HARNESS	
	<p>1 SELECT APPROPRIATE HARNESS TYPE BASED ON CONFIGURATION OF MICROFIT CONNECTOR</p> <p>Audio Input Control Module Power Harness - 2x11 Microfit Connector</p>  <p>E141504</p>
	<p>2 Reconnect the retrofit audio input control module power harness</p> <p>3 Check the voltages of the 2x11 audio input control module microfit connector using a multimeter</p> <ul style="list-style-type: none"> • Red wire: permanent 12 volts supply • Black wire: GND • Blue wire: switched 12 volts
	<p>Audio Input Control Module Power Harness - 2x2 Microfit Connector</p>  <p>E141505</p>
	<p>4 Reconnect the retrofit audio input control module power harness</p> <p>5 Check the voltages of the 2x2 audio input control module microfit connector using a multimeter</p> <ul style="list-style-type: none"> • Red wire: permanent 12 volts supply • Black wire: GND • Purple wire: switched 12 volts
	<p>Are the voltage readings correct?</p> <p>Yes No further action</p> <p>No Replace the audio input control module power harness</p>

DTC Index

For a list of diagnostic trouble codes that could be logged on this vehicle, please refer to the relevant DTC index

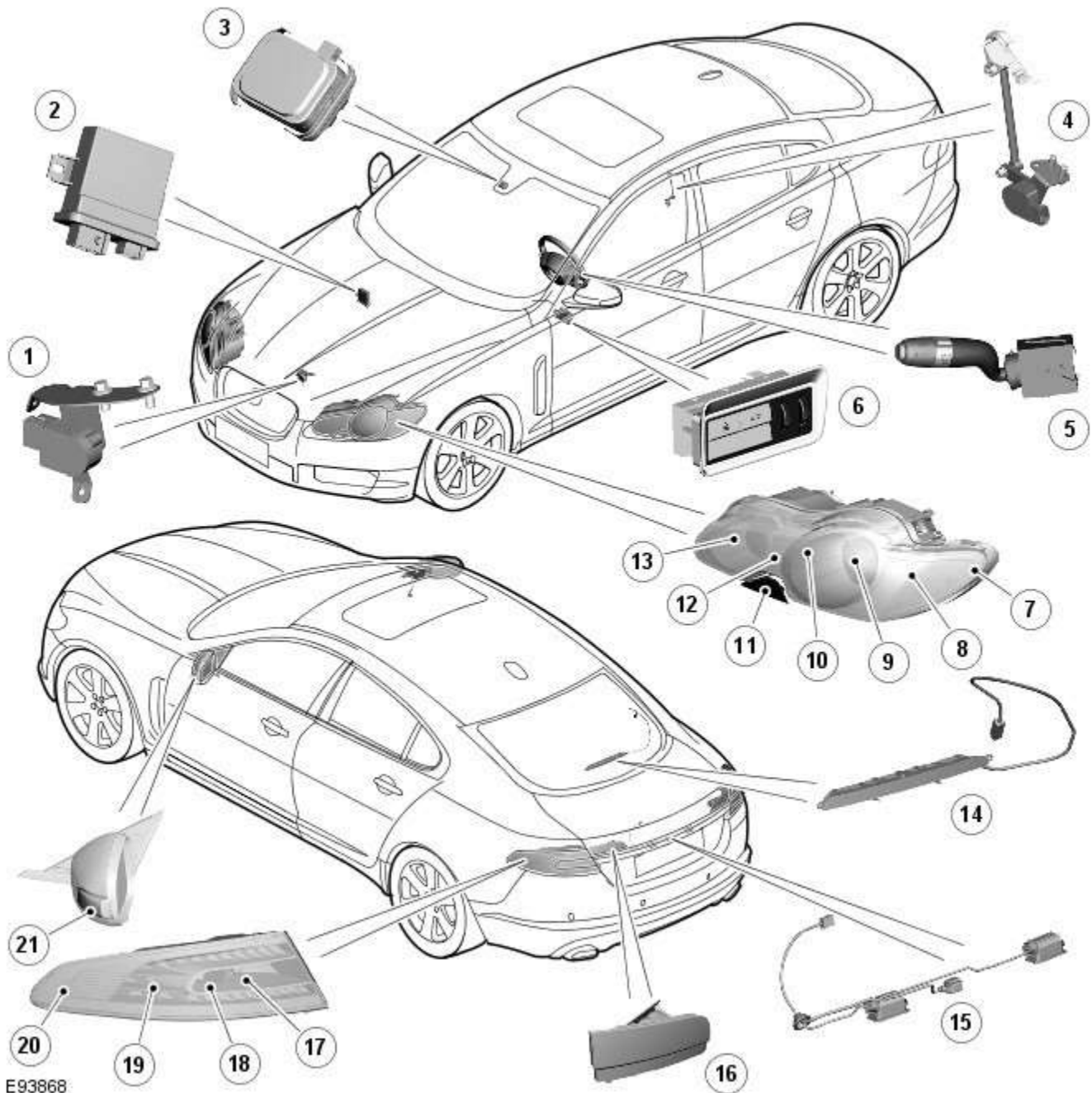
Exterior Lighting -

General Specifications

Item	Specification
Low beam headlamp bulb - Vehicles with conventional headlamps - non Federal	H7
Low beam headlamp bulb - Vehicles with conventional headlamps - Federal	H11
Low beam headlamp bulb - Vehicles with xenon headlamps	D1S
High beam headlamp bulb	H7
Cornering lamp bulb	H8
Side repeater lamp bulb	WY5W
Side marker lamp bulb - Federal	W5W
Front turn signal lamp bulb - non Federal	PY21W
Front turn signal lamp bulb - Federal	3457 AK
Rear turn signal lamp bulb	PY19W
Front side/parking lamp bulb - Vehicles built up to 01/2009	W5W halogen cool blue
Front side/parking lamp bulb - Vehicles built 02/2009 onwards	W5W
Reversing lamp bulb	PS19W

Exterior Lighting - Exterior Lighting - Component Location

Description and Operation



E93868

Item	Description
1	Front height sensor
2	Headlamp leveling module
3	Rain/light sensor
4	Rear height sensor
5	Light switch - LH (left-hand) steering column multifunction switch
6	Auxiliary lighting switch
7	Side marker lamp (NAS only) (2 off)
8	Front turn signal indicator (2 off)
9	Halogen or xenon headlamp projector module (2 off)
10	Cornering/Static bending lamp (where fitted) (2 off)
11	Front fog lamp
12	Front fog lamp
13	Front fog lamp
14	Rear fog lamp
15	Rear fog lamp
16	Rear fog lamp
17	Rear fog lamp
18	Rear fog lamp
19	Rear fog lamp
20	Rear fog lamp
21	Rear fog lamp

11	Headlamp telescopic power washer (2 off)
12	Front side lamp (2 off)
13	High beam only halogen lamp (2 off)
14	High Mounted Stop Lamp (HMSL) LED (light emitting diode) 's
15	License plate lamps (2 off)
16	Rear fog lamp (2 off)
17	Rear turn signal indicator (2 off)
18	Reverse lamp (2 off)
19	Side lamp/stop lamp LED 's (2 off)
20	Side marker LED 's (All markets) (2 off)
21	Side repeater lamp (2 off)

Exterior Lighting - Exterior Lighting - Overview

Description and Operation

OVERVIEW

The lighting systems are controlled by the [EJB \(engine junction box\)](#), [RJB \(rear junction box\)](#) and the [CJB \(central junction box\)](#). The two boxes contain fuses, relays and microprocessors to control the power supply and functionality of the lighting systems.

Driver lighting selections using the [LH \(left-hand\)](#) steering column multifunction switch or the auxiliary lighting switch are passed to the [CJB](#) via the instrument cluster.

The lighting system has an 'auto' lights function which is controlled by the [CJB](#) on receipt of signals from the rain/light sensor located at the top of the windscreen. The exterior lights are turned on or off in response to ambient light signals from the rain/light sensor on a [LIN \(local interconnect network\)](#) bus connection to the [CJB](#). The auto lights can also be activated when the windshield wipers are activated by signals from the rain sensor, which is located at the top of the windshield or when the driver activates the wipers in the fast wipe position.

Two levels of headlamp specification are available; halogen or xenon. In certain markets the headlamps feature a cornering lamp or a static bending lamp which illuminates the area at the side of the vehicle when turning into driveways for example. North American Specification (NAS) vehicles have a side marker lamp installed in the headlamp assembly. Replacement of any of the headlamp bulbs requires removal of the headlamp assembly.

The tail lamp comprises two separate lamp assemblies. The turn signal indicator, side and stop lamps and reverse lamps are located in each rear fender tail lamp assembly. The rear fog lamps are located in separate units attached to the luggage compartment lid. A side marker lamp is fitted to the rear fender tail lamp assembly and is fitted in all markets.

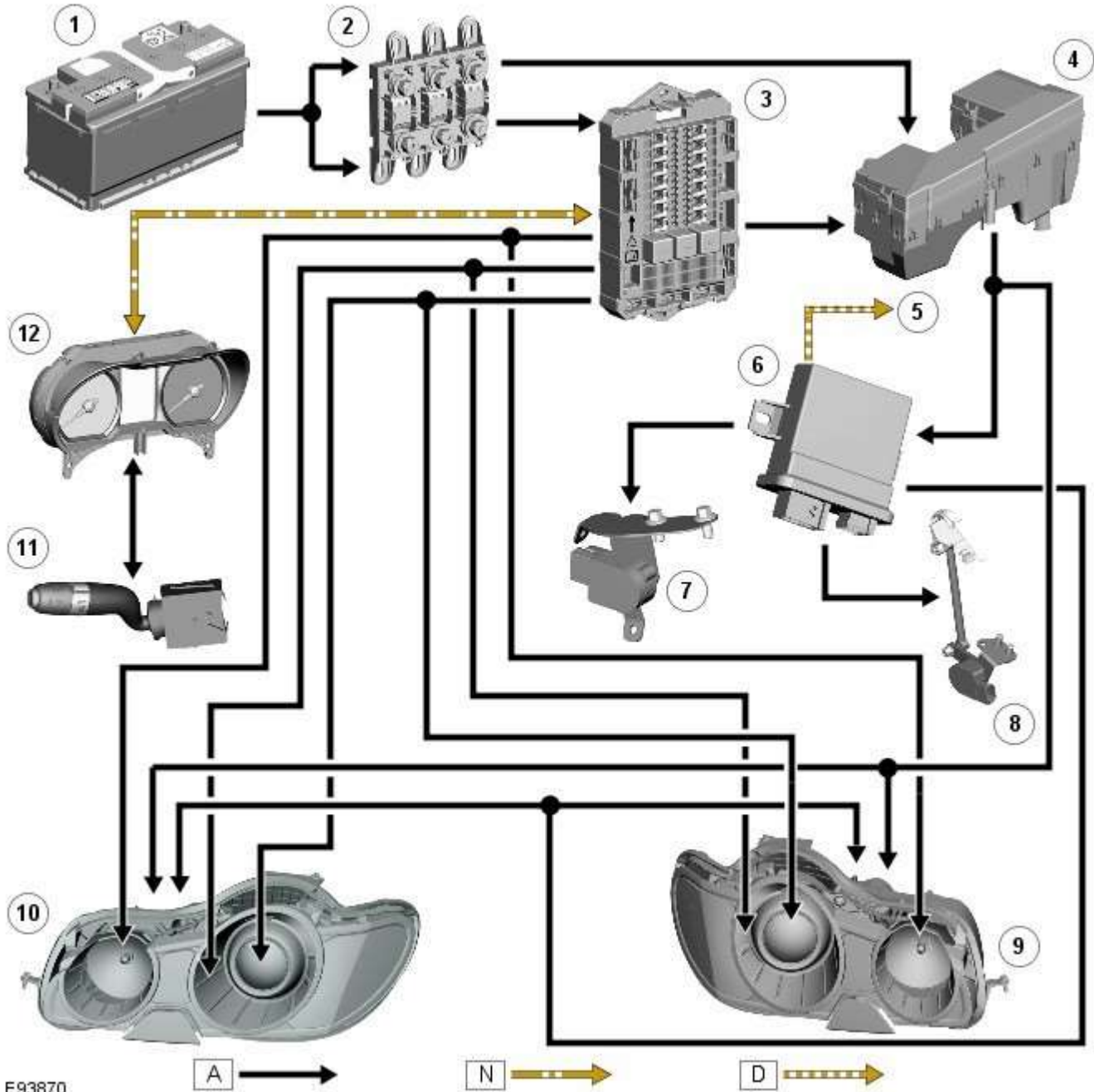
Two systems of headlamp leveling are available; manual leveling which is only available on halogen headlamps and static dynamic leveling which is available on xenon headlamps. The manual system uses a thumbwheel rheostat to adjust the vertical alignment of the headlamps to compensate for differing vehicle loading. The static dynamic system uses height sensors fitted to the front and rear suspension and a headlamp leveling module which periodically monitors the vehicle attitude and adjusts the headlamp vertical alignment accordingly.

Exterior Lighting - Exterior Lighting - System Operation and Component Description

Description and Operation

Control Diagram

XENON HEADLAMPS - CONTROL DIAGRAM

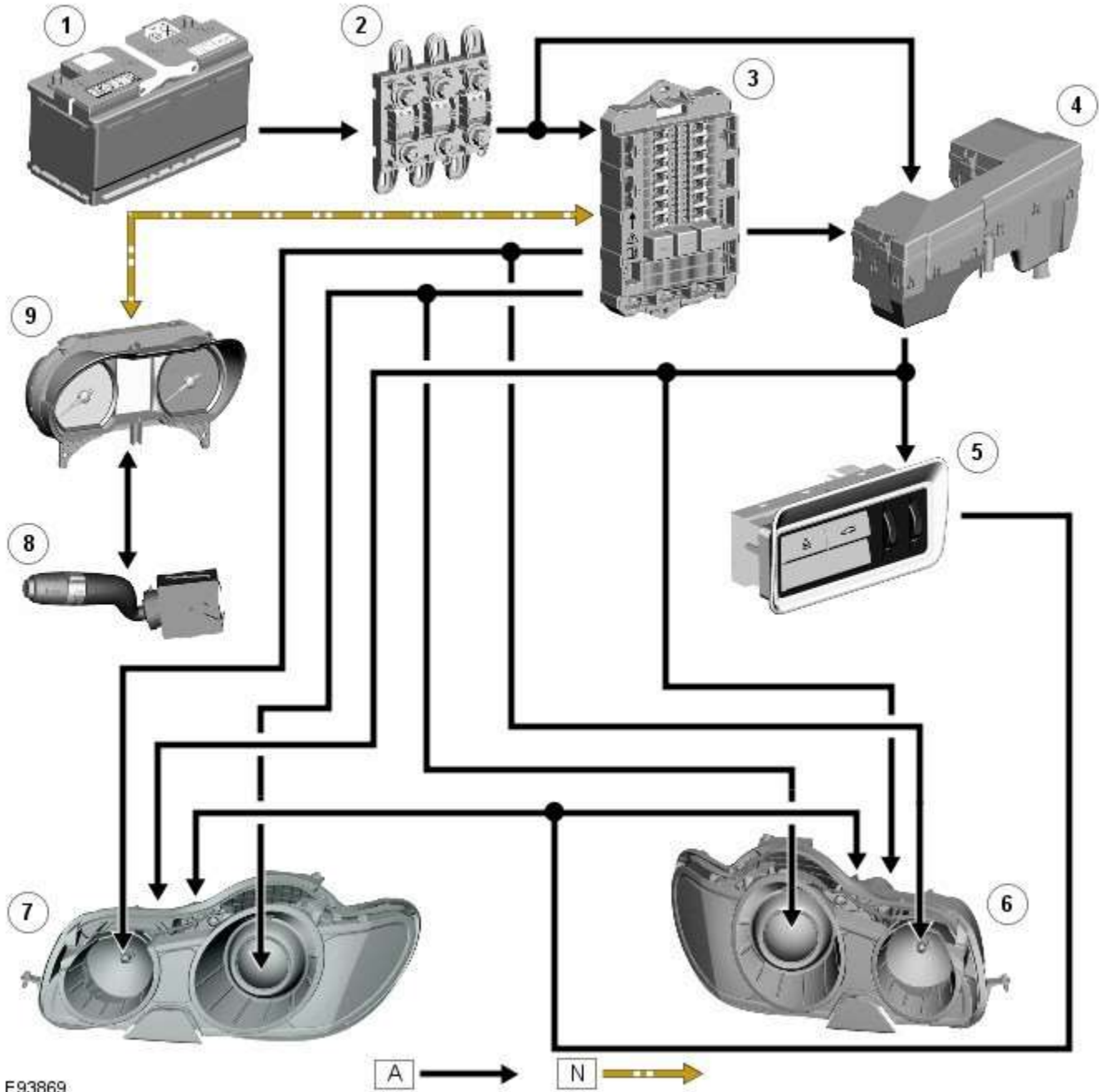


E93870

Item	Description
A = Hardwired; D = High speed CAN bus; N = Medium speed CAN bus	
1	Battery
2	BJB (battery junction box)
3	CJB (central junction box)
4	EJB (engine junction box)
5	Medium speed CAN (controller area network) bus to other vehicle systems
6	Headlamp leveling module

7	Front height sensor
8	Rear height sensor
9	RH (right-hand) headlamp assembly
10	LH (left-hand) headlamp assembly
11	Lighting control switch - LH steering column multifunction switch
12	Instrument cluster

HALOGEN HEADLAMPS - CONTROL DIAGRAM

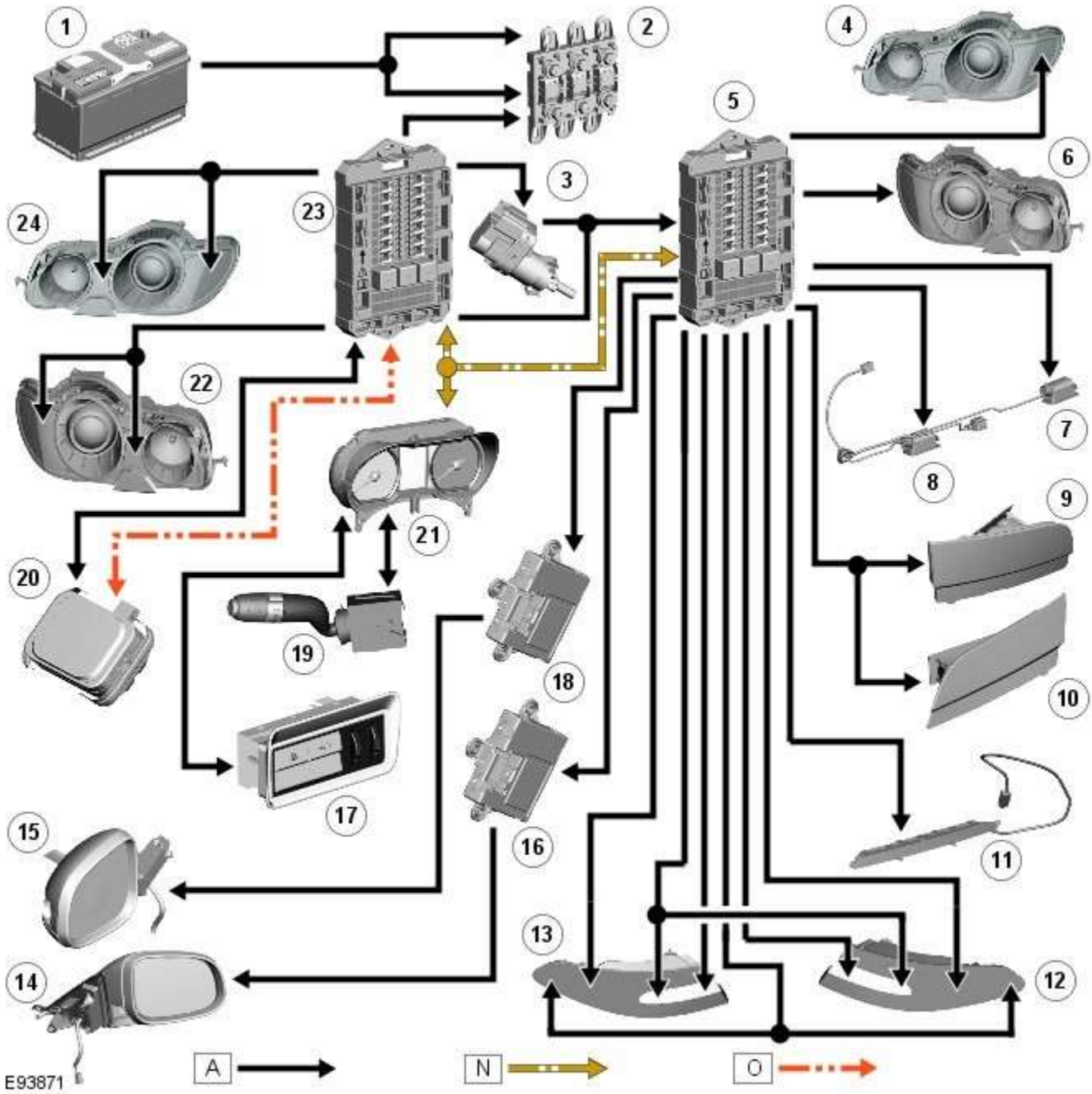


E93869

Item	Description
	A = Hardwired; N = Medium speed CAN bus
1	Battery
2	BJB
3	CJB
4	EJB
5	Auxiliary lighting switch

6	RH headlamp assembly
7	LH headlamp assembly
8	Lighting control switch - LH steering column multifunction switch
9	Instrument cluster

SIDE LAMPS/TURN SIGNAL INDICATORS/FOG LAMPS - CONTROL DIAGRAM



Item	Description
A = Hardwired; N = Medium speed CAN bus; O = LIN bus	
1	Battery
2	BJB - Megafuse
3	Stop lamp switch
4	LH turn signal indicator
5	RJB (rear junction box)
6	RH turn signal indicator
7	RH licence plate lamp

8	LH licence plate lamp
9	LH fog lamp
10	RH fog lamp
11	High mounted stop lamp
12	RH tail lamp assembly
13	LH tail lamp assembly
14	RH door mirror side repeater
15	LH door mirror side repeater
16	RH front door module
17	Auxiliary lighting switch
18	LH front door module
19	Lighting control switch - LH steering column multifunction switch
20	Rain/light sensor
21	Instrument cluster
22	RH headlamp assembly - side lamp and side marker lamp (if fitted)
23	CJB
24	LH headlamp assembly - side lamp and side marker lamp (if fitted)

System Operation

CENTRAL JUNCTION BOX (CJB) AND REAR JUNCTION BOX (RJB)

The [CJB](#) is an integrated unit which controls body functions and power distribution. The [CJB](#) is located on the [RH](#) 'A' pillar.

The [RJB](#) also controls body functions and power distribution and is located in the [RH](#) side of the luggage compartment.

Central Junction Box

The [CJB](#) receives inputs from the following switches via the instrument cluster and the medium speed [CAN](#) bus:

- [LH](#) Steering column multifunction switch
 - Side lamp position
 - Headlamp position
 - Automatic (AUTO) position
 - Timer delay positions
 - Turn signal indicators
 - Headlamp flash and main beam positions.

The [CJB](#) receives direct inputs from the following components:

- Stop lamp switch
- Rain/light sensor.

The [CJB](#) provides power supplies to the following lamps:

- [LH](#) and [RH](#) front side lamps
- [LH](#) and [RH](#) front side marker lamps (if fitted)
- [LH](#) and [RH](#) static bending lamp (if fitted)
- [LH](#) and [RH](#) low beam headlamp
- [LH](#) and [RH](#) high beam headlamp.

Rear Junction Box

The [RJB](#) provides power supplies to the following lamps:

- [LH](#) and [RH](#) tail lamps
- [LH](#) and [RH](#) stop lamps
- [LH](#) and [RH](#) front turn signal indicators
- [LH](#) and [RH](#) rear turn signal indicators
- [LH](#) and [RH](#) licence plate lamps
- [LH](#) and [RH](#) side marker lamps
- High mounted stop lamp
- Rear fog lamps
- Reverse lamps.

The [RJB](#) also provides a power supply to the [LH](#) and [RH](#) door modules. The door modules use the power supply to activate the turn signal indicator side repeater lamps located in the door mirrors, on receipt of a medium speed [CAN](#) bus message from the [RJB](#).

Circuit Protection

The [CJB](#) and the [RJB](#) provide circuit protection for their respective lighting circuits. The exterior lighting circuits are protected

by Field Effect Transistors (FET's). The FET's can detect overloads and short circuits and respond to heat generated by increased current flow caused by a short circuit.

On a normal conventionally protected circuit this would cause a fuse to blow. The FET's respond to the heat increase and disconnect the power supply to the affected circuit. When the fault is rectified or the FET has cooled, the FET will reset and operate the circuit normally. If the fault persists the FET will cycle, disconnecting and reconnecting the power supply.

The [CJB](#) and the [RJB](#) store fault codes which can be retrieved using a Jaguar approved diagnostic system. The fault code will identify that there is a fault on a particular output circuit which will assist with fault diagnosis and detection.

Alarm Indications

The exterior lighting system is used for alarm arm and disarm requests to show alarm system status.

When the driver locks and arms the vehicle, a visual indication of a successful lock and arm request is displayed to the driver by a single flash of the hazard flashers. If the vehicle is superlocked, then the hazard flashers will flash a second time (200 ms off and 200 ms on) to confirm the superlock request.

If the alarm is activated, the hazard flashers are operated for 10, 30 second cycles of 200 ms on and 200 ms off, with a 10 second delay between each cycle.



NOTE: On North American Specification (NAS) vehicles, the delay between the cycle when the alarm is activated is 60 seconds.

Lights on Warning

When the ignition is in the off power mode 0 or accessory power mode 4 and the lighting control switch is in the side lamp or headlamp position, a warning chime will sound if the driver's door is opened. This indicates to the driver that the exterior lights have been left switched on.

The chime is generated from the instrument cluster sounder on receipt of a lights on signal, a driver's door open signal and an ignition off power mode 0 or accessory power mode 4 signal via a medium speed [CAN](#) bus signal from the [CJB](#).

Headlamp Timer

The [RJB](#) controls the headlamp timer function which allows the headlamps to remain on for a period of time after leaving the vehicle. This is a driver convenience feature which illuminates the driveway after leaving the vehicle.

To operate the timer function the lighting control switch must be in one of the three headlamp timer positions when the ignition status is changed from ignition on power mode 6 to the off power mode 0. The timer function will then be initiated and the low beam headlamps will be illuminated for the selected timer period.



NOTE: If the lighting switch is in the AUTO position, the headlamp timer will not function when the ignition is changed to off power mode 0.

When the lighting control switch is in the autolamp exit delay position, the lighting control switch reference voltage flows through 4 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [RJB](#) that autolamps has been selected.

Depending on the selected exit delay position, the reference voltage to the autolamp exit delay switch is routed through 3, 2 or 1 resistors which is detected by the instrument cluster. The cluster outputs a message on the medium speed [CAN](#) bus to the [RJB](#) that autolamp exit delay period has been selected at 30, 60 or 120 seconds respectively.

Crash Signal Activation

When a crash signal is transmitted from the [RCM](#) (restraints control module), the [RJB](#) activates the hazard flashers. The hazard flashers continue to operate until the ignition is in the off power mode 0 or accessory power mode 6. Once this ignition state has occurred, the [RCM](#) will cease to transmit the crash signal.

LIGHTING CONTROL SWITCH

The instrument cluster outputs 2 reference voltages to the rotary lighting control switch; one feed being supplied to the light selection function of the switch and the second feed being supplied to the auto headlamp exit delay function. The switch position is determined by instrument cluster by the change in returned signal voltage which is routed through up to 4 resistors in series depending on the selection made.

OFF - When the lighting control switch is in the off position, the reference voltage flows through 1 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [CJB](#) that no lighting selection is made. The reference voltage to the auto headlamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [CJB](#) that auto headlamp or exit delay has not been selected.

SIDE LAMPS - When the lighting control switch is in the side lamp position, the reference voltage flows through 2 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [CJB](#) to activate the side lamps. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [CJB](#) that auto headlamp or exit delay has not been selected.

HEADLAMPS - When the lighting control switch is in the headlamp position, the reference voltage flows through 3 of the

resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [CJB](#) to activate the headlamps. The reference voltage to the auto headlamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [CJB](#) that auto headlamp or exit delay has not been selected.

AUTOLAMPS - When the lighting control switch is in the auto headlamp position, the reference voltage flows through 4 of the resistors. The returned signal voltage is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [CJB](#) to activate the autolamp function. The reference voltage to the autolamp exit delay switch is routed through 4 resistors which is detected by the instrument cluster which outputs a message on the medium speed [CAN](#) bus to the [CJB](#) that auto headlamp has been selected.

AUXILIARY LIGHTING SWITCH

Headlamp Leveling Rotary Thumbwheel (Halogen headlamps only)

A power supply is passed to the headlamp leveling thumbwheel from the ignition relay in the [EJB](#). Depending on the position of the thumbwheel, the voltage passes through 1, 2 or 3 resistors connected in series. The voltage through the resistors is passed to the headlamp leveling motor controller in each headlamp. The received voltage is determined as a request for the appropriate level position and the controller powers the headlamp level motors to the applicable position for each headlamp.

Rear Fog Lamp Switch

The instrument cluster supplies a reference voltage and return to the rear fog lamp switch. The fog lamp switch is a non-latching, momentary switch.

When the fog lamp switch is off the reference voltage is passed through a 1Kohm resistor. The voltage through the resistor is returned to the instrument cluster that determines that no request for fog lamp operation has been made.

When the driver presses the fog lamp switch, the reference voltage is passed through a 330 ohm resistor. The change in return voltage is sensed by the instrument cluster which determines fog lamp operation has been requested. The instrument cluster transmits a medium speed [CAN](#) bus signal to the [RJB](#) providing the lighting control switch is in the correct position. The [RJB](#) reacts to the message and provides a power supply to the 3 [LED \(light emitting diode\)](#)'s in each rear fog lamp. A fog lamp warning lamp in the instrument cluster will also be illuminated when the fog lamps are operating.

The [RJB](#) will only activate the rear fog lamps if the headlamps are selected on or are active with auto headlamp activation. When the headlamps are turned off the fog lamps are also turned off. When the headlamps are next switched on, the fog lamps will not be activated until the driver requests fog lamp operation.



NOTE: The fog lamps do operate when DRL (daytime running lamps) are active.

HEADLAMP LEVELING

Manual Headlamp Leveling - Halogen headlamps only

A power supply is passed to the headlamp leveling motor in each headlamp from the ignition relay in the [EJB](#). When a signal voltage is received from the headlamp leveling rotary thumbwheel, the headlamp leveling motor controller in each headlamp uses the power supply to operate the motors and move the headlamp to the requested position.

Static Dynamic Headlamp Leveling - Xenon headlamps only

The headlamp leveling module receives a power supply from the ignition relay in the [EJB](#). The same power supply is also supplied to the headlamp leveling motor in each headlamp assembly. The front and rear height sensors are connected to the headlamp leveling module and receive a power and ground from the module. Each sensor has a signal line to the headlamp leveling module to return height information to the module. The module uses the height signals from the sensors to calculate the vehicle attitude and supplies a signal to each motor to power the headlamp to the required position.

Component Description

EXTERIOR BULB TYPE/RATING

The following table shows the bulbs used for the exterior lighting system and their type and specification.

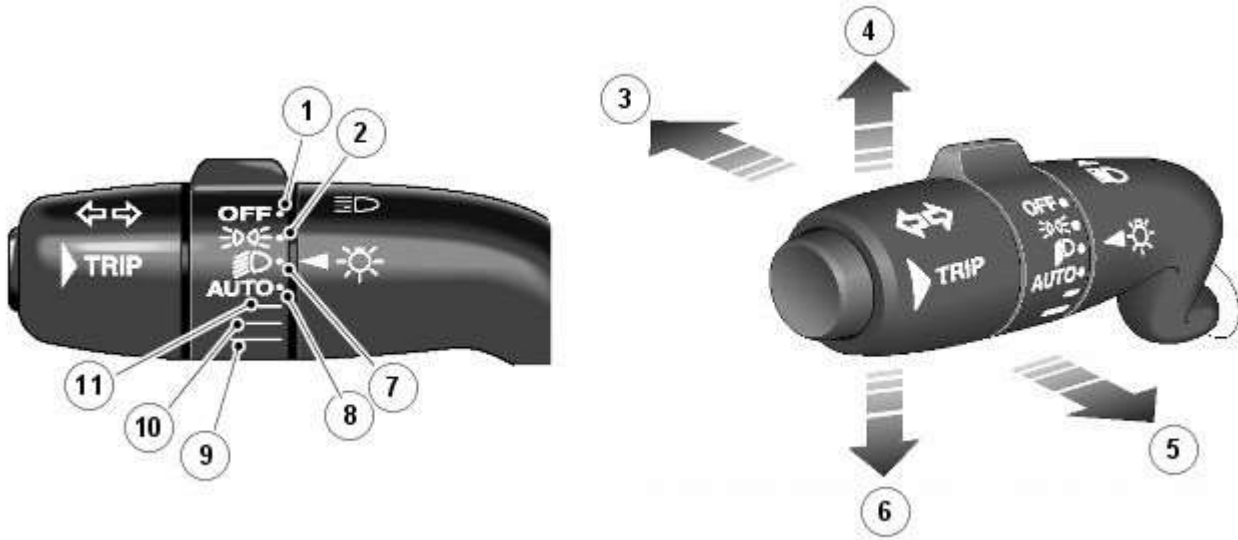


NOTE: The tail lamps, side marker lamps, stop lamps, high mounted stop lamp and rear fog lamps are illuminated by [LED](#)'s and are non-serviceable components.

Bulb	Type	Rating
Halogen headlamp - Projector module low/high beam - Not NAS	H7	55W
Halogen headlamp - Projector module low/high beam - NAS only	H11	60W
Xenon headlamp - Projector module low/high beam - All markets	D1S	35W
High beam only (halogen) - High/low beam (xenon) - All markets	H7	55W
Front side lamps - all markets	W5W Halogen cool blue (HCB)	5W
Front turn signal indicators - Not NAS	PY21W	21W
Front turn signal indicators - NAS only	3457AK	27W
Rear turn signal indicators - All markets	PSY19W	19W
Turn signal indicator side repeaters - All markets	WY5W	5W

Bulb	Type	Rating
Reverse lamps - All markets	PS19W	19W
Licence plate lamps - All markets	W5W	5W

LIGHTING CONTROL SWITCH



E82943

Item	Description
1	Off position
2	Side lamp position
3	High beam position
4	RH turn signal indicator
5	Headlamp flash/high beam off position
6	LH turn signal indicator
7	Headlamp position
8	AUTO headlamp position
9	Headlamp timer 120 second delay position
10	Headlamp timer 60 second delay position
11	Headlamp timer 30 second timer delay position

The lighting control switch is located on the [LH](#) steering column multifunction switch. The lighting control switch is a rotary control with positions for the following lighting functions:

- Off
- Side lamps
- Headlamps
- AUTO headlamps
- Headlamp timer (3 time period selections).

The [LH](#) steering column multifunction switch also provides for the following functions:

- Low beam headlamps
- High beam headlamps
- Headlamp flash
- [LH](#) and [RH](#) turn signal indicators
- Trip computer function button.

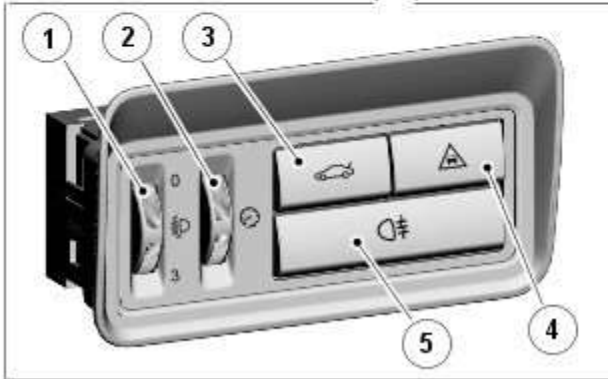
Refer to: [Information and Message Center](#) (413-08 Information and Message Center, Description and Operation).

The switch has a turn signal indicator lane change function. If the switch is gently pushed to either turn signal indicator position and then released, the applicable turn signal indicators will flash 3 times and then will be automatically cancelled. If a turn signal indicator bulb fails, the green turn signal warning indicator in the instrument cluster will flash at twice the normal rate and the audible ticking from the instrument cluster sounder will also be at twice the normal rate.

AUXILIARY LIGHTING SWITCH



NOTE: RHD (right-hand drive) switch shown



E98399

Item	Description
1	Headlamp leveling rotary thumbwheel (halogen headlamps only)
2	Instrument panel illumination dimmer thumbwheel
3	Luggage compartment lid release switch
4	Forward alert switch (if fitted)
5	Rear fog lamp switch

The auxiliary lighting switch is located in the instrument panel, adjacent to the steering column. The switch has a rear fog lamp switch and a rotary thumbwheel to adjust headlamp leveling on vehicles with halogen headlamps. The auxiliary lighting switch also has a forward alert switch (if fitted) and a rotary thumbwheel for instrument panel illumination dimming.

The rear fog lamp switch is a non-latching switch which provides a momentary signal to the instrument cluster. The fog lamps can only be activated if the ignition is in power mode 6 and the headlamp or auto headlamps are selected on. If the fog lamp switch is pressed when the fog lamps are operating, they will be switched off. If the lighting control switch is moved to the side lamp or off position or if the auto headlamps turns off the headlamps the rear fog lamps will be extinguished. If the headlamps are subsequently turned on the rear fog lamp operation will not be active and the rear fog lamp switch must be pressed to activate the lamps.

HEADLAMP ASSEMBLY

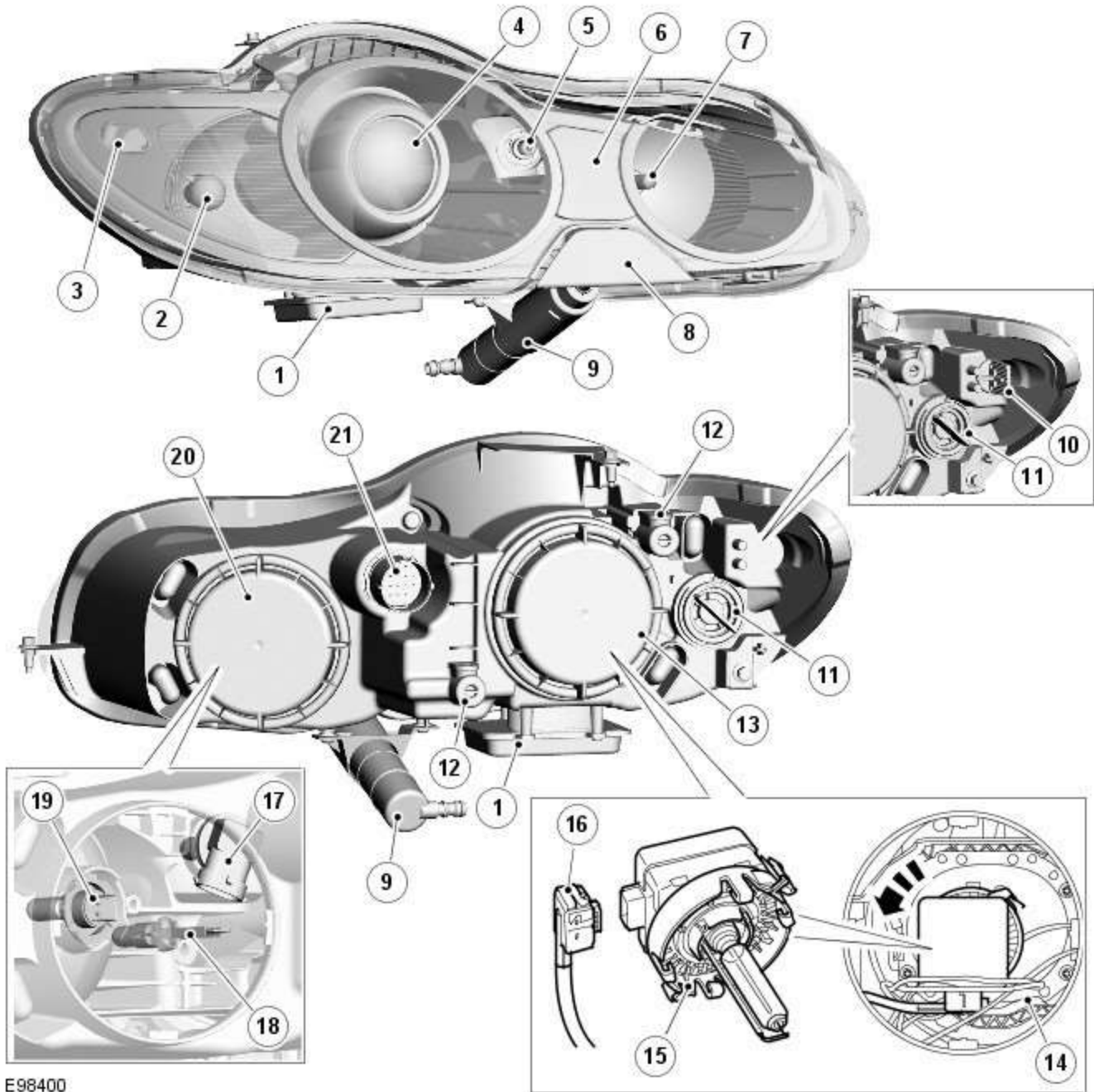
Two types of headlamp are available; xenon or halogen. The headlamp is secured in the front of the vehicle with three bolts; one outboard bolt is screwed into the front upper cross member, one inboard bolt in the front upper body gusset and one bolt located at the rear of the headlamp assembly which locates in the front fender reinforcing panel. Bulb replacement requires the removal of the 3 bolts and the headlamp assembly.

The rear of the headlamp has removable panels which allow access to the bulbs for replacement. A large cover can be rotated counter-clockwise for removal allows access the headlamp low beam halogen or xenon D1S bulb. Another large removable cover can be rotated for removal to provide access to the high beam bulb, side lamp bulb and cornering/static bending lamp bulb (if fitted).

The headlamps have 2 adjustment screws on the rear which allow for the manual setting of the vertical and horizontal alignment.

On NAS vehicles, the headlamp is regarded as 'Visual Optically Left' aiming. The adjustment screws must be turned equal amounts to maintain the correlation in the vertical axis only. There is no horizontal adjustment. Refer to the Service Repair Procedures manual for headlamp alignment data and procedures.

Each headlamp has an integral 16 pin connector which provides inputs and outputs for the various functions of the headlamp assembly.



E98400

Item	Description
1	Xenon control module (not fitted on halogen low beam headlamps)
2	Turn signal indicator
3	Side marker lamp (NAS only)
4	Projector module - Low beam headlamp(Halogen) – Low/High beam headlamp (xenon)
5	Cornering/static bending lamp (if fitted)
6	Side lamp
7	High beam headlamp
8	Power wash jets trim cover
9	Headlamp powerwash
10	Side marker lamp bulb (NAS only)
11	Turn signal indicator bulb
12	Headlamp adjuster screw (2 off)
13	Cover - Low beam headlamp projector module bulb
14	Mounting collar

15	Xenon igniter unit and bulb
16	Xenon igniter electrical connector
17	Cornering/static bending lamp bulb (if fitted)
18	Side lamp bulb
19	High beam headlamp bulb
20	Cover - Side lamp, cornering/static bending lamp (if fitted) and high beam headlamp bulbs
21	Electrical connector

Bi-Xenon Headlamp

The bi-xenon headlamp uses a projector lens, similar to the halogen headlamp. The projector module comprises an ellipsoidal lens and a reflector. The projector reflector collects the light produced by the halogen bulb and projects the light into a focal plane containing a shield. The contour of the shield is projected onto the road by the lens. A complex surface reflector is used for the halogen fill in high beam lamp. This type of reflector is divided into separate parabolic segments, with each segment having a different focal length. The low and high beam bulbs are quartz halogen H7, with a rating of 55W. The bulbs are retained in the headlamp unit with conventional wire retaining clips.

A tourist lever mechanism is located on the right hand side of the projector module. This mechanism moves a flap to blank off a portion of the beam spread to enable the vehicle to be driven in opposite drive hand markets without applying blanking decals to the headlamp lens. The beam is changed by removing the access cover at the rear of the lamp assembly and moving a small lever located near the bulb holder, at the side of the projector.



NOTE: The tourist lever is not fitted to NAS vehicles.



WARNING: The Xenon system generates up to 30000 volts and contact with this voltage could lead to fatality. Make sure that the headlamps are switched off before working on the system.

The following safety precautions must be adhered to when working on the xenon low beam headlamp system:

- **DO NOT** attempt any procedures on the xenon headlamps when the lights are switched on.
- Handling of the D1S xenon bulb must be performed using suitable protective equipment; for example gloves and goggles. The glass part of the bulb must not be touched.
- Xenon bulbs must be disposed of as hazardous waste.
- Only operate the bulb in a mounted condition in the projector module installed in the headlamp.

The xenon headlamp is known as 'bi-xenon' because it operates as both a low and high beam headlamp unit. The xenon lamp, or High Intensity Discharge (HID) lamp as they are sometimes referred to, comprises an ellipsoidal lens with a solenoid controlled shutter to change the beam output from low to high beam.



NOTE: If the lighting control switch is in the 'off' position, both the xenon lamp and the halogen high beam lamp will operate when the high beam 'flash' function is operated.

The xenon headlamp system is controlled by the [CJB](#) using a control module for each headlamp and an igniter. The control modules and the igniters provide the regulated power supply required to illuminate the bulbs through their start-up phases of operation.

The xenon headlamp is a self contained unit located within the headlamp assembly. The unit comprises a reflector, an adaptor ring, the lens, a shutter controller and the xenon bulb, which together forms an assembly known as the projector module. The reflector is curved and provides the mounting point for the xenon bulb. The bulb locates in a keyway to ensure the correct alignment in the reflector and is secured by a plastic mounting ring. The bulb is an integral component of the igniter and is electrically connected by a connector located in the igniter unit.

The shutter controller is a solenoid which operates the shutter mechanism via a lever. The shutter is used to change the beam projection from low beam to high beam and vice versa.

The xenon bulbs illuminate when an arc of electrical current is established between 2 electrodes within the bulb. The xenon gas sealed in the bulb reacts to the electrical excitation and the heat generated by the current flow to produce the characteristic blue/white light.

To operate at full efficiency, the xenon bulb goes through 3 full stages of operation before full output for continuous operation is achieved. The 3 phases are; start-up phase, warm-up phase and continuous phase.

In the start-up phase, the bulb requires an initial high voltage starting pulse of up to 30000 volts to establish the arc. This is produced by the igniter. The warm-up phase begins once the arc is established. The xenon control module regulates the supply to the bulb to 2.6A which gives a lamp output of 75W. During this phase, the xenon gas begins to illuminate brightly and the environment within the bulb stabilizes, ensuring a continual current flow between the electrodes. When the warm-up phase is complete, the xenon control module changes to continuous phase. The supply voltage to the bulb is reduced and the operating power required for continual operation is reduced to 35W. The process from start-up to continuous phase is completed in a very short time.

The xenon control modules (one per headlamp) receive an operating voltage from the [CJB](#) when the headlamps are switched on. The modules regulate the power supply required through the phases of start-up.

The igniters (one per headlamp) generate the initial high voltage required to establish the arc. The igniters have integral coils which generate high voltage pulses required for start-up. Once the xenon bulbs are operating, the igniters provide a closed circuit for the regulated power supply from the control modules.

Halogen Low/high Beam Headlamp

The halogen low/high beam headlamp uses a projector lens, similar to the xenon headlamp. The projector module comprises an ellipsoidal lens and a reflector. The projector reflector collects the light produced by the halogen bulb and projects the light into a focal plane containing a shield. The contour of the shield is projected onto the road by the lens. The low/high beam bulbs are quartz halogen and are retained in the headlamp unit with conventional wire retaining clips.

A tourist lever mechanism is located on the right hand side of the projector module. This mechanism moves a flap to blank off a portion of the beam spread to enable the vehicle to be driven in opposite drive hand markets without applying blanking decals to the headlamp lens. The beam is changed by removing the access cover at the rear of the lamp assembly and moving a small lever located near the bulb holder, at the side of the projector.

Halogen High Beam Headlamp - Xenon and Halogen

The xenon and halogen headlamps use a complex surface reflector for the halogen fill in high beam lamp only lighting unit, which is of the same design on both headlamp types. This type of reflector has the reflector divided into separate parabolic segments, with each segment having a different focal length.

The high beam headlamp bulbs are quartz halogen and are retained in the headlamp unit with conventional wire retaining clips.

Cornering Lamps



NOTE: The cornering lamps are not fitted to NAS vehicles.

The cornering lamps are an optional feature designed to illuminate the direction of travel when cornering at low speeds. The design of the lens projects a spread of light from the vehicle at approximately 45 degrees to the vehicle axis. The cornering lamp is incorporated into the headlamp assembly and shares the same housing as the low beam headlamp. The cornering lamp uses a 35W Halogen H8 bulb which is permanently located in an integral holder which is connected on the headlamp housing. The holder is located in an aperture in the headlamp housing and rotated to lock. The bulb is accessible via a removable cover on the base of the headlamp housing.

The cornering lamps are controlled by the [LH](#) steering column multifunction switch with the lighting control switch in the headlamp position and the ignition in power mode 6. The cornering lamps are supplied power via the ignition circuit to ensure that they do not function with the headlamp delay feature. The cornering lamps are deactivated if the vehicle speed exceeds 25 mph (40 km/h). Only one cornering lamp will illuminate at any one time. If the left hand turn signal indicators are selected on, the left hand cornering lamp will be illuminated and vice versa, providing the vehicle speed and lighting control switch positions are correct.

Static Bending Lamps



NOTE: The static bending lamps are not fitted to NAS vehicles.

The static bending lamps are designed to illuminate the direction of travel when cornering at low speeds. The static bending lamp functionality, which is controlled by the [CJB](#) and the headlamp leveling module, operates using inputs from the steering angle sensor and vehicle speed information from the [ABS \(anti-lock brake system\)](#) module. The static bending lamp is incorporated into the headlamp assembly and shares the same housing as the low beam headlamp. The design of the lens projects a spread of light from the vehicle at approximately 45 degrees to the vehicle axis. The static bending lamp uses a 35W Halogen H8 bulb which locates in a holder which is connected via wires to the main connector on the headlamp housing. The holder is located in an aperture in the headlamp housing and rotated to lock. The bulb is accessible via a removable cover at the rear of the headlamp housing.

The static bending lamps operate with a steering angle sensor [CAN](#) bus signal which is received by the [CJB](#). The [CJB](#) monitors this signal and vehicle speed and activates the static bending lamp bulb. When the operation parameters of the lamp are reached, the [CJB](#) fades the static bending lamp bulb on using a [PWM \(pulse width modulation\)](#) voltage over a period of approximately 2 seconds. When the lamp is switched off, the [CJB](#) fades the bulb off by decreasing the [PWM](#) voltage in a linear manner depending on steering angle and vehicle speed. The cornering lamps can only be active for a maximum of 3 minutes.



NOTE: Static bending lamps only operate when the transmission is in **DRIVE** or in **SPORT**.

Turn Signal Indicators

The turn signal indicator lamp is incorporated into the outer part of the headlamp assembly. The turn signal indicator lamp uses a PY21W bayonet orange colored bulb in ROW markets, a S8W 27/7W wedge bulb is used in NAS markets. The bulb is fitted into a holder which connects with contacts in the headlamp housing. The holder is fitted into an aperture in the headlamp housing and rotated to lock into position.

When active, the turn signal indicator lamps will flash at a frequency cycle of 380ms on and 380ms off. If a bulb fails, the remaining turn signal lamps bulbs continue to flash at normal speed. The turn signal indicators in the instrument cluster will flash at double speed to indicate the bulb failure to the driver.

Side Lamps

The side lamp is located between the headlamp projector module and the high beam headlamp. The side lamp uses a W5W wedge fitting bulb which locates in a holder which connected via wires to the main connector on the headlamp housing. The holder is a push fit into a receptacle in the headlamp housing. The bulb is accessible by removal of the inner cover on the rear of the headlamp housing. Access to the bulb requires removal of the headlamp from the vehicle. The side lamps are operated by selecting side lamps or headlamps on the lighting control switch. The side lamps are functional at all times and are

dependant on a particular ignition mode status. The side lamps will also be illuminated when the lighting control switch is in the AUTO position and a 'lights on' signal is received by the [CJB](#) from the rain/light sensor

Side Marker Lamps (NAS only)

The side marker lamp is located in the outer part of the headlamp assembly. The side marker lamp uses a W5W wedge fitting bulb. The bulb is fitted into a holder which connects with contacts in the headlamp housing. The holder is fitted into an aperture which connects with contacts in the headlamp housing. The side marker lamp is active at all times when the side lamps are active.

AUTOMATIC HEADLAMP OPERATION

The automatic headlamp function is a driver assistance system. The driver can override the system operation by selection of side lamp or headlamp on if the ambient light conditions require front and rear lighting to be active. The automatic headlamp system uses a light sensor and the [CJB](#), which are connected via a [LIN \(local interconnect network\)](#) bus to control the headlamp functionality. The light sensor is incorporated in the rain/light sensor located on the inside of the windshield, below the rear view mirror. The wiper system also uses the rain/light sensor for automatic wiper operation.

The light sensor measures the ambient light around the vehicle in a vertical direction and also the angular light level from the front of the vehicle. The rain/light sensor uses vehicle speed signals, wiper switch position and the park position of the front wipers to control the system. The automatic headlamp operation uses ambient light levels which are monitored by photodiode incorporated in the rain/light sensor. The rain/light sensor sends a lights on/off request to the [CJB](#) on the [LIN](#) bus, which responds by switching on the low beam headlamps, front side lamps and rear tail lamps. The automatic headlamps are activated under the following conditions:

- Twilight
- Darkness
- Rain
- Snow
- Tunnels
- Underground or multistoried car parks.

Operation of the automatic headlamps requires the ignition to be in ignition mode 6, the lighting control switch to be in the 'AUTO' position and a lights on request signal from the light sensor. If the rain sensor signal activates the fast speed wipers, the low beam headlamps are activated, providing the lighting control switch is in the 'AUTO' position.

HEADLAMP LEVELING

Headlamp leveling provides for the adjustment of the vertical aim of the headlamps. The leveling system is primarily required to minimise glare to other road users when a heavy load is in the rear of the vehicle. Two systems of headlamp leveling are available; manual and static dynamic.

Manual Headlamp Leveling

The manual system uses a thumbwheel rheostat to adjust the vertical alignment of the headlamps to compensate for differing vehicle loading. The rotary thumbwheel is located on the auxiliary lighting switch, adjacent to the illumination dimmer thumbwheel. Three positions are available to adjust the headlamps to a position to prevent glare to other road users.

Static Dynamic Headlamp Leveling

The static dynamic headlamp leveling system uses the following components:

- Front and rear vehicle height sensors
- Two headlamp leveling, vertical adjustment motors
- Headlamp leveling module
- Ignition in mode 6
- Vehicle speed information from [ABS](#) module.

The static dynamic system uses height sensors fitted to the front and rear suspension and a headlamp leveling module which periodically monitors the vehicle attitude and adjusts the headlamp vertical alignment accordingly.

Static dynamic headlamp leveling is controlled by a headlamp leveling module located in the lower instrument panel, behind the glovebox.

The height sensors are both located on the [RH](#) side of the vehicle. The front sensor is attached to the front suspension lower arm with a strap and to the front sub frame with a bracket and 2 bolts. The rear sensor is attached to the rear suspension upper control arm with a cable tied clip and to the rear sub frame with a bracket and 2 bolts. Each sensor has 3 connections to the headlamp leveling module; power, ground and signal.

DAYTIME RUNNING LAMPS (DRL)

Refer to [DRL](#) section for details.

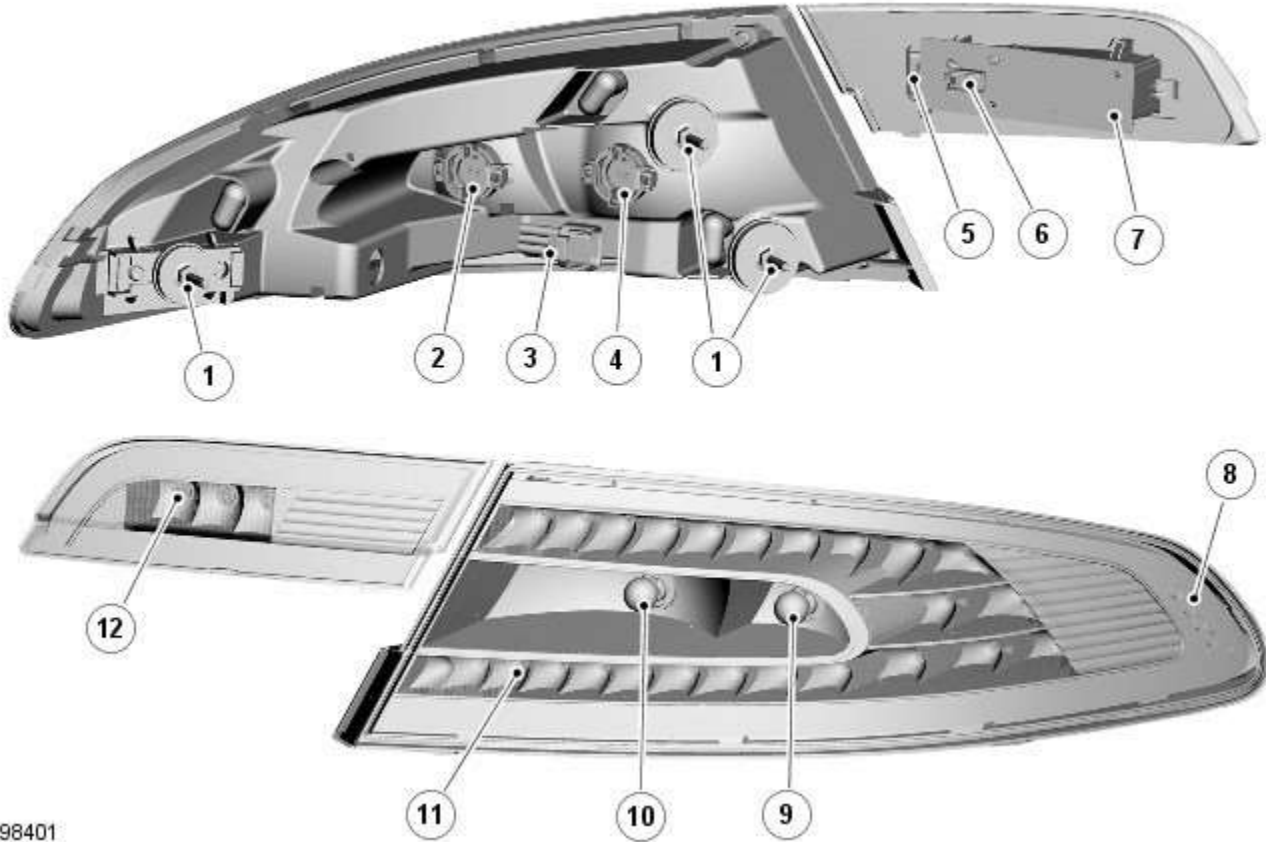
Refer to: [Daytime Running Lamps \(DRL\)](#) (417-04 Daytime Running Lamps (DRL), Description and Operation).

REAR LAMP ASSEMBLY

The rear lamp assembly is a 2 piece unit, with one part located in the rear quarter panel and the second part attached to the luggage compartment lid. The outer rear lamp assembly is located in a recess in the vehicle body. The lamp is secured with 2 studs inboard studs on the lamp body which are secured to the vehicle body with 2 nuts. A third outboard stud and nut secures

a clip to the vehicle body. To remove the lamp assembly, only the 2 inboard nuts require removal. The outboard nut retains a sliding clip in position on the vehicle body. To remove the rear lamp assembly, remove the 2 inboard nuts and slide the lamp rearwards to release the outboard clip.

The inner rear lamp is located in a recess in the luggage compartment lip and secured with a clip.



E98401

Item	Description
1	Nut (3 off)
2	Reverse lamp bulb and holder
3	Rear lamp electrical connector
4	Turn signal indicator bulb and holder
5	Securing clip
6	Rear fog lamp electrical connector
7	Rear fog lamp LED's and Printed Circuit Board (PCB)
8	Side marker LED's (4 off - all markets)
9	Reverse lamp
10	Turn signal indicator lamp
11	Side lamp/stop lamp LED's (24 off)
12	Rear fog lamp LED's (3 off)

Rear Stop and Side Lamp

The turn signal indicator, side and stop lamps and reverse lamps are located in each outer rear lamp assembly. The side lamps and stop lamps use 24 LED's. The 24 LED's are illuminated at a higher intensity than the side lamp when the stop lamp switch is operated by pressing the brake pedal. A side marker lamp is fitted to the outer rear lamp assembly and is fitted in all markets. The side marker lamp also uses 4 LED's and are active at all times when the side lamps are selected on.

The stop lamps can also be activated by the adaptive speed control system. A signal from the adaptive speed control module is sent via the high speed CAN bus to the RJB which activates the stop lamps until an off message is received.

Turn Signal Indicator

The turn signal indicator lamp uses a Phillips Hypervision glass filament bulb. The bulb is located in a holder which has contacts which mate with contacts on lamp body. The holder locates in the lamp body and is rotated to lock.

If a bulb fails, the remaining turn signal indicator lamps continue to flash at the normal speed. The applicable turn signal indicator in the instrument cluster will flash at double speed to indicate the bulb failure to the driver.

Reverse Lamp

The reverse lamp also uses a Phillips Hypervision glass filament bulb. The bulb is located in a holder which has contacts which mate with contacts on lamp body. The holder locates in the lamp body and is rotated to lock.

The reverse lamps are activated on receipt of a reverse selected message sent on the medium speed [CAN](#) bus to the [RJB](#).

Rear Fog Lamp

The rear fog lamps are located in separate units attached to the luggage compartment lid. The rear fog lamps each use 3 high intensity [LED](#)'s. The fog lamp locates in a recess in the luggage compartment lid has a seal to prevent the ingress of water into the luggage compartment. The lamp is secured in the recess with a metal securing clip. The rear fog lamp is activated using a button located on the auxiliary lighting switch in the instrument panel.

LICENCE PLATE LAMPS

Two licence plate lamps are located in the luggage compartment lid trim finisher. One is located adjacent to the emergency luggage compartment lid release key barrel cover and the other is adjacent to the rear view camera (if fitted). The licence plate lamps are active at all times when the side lamps are operating. Each lamp can be removed from the finisher by inserting a wide, flat screwdriver blade or similar tool in a slot between the lamp lens and the finisher and gently levering the lamp from the surround. The bulb is a push fit in a holder which in turn is a press fit in the lamp housing.

HIGH MOUNTED STOP LAMP

The high mounted stop lamp is located at the bottom of the rear windshield. The lamp is secured to a bezel in the parcel shelf with 2 screws.

The high mounted stop lamp uses 12, red colored [LED](#)'s which illuminate through a clear lens. The high mounted stop lamp functionality is the same as that described for the stop lamps.

TURN SIGNAL INDICATOR SIDE REPEATER LAMPS

The turn signal indicator side repeaters are located in each door mirror. On vehicles from 10MY the lamp is an [LED](#) unit which illuminates in an orange color. The [LED](#) unit is secured to the mirror bezel with 2 screws and is connected to the mirror wiring harness with a 2 pin connector.

The side repeaters have the same functionality and operate in conjunction with the front and rear turn signal indicators and the hazard warning flashers.

HAZARD FLASHERS

The hazard flashers are activated by a non-latching switch located in the switch pack located in the center of the instrument panel. The hazard flashers operate at all times when selected and operate independent of the ignition mode.

When the hazard flashers are selected on by the driver, a ground path is momentarily completed to the [CJB](#) which activates the front and rear and side repeater turn signal indicators. A second press of the switch is sensed by the [CJB](#) and the hazard flasher are deactivated. When the hazard flashers are active, they override any request for turn signal indicator operation.

The hazard flashers can also be activated by a crash signal from the [RCM](#).

Refer to: [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) (501-20B Supplemental Restraint System, Description and Operation).

Exterior Lighting - Headlamps

Diagnosis and Testing

Principles of Operation

For a detailed description of the exterior lighting system, refer to the relevant Description and Operation section in the workshop manual. REFER to: (417-01 Exterior Lighting)

[Exterior Lighting](#) (Description and Operation),
[Exterior Lighting](#) (Description and Operation),
[Exterior Lighting](#) (Description and Operation).

Safety Information

WARNINGS:



The Xenon Headlamp system generates up to 28,000 volts. Make sure that the headlamps are switched off before working on the system. Failure to follow this instruction may lead to fatality.



The following safety precautions must be followed when working on the Xenon Headlamp system:

- DO NOT attempt any procedures on the Xenon Headlamps or circuits when the system is energized.
- Handling of the xenon bulb must be performed using suitable protective equipment, e.g. gloves and goggles. The glass part of the bulb must not be touched.
- Only operate the lamp in a mounted condition in the reflector.
- All safety procedures and precautions must be followed to prevent personal injury.



CAUTION: Xenon bulbs must be disposed of as hazardous waste.

There are instructions on the correct procedures for Xenon Headlamp System repairs in the manual, refer to section 100-00 - General Information, Standard Workshop Practices of the workshop manual.

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage.

Visual Inspection

Electrical

- Headlamp Leveling Module (HLM)
- Bulb(s)
- Photocell(s)
- Ballast
- Wiring harness/electrical connectors
- Fuse(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to DTC Index.

Symptom Chart

Symptom	Possible Causes	Action
Low beam lamp(s) inoperative	<ul style="list-style-type: none"> • Bulb failure • Fuse(s) blown • Circuit fault • Lighting control switch fault 	Check the bulb and fuse condition (see visual inspection). Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch operation. Refer to the electrical guides. Check for DTCs indicating a headlamp or related circuit fault.
High beam lamp(s) inoperative	<ul style="list-style-type: none"> • Left-hand steering column multifunction switch fault 	

Symptom	Possible Causes	Action
Low beam lamp(s) dim	<ul style="list-style-type: none"> • Incorrect bulb rating • Tourist lever set in the wrong position • Circuit fault • Lighting control switch fault • Left-hand steering column multifunction switch fault 	Check the bulb condition and rating. Check the tourist lever is set correctly. Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Refer to the electrical guides.
High beam lamp(s) dim		
Low beam lamp(s) stuck on	<ul style="list-style-type: none"> • Circuit fault • Lighting control switch fault • Left-hand steering column multifunction switch fault • Headlamp timer function fault 	Check the headlamp circuits. Check the lighting control switch function. Check the left-hand steering column multifunction switch operation. Check the headlamp timer function. Refer to the electrical guides. Check for DTCs indicating a headlamp circuit fault
High beam lamp(s) stuck on		
Headlamp low/high beam switching function inoperative	<ul style="list-style-type: none"> • Circuit fault • Left-hand steering column multifunction switch fault • Xenon lamp shutter mechanism fault 	Check the headlamp circuits. Check the left-hand steering column multifunction switch operation. Check the xenon lamp shutter mechanism operation. Refer to the electrical guides. Check for DTCs indicating a headlamp circuit fault
Warning lamp(s) inoperative	<ul style="list-style-type: none"> • Fuse(s) blown • Lighting control switch fault • Left-hand steering column multifunction switch inoperative • Circuit fault • Instrument cluster fault 	Check the fuse(s) (see visual inspection). Check the lighting control switch function. Check the left-hand steering column multifunction switch function. Check the warning lamp circuits. Refer to the electrical guides. Check for DTCs indicating an instrument cluster or CAN system fault.
Headlamp Wet - Internal	<ul style="list-style-type: none"> • Condensation • Water Ingress 	Check for outstanding Technical Service Bulletins (TSBs) relating to 'Headlamp Internal Condensation'. Carry out the instructions in the service bulletin to determine if the fault is related to condensation or water ingress.

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Headlamp Control Module \(HCM\)](#) (100-00 General Information, Description and Operation).

Exterior Lighting - Headlamp Adjustment

General Procedures



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1.
 - Make sure to check and adjust the tyre pressures to the correct level.
 - Park the vehicle on a horizontally level surface.

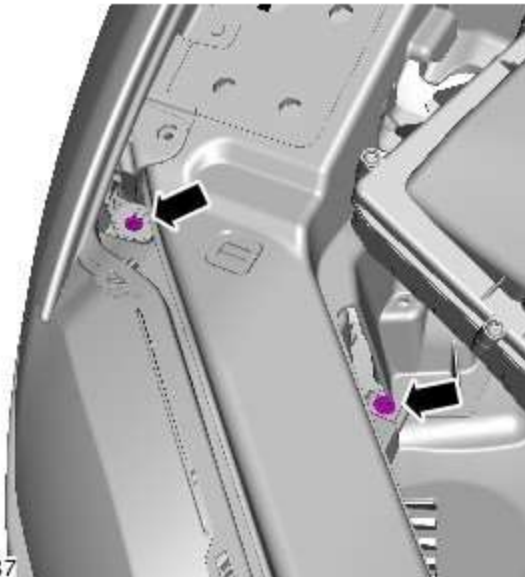
2.
 - Align the headlamp beam setting equipment to one headlamp. [Headlamp beam setter](#)



3. NOTE: The headlamp setting is 1 % below horizontal and parallel.

- Check the headlamp beam alignment.

4. Open the hood.



5.
 - Adjust the headlamps with an Allen Key.

6.
 - To adjust the second headlamp, repeat the above procedure.

Exterior Lighting - Approach Lamp

Removal and Installation

Removal

NOTES:



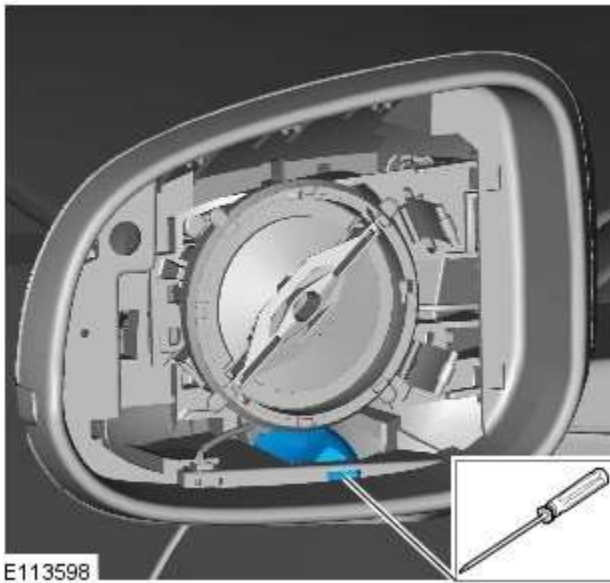
Removal steps in this procedure may contain installation details.



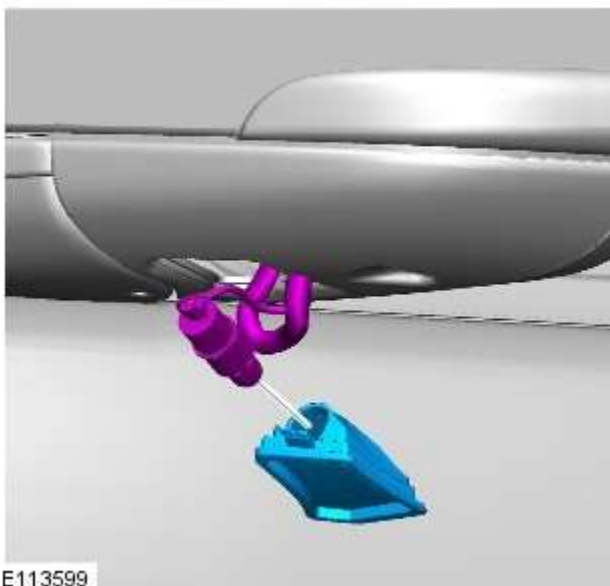
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Exterior Mirror Glass](#) (501-09 Rear View Mirrors, Removal and Installation).

2.



3.



Installation

1. To install, reverse the removal procedure.

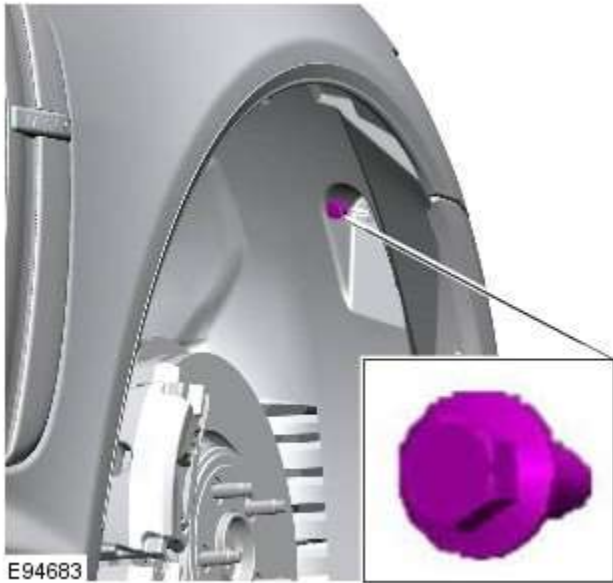
Exterior Lighting - Headlamp Assembly

Removal and Installation

Removal



NOTE: RH illustration shown, LH is similar.



1.

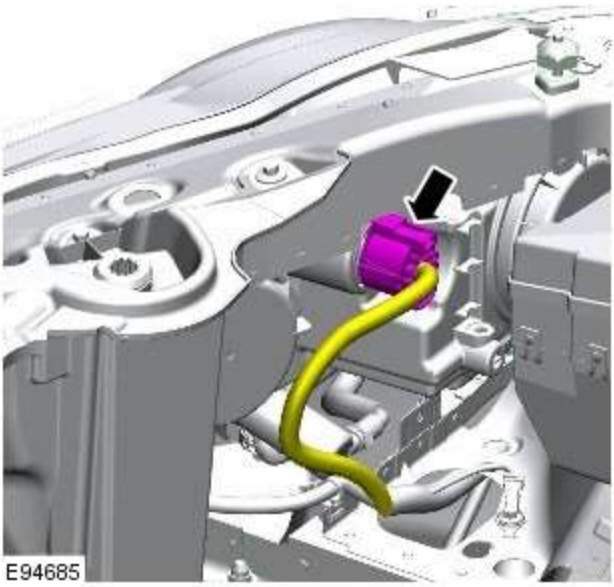


NOTE: Turn the steering wheel to full LH lock.

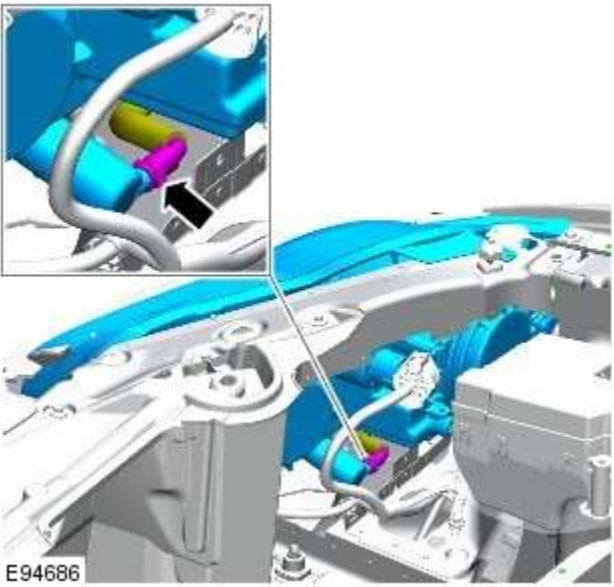
2.



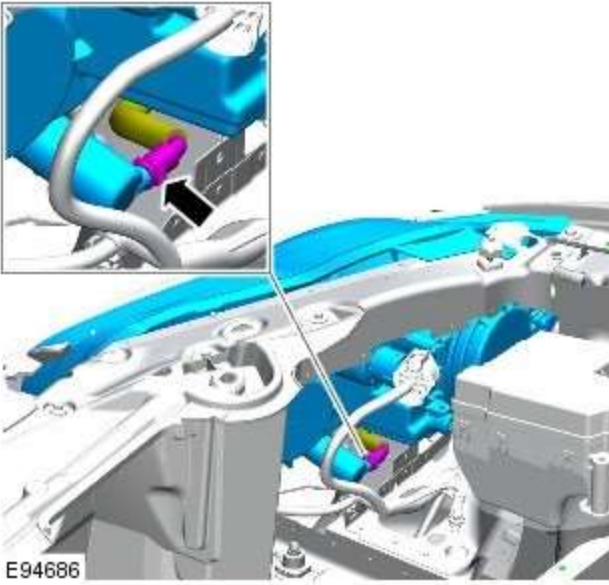
3.



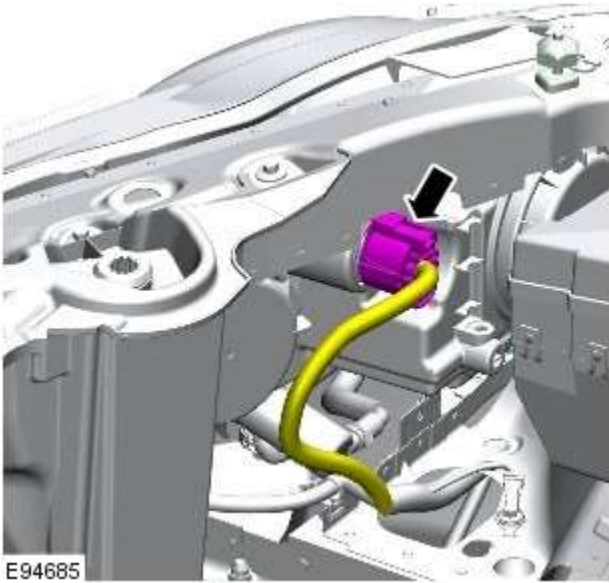
4.



Installation

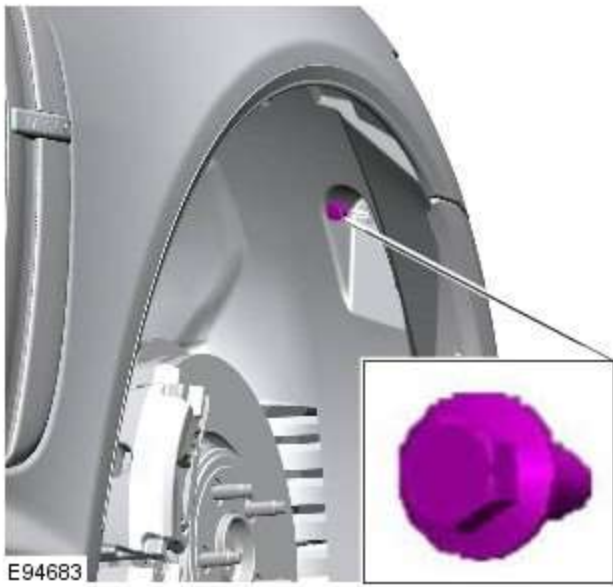


1.



2.

3. Torque: 5 Nm




4. Torque: 5 Nm



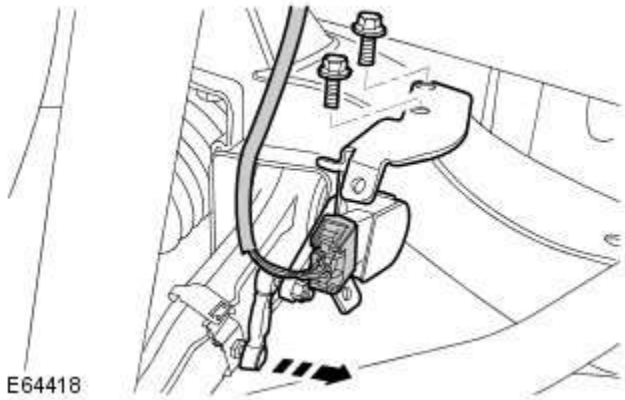
Exterior Lighting - Headlamp Leveling Front Sensor

Removal and Installation

Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



E64418


2. Remove the headlamp leveling sensor.
 - Disconnect the height sensor link.
 - Disconnect the electrical connector.
 - Remove the 2 bolts.

3. **NOTE:** Do not disassemble further if the component is removed for access only.

Remove the height sensor link.



E64419


4.  **NOTE:** Note the fitted position.

Remove the bracket.

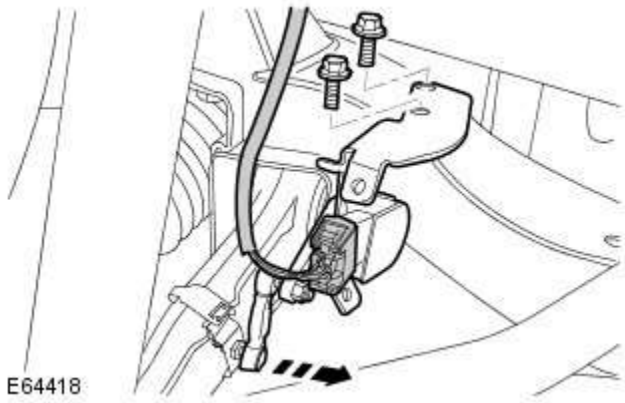
- Remove the 2 Allen bolts.

Installation



1.  NOTE: Align to the position noted on removal.
Install the bracket.
 - Tighten to 5 Nm.

2. Install the height sensor link.




3. Install the headlamp leveling sensor.
 - Tighten to 25 Nm.
 - Connect the electrical connector.
 - Connect the height sensor link.

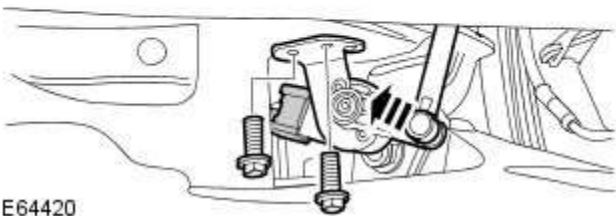
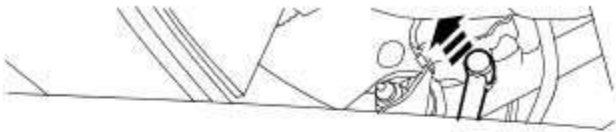
Exterior Lighting - Headlamp Leveling Rear Sensor

Removal and Installation

Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



E64420

2. Remove the headlamp leveling sensor.
 - Disconnect the height sensor link.
 - Release and disconnect the electrical connector.
 - Remove the 2 bolts.



E64421

3. **NOTES:**



Do not disassemble further if the component is removed for access only.

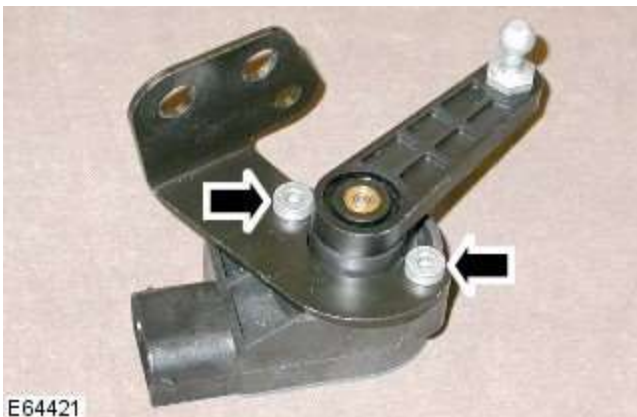


Note the fitted position.

Remove the bracket.

- Remove the 2 Allen bolts.

Installation



E64421

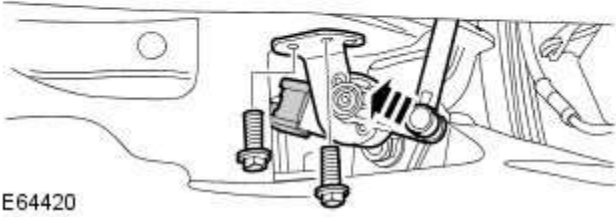
1.  **NOTE:** Align to the position noted on removal.

Install the bracket.

- Tighten to 5 Nm.



2. Install the headlamp leveling sensor.
 - Tighten to 25 Nm
 - Connect the electrical connector.
 - Install the height sensor link.



E64420

Exterior Lighting - High Mounted Stoplamp

Removal and Installation

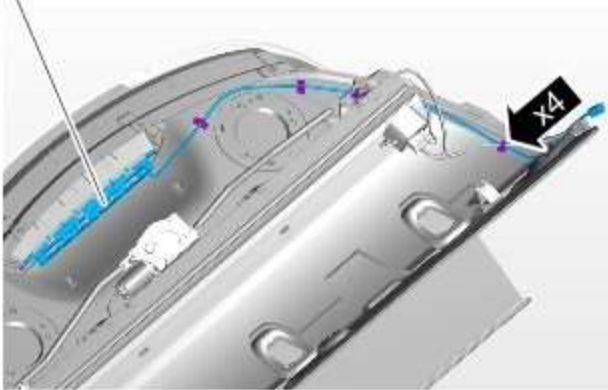
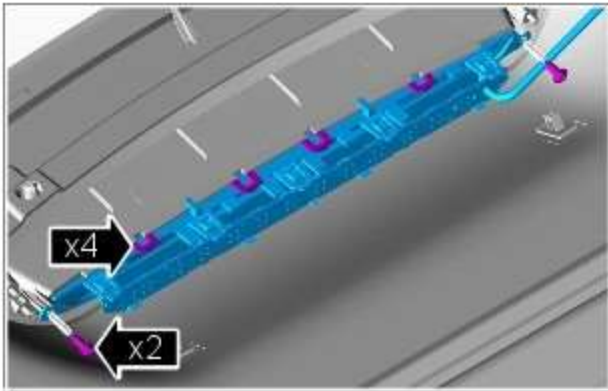
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Parcel Shelf](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



E99046

Installation

1. To install, reverse the removal procedure.

Exterior Lighting - Rear Fog Lamp

Removal and Installation

General Equipment

Spatula

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Luggage Compartment Lid Moulding](#) (501-08 Exterior Trim and Ornamentation, Removal and Installation).

2. CAUTIONS:

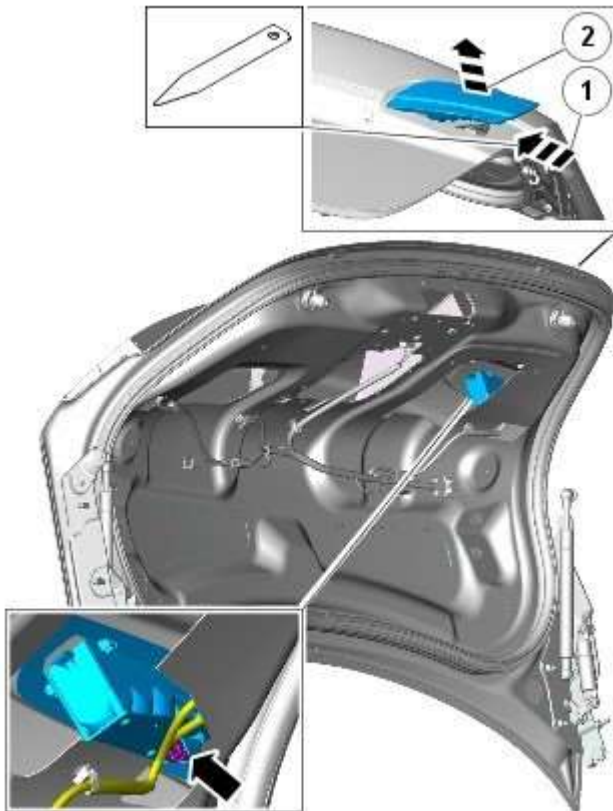


Protect the surrounding paintwork to avoid damage.



Take extra care not to damage the edges of the component.

General Equipment: [Spatula](#)



E93231

Installation

1. To install, reverse the removal procedure.

Exterior Lighting - Rear Lamp Assembly

Removal and Installation

Removal

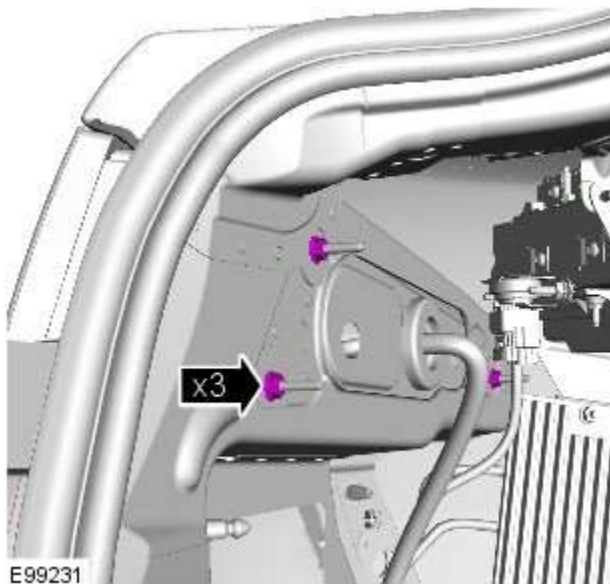


NOTE: Removal steps in this procedure may contain installation details.

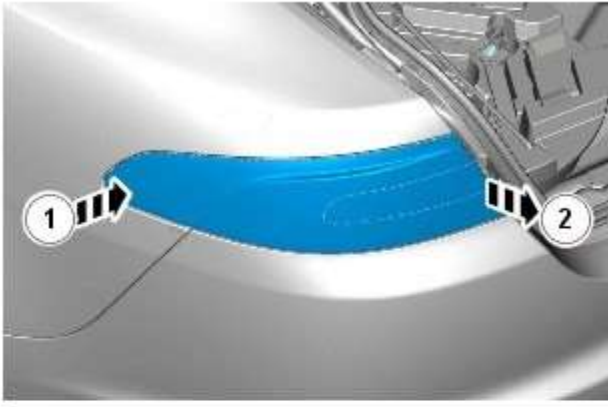
1. Refer to: [Loadspace Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



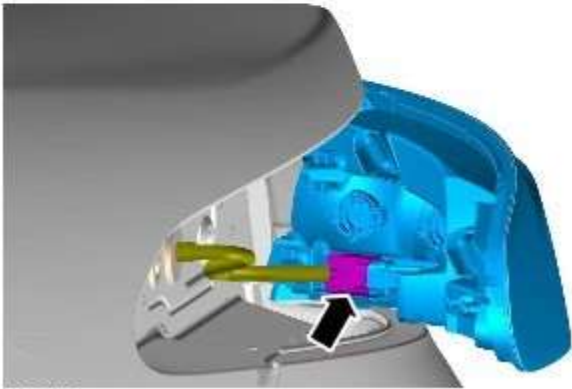
2.  NOTE: LH illustration shown, RH is similar.



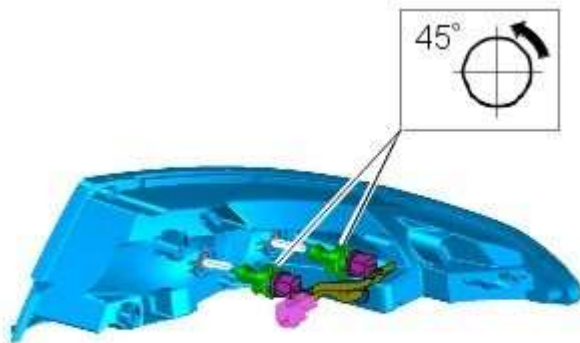
3.  NOTE: LH illustration shown, RH is similar.
 - Torque: 3 Nm




4.  CAUTION: Take extra care not to damage the edges of the component.



E93318



E93319

5.  NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

Exterior Lighting - Side Turn Signal Lamp

Removal and Installation

Removal

NOTES:



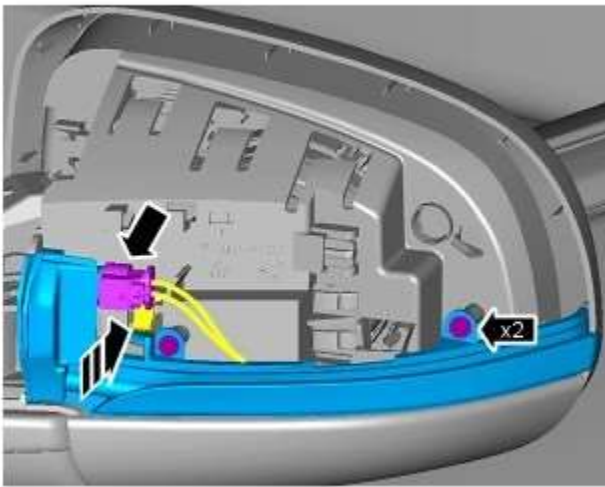
Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

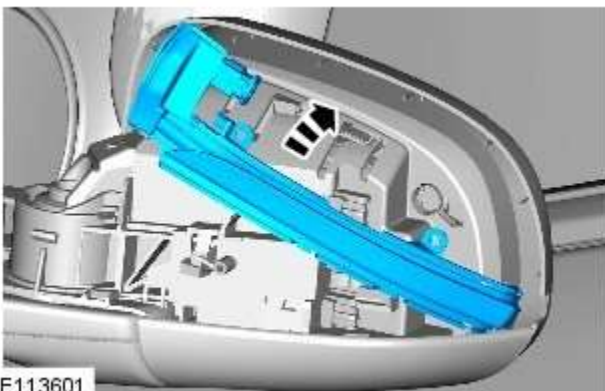
1. Refer to: [Exterior Mirror Cover](#) (501-09 Rear View Mirrors, Removal and Installation).

2.



E113600

3.



E113601

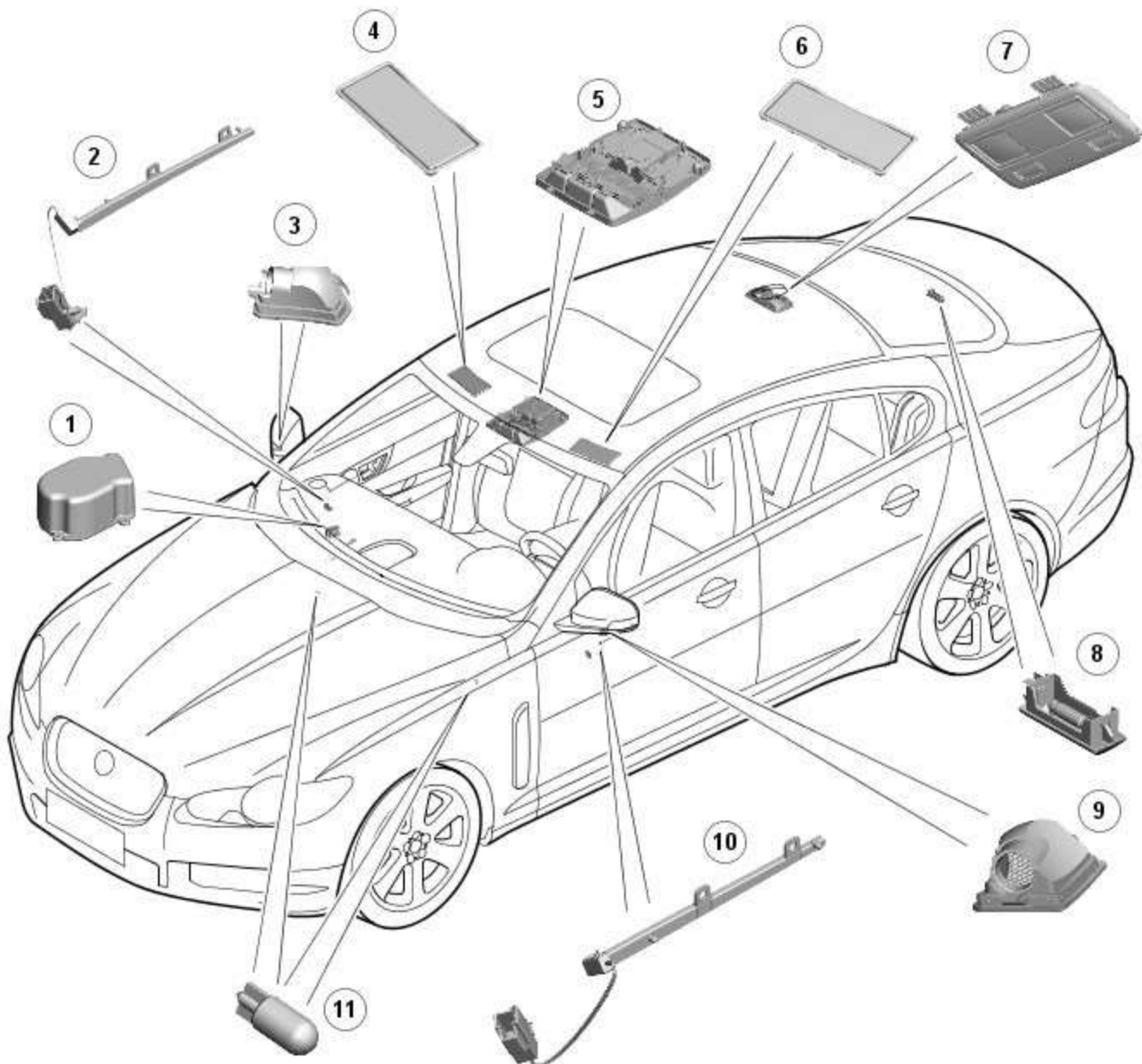
Installation

1. To install, reverse the removal procedure.

Interior Lighting - Interior Lighting - Component Location

Description and Operation

INTERIOR LIGHTING COMPONENT LOCATION



E93973

Item	Description
1	Glovebox lamp
2	Door casing LED (light emitting diode) illumination
3	Approach lamp
4	Vanity mirror illumination
5	Overhead console
6	Vanity mirror illumination
7	Rear overhead console
8	Luggage compartment lamp
9	Approach lamp
10	Door casing LED illumination
11	Footwell lamps

Interior Lighting - Interior Lighting - Overview

Description and Operation

OVERVIEW

Interior lighting is provided to enable the safe entry and departure from the vehicle for the driver and passengers in low ambient light conditions, without any manual switching of the lights.



NOTE: The term interior lamps also includes the door mirror approach lamps.

The interior lamps are controlled by the [CJB \(central junction box\)](#) and the [RJB \(rear junction box\)](#) and have 2 modes of operation: manual and automatic. The front interior lamps in the front overhead console are operated using the 'JaguarSense' system. The system uses capacitive proximity sensor technology for the switch operation which is integral with the overhead console. The rear overhead console interior lamps have conventional switches.

In the manual mode the interior lamps can be switched on and off with the JaguarSense system. Positioning your hand adjacent to each lamp in the front overhead console will switch interior lamps on or off and completely disable the interior lamp system. In the automatic mode the interior lamp functionality is controlled by the [CJB](#) and the [RJB](#) and reacts to the vehicle being locked or unlocked and opening the vehicle doors.

In manual mode the interior lamps can be operated by placing your finger(s) close to, or touch, the surface of the appropriate lamp. The courtesy light and map reading lamps can be operated manually by the 'JaguarSense' system. When in automatic mode, the courtesy lamp functionality is also controlled by the [CJB](#) and the [RJB](#) and reacts to the vehicle being locked or unlocked and opening the vehicle doors. To deactivate or activate automatic illumination, touch the front courtesy lamp for approximately 2 seconds

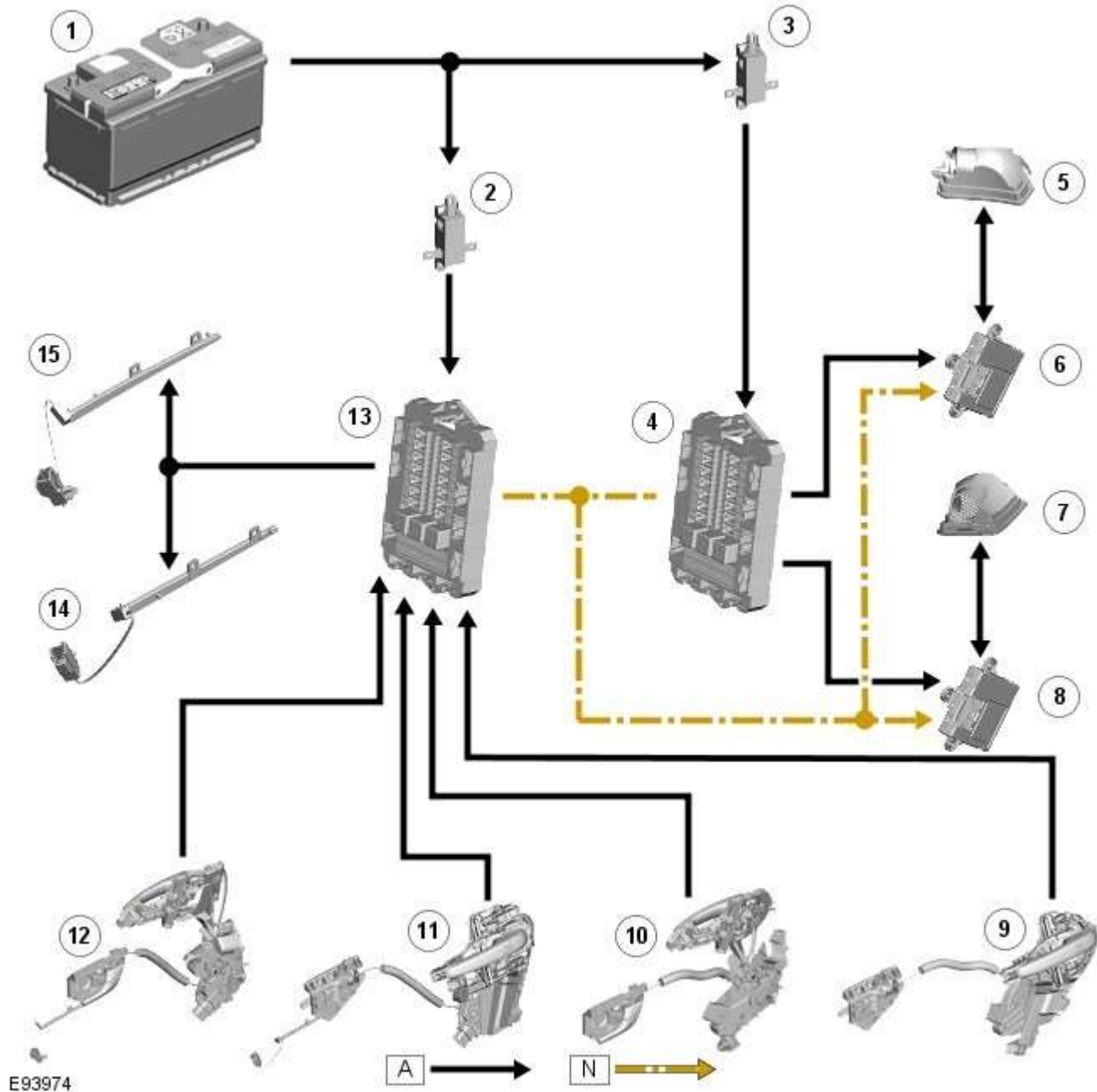
The driver's and passenger door approach lamps are controlled by the driver's door module and the passenger door module respectively and operate with the automatic mode. The door modules receive a power supply from the [RJB](#) and receive information to illuminate the approach lamps on the medium speed [CAN \(controller area network\)](#) bus from the [RJB](#) and the [CJB](#).

Interior Lighting - Interior Lighting - System Operation and Component Description

Description and Operation

Control Diagram

CONTROL DIAGRAM (SHEET 1 OF 2)

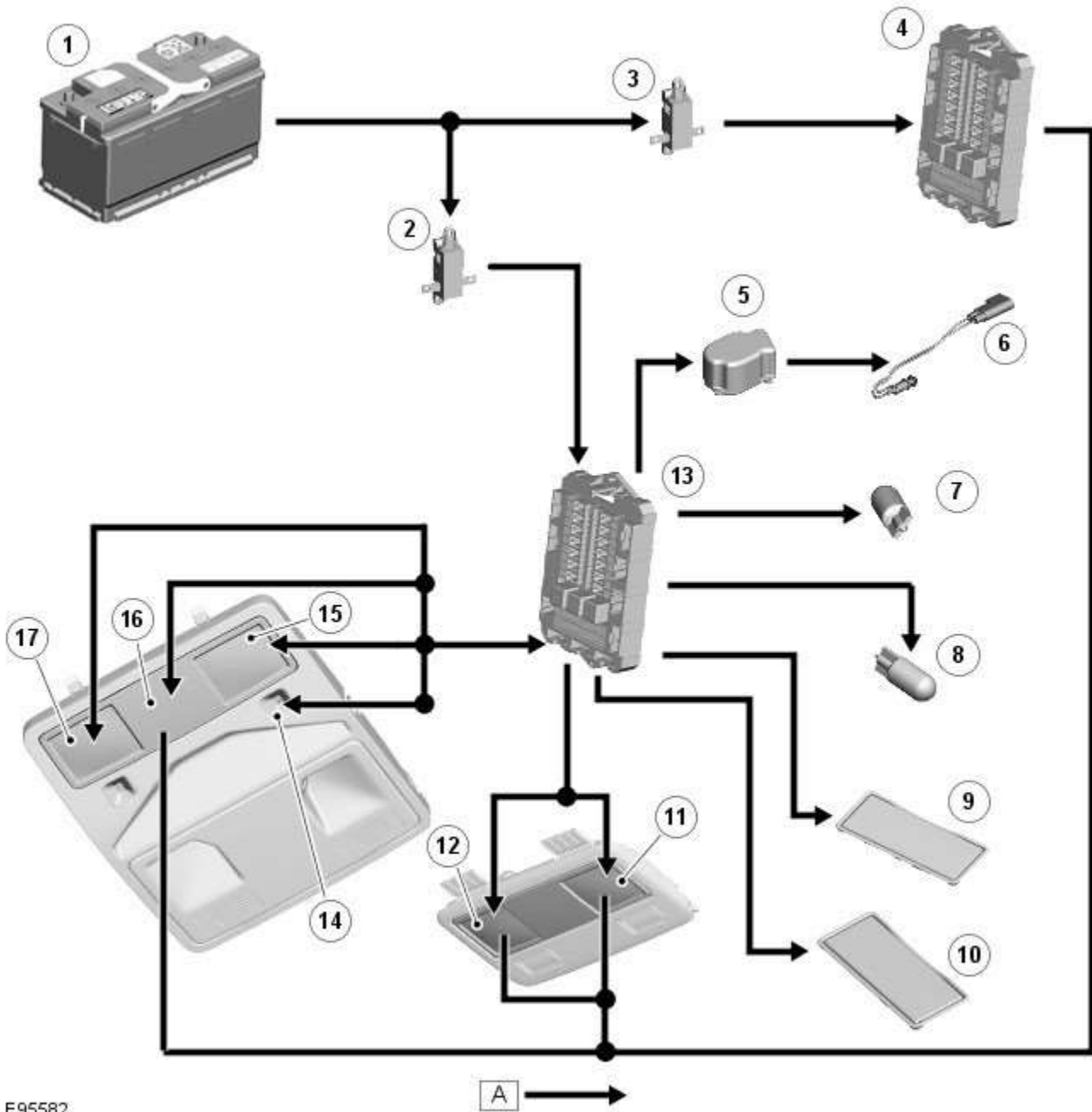


E93974

Item	Description
A = Hardwired; N = Medium speed CAN Bus	
1	Battery
2	BJB (battery junction box) - Megafuse
3	BJB - Megafuse
4	RJB (rear junction box)
5	Driver's door mirror approach lamp
6	Driver's door module

7	Passenger door mirror approach lamp
8	Passenger door module
9	LH (left-hand) rear door latch
10	RH (right-hand) rear door latch
11	LH front door latch
12	RH front door latch
13	CJB (central junction box)
14	LH front door handle LED (light emitting diode) illumination
15	RH front door handle LED illumination

CONTROL DIAGRAM (SHEET 2 OF 2)



E95582

Item	Description
	A = Hardwired
1	Battery
2	BJB - Megafuse

3	BJB - Megafuse
4	RJB
5	Glovebox lamp
6	Glovebox lamp switch
7	LH footwell lamp
8	RH footwell lamp
9	LH vanity mirror
10	RH vanity mirror
11	LH rear interior lamp
12	RH rear interior lamp
13	CJB
14	Ambience lighting LED 's
15	LH map reading lamp
16	Courtesy lamp
17	RH map reading lamp

System Operation

JUNCTION BOXES

Inputs

The [CJB](#) receives the following inputs which affect the operation of the interior lamps:

- Ignition mode
- Lock/unlock
- Luggage compartment lid latch switch
- Door latch switches.

Outputs

The [RJB](#) outputs the following for the interior lighting system:

- Luggage compartment lamp power supply
- Driver and passenger door module power supplies
- Fade on and off grounds for front and rear overhead console interior lamps and footwell lamps
- [PWM \(pulse width modulation\)](#) power output for the ambience lighting.

Interior Lamp Time-Out

The interior lamps are controlled by a timer within the [CJB](#) which allows a 60 second delay period for the lamps to remain active after the ignition mode has been changed to off power mode 0 or the vehicle has been unlocked. The interior lamp fade off is controlled by the [RJB](#) via a delayed power off relay in the [CJB](#). The following interior lamps are subject to the delay period:

- Front overhead console interior lamp
- Rear interior lamps
- Footwell lamps
- Door mirror approach lamps.

The timer delay is activated when the [CJB](#) receives one of the following signals:

- An unlock signal from the Smart Key via the keyless vehicle module.
- Ignition mode is changed from the crank power mode 9 or ignition power mode 6 to the accessory power mode 4 to the off power mode 0.

If a second occurrence of the above actions occurs within the timer period, the timer will be reset and the delay period timer will restart.

The timer delay is deactivated when the [CJB](#) receives one of the following signals:

- A lock signal from the Smart Key via the keyless vehicle module
- Ignition mode is changed from the off power mode 0 to the accessory power mode 4 or ignition power mode 6
- The [CJB](#) receives a door opened signal (even if that door is subsequently closed).

Battery Saver

The battery saver provides an automatic shut-off of the interior lamps after a period of 15 minutes in order to prevent excessive power drain on the battery.

When the ignition mode is changed from the ignition power mode 6 or accessory power mode 4 to the off power mode 0, the [CJB](#) starts a timer which de-energizes a delayed power off relay in the [CJB](#), removing the power supply to the interior lamps after a period of 15 minutes, switching off all or any interior lamps which have remained on for any reason.

Once the timer has expired and the lamps are off, any one of the following will 'wake up' the battery saver and the interior lamps will function again. The timer will be restarted as soon as an input is received by the [CJB](#) from one of the following:

- Ignition mode changed from off power mode 0 to accessory power mode 4, ignition power mode 6 or crank power mode 9.
- Any door, including the luggage compartment lid is opened
- An unlock request is received from the Smart Key via the keyless vehicle module
- Overhead console interior lamp is switched on via the JaguarSense function.

INTERIOR LAMPS

When the interior lighting system switches the interior lamps on, the [CJB](#) ramps the lamps up to full power over a period of 1.3 seconds. When the system switches the lamps off, after the time-out period has expired, the [CJB](#) fades the lamps off over a period of 2.6 seconds.

The interior lighting system will illuminate the interior lamps when one of the following events occurs:

- The [CJB](#) receives an unlock signal from the Smart Key via the keyless vehicle module
- Any door is opened including the luggage compartment lid
- The ignition mode is changed from ignition power mode 6 or accessory power mode 4 to off power mode 0.

The interior lighting system will turn off the interior lamps when one of the following events occurs:

- Once the time-out timer delay has expired since the lamps were either activated or the last door is closed and the vehicle is not locked
- The ignition is in off power mode 0 and an external lock is requested (using either the door lock buttons or the Smart Key) with all doors closed
- The ignition mode is changed from the off power mode 0 or the accessory power mode 4 to the ignition power mode 6
- The last door is closed and the vehicle is externally locked, on receipt of an unlock request from the Smart Key or door handle operation detected when the time-out timer is still active.

DELIVERY MODE

Delivery mode is set at the factory on vehicles to minimize battery drain. The mode enables the switching off of non-critical electrical components, including the interior lighting system. The delivery mode feature is cancelled by the dealer during the Pre-Delivery Inspection using an approved Jaguar diagnostic system.

CRASH ILLUMINATION

When a crash signal is received from the [RCM \(restraints control module\)](#), the [CJB](#) activates the interior lamps once the vehicle speed has reduced to 5 km/h (3.1 mph). The hazard flashers are also activated and the doors are prevented from being locked. The lamps remain on until the crash signal is removed, they cannot be switched off using the JaguarSense feature. The crash signal is removed by completing one ignition on and off cycle.

Component Description

INTERIOR BULB TYPE/RATING

The following table shows the bulbs used for the interior lighting system and their type and specification.



NOTE: The front overhead console and the front door ambience lighting is illuminated by [LED's](#) and are non-serviceable components.

Bulb	Type	Rating
Front overhead console - interior lamp	W6WX	6W
Front overhead console - LH/RH map reading lamps	W6WX	6W
Rear interior lamps	W6WX	10W
Sunvisor lamps	TS1.3W	1.3W
LH/RH footwell lamps	W5W	5W
Glovebox lamp	W5W	5W
LH/RH door mirror approach lamps	W5W	5W
Luggage compartment lamp	S10W	10W

JUNCTION BOXES

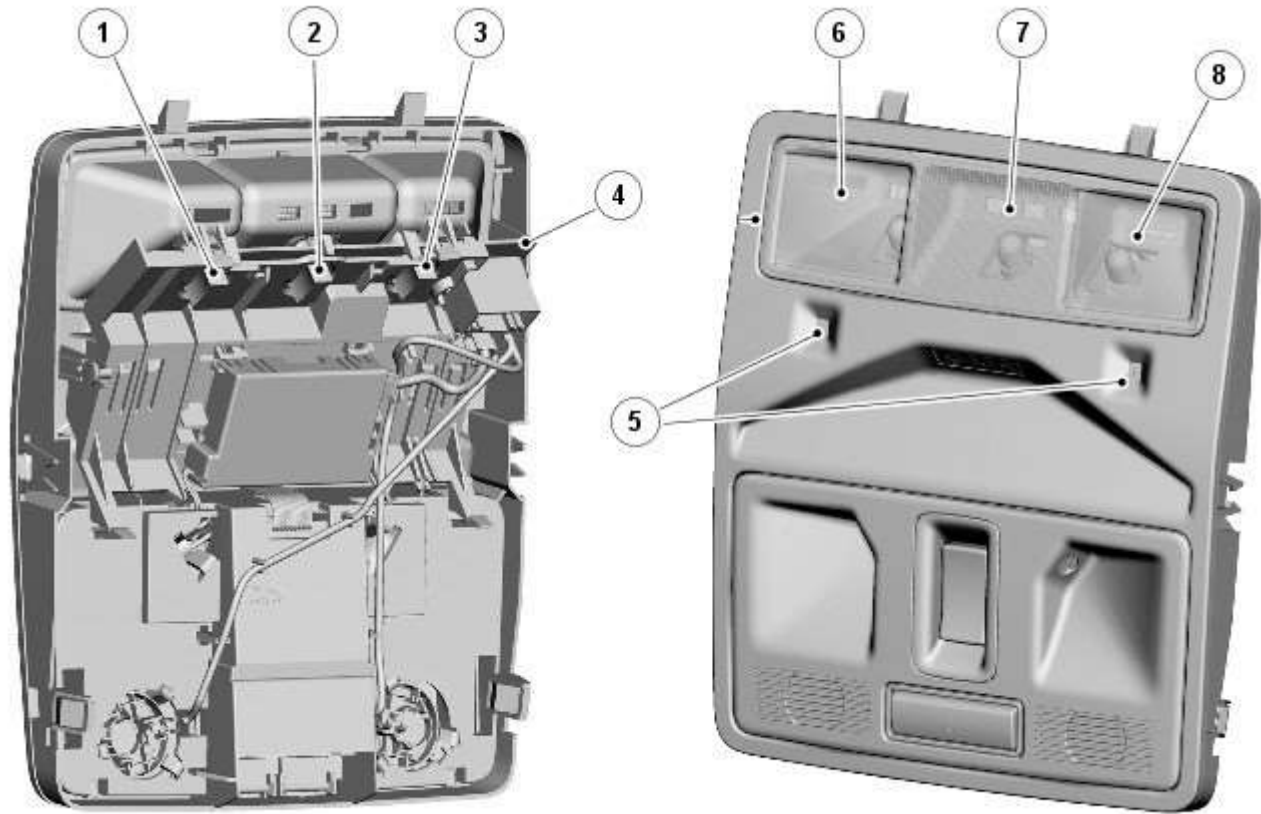
The [CJB](#) is an integrated unit located on the [RH](#) 'A' pillar, below the instrument panel. The [CJB](#) contains fuses, relays and number of microprocessors which control the power supply and functionality of the interior lighting system and other vehicle systems.

The [RJB](#) is located on the [RH](#) side of the luggage compartment. The [RJB](#) contains fuses, relays and microprocessors which in conjunction with the [CJB](#) control the interior lighting system and other vehicle systems.

Circuit Protection

The [CJB](#) and the [RJB](#) provide circuit protection for all interior lamp circuits. The lamps are protected by fuses in the [CJB](#) and the [RJB](#).

FRONT OVERHEAD CONSOLE



E98639

Item	Description
1	LH map reading lamp bulb
2	Interior lamp bulb
3	RH map reading lamp bulb
4	Printed Circuit Board (PCB) - JaguarSense
5	Ambience lighting LED's
6	RH map reading lamp
7	Interior lamp
8	LH map reading lamp

The overhead console is located near the windshield in the head lining. The console can be removed by carefully levering out the rear edge of the housing to release 2 spring clips, and then pulling the console rearwards to release 2 locating tabs. Removal of the console is required to replace any of the interior or map reading lamp bulbs.

The interior lamps and air bag off warning lamp in the front overhead console are common to all vehicles. The overhead console can also contain security system intrusion detection module and volumetric sensors, sunroof switch and a voice activation microphone depending on vehicle specification and market.

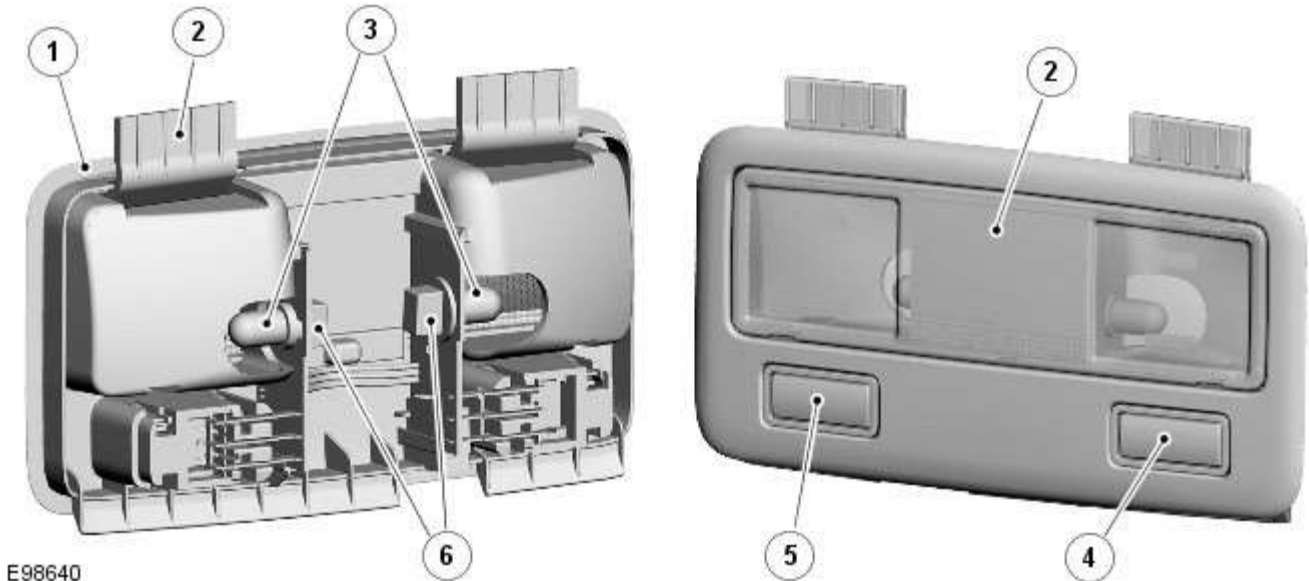
The interior lamp can operated manually using the JaguarSense feature to switch the lamp on and off. The lamp is also controlled as part of the automatic interior lighting system.

The map reading lamps only operate manually using the JaguarSense feature to activate the lamps.

The interior and map reading lamp bulbs are located in holders which locate in a PCB. The PCB also provides for the operation of the ambience lighting LED's, the air bag off warning lamp and the JaguarSense proximity sensors which are integral with the PCB.

The overhead console also contains 2 LED's for the ambience lighting system. The ambience lighting is part of the lighting control switch functionality and is subject to the setting of the instrument panel illumination dimmer control in the auxiliary lighting switch. The ambience lighting provides very limited illumination of the instrument panel and floor console when the vehicle is being driven without affecting the driver's visibility.

REAR OVERHEAD CONSOLE



E98640

Item	Description
1	Lamp body
2	Lamp lens
3	Interior lamp bulbs
4	LH lamp switch
5	RH lamp switch
6	Bulb holders

The rear overhead console is located in the head lining, at the rear of the vehicle. The console can be removed by carefully levering the lamp lens from the body. This releases 2 tabs which are integral with the lens allowing the body to be removed from the aperture in the head lining.

The lamp comprises the lamp body and lens and 2 separate lamps with 2 switches to operate each lamp individually.

The rear interior lamps can be operated manually using the 2 switches located on the lamp body. The lamp is also controlled as part of the automatic interior lighting system.

The bulbs are located in bulb holders which locate in a PCB connected to each switch. Removal of the rear overhead console is required to replace the bulbs.

GLOVEBOX LAMP

The glovebox lamp is located in the top of the glovebox housing in the instrument panel. The lamp is located in a cover on the outside, upper surface of the housing and projects the light into the top of the glovebox.

The lamp is operated by a switch located at the rear of the glovebox housing. The switch protrudes into the housing and is operated by the rear face of the glovebox lid tray when the glovebox is opened or closed.

The bulb is located in a holder which is fitted into the side of the glovebox lamp cover. Replacement of the bulb requires the removal of the glovebox housing.

The glovebox lamp is active at all times when the interior lamps are active and will illuminate only when the glovebox is opened.

FOOTWELL LAMPS

The footwell lamps are located under the instrument panel. Each lamp comprises a bulb and holder which is part of the instrument panel wiring harness. The bulb and holder is located in a hole in the front footwell air ducts. The footwell lamps are active at all times when the interior lamps are active.

LUGGAGE COMPARTMENT LAMP

The luggage compartment lamp is located in the luggage compartment trim, in a central position below the rear screen. The lamp comprises a molded lens and housing and two electrical contacts which locate the bulb.

The lamp is accessible by removing one end from the trim panel to gain access to the bulb. The lamp is active at all times when the interior lamps are active.

VANITY MIRROR LAMPS

Four vanity mirror lamps are fitted, two in each vanity mirror. The lamps are illuminated when the mirror cover is raised. The vanity mirror lamps operate at all times when the interior lamps are active.

The vanity mirrors use low voltage, 1.2W festoon type bulbs.

DOOR MIRROR APPROACH LAMPS

A door mirror approach lamp is located on the underside of each exterior door mirror.

The approach lamps are active at all times when the interior lamps are active.

Interior Lighting - Interior Lighting

Diagnosis and Testing

Principles of Operation

For a detailed description of the interior lighting system, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (417-02 Interior Lighting)

[Interior Lighting](#) (Description and Operation),

[Interior Lighting](#) (Description and Operation),

[Interior Lighting](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Bulbs 	<ul style="list-style-type: none"> • Fuses/relays (refer to electrical guide) • Wiring harness • Correct engagement of electrical connectors • Loose or corroded connections

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B116511	Left Front Puddle Lamp Output	<ul style="list-style-type: none"> • Left front puddle lamp control circuit - short to ground 	Refer to the electrical circuit diagrams and test left front puddle lamp control circuit for short to ground

DTC	Description	Possible Cause	Action
B116515	Left Front Puddle Lamp Output	<ul style="list-style-type: none"> Left front puddle lamp control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test left front puddle lamp control circuit for short to power, open circuit
B116611	Right Front Puddle Lamp Output	<ul style="list-style-type: none"> Right front puddle lamp control circuit - short to ground 	Refer to the electrical circuit diagrams and test right front puddle lamp control circuit for short to ground
B116615	Right Front Puddle Lamp Output	<ul style="list-style-type: none"> Right front puddle lamp control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test right front puddle lamp control circuit for short to power, open circuit
B111E11	Boot/Trunk Lamps	<ul style="list-style-type: none"> Luggage compartment lamp control circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check luggage compartment lamp control circuit for short to ground
B111E15	Boot/Trunk Lamps	<ul style="list-style-type: none"> Luggage compartment lamp control circuit - short to power, open circuit 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check luggage compartment lamp control circuit for short to power, open circuit
B112412	Lamp Fade Control	<ul style="list-style-type: none"> Interior lamp fade control circuit - short to power 	Refer to the electrical circuit diagrams and check interior lamp fade control circuit for short to power
B113C12	Hazard Switch Illumination	<ul style="list-style-type: none"> Hazard switch illumination control circuit - short to power 	Refer to the electrical circuit diagrams and check hazard switch illumination control circuit for short to power
B1A8596	Ambient Light Sensor	<ul style="list-style-type: none"> Light sensor internal electronic failure 	Check and install a new sensor as required
U201012	Switch Illumination	<ul style="list-style-type: none"> Switch/interior illumination PWM supply circuit - short to power 	Refer to the electrical circuit diagrams and check switch/interior illumination PWM supply circuit for short to power
U201014	Switch Illumination	<ul style="list-style-type: none"> Switch/interior illumination PWM supply circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check switch/interior illumination PWM supply circuit for short to ground, open circuit

Daytime Running Lamps (DRL) - Daytime Running Lamps (DRL) - Overview

Description and Operation

OVERVIEW

[DRL \(daytime running lamps\)](#) use the full intensity low beam headlamps which are permanently illuminated when the vehicle is being driven.

Two [DRL](#) systems are available depending on market requirements.

Daytime Running Lamps (DRL) - Daytime Running Lamps (DRL) - System Operation and Component Description

Description and Operation

System Operation

CENTRAL JUNCTION BOX (CJB)

The [CJB](#) (central junction box) controls the operation of the [DRL](#) (daytime running lamps). The [DRL](#) are activated once the [CJB](#) detects an ignition on power mode 6 signal.

The [CJB](#) also monitors the lighting control switch and the auto lamps feature and overrides the [DRL](#) if required.

Component Description

DAYTIME RUNNING LAMPS - CANADA

The [DRL](#) for this market use full intensity low beam headlamps. The side marker lamps, tail lamps and license plate lamps will be on, but instrument cluster illumination will be off. [DRL](#) are active when the following parameters are met:

- PARK is not selected on the electronic transmission selector
- Electronic Parking Brake (EPB) is off
- Power mode 6 (ignition on) detected by the [CJB](#)
- The [CJB](#) receives an engine running signal
- The lighting control switch is in the off or side lamps position.

NOTES:



If the lighting control switch is moved to the headlamp position, [DRL](#) are deactivated and normal side lamp and headlamp functionality is operational.



When [DRL](#) are active, the headlamp flash function using the left hand steering column multifunction switch will operate normally.

The high beam headlamp function using the left hand steering column stalk switch will be deactivated. When the transmission is in PARK, [DRL](#) are turned off. This is to reduce battery discharge during long periods of engine idling in cold climate conditions. When the electronic transmission selector is moved from the PARK position, normal [DRL](#) functionality is restored.

DAYTIME RUNNING LAMPS - DENMARK, HOLLAND, NORWAY, SWEDEN, FINLAND AND POLAND



NOTE: DRL for Poland is on vehicles from 2008MY.

[DRL](#) for these markets use full intensity low beam headlamps. Side lamps and license plate lamps will be on, but instrument cluster illumination will be off. [DRL](#) are active when the following parameters are met:

- Power mode 6 (ignition on) detected by the [CJB](#)
- The [CJB](#) receives an engine running signal
- The lighting control switch is in the off position.



NOTE: When [DRL](#) are active, the headlamp flash function using the left hand steering column multifunction switch will operate normally. The high beam headlamp function using the left hand steering column stalk switch will be deactivated.

If the lighting control switch is moved to the side lamp or headlamp positions, [DRL](#) are deactivated and normal side lamp and headlamp functionality is operational.

AUTOMATIC HEADLAMPS

On vehicles fitted with the automatic headlamps feature, [DRL](#) are overridden if the lighting control switch is in the 'Auto' position and the [CJB](#) receives a signal from the rain/light sensor to activate the exterior lights.

When the [CJB](#) receives a signal to de-activate the automatic headlamps feature the [DRL](#) function is restored providing the parameters for [DRL](#) activation are met.

Module Communications Network - Communications Network - Overview

Description and Operation

OVERVIEW

A number of different types of communication network are incorporated into the vehicle wiring harnesses for the transmission of commands and information between control modules. The configuration installed on a particular vehicle depends on the model and equipment level.



NOTE: The control diagrams shown later in this section are schematics reflecting communications networks fitted to LH (left-hand) vehicles only. For detailed layouts of the various communications networks fitted to LHD (left-hand drive) and RHD (right-hand drive) vehicles, refer to the Electrical Guide.

The communications networks available on the vehicle are shown in the table below.

Network	Baud Rate
LIN (local interconnect network) bus	9.6 kbits/s
Medium speed CAN (controller area network) bus	125 kbits/s
High speed CAN bus	500 kbits/s
Media Orientated System Transport (MOST) ring	24 mbits/s

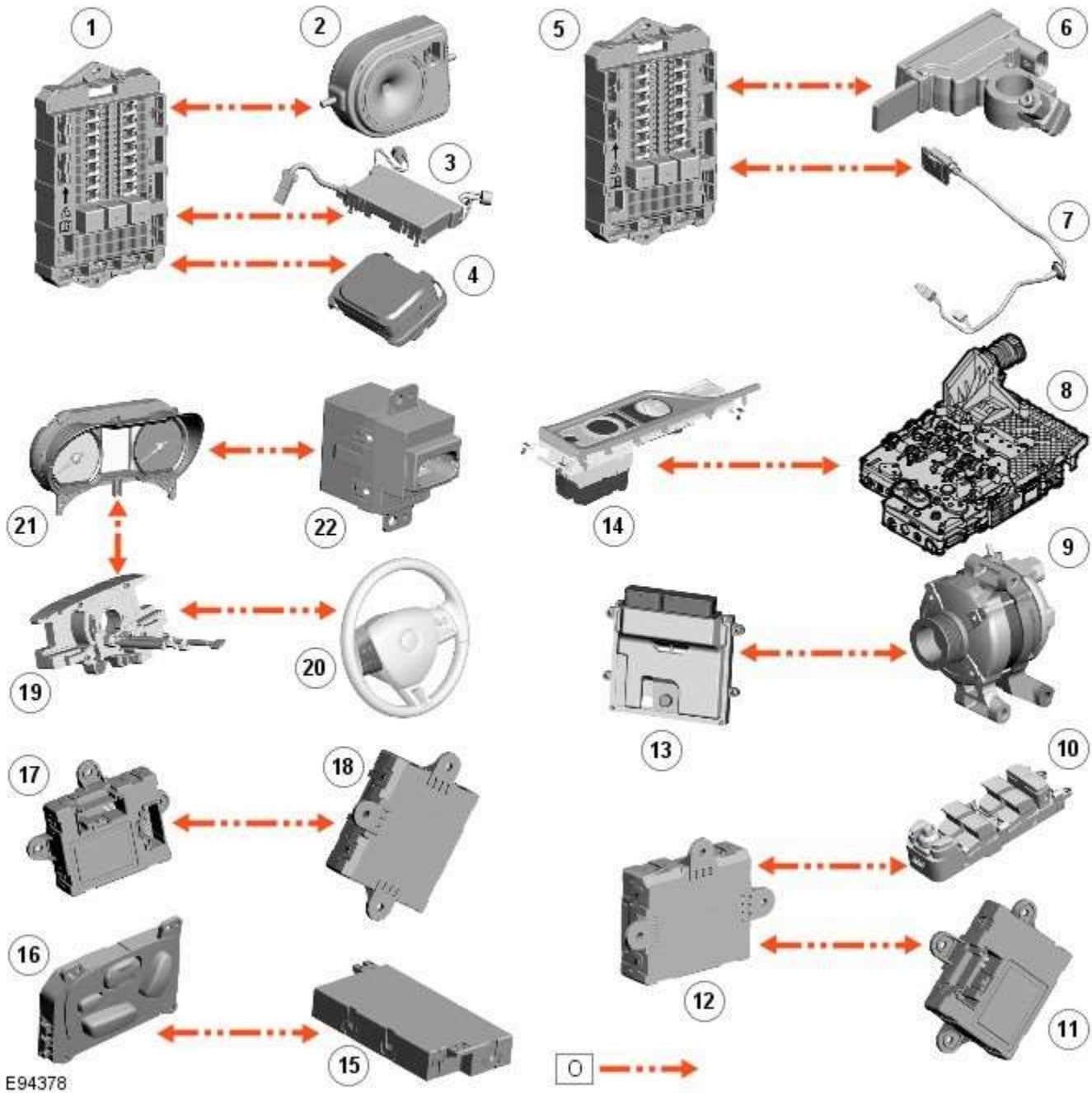
Module Communications Network - Communications Network - System Operation and Component Description

Description and Operation

Control Diagram



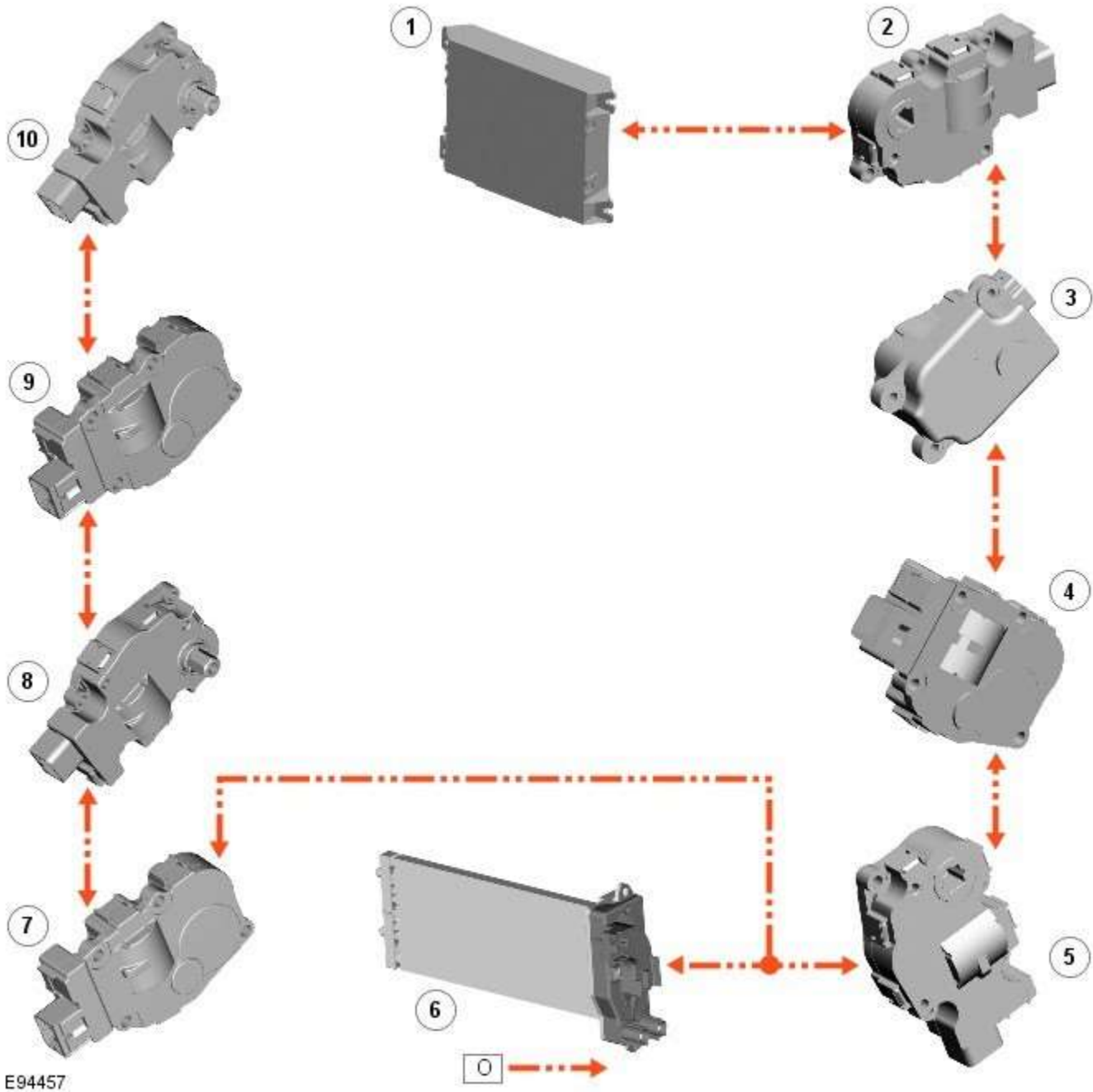
CONTROL DIAGRAM - LIN BUS - SHEET 1 OF 2



E94378

Item	Description
	O = LIN (local interconnect network) bus
1	CJB (central junction box)
2	Battery backed sounder
3	Intrusion detection module

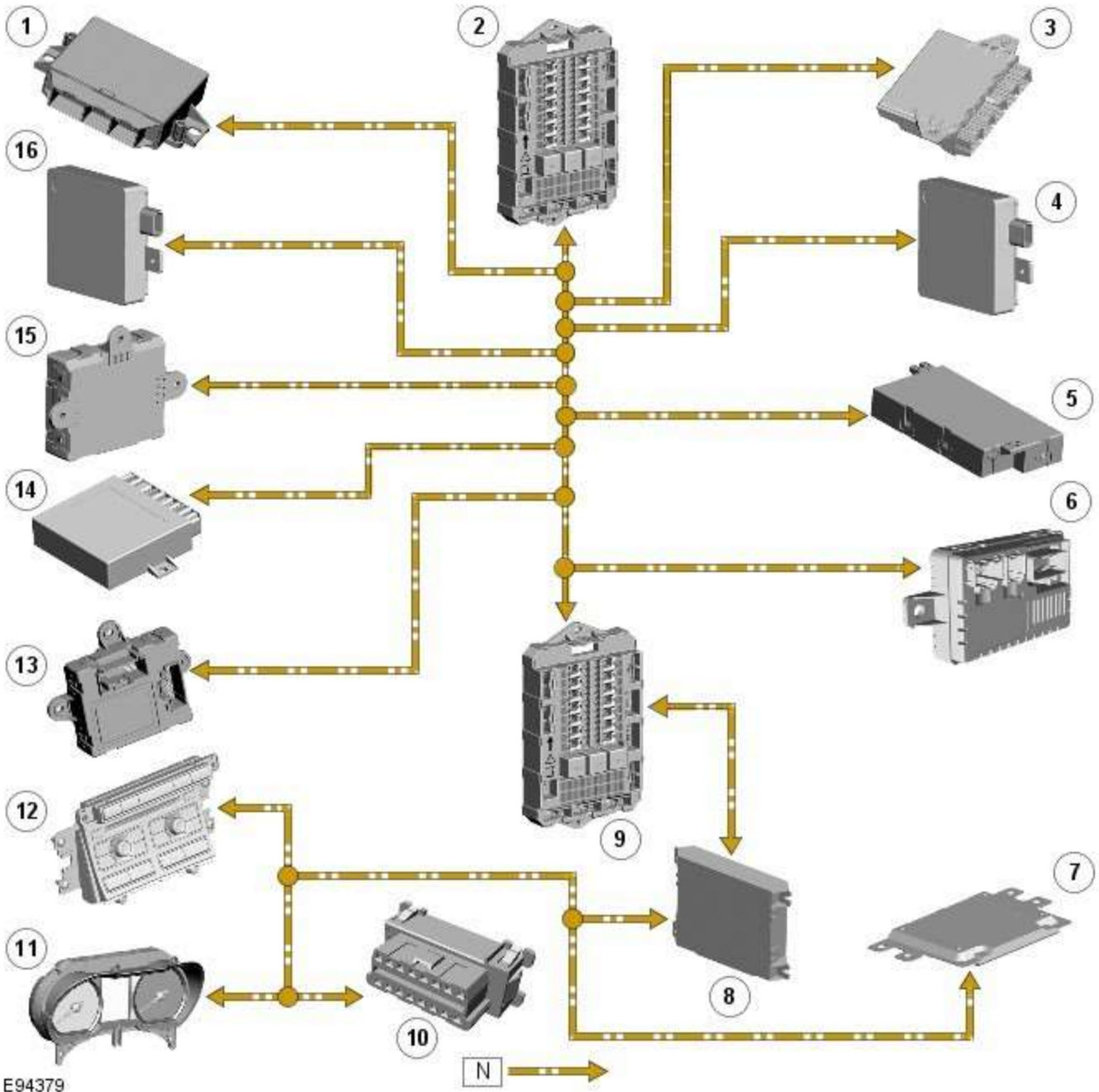
4	Rain/Light sensor
5	RJB (rear junction box)
6	Battery monitoring system module
7	Rear view camera
8	TCM (transmission control module)
9	Generator
10	Driver's door switch pack
11	Rear door control module
12	Driver's door control module
13	ECM (engine control module)
14	Electronic transmission selector
15	Driver's seat module
16	Driver's seat switch pack
17	Rear door control module
18	Front passenger door control module
19	Clockspring
20	Audio and telephone steering wheel switches
21	Instrument cluster
22	Start control module



E94457

Item	Description
	O = LIN bus
1	ATC (automatic temperature control) module
2	Stepper motor - Windshield defrost
3	Stepper motor - Face/feet distribution
4	Stepper motor - LH (left-hand) temperature blend
5	Stepper motor - RH (right-hand) temperature blend
6	Electric booster heater
7	Stepper motor - RH_outer face level vent
8	Stepper motor - RH_inner face level vent
9	Stepper motor - LH_inner face level vent
10	Stepper motor - LH_outer face level vent

CONTROL DIAGRAM - MEDIUM SPEED CAN BUS

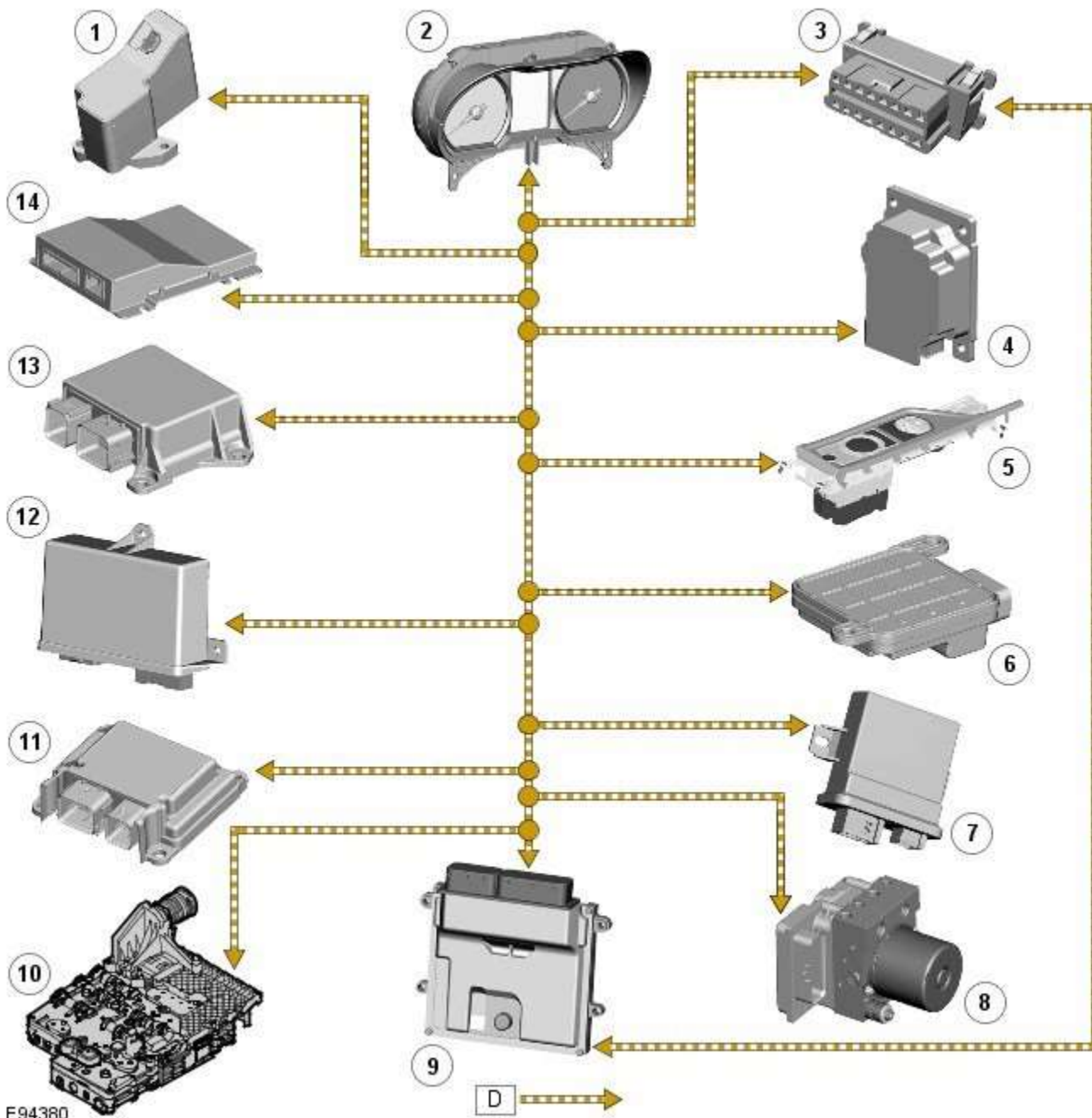


E94379

Item	Description
	N = Medium speed CAN (controller area network) bus
1	Parking aid module
2	RJB
3	Keyless vehicle module
4	RH blind spot monitoring module
5	Driver's seat module
6	Front seat climate control module
7	Information control module
8	ATC module
9	CJB
10	Diagnostic socket
11	Instrument cluster
12	Integrated control panel
13	Front passenger door control module

14	Tire Pressure Monitoring System (TPMS) module
15	Driver's door control module
16	LH blind spot monitoring module

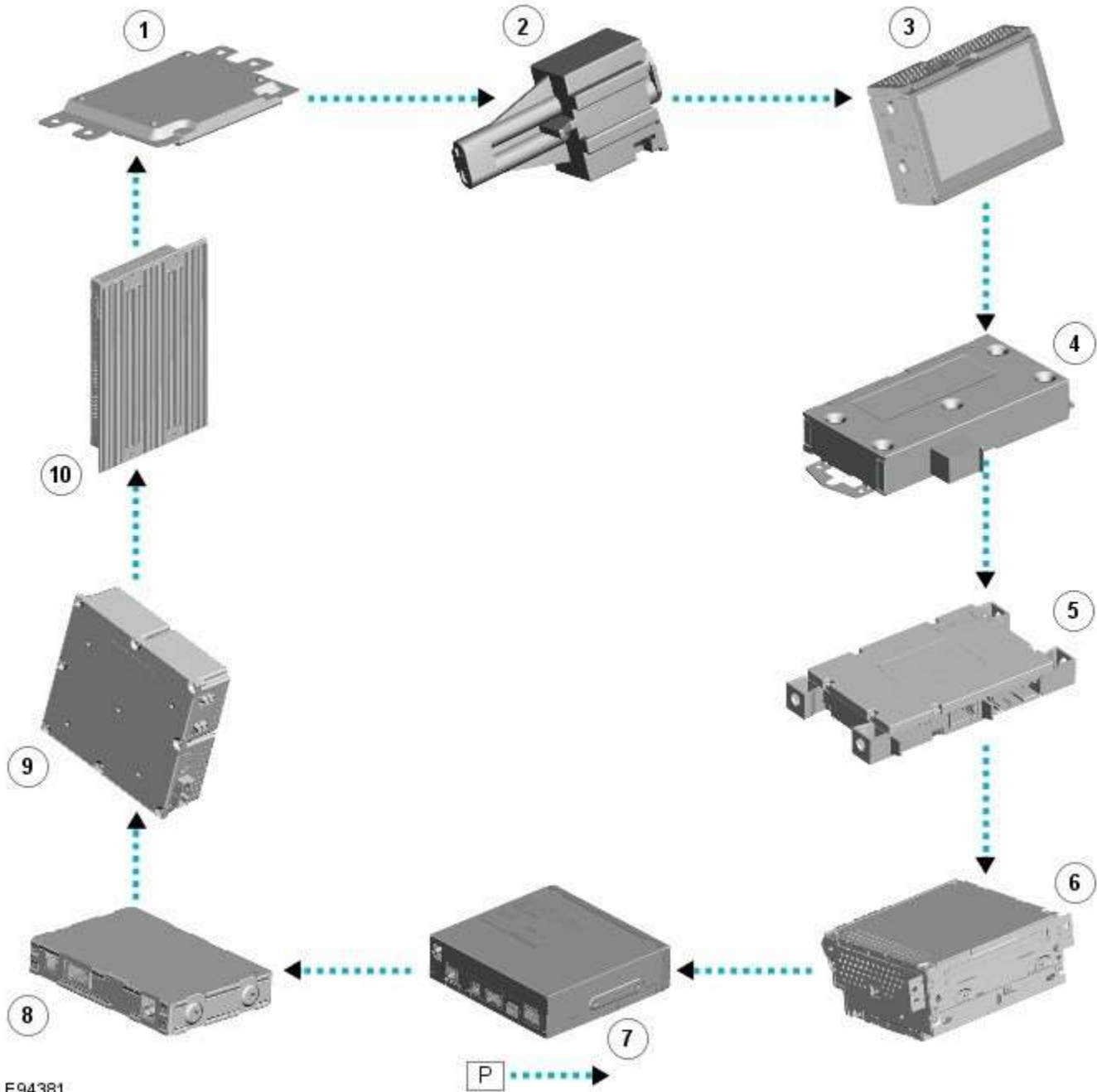
CONTROL DIAGRAM - HIGH SPEED CAN BUS



Item	Description
	D = High speed CAN bus
1	Electric steering column lock
2	Instrument cluster
3	Diagnostic socket
4	Adaptive speed control module
5	Electronic transmission selector
6	Occupant classification system control module
7	Headlamp leveling module
8	ABS (anti-lock brake system) module

9	ECM
10	TCM
11	Pedestrian protection system control module
12	Electric park brake module
13	RCM (restraints control module)
14	Adaptive damping control module

CONTROL DIAGRAM - MOST RING



E94381

Item	Description
	P = MOST ring
1	Entertainment system control module
2	Software download socket
3	Touch Screen Display (TSD)
4	Portable audio interface
5	Bluetooth® telephone module

6	Integrated audio module
7	Multi-media module
8	DAB/SDARS receiver
9	Television (TV) tuner
10	Audio system amplifier

System Operation

OPERATION

Refer to the relevant system section for details of system operation.

Component Description

DESCRIPTION

Refer to the relevant system section for details of system description.

Module Communications Network - Communications Network

Diagnosis and Testing

Principles of Operation

For a detailed description of the Communications Network, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (418-00 Module Communications Network)

Communications Network (Description and Operation),
[Communications Network](#) (Description and Operation),
[Communications Network](#) (Description and Operation).

Inspection and Verification

CAUTIONS:



Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.



Electronic modules are sensitive to static electrical charges. If exposed to these charges, damage may result.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Electrical
<ul style="list-style-type: none"> • Fuses (refer to electrical guide) • Wiring harness • Correct engagement of electrical connectors • Loose or corroded connections • Routing of fibre optic harnesses • Correct engagement of optical connectors • Correct placement of optical connectors (ring order) • Correct assembly of optical connectors (backout, etc) • Damage to fibre (chafing, abrasion, kinking, cuts, etc)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index

Symptom Chart

Symptom	Possible Causes	Action
MOST network fault - Touch screen display displaying flashing logo	<ul style="list-style-type: none"> • MOST ring broken after the touch screen display • Control module on MOST network power or ground circuit open circuit, high resistance • Control module on MOST network internal failure 	<ul style="list-style-type: none"> • GO to Pinpoint Test B.
MOST network fault - Touch screen display blank	<ul style="list-style-type: none"> • MOST ring broken between the information and entertainment control module and the touch screen display • Information and entertainment control module or touch screen display power or ground circuit open circuit, high resistance • Wake up signal not received by the information and entertainment control module • Information and entertainment control module or touch screen display internal failure 	<ul style="list-style-type: none"> • GO to Pinpoint Test H.

Controller Area Network (CAN)

Control Module Connections to the CAN Harness

Control modules are connected to the CAN harness either in a 'loop' or 'spur' configuration. In the 'loop' type configuration the CAN harness loops into the module (via two connector pins) and then loops out of the module (via another two connector pins). In the 'spur' type configuration, a harness spur is spliced into the main 'backbone' of the CAN harness and the module is connected to the harness spur via two connector pins.

CAN Harness Architecture

For a detailed description of the CAN Networks and architecture, refer to the relevant Description and Operation section in the Workshop Manual.

CAN Network Integrity Tests

If a control module is suspected of non-communication, the Network Integrity test application available on the manufacturer approved diagnostic system can be used to confirm if communication is possible between the control modules on the vehicle and the manufacturer approved diagnostic system (via the J1962 diagnostic connector). The results from the test can be used to determine if either a single module or multiple modules are failing to communicate.

CAN Terminating Modules

If the Network Integrity test indicates that one or more module on one of the CAN networks (HS or MS) are failing to communicate, there are several checks that can be made. The first step is to identify if both of the CAN terminating modules on each individual CAN Bus are communicating. If both CAN terminating modules for each individual CAN Bus are communicating (identified via the Network Integrity test), then it can be confirmed that the main 'backbone' of the CAN harness is complete. The main 'backbone' of the CAN harness consists of all the modules connected to the CAN harness via a 'loop' configuration and also includes the two terminating modules.

Communication with both CAN terminating modules via the Network Integrity test confirms the physical integrity of the main 'backbone' of the CAN harness (and the harness spur to the J1962 diagnostic connector). This means that there is no requirement to check the resistance of the CAN Network. This is because the standard check for 60 ohms across the CAN High and CAN Low lines will not provide any additional information regarding the physical condition of the CAN harness, beyond what has already been determined from the Network Integrity test.

Non-Communication of a Terminating Module

If a Network Integrity test reveals a terminating module is failing to communicate it can indicate a break in the main 'backbone' of the CAN harness. The first checks should always be to confirm the power and ground supplies to the non-communicating module are correct. Providing these are correct, the resistance between the CAN High and CAN Low lines at the J1962 connector can be checked to determine the integrity of the main 'backbone' of the CAN harness. After disconnecting the battery a reading of 120 ohms would indicate an open circuit in the main 'backbone' of the CAN harness. Alternatively, a reading of 60 ohms would indicate that there is no open circuit fault with the main 'backbone' of the CAN harness.

It is worth noting that even if one of the terminating modules is disconnected from the CAN harness, communications between the modules still connected may still be possible. Therefore communication between the manufacturer approved diagnostic system and the connected modules may also be possible.

Locating CAN Harness Open Circuits

In the case where multiple modules, including a terminating module, are failing to communicate, having first confirmed the power and ground supplies are correct, the approximate location of the open circuit can be identified from analysis of the Network Integrity test results and reference to the relevant CAN network circuit diagrams. For example, if an open circuit existed in a certain position on the CAN harness, any module positioned on the Network between the J1962 connector and the open circuit should return a response during the Network Integrity test. No responses would be returned from any modules past the open circuit fault in the Network.

CAN Harness 'Spur' Type Configuration Circuits

If, after the initial checks (Network Integrity test using the manufacturer approved diagnostic system, and power and ground supplies to the module have been checked and confirmed as correct), a module that is connected to the CAN harness via a 'spur' type configuration is suspected of not communicating, then the physical integrity of the CAN harness 'spur' can be checked.

This is most easily undertaken by individually checking the continuity of the CAN High and CAN Low lines between the non-communicating module connector (with the module disconnected) and the J1962 diagnostic connector.

'Lost Communications' DTCs

As well as the methods described so far in this document, which can be used to determine the location of an open circuit in the CAN harness, 'Lost Communications' DTCs can also be used for this purpose. Lost communication DTCs mean that a module is not receiving CAN information from another module.

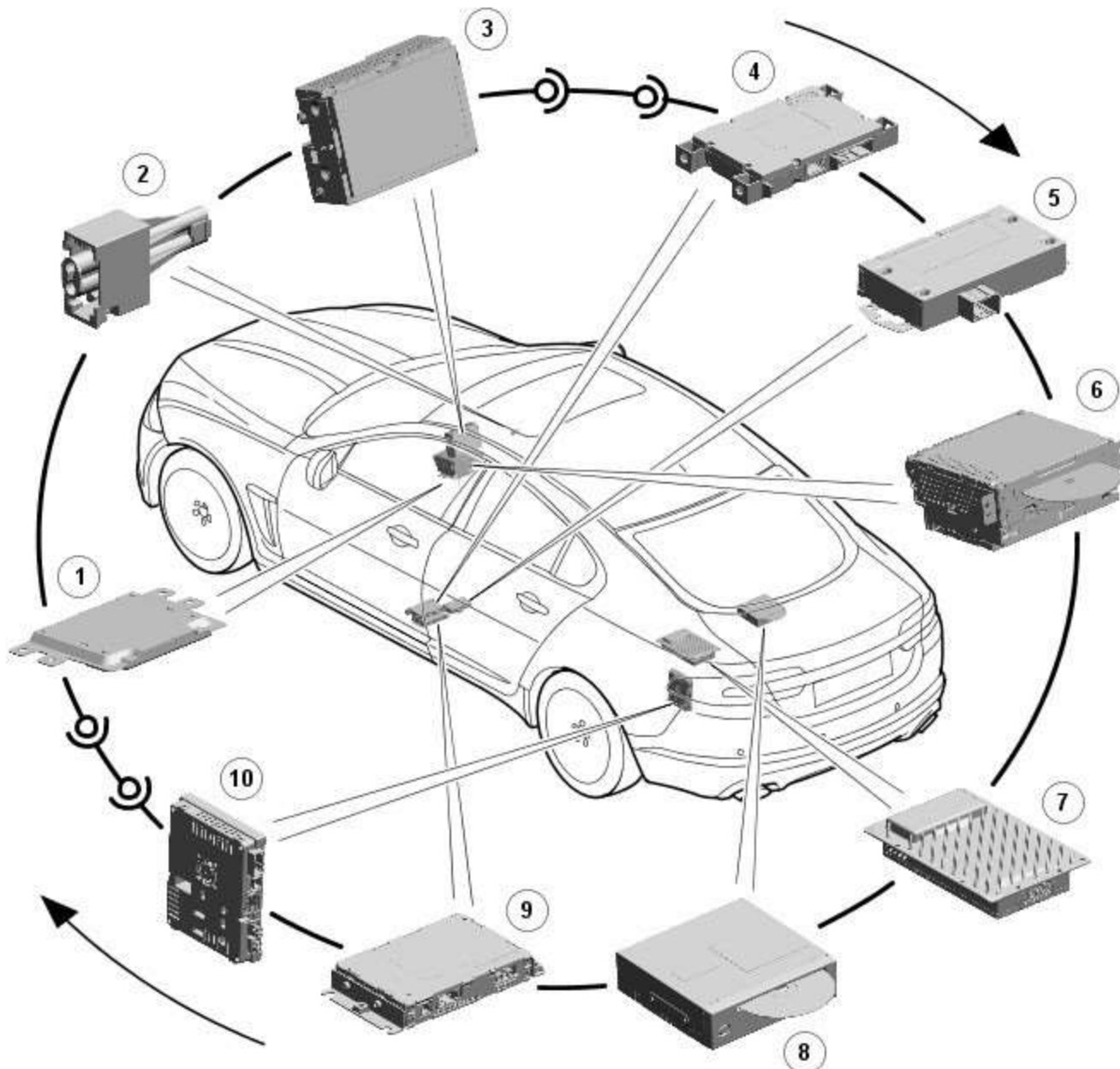
For example, if a global DTC read were to be carried out, only DTCs stored in the modules that the manufacturer approved diagnostic system could communicate with would be displayed. If there was an open circuit fault in a certain position on the CAN harness, the modules that could display DTCs would all be prior to the open circuit on the Network, and these modules should display 'Lost Communications' DTCs with all the modules located on the Network past the open circuit fault.

'Bus off' DTCs

The references to bus and its condition refer to the network concerned and the modules on that network.

If a module logs a 'Bus Off' DTC, it means that the module has detected CAN transmission errors and has disabled its own CAN transmissions and disconnected itself from the network in an attempt to allow the rest of the network to function. At this point the 'Bus Off' DTC is set. A common cause of 'Bus Off' DTCs can be a short circuit in the CAN network.

Media Oriented Systems Transport (MOST)



E151896



NOTE: Items 1, 2, 3 and 6 will always be present. The remaining items are optional and/or market specific.

Item	Description
1	Information and entertainment control module
2	MOST diagnostic connector
3	Touch screen display
4	Telephone module
5	Portable audio interface module
6	Integrated audio module
7	Power amplifier
8	Navigation control module
9	DAB tuner module
10	Television receiver

Overview

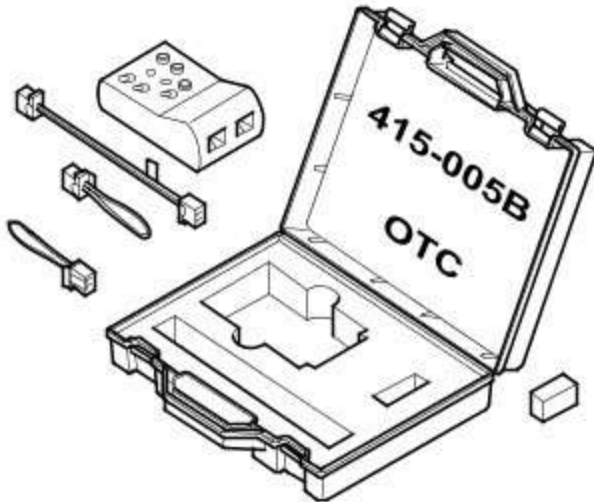
The basic guidelines are covered in the description and operation section, such as not attempting to repair fibre optic cables, but additional precautions include:

- Do not touch the exposed ends of the optical fibres (grease from skin can contaminate the fibre)

- Whenever the fibre optic cable is disconnected, cover the connectors to prevent dust contamination
- Do not expose the fibre optic cable to heat
- Do not bend the fibre optic cable through less than a 25 mm (one inch) radius
- Do not use laser pens to test the fibre optic cable's ability to pass light

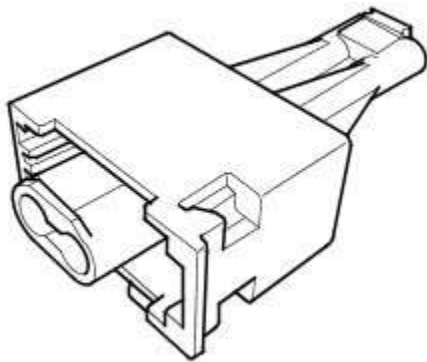
MOST Diagnostic Tools

There are two dedicated tools for testing the MOST system:



E150402

MOST tester. The MOST tester is connected to the MOST network in place of a control module. It will confirm receipt of any existing MOST signal and transmit it to the next control module on the network. Perform the following tests to validate the operation of the MOST tester. GO to Pinpoint Test [A](#).



E150401

MOST prism. The MOST prism is connected in the same way as the MOST tester but will simply reflect any existing signal onward to the next control module. Using the MOST prism before or after a long run of harness may cause a ring break as a good signal may be too weak after travelling the extended distance. Also, the MOST prism will pass light in either direction so will not detect reversed MOST terminals elsewhere in the network. For these reasons, the MOST tester is the preferred tool and should be used unless limited access does not permit it

MOST Ring Break Indication

A ring break in the MOST network is indicated by a blank touch screen display if the break is before the touch screen display or a flashing logo of the break is after the touch screen display. Possible causes of ring breaks are listed in the symptom chart

Pinpoint Tests

PINPOINT TEST A : MOST TESTER TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: MOST TESTER BATTERY TEST	
1	Set the MOST tester power switch to 'on'

	<p>Is the power LED illuminated?</p> <p>Yes Test passed. GO to A2.</p> <p>No Test failed. Install a new battery into the MOST tester. GO to A1.</p>
--	---

A2: 2+0 INPUT/OUTPUT TEST

NOTES:



2+0' indicates that the loop harness connector consists of 2 fibre optic terminals and 0 electrical terminals.



The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.

	1	Set the MOST tester power switch to 'on'
	2	Set the connector selector switch to '2+0'
	3	Set the indication switch to 'beep' or 'LED'
	4	Remove the covers from the MOST tester 2+0 connector and the 2+0 loop harness connector
	5	Connect the 2+0 loop harness to the MOST tester 2+0 connector
	6	Operate the test switch and check the MOST tester beep/LED
		Did the MOST tester emit a tone or illuminate the LED?
	Yes	Test passed. GO to A3.
	No	Test failed. MOST tester or 2+0 harness fault

A3: 2+4 INPUT/OUTPUT TEST

NOTES:



2+4' indicates that the loop harness connector consists of 2 fibre optic terminals and 4 electrical terminals.



The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.

	1	Set the MOST tester power switch to 'on'
	2	Set the connector selector switch to '2+4'
	3	Set the indication switch to 'beep' or 'LED'
	4	Remove the covers from the MOST tester 2+4 connector and the 2+4 loop harness connector
	5	Connect the 2+4 loop harness to the MOST tester 2+4 connector
	6	Operate the test switch and check the MOST tester beep/LED
		Did the MOST tester emit a tone or illuminate the LED?
	Yes	Test passed. GO to A4.
	No	Test failed. MOST tester or 2+4 harness fault

A4: ADAPTER HARNESS AND PRISM TEST



NOTE: The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.

	1	Set the MOST tester power switch to 'on'
	2	Set the connector selector switch to '2+0'
	3	Set the indication switch to 'beep' or 'LED'
	4	Remove the covers from the MOST tester 2+0 connector, the prism, and the adapter harness connectors
	5	Connect the adapter harness to the MOST tester 2+0 connector
	6	Connect the prism to the adapter harness
	7	Operate the test switch and check the MOST tester beep/LED
		Did the MOST tester emit a tone or illuminate the LED?
	Yes	Test passed
	No	Test failed. MOST tester, adapter harness or prism fault

PINPOINT TEST B : MOST NETWORK INITIAL TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: MOST NETWORK INITIAL TEST 1	



NOTE: When connecting the MOST tester, use the 2+0 or 2+4 socket as appropriate and set the connector selector switch to match the socket in use

- 1 Switch on the audio/video system
- 2 Disconnect the MOST harness connector from a control module located after the touch screen display and before the information and entertainment control module
- 3 Set the MOST tester power switch to 'on'
- 4 Connect the MOST harness connector to the MOST tester
- 5 Check the touch screen display for indication of a MOST network fault

Has the MOST network been restored?

Yes

The disconnected control module is causing the MOST network fault. GO to Pinpoint Test [E](#).

No

The disconnected control module is not causing MOST network fault. [GO to B2](#).

B2: MOST NETWORK INITIAL TEST 2

- 1 Check the MOST tester beep/LED

Did the MOST tester emit a tone or illuminate the LED?

Yes

MOST signal received. The MOST network fault is located downstream of the MOST tester. GO to Pinpoint Test [C](#).

No

MOST signal not received. The MOST network fault is located upstream of the MOST tester. Disconnect the MOST harness connector from the MOST tester and reconnect it to the control module. GO to Pinpoint Test [D](#).

PINPOINT TEST C : MOST NETWORK DOWNSTREAM TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
-----------------	-------------------------

C1: MOST NETWORK DOWNSTREAM TEST 1

- 1 Refer to the electrical circuit diagrams and identify the succeeding control module on the MOST network

Is this control module the information and entertainment control module?

Yes

GO to Pinpoint Test [E](#).

No

[GO to C2](#).

C2: MOST NETWORK DOWNSTREAM TEST 2

- 1 Disconnect the MOST harness connector

- 2 Direct the MOST harness connector at a suitable surface and check for the presence of red light

Is red light present?

Yes

Disconnect the MOST harness connector from the MOST tester and reconnect it to the control module. [GO to C3](#).

No

The fault is in the MOST harness between the MOST tester and the disconnected MOST harness connector. Install a new MOST harness as necessary

C3: MOST NETWORK DOWNSTREAM TEST 3



NOTE: When connecting the MOST tester, use the 2+0 or 2+4 socket as appropriate and set the connector selector switch to match the socket in use

- 1 Connect the succeeding MOST harness connector to the MOST tester

- 2 Check the touch screen display for indication of a MOST network fault

Has the MOST network been restored?

Yes

The disconnected control module is causing the MOST network fault. GO to Pinpoint Test [E](#).

No

The disconnected control module is not causing the MOST network fault. [GO to C1](#).

PINPOINT TEST D : MOST NETWORK UPSTREAM TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
-----------------	-------------------------

D1: MOST NETWORK UPSTREAM TEST 1

- 1 Refer to the electrical circuit diagrams and identify the preceding control module on the MOST network

Is this control module the touch screen display?

Yes

GO to Pinpoint Test [G](#).

No


[GO to D2](#).

D2: MOST NETWORK UPSTREAM TEST 2

- 1 Disconnect the MOST harness connector from the control module

	2 Direct the MOST harness connector at a suitable surface and check for the presence of red light
	Is red light present?
	Yes The MOST network fault is in the control module or the MOST harness to the succeeding control module. GO to D3 .
	No The MOST network fault is located upstream of the disconnected control module. Reconnect the MOST harness connector to the control module. GO to D1 .

D3: MOST NETWORK UPSTREAM TEST 3

 NOTE: When connecting the MOST tester, use the 2+0 or 2+4 socket as appropriate and set the connector selector switch to match the socket in use

	1 Connect the MOST harness connector to the MOST tester
	2 Check the touch screen display for indication of a MOST network fault
	Has the MOST network been restored?
	Yes The disconnected control module is causing the MOST network fault. GO to Pinpoint Test E .
	No The fault is in the MOST harness between the MOST tester and the succeeding control module. Install a new MOST harness as necessary


PINPOINT TEST E : CONTROL MODULE TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
-----------------	-------------------------

E1: CONTROL MODULE TEST 1

NOTES:

 When connecting the MOST tester, use the 2+0 or 2+4 socket as appropriate and set the connector selector switch to match the socket in use

 The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.

	1 Connect the MOST tester to the relevant control module using the adapter harness
	2 Operate the test switch and check the MOST tester beep/LED
	Did the MOST tester emit a tone or illuminate the LED?
	Yes MOST signal received. Tests inconclusive. Reconnect the MOST harness connector to the control module and confirm that the MOST network fault is still present. Repeat the tests from the beginning. GO to Pinpoint Test B .
	No GO to E2 .

E2: CONTROL MODULE TEST 2

	1 Refer to the electrical circuit diagrams and test the relevant control module power and ground circuits for open circuit, high resistance
	Are the power and ground circuits within specification?
	Yes GO to E3 .
	No Repair the power and/or ground circuit

E3: CONTROL MODULE TEST 3

	1 Reconnect the MOST harness to the control module
	2 Check the touch screen display for indication of a MOST network fault
	Has the MOST network been restored?
	Yes Tests inconclusive. Repeat the tests from the beginning. GO to Pinpoint Test B .
	No Install a new control module

PINPOINT TEST F : MOST NETWORK FINAL DOWNSTREAM TEST

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
-----------------	-------------------------

F1: MOST NETWORK FINAL DOWNSTREAM TEST 1

NOTES:

 When connecting the MOST tester, use the 2+0 or 2+4 socket as appropriate and set the connector selector switch to match the socket in use



The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.

	1	Disconnect the MOST harness connector from the MOST tester
	2	Reconnect the MOST harness connector to the control module
	3	Disconnect the MOST harness connector from the information and entertainment control module
	4	Connect the MOST harness connector to the MOST tester
	5	Operate the test switch and check the MOST tester beep/LED
		Did the MOST tester emit a tone or illuminate the LED?
	Yes	GO to F2.
	No	The fault is in the harness between the information and entertainment control module and the preceding control module. Install a new MOST harness as necessary
F2: MOST NETWORK FINAL DOWNSTREAM TEST 2		
	1	Disconnect the MOST harness connector from the MOST tester
	2	Reconnect the MOST harness connector to the information and entertainment control module
	3	Check the touch screen display for indication of a MOST network fault
		Has the MOST network been restored?
	Yes	Tests inconclusive. Repeat the tests from the beginning. GO to Pinpoint Test B.
	No	Install a new information and entertainment control module

PINPOINT TEST G : MOST NETWORK FINAL UPSTREAM TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS	
G1: MOST NETWORK FINAL UPSTREAM TEST 1		
		NOTE: The MOST tester may continue to emit a tone or illuminate the LED after the test switch is released. This does not indicate a fault.
	1	Disconnect the MOST harness connector from the touch screen display
	2	Connect the MOST tester to the touch screen display using the adapter harness
	3	Operate the test switch and check the MOST tester beep/LED
		Did the MOST tester emit a tone or illuminate the LED?
	Yes	The fault is in the MOST harness between the touch screen display and the succeeding control module. Install a new MOST harness as necessary
	No	GO to G2.
G2: MOST NETWORK FINAL UPSTREAM TEST 2		
	1	Reconnect the MOST harness to the touch screen display
	2	Check the touch screen display for indication of a MOST network fault
		Has the MOST network been restored?
	Yes	Tests inconclusive. Repeat the tests from beginning. GO to Pinpoint Test B.
	No	Install a new touch screen display

PINPOINT TEST H : BLANK SCREEN TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS	
H1: BLANK SCREEN TEST 1		
		NOTE: When connecting the MOST tester, use the 2+0 or 2+4 socket as appropriate and set the connector selector switch to match the socket in use
	1	Switch on the audio/video system
	2	Remove the cover from the MOST diagnostic connector
	3	Set the MOST tester power switch to 'on'
	4	Connect the MOST tester to the MOST diagnostic connector
	5	Check the touch screen display for indication of a MOST network fault
		Has the MOST network been restored?
	Yes	The MOST diagnostic connector cover is causing the MOST network fault. GO to H2.
	No	The MOST diagnostic connector cover is not causing MOST network fault. GO to H3.
H2: BLANK SCREEN TEST 2		

	1	Disconnect the MOST tester
	2	Install the cover to the MOST diagnostic connector
		Has the MOST network been restored? Yes No further action required No Install a new MOST diagnostic connector cover
H3: BLANK SCREEN TEST 3		
	1	Check the MOST tester beep/LED
		Did the MOST tester emit a tone or illuminate the LED? Yes MOST signal received. The MOST network fault is located downstream of the MOST tester. GO to H4. No MOST signal not received. The MOST network fault is located upstream of the MOST tester. Disconnect the MOST tester from the MOST diagnostic connector and install the cover. GO to H5.
H4: BLANK SCREEN TEST 4		
	1	Disconnect the MOST harness connector from the touch screen display
	2	Direct the MOST harness connector at a suitable surface and check for the presence of red light
		Is red light present? Yes GO to Pinpoint Test J. No The fault is in the MOST harness between the MOST diagnostic connector and the touch screen display. Install a new MOST harness as necessary
H5: BLANK SCREEN TEST 5		
	1	Disconnect the MOST harness connector from the information and entertainment control module
	2	Direct the information and entertainment control module at a suitable surface and check for the presence of red light
		Is red light present? Yes Install a new MOST harness between the information and entertainment control module and the MOST diagnostic connector No GO to Pinpoint Test I.

PINPOINT TEST I : INFORMATION AND ENTERTAINMENT CONTROL MODULE TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I1: INFORMATION AND ENTERTAINMENT CONTROL MODULE TEST 1	
	1 Using the manufacturer approved diagnostic system, check the information and entertainment control module for related DTCs
	Is communication possible between the manufacturer approved diagnostic system and the information and entertainment control module? Yes Refer to the relevant DTC index No GO to I2.
I2: INFORMATION AND ENTERTAINMENT CONTROL MODULE TEST 2	
	1 Refer to the electrical circuit diagrams and test the information and entertainment control module power and ground circuits for open circuit, high resistance
	Are the power and ground circuits within specification? Yes GO to I3. No Repair the power and/or ground circuit
I3: INFORMATION AND ENTERTAINMENT CONTROL MODULE TEST 3	
	1 Using the manufacturer approved diagnostic system, perform a CAN network integrity test. Refer to the electrical circuit diagrams and test the medium speed CAN bus circuit for short circuit to ground, short circuit to power, open circuit, high resistance
	Is the medium speed CAN bus within specification? Yes Install a new information and entertainment control module No Repair the medium speed CAN bus circuit

PINPOINT TEST J : TOUCH SCREEN DISPLAY TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
J1: TOUCH SCREEN DISPLAY TEST 1	
	1 Refer to the electrical circuit diagrams and test the touch screen display power and ground circuits for open circuit, high resistance

	Are the power and ground circuits within specification? Yes GO to J2. No Repair the power and/or ground circuit
J2: TOUCH SCREEN DISPLAY TEST 2	
	1 Reconnect the MOST harness to the touch screen display
	2 Check the touch screen display for indication of a MOST network fault
	Has the MOST network been restored? Yes Tests inconclusive. Repeat the tests from beginning. GO to Pinpoint Test B. No Install a new touch screen display

DTC Index

Central Junction Box (CJB)

CAUTIONS:



Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle



When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

DTC	Description	Possible Cause	Action
B00D511	Restraint System Passenger Disable Indicator	<ul style="list-style-type: none"> PAD lamp supply circuit - short to ground 	Refer to the electrical circuit diagrams and check PAD lamp supply circuit for short to ground
B00D512	Restraint System Passenger Disable Indicator	<ul style="list-style-type: none"> PAD lamp supply circuit - short to power 	Refer to the electrical circuit diagrams and check PAD lamp supply circuit for short to power
B00D513	Restraint System Passenger Disable Indicator	<ul style="list-style-type: none"> PAD lamp supply circuit - open circuit 	Refer to the electrical circuit diagrams and check PAD lamp supply circuit for open circuit

DTC	Description	Possible Cause	Action
B100951	Ignition Authorisation	<ul style="list-style-type: none"> Faulty instrument cluster Target SID re-synchronisation error following programming CAN fault 	Check ignition, power and ground supplies to CJB and instrument cluster. Re-synchronize ID by re-configuring the instrument cluster as a new module. Check CAN communications between instrument cluster and tester
B100962	Ignition Authorisation	<ul style="list-style-type: none"> Low speed CAN fault CJB fault Instrument cluster fault Incorrect module installed (CJB/Instrument cluster) Target SID synchronisation error following re-programming Noise/EMC related error 	Check CAN communications between CJB and instrument cluster. Check ignition, power and ground supplies to CJB and instrument cluster. Confirm correct module is installed. Re-synchronise ID by re-configuring the instrument cluster as a new module. Check CAN network for interference/EMC related issues
B100963	Ignition Authorisation	<ul style="list-style-type: none"> CJB fault Low speed CAN fault Instrument cluster fault Low battery voltage <9V 	Check Power and Ground supplies to CJB and instrument cluster. Check CAN communications between CJB and instrument cluster. Check battery is in fully charged and serviceable condition, refer to the battery care manual
B100964	Ignition Authorisation	<ul style="list-style-type: none"> CJB fault Low speed CAN fault Instrument cluster fault 	Check power and ground supplies to CJB and instrument cluster. Check CAN communications between CJB and instrument cluster
B102B67	Passive Key	<ul style="list-style-type: none"> CJB fault Low speed CAN fault Remote Keyless Entry (RKE) module fault Write target SID synchronisation error following re-programming 	Check power and ground supplies to CJB and RKE module. Check CAN communications between CJB and RKE module. Re-synchronise ID by re-configuring the RKE module as a new module
B102B87	Passive Key	<ul style="list-style-type: none"> CJB fault Low speed CAN fault RKE module fault Key fob battery low/battery contact issue Interference from other RF signal EMC/noise Receiver fault Receiver not programmed correctly Serial communications fault (between receiver and RKE module) Key fault Passive antenna fault Confirm placement of key within vehicle 	Check power and ground supplies to CJB, RKE module and receiver. Check CAN communications between CJB and instrument cluster. Check key fob battery. Confirm vehicle surroundings, move vehicle. Check CAN network for interference/EMC related issues. Disconnect battery, then re-connect - confirm operation by re-programming keys. Check serial circuit between receiver and RKE module. Confirm spare key works. Refer to the electrical circuit diagrams and test circuits to all 3 antennas. Check whereabouts of key
B108413	Boot/Trunk Motor Close Switch	<ul style="list-style-type: none"> Trunk latch open signal circuit - open circuit 	Refer to the electrical circuit diagrams and check trunk latch open signal circuit for open circuit
B108783	LIN Bus "A"	<ul style="list-style-type: none"> Checksum of the received LIN frame from battery backed sounder, roof header console, and/or rain/light sensor is incorrect 	Check operation of rain/light sensor by covering sensor or applying water to screen, install a new sensor as required
B108788	LIN Bus "A"	<ul style="list-style-type: none"> Bus off. Battery backed sounder, roof header console, and/or rain/light sensor LIN circuit - short to ground, power 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check battery backed sounder, roof header console, and rain/light sensor LIN circuit for short to ground, power
B108A11	Start Button	<ul style="list-style-type: none"> Start/Stop switch analogue input circuits 1 or 2 - short to ground 	Refer to the electrical circuit diagrams and check Start/Stop switch analogue input circuits 1 and 2 for short to ground

DTC	Description	Possible Cause	Action
B108A12	Start Button	<ul style="list-style-type: none"> Start/Stop switch analogue input circuits 1 or 2 - short to power 	Refer to the electrical circuit diagrams and check Start/Stop switch analogue input circuits 1 and 2 for short to power
B109512	Wiper On/Off Relay	<ul style="list-style-type: none"> Wiper On/Off relay control circuit - short to power 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check wiper On/Off relay control circuit for short to power
B109514	Wiper On/Off Relay	<ul style="list-style-type: none"> Wiper On/Off relay control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check wiper On/Off relay control circuit for short to ground, open circuit
B109612	Wiper High/Low Relay	<ul style="list-style-type: none"> Wiper Fast/Slow relay control circuit - short to power 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check wiper Fast/Slow relay control circuit for short to power
B109614	Wiper High/Low Relay	<ul style="list-style-type: none"> Wiper Fast/Slow relay control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check wiper Fast/Slow relay control circuit for short to ground, open circuit
B109712	Heated Windshield Relay	<ul style="list-style-type: none"> Heated windshield relay control circuit - short to power 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check heated windshield relay control circuit for short to power
B109714	Heated Windshield Relay	<ul style="list-style-type: none"> Heated windshield relay control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check heated windshield relay control circuit for short to ground, open circuit
B10A612	Main Light Switch	<ul style="list-style-type: none"> Master light switch signal from roof header console circuit - short to power 	Refer to the electrical circuit diagrams and check master light switch signal from roof header console circuit for short to power
B10A623	Main Light Switch	<ul style="list-style-type: none"> Master light switch signal from roof header console signal stuck low. Switch is read as ON for too long a time 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check master light switch signal from roof header console for short to ground
B10AD09	Rain Sensor	<ul style="list-style-type: none"> Component failures 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Suspect the rain/light sensor, check and install a new sensor as required
B10AD11	Rain Sensor	<ul style="list-style-type: none"> Rain/light sensor power circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check rain/light sensor power circuit for short to ground
B10AD96	Rain Sensor	<ul style="list-style-type: none"> Component internal failure 	Suspect the rain/light sensor, check and install a new sensor as required
B10E511	PCM Wake-up Signal	<ul style="list-style-type: none"> ECM wake-up signal circuit - short to ground 	Refer to the electrical circuit diagrams and check ECM wake-up signal circuit for short to ground
B10E512	PCM Wake-up Signal	<ul style="list-style-type: none"> ECM wake-up signal circuit - short to power 	Refer to the electrical circuit diagrams and check ECM wake-up signal circuit for short to power
B10E513	PCM Wake-up Signal	<ul style="list-style-type: none"> ECM wake-up signal circuit - open circuit 	Refer to the electrical circuit diagrams and check ECM wake-up signal circuit for open circuit
B10F111	Key In Switch	<ul style="list-style-type: none"> Keyless vehicle module, key IN status circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check keyless vehicle module, key IN status circuit for short to ground
B10F112	Key In Switch	<ul style="list-style-type: none"> Keyless vehicle module, key IN status circuit - short to power 	Refer to the electrical circuit diagrams and check keyless vehicle module, key IN status circuit for short to power
B10F113	Key In Switch	<ul style="list-style-type: none"> Keyless vehicle module, key IN status circuit - open circuit 	Refer to the electrical circuit diagrams and check keyless vehicle module, key IN status circuit for open circuit



DTC	Description	Possible Cause	Action
B10F211	Sunroof Control	<ul style="list-style-type: none"> Sunroof enable signal circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check sunroof enable signal circuit for short to ground
B10F212	Sunroof Control	<ul style="list-style-type: none"> Sunroof enable signal circuit - short to power 	Refer to the electrical circuit diagrams and check sunroof enable signal circuit for short to power
B10F213	Sunroof Control	<ul style="list-style-type: none"> Sunroof enable signal circuit - open circuit 	Refer to the electrical circuit diagrams and check sunroof enable signal circuit for open circuit
B10F311	Left Front Position Light	<ul style="list-style-type: none"> Left front side lamps circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left front side lamps circuit for short to ground
B10F315	Left Front Position Light	<ul style="list-style-type: none"> Left front side lamps circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left front side lamps circuit for short to power, open circuit
B10F411	Right Front Position Light	<ul style="list-style-type: none"> Right front side lamps circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right front side lamps circuit for short to ground
B10F415	Right Front Position Light	<ul style="list-style-type: none"> Right front side lamps circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right front side lamps circuit for short to power, open circuit
B10F812	Accessory socket 'A' relay	<ul style="list-style-type: none"> Accessory socket 'A' relay control circuit - short to power 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check accessory socket 'A' relay control circuit for short to power
B10F814	Accessory socket 'A' relay	<ul style="list-style-type: none"> Accessory socket 'A' relay control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check accessory socket 'A' relay control circuit for short to ground, open circuit
B10F912	Accessory socket 'B' relay	<ul style="list-style-type: none"> Front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits - short to power 	Refer to the electrical circuit diagrams and check front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits for short to power
B10F914	Accessory socket 'B' relay	<ul style="list-style-type: none"> Front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits - short to ground, open circuit 	Refer to the electrical circuit diagrams and check front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits for short to ground, open circuit
B10F993	Accessory socket 'B' relay	<ul style="list-style-type: none"> Front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits - short to power, ground, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front powerpoint, trailer tow connector, road pricing connector, sunblind power supply circuits for short to power, ground, open circuit
B10FA93	Delayed Power Off relay	<ul style="list-style-type: none"> ADRC ECM, roof header console lamp, glove box lamp , RH/LH footwell lamps, JAG Sense glove box module, RH/LH sunvisor lamps, rear dome lamps switched power circuits - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check ADRC ECM, roof header console lamp, glove box lamp , RH/LH footwell lamps, JAG Sense glove box module, RH/LH sunvisor lamps, rear dome lamps switched power circuits for short to power, open circuit
B10FF11	Ignition control	<ul style="list-style-type: none"> ECM and FPDB ignition control circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check ECM and FPDB ignition control circuit for short to ground
B10FF13	Ignition control	<ul style="list-style-type: none"> ECM and FPDB ignition control circuit - open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check ECM and FPDB ignition control circuit for open circuit

DTC	Description	Possible Cause	Action
B110011	O2 sensor heater relay	<ul style="list-style-type: none"> FPDB O2 sensor heater relay control circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check FPDB O2 sensor heater relay control circuit for short to ground
B113D12	Sunroof Global Open/Close Control	<ul style="list-style-type: none"> Roof opening panel global open/close control circuit - short to power 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check roof opening panel global open/close control circuit for short to power
B113D14	Sunroof Global Open/Close Control	<ul style="list-style-type: none"> Roof opening panel global open/close control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check roof opening panel global open/close control circuit for short to ground, open circuit
B114011	Engine Crank Authorisation	<ul style="list-style-type: none"> Engine crank authorisation signal circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check engine crank authorisation signal circuit for short to ground
B114211	Ignition Status 1	<ul style="list-style-type: none"> Ignition supply 1 circuits - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check all ignition supply 1 circuits for short to ground
B114311	Ignition Status 2	<ul style="list-style-type: none"> Ignition supply 2 circuits - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check all ignition supply 2 circuits for short to ground
B114411	Heated Steering Wheel Supply	<ul style="list-style-type: none"> Heated steering wheel supply circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check heated steering wheel supply circuit for short to ground
B114511	Glovebox Locking Motor	<ul style="list-style-type: none"> Glovebox latch locking motor circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check glovebox latch locking motor circuit for short to ground
B114512	Glovebox Locking Motor	<ul style="list-style-type: none"> Glovebox latch locking motor control circuit - short to power 	Refer to the electrical circuit diagrams and check glovebox latch locking motor control circuit for short to power
B114513	Glovebox Locking Motor	<ul style="list-style-type: none"> Glovebox latch locking motor control circuit - open circuit 	Refer to the electrical circuit diagrams and check glovebox latch locking motor control circuit for open circuit
B114612	Passive sounder Supply	<ul style="list-style-type: none"> Security passive sounder control circuit - short to power 	Refer to the electrical circuit diagrams and check security passive sounder control circuit for short to power
B114614	Passive sounder Supply	<ul style="list-style-type: none"> Security passive sounder control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check security passive sounder control circuit for short to ground, open circuit
B115811	Front Passenger Seat Heater Sensor	<ul style="list-style-type: none"> Front passenger seat heater sensor circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front passenger seat heater sensor circuit for short to ground
B115813	Front Passenger Seat Heater Sensor	<ul style="list-style-type: none"> Front passenger seat heater sensor circuit - open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front passenger seat heater sensor circuit for open circuit
B115911	Driver Seat Heater Sensor	<ul style="list-style-type: none"> Driver seat heater sensor circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat heater sensor circuit for short to ground
B115913	Driver Seat Heater Sensor	<ul style="list-style-type: none"> Driver seat heater sensor circuit - open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat heater sensor circuit for open circuit
B115A11	Front Passenger Seat Heater	<ul style="list-style-type: none"> Front passenger seat heater supply circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front passenger seat heater supply circuit for short to ground
B115A15	Front Passenger Seat Heater	<ul style="list-style-type: none"> Front passenger seat heater supply circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check front passenger seat heater supply circuit for short to power, open circuit

DTC	Description	Possible Cause	Action
B115B11	Driver Seat Heater	<ul style="list-style-type: none"> • Driver seat heater supply circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat heater supply circuit for short to ground
B115B15	Driver Seat Heater	<ul style="list-style-type: none"> • Driver seat heater supply circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat heater supply circuit for short to power, open circuit
B117513	Driver Door Ajar Switch	<ul style="list-style-type: none"> • Driver door ajar switch signal circuit - open circuit 	Refer to the electrical circuit diagrams and check driver door ajar switch signal circuit for open circuit
B117613	Passenger Door Ajar Switch	<ul style="list-style-type: none"> • Passenger door ajar switch signal circuit - open circuit 	Refer to the electrical circuit diagrams and check passenger door ajar switch signal circuit for open circuit
B117712	Screenwash Level Switch	<ul style="list-style-type: none"> • Screenwash level switch signal circuit - short to power 	Refer to the electrical circuit diagrams and check screenwash level switch signal circuit for short to power
B11C013	Driver Side Rear Door Ajar Switch	<ul style="list-style-type: none"> • Left rear door ajar switch signal circuit - open circuit 	Refer to the electrical circuit diagrams and check left rear door ajar switch signal circuit for open circuit
B11C113	Passenger Side Rear Door Ajar Switch	<ul style="list-style-type: none"> • Right rear door ajar switch signal circuit - open circuit 	Refer to the electrical circuit diagrams and check right rear door ajar switch signal circuit for open circuit
B122223	Master Lock/Unlock Switch	<ul style="list-style-type: none"> • Master lock or unlock switch digital input circuit - signal stuck low 	Refer to the electrical circuit diagrams and check master lock and unlock switch digital input circuits for short to ground, open circuit
B123711	Gear Shift Module Early Wake-up	<ul style="list-style-type: none"> • Transmission shift module wake-up control circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check transmission shift module wake-up control circuit for short to ground
B123712	Gear Shift Module Early Wake-up	<ul style="list-style-type: none"> • Transmission shift module wake-up control circuit - short to power 	Refer to the electrical circuit diagrams and check transmission shift module wake-up control circuit for short to power
B123713	Gear Shift Module Early Wake-up	<ul style="list-style-type: none"> • Transmission shift module wake-up control circuit - open circuit 	Refer to the electrical circuit diagrams and check transmission shift module wake-up control circuit for open circuit
B123E13	Crank Enable	<ul style="list-style-type: none"> • OK to crank signal circuit - open circuit 	Refer to the electrical circuit diagrams and check OK to crank signal circuit for open circuit
B1A8596	Ambient Light Sensor	<ul style="list-style-type: none"> • Light sensor internal electronic failure 	Check and install a new sensor as required
B1C4513	Front Wiper Park Position Switch	<ul style="list-style-type: none"> • Windshield wiper motor park switch signal circuit - open circuit 	Refer to the electrical circuit diagrams and check windshield wiper motor park switch signal circuit for open circuit
B1C4523	Front Wiper Park Position Switch	<ul style="list-style-type: none"> • Signal stuck low 	Refer to the electrical circuit diagrams and check front wiper park position switch input circuit for short, open circuit
B1C7812	Powerwash Relay	<ul style="list-style-type: none"> • Powerwash relay control circuit - short to power 	Refer to the electrical circuit diagrams and check powerwash relay control circuit for short to power
B1C7814	Powerwash Relay	<ul style="list-style-type: none"> • Powerwash relay control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check powerwash relay control circuit for short to ground, open circuit
B1C7911	Front Washer Pump	<ul style="list-style-type: none"> • Screenwash pump control circuit - short to ground 	Refer to the electrical circuit diagrams and check screenwash pump control circuit for short to ground

DTC	Description	Possible Cause	Action
B1C7913	Front Washer Pump	<ul style="list-style-type: none"> Screenwash pump control circuit - open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check screenwash pump control circuit for open circuit
B1C9812	Left Corner Lamp Circuit	<ul style="list-style-type: none"> Left front corner lamp control circuit - short to power 	Refer to the electrical circuit diagrams and check left front corner lamp control circuit for short to power
B1C9814	Left Corner Lamp Circuit	<ul style="list-style-type: none"> Left front corner lamp control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check left front corner lamp control circuit for short to ground, open circuit
B1C9912	Right Corner Lamp Circuit	<ul style="list-style-type: none"> Right front corner lamp control circuit - short to power 	Refer to the electrical circuit diagrams and check right front corner lamp control circuit for short to power
B1C9914	Right Corner Lamp Circuit	<ul style="list-style-type: none"> Right front corner lamp control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check right front corner lamp control circuit for short to ground, open circuit
B1D0011	Left Low Beam	<ul style="list-style-type: none"> Left dip beam control circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left dip beam control circuit for short to ground
B1D0012	Left Low Beam	<ul style="list-style-type: none"> Left dip beam control circuit - short to power 	Refer to the electrical circuit diagrams and check left dip beam control circuit for short to power
B1D0013	Left Low Beam	<ul style="list-style-type: none"> Left dip beam control circuit - open circuit 	Refer to the electrical circuit diagrams and check left dip beam control circuit for open circuit
B1D0111	Right Low Beam	<ul style="list-style-type: none"> Right dip beam control circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right dip beam control circuit for short to ground
B1D0112	Right Low Beam	<ul style="list-style-type: none"> Right dip beam control circuit - short to power 	Refer to the electrical circuit diagrams and check right dip beam control circuit for short to power
B1D0113	Right Low Beam	<ul style="list-style-type: none"> Right dip beam control circuit - open circuit 	Refer to the electrical circuit diagrams and check right dip beam control circuit for open circuit
B1D0211	Left High Beam Circuit	<ul style="list-style-type: none"> Left high beam control circuit - short to ground 	Refer to the electrical circuit diagrams and check left high beam control circuit for short to ground
B1D0212	Left High Beam Circuit	<ul style="list-style-type: none"> Left high beam control circuit - short to power 	Refer to the electrical circuit diagrams and check left high beam control circuit for short to power
B1D0213	Left High Beam Circuit	<ul style="list-style-type: none"> Left high beam control circuit - open circuit 	Refer to the electrical circuit diagrams and check left high beam control circuit for open circuit
B1D0311	Right High Beam Circuit	<ul style="list-style-type: none"> Right high beam control circuit - short to ground 	Refer to the electrical circuit diagrams and check right high beam control circuit for short to ground
B1D0312	Right High Beam Circuit	<ul style="list-style-type: none"> Right high beam control circuit - short to power 	Refer to the electrical circuit diagrams and check right high beam control circuit for short to power
B1D0313	Right High Beam Circuit	<ul style="list-style-type: none"> Right high beam control circuit - open circuit 	Refer to the electrical circuit diagrams and check right high beam control circuit for open circuit
B1D1711	Battery Backed Sounder	<ul style="list-style-type: none"> Battery backed sounder inclination sensor control circuit - short to ground 	Refer to the electrical circuit diagrams and check battery backed sounder inclination sensor control circuit for short to ground
B1D1811	Volumetric Sensor	<ul style="list-style-type: none"> Intrusion sensor module supply circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check intrusion sensor module supply circuit for short to ground

DTC	Description	Possible Cause	Action
B1D2711	Heater Coolant Pump	<ul style="list-style-type: none"> Heater coolant pump control circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check heater coolant pump control circuit for short to ground
B1D2713	Heater Coolant Pump	<ul style="list-style-type: none"> Heater coolant pump control circuit - open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check heater coolant pump control circuit for open circuit
B1D9796	Tilt Sensor	<ul style="list-style-type: none"> Component internal failure 	Suspect the battery backed sounder, check and install a new battery backed sounder as required
P057112	Brake Switch A Circuit	<ul style="list-style-type: none"> Footbrake switch circuit - short to power 	Refer to the electrical circuit diagrams and check footbrake switch circuit for short to power
P080111	Reverse Inhibit Control Circuit	<ul style="list-style-type: none"> Electrochromic rear view mirror, reverse inhibit circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check electrochromic rear view mirror, reverse inhibit circuit for short to ground
P080112	Reverse Inhibit Control Circuit	<ul style="list-style-type: none"> Electrochromic rear view mirror, reverse inhibit circuit - short to power 	Refer to the electrical circuit diagrams and check electrochromic rear view mirror, reverse inhibit circuit for short to power
P080113	Reverse Inhibit Control Circuit	<ul style="list-style-type: none"> Electrochromic rear view mirror, reverse inhibit circuit - open circuit 	Refer to the electrical circuit diagrams and check electrochromic rear view mirror, reverse inhibit circuit for open circuit
P085013	Park/Neutral Switch Input Circuit	<ul style="list-style-type: none"> Park/Neutral signal circuit - open circuit 	Refer to the electrical circuit diagrams and check Park/Neutral signal circuit for open circuit
P162413	Anti-theft System	<ul style="list-style-type: none"> RJB anti-theft signal circuit - open circuit 	Refer to the electrical circuit diagrams and check RJB anti-theft signal circuit for open circuit
P254F13	Engine Hood Switch Circuit/Open	<ul style="list-style-type: none"> Hood ajar switch signal circuit - open circuit 	Refer to the electrical circuit diagrams and check hood ajar switch signal circuit for open circuit
U001988	Low Speed CAN Communication Bus	<ul style="list-style-type: none"> Bus OFF 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
U014200	Lost Communication With Body Control Module "B"	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
U015500	Lost Communication With Instrument Panel Cluster (IPC) Control Module	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
U015600	Lost Communication With Information Center "A"	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
U016400	Lost Communication With HVAC Control Module	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
U016800	Lost Communication With Vehicle Security Control Module	<ul style="list-style-type: none"> No sub type information 	Check power and ground supplies to vehicle security module
U019900	Lost Communication With "Door Control Module A"	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
U020000	Lost Communication With "Door Control Module B"	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.

DTC	Description	Possible Cause	Action
U021400	Lost Communication With Remote Function Actuation	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.
U023100	Lost Communication With Rain Sensing Module	<ul style="list-style-type: none"> No sub type information 	Check power and ground supplies to rain sensing module. LIN circuit fault
U030000	Internal Control Module Software Incompatibility	<ul style="list-style-type: none"> No sub type information 	Suspect the CJB. Check and install a new CJB as required, refer to the new module/component installation note at the top of the DTC Index
U1000-00	Solid State Driver Protection Active - Driver Disabled - No sub type information	<ul style="list-style-type: none"> Central junction box output circuit - Short circuit to ground, short circuit to power 	 <p>NOTE: The relevant output is disabled while this DTC is set. Do not clear the DTC until the fault has been rectified</p> <ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, check for other central junction box short circuit to ground and/or short circuit to power DTCs and refer to the relevant DTC index for corrective actions Once circuit faults have been rectified, clear DTC and retest
U1A1449	CAN Initialisation Failure	<ul style="list-style-type: none"> Internal electronic failure 	Suspect the CJB. Check and install a new CJB as required, refer to the new module/component installation note at the top of the DTC Index
U200813	Sensor Cluster	<ul style="list-style-type: none"> Instrument cluster security signal circuit - open circuit 	Refer to the electrical circuit diagrams and check instrument cluster security signal circuit for open circuit
U201012	Switch Illumination	<ul style="list-style-type: none"> Switch/interior illumination PWM supply circuit - short to power 	Refer to the electrical circuit diagrams and check switch/interior illumination PWM supply circuit for short to power
U201014	Switch Illumination	<ul style="list-style-type: none"> Switch/interior illumination PWM supply circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check switch/interior illumination PWM supply circuit for short to ground, open circuit
U210000	Initial Configuration Not Complete	<ul style="list-style-type: none"> RJB configuration (parameters) failure 	Re-configure the RJB using the manufacturer approved diagnostic system
U3000-49	Control Module - Internal electronic failure	<ul style="list-style-type: none"> Central junction box - Internal failure 	 <p>NOTE: The relevant output is disabled while this DTC is set</p> <ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, check for other central junction box short circuit to ground and/or short circuit to power DTCs and refer to the relevant DTC index for corrective actions Install a new central junction box as required. Clear DTCs and retest
U300055	Control Module	<ul style="list-style-type: none"> Not configured 	Re-configure the RJB using the manufacturer approved diagnostic system. Check the correct CJB is installed to vehicle market/specification. Install a new/correct CJB as required, refer to the new module/component installation note at the top of the DTC Index
U300087	Control Module	<ul style="list-style-type: none"> Missing message 	Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CAN network between RJB and CJB for short, open circuit. Check RJB and then CJB for related DTCs and refer to the relevant DTC Index
U300281	Vehicle Identification Number	<ul style="list-style-type: none"> Invalid serial data received 	Suspect the CJB has previously been installed to another vehicle. Check and install the original or a new CJB
U300317	Battery Voltage	<ul style="list-style-type: none"> Circuit voltage above threshold 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.

DTC	Description	Possible Cause	Action
U300362	Battery Voltage	<ul style="list-style-type: none"> Mis-match in battery voltage, of 2 volts or more, between CJB and RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system.

Rear Junction Box (RJB)

CAUTIONS:



Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle



When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system)



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the digital multimeter leads into account



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion



If diagnostic trouble codes are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



Where an 'on demand self-test' is referred to, this can be accessed via the 'diagnostic trouble code monitor' tab on the manufacturers approved diagnostic system



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

DTC	Description	Possible Causes	Action
P046011	Fuel Level Sensor A Circuit	<ul style="list-style-type: none"> Fuel level sensor A analogue input circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check fuel level sensor A analogue input circuit for short to ground
P046015	Fuel Level Sensor A Circuit	<ul style="list-style-type: none"> Fuel level sensor A analogue input circuit - short to power, open circuit 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check fuel level sensor A analogue input circuit for short to power, open circuit
P057112	Brake Switch A Circuit	<ul style="list-style-type: none"> Footbrake switch digital input signal circuits - short to power 	Refer to the electrical circuit diagrams and check footbrake switch digital input signal circuits for short to power
P123012	Fuel Pump Low Speed Malfunction (VLCM)	<ul style="list-style-type: none"> High Side output not driven - Diagnosis feedback indicates output is short to power 	Refer to the electrical circuit diagrams and check fuel pump delivery module for short to power

DTC	Description	Possible Causes	Action
P123014	Fuel Pump Low Speed Malfunction (VLCM)	<ul style="list-style-type: none"> High Side output not driven - Diagnosis feedback indicates output is short to ground, open circuit 	Refer to the electrical circuit diagrams and check fuel pump delivery module for short to ground, open circuit
P123093	Fuel Pump Low Speed Malfunction (VLCM)	<ul style="list-style-type: none"> High Side output not driven - Diagnosis feedback indicates output is at open load or short to power 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check fuel pump delivery module for short to power, open circuit
P134611	Fuel Level Sensor B Circuit	<ul style="list-style-type: none"> Fuel level sensor B analogue input circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check fuel level sensor B analogue input circuit for short to ground
P134615	Fuel Level Sensor B Circuit	<ul style="list-style-type: none"> Fuel level sensor B analogue input circuit - short to power, open circuit 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check fuel level sensor B analogue input circuit for short to power, open circuit
P162413	Anti-theft System	<ul style="list-style-type: none"> Anti-theft signal circuit from CJB - open circuit 	Refer to the electrical circuit diagrams and check anti-theft signal circuit from CJB for open circuit
C111A11	Right Stop Lamp	<ul style="list-style-type: none"> Right stop lamp control circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right stop lamp control circuit for short to ground
C111A12	Right Stop Lamp	<ul style="list-style-type: none"> Right stop lamp control circuit - short to power 	Refer to the electrical circuit diagrams and check right stop lamp control circuit for short to power
C111A13	Right Stop Lamp	<ul style="list-style-type: none"> Right stop lamp control circuit - open circuit 	Refer to the electrical circuit diagrams and check right stop lamp control circuit for open circuit
C111B11	Left Stop Lamp	<ul style="list-style-type: none"> Left stop lamp control circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left stop lamp control circuit for short to ground
C111B13	Left Stop Lamp	<ul style="list-style-type: none"> Left stop lamp control circuit - open circuit 	Refer to the electrical circuit diagrams and check left stop lamp control circuit for open circuit
C112011	Reversing lamp	<ul style="list-style-type: none"> Reverse lamp control circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check reverse lamp control circuit for short to ground
C112012	Reversing lamp	<ul style="list-style-type: none"> Reverse lamp control circuit - short to power 	Refer to the electrical circuit diagrams and check reverse lamp control circuit for short to power
C112013	Reversing lamp	<ul style="list-style-type: none"> Reverse lamp control circuit - open circuit 	Refer to the electrical circuit diagrams and check reverse lamp control circuit for open circuit
C1120-15	Reversing lamp - circuit short to battery or open	<ul style="list-style-type: none"> Reverse lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check reverse lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B100A51	Fuel Pump Authorisation	<ul style="list-style-type: none"> RJB fault Low speed CAN fault Instrument cluster fault 	Check power and ground supplies to RJB. Check CAN communications between RJB and instrument cluster. Check power and ground supplies to instrument cluster
B100A62	Fuel Pump Authorisation	<ul style="list-style-type: none"> Low speed CAN fault RJB fault Instrument cluster fault Incorrect module installed (RJB/Instrument cluster) 	Check CAN communications between RJB and instrument cluster. Check power and ground supplies to RJB and instrument cluster. Confirm correct module installed. Re-synchronise ID by re-configuring the RJB as a new module. Check CAN network for interference/EMC related issues

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> • Write target SID synchronisation error following re-programming • Noise/EMC related error 	
B100A63	Fuel Pump Authorisation	<ul style="list-style-type: none"> • RJB fault • Low speed CAN fault • Instrument cluster fault • Low battery voltage <9V 	Check power and ground supplies to RJB and instrument cluster. Check CAN communications between RJB and instrument cluster. Check battery is in fully charged and serviceable condition, refer to the battery care manual
B102612	Steering Column Lock	<ul style="list-style-type: none"> • Steering column lock ground circuit - short to power 	Refer to the electrical circuit diagrams and check steering column lock ground circuit for short to power
B108783	LIN Bus "A"	<ul style="list-style-type: none"> • The checksum of the received LIN frame is incorrect 	Check the battery monitoring system and rear parking aid system for DTCs and refer to relevant DTC Index
B108786	LIN Bus "A"	<ul style="list-style-type: none"> • The header of the LIN message received is incorrect 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Check the battery monitoring system and rear parking aid system for DTCs and refer to relevant DTC Index
B108788	LIN Bus "A"	<ul style="list-style-type: none"> • Battery monitoring system LIN circuit - short to ground, power 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check battery monitoring system LIN circuit for short to ground, power
B108A23	Start Button	<ul style="list-style-type: none"> • Start/Stop switch digital input signal circuit - stuck low 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check Start/Stop switch digital input signal circuit for short to ground
B10A111	Trailer Tow Detection	<ul style="list-style-type: none"> • Trailer tow detection digital input circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check trailer tow detection digital input circuit for short to ground
B10AF12	Blower Fan Relay	<ul style="list-style-type: none"> • High Side output not driven - Diagnosis feedback indicates output is short to power 	Refer to the electrical circuit diagrams and check blower motor supply circuit for short to power
B10AF14	Blower Fan Relay	<ul style="list-style-type: none"> • High Side output not driven - Diagnosis feedback indicates output is short to ground, open circuit 	Refer to the electrical circuit diagrams and check blower motor supply circuit for short to ground, open circuit
B10AF93	Blower Fan Relay	<ul style="list-style-type: none"> • High Side output not driven - Diagnosis feedback indicates output is at open load or short to power 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check blower motor supply circuit for short to power, open circuit
B10DD11	Airbag Deployed	<ul style="list-style-type: none"> • Airbag deployed digital input signal circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check airbag deployed digital input signal circuit for short to ground
B10DD15	Airbag Deployed	<ul style="list-style-type: none"> • Airbag deployed digital input signal circuit - short to power, open circuit 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check airbag deployed digital input signal circuit for short to power, open circuit
B10DD38	Airbag Deployed	<ul style="list-style-type: none"> • Signal frequency incorrect 	Check the RCM for related DTCs and refer to the relevant DTC Index
B10DE11	Low Fuel Warning Switch	<ul style="list-style-type: none"> • Diesel run-dry switch analogue input circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check diesel run-dry switch analogue input circuit for short to ground

DTC	Description	Possible Causes	Action
B10DE15	Low Fuel Warning Switch	<ul style="list-style-type: none"> • Diesel run-dry switch analogue input circuit - short to power, open circuit 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check diesel run-dry switch analogue input circuit for short to power, open circuit
B111211	Park Aid Ignition	<ul style="list-style-type: none"> • Parking aid ignition supply circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check parking aid ignition supply circuit for short to ground
B111212	Park Aid Ignition	<ul style="list-style-type: none"> • Parking aid ignition supply circuit - short to power 	Refer to the electrical circuit diagrams and check parking aid ignition supply circuit for short to power
B111511	High Mounted Stop Lamp Control	<ul style="list-style-type: none"> • High mounted stop lamp control circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check high mounted stop lamp control circuit for short to ground
B111611	Left Tail Lamp	<ul style="list-style-type: none"> • Left hand tail lamp control circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left hand tail lamp control circuit for short to ground
B111711	Right Tail Lamp	<ul style="list-style-type: none"> • Right hand tail lamp control circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right hand tail lamp control circuit for short to ground
B111A11	Number Plate Lamps	<ul style="list-style-type: none"> • Right hand or left hand number plate lamp control circuits - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right hand and left hand number plate lamp control circuits for short to ground
B111A12	Number Plate Lamps	<ul style="list-style-type: none"> • Right hand or left hand number plate lamp control circuits - short to power 	Refer to the electrical circuit diagrams and check right hand and left hand number plate lamp control circuits for short to power
B111A13	Number Plate Lamps	<ul style="list-style-type: none"> • Right hand or left hand number plate lamp control circuits - open circuit 	Refer to the electrical circuit diagrams and check right hand and left hand number plate lamp control circuits for open circuit
B111A-15	Number Plate Lamps - circuit short to battery or open	<ul style="list-style-type: none"> • Right or left side licence plate lamp(s) inoperative • Right or left side licence plate lamp control circuits - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check right side and left side licence plate lamp control circuits for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B111D12	Boot/Trunk Motor Open	<ul style="list-style-type: none"> • Luggage compartment lid latch actuator control circuit - short to power 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check luggage compartment lid latch actuator control circuit for short to power
B111D14	Boot/Trunk Motor Open	<ul style="list-style-type: none"> • Luggage compartment lid latch actuator control circuit - short to ground, open circuit 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check luggage compartment lid latch actuator control circuit for short to ground, open circuit
B111E11	Boot/Trunk Lamps	<ul style="list-style-type: none"> • Luggage compartment lamp control circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check luggage compartment lamp control circuit for short to ground
B111E12	Boot/Trunk Lamps	<ul style="list-style-type: none"> • Luggage compartment lamp control circuit - short to power 	Refer to the electrical circuit diagrams and check luggage compartment lamp control circuit for short to power

DTC	Description	Possible Causes	Action
B111E13	Boot/Trunk Lamps	<ul style="list-style-type: none"> Luggage compartment lamp control circuit - open circuit 	Refer to the electrical circuit diagrams and check luggage compartment lamp control circuit for open circuit
B111E-15	Boot/Trunk Lamps - circuit short to battery or open	<ul style="list-style-type: none"> Luggage compartment lamp inoperative Luggage compartment lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check luggage compartment lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B112312	Restraints Ignition Relay	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is short to power 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check restraints ignition relay output for short to power
B112314	Restraints Ignition Relay	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is short to ground, open circuit 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check restraints ignition relay output for short to ground, open circuit
B112393	Restraints Ignition Relay	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is at open load or short to power 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check restraints ignition relay output for open load or short to power
B112411	Lamp Fade Control	<ul style="list-style-type: none"> Interior lamp fade control circuit - short to ground 	Refer to the electrical circuit diagrams and check interior lamp fade control circuit for short to ground
B112412	Lamp Fade Control	<ul style="list-style-type: none"> Interior lamp fade control circuit - short to power 	Refer to the electrical circuit diagrams and check interior lamp fade control circuit for short to power
B113C12	Hazard Switch Illumination	<ul style="list-style-type: none"> Hazard switch illumination control circuit - short to power 	Refer to the electrical circuit diagrams and check hazard switch illumination control circuit for short to power
B113C14	Hazard Switch Illumination	<ul style="list-style-type: none"> Hazard switch illumination control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check hazard switch illumination control circuit for short to ground, open circuit
B113E12	External Boot/Trunk Release Switch	<ul style="list-style-type: none"> External luggage compartment lid release switch digital input circuit - short to power 	Refer to the electrical circuit diagrams and check external luggage compartment lid release switch digital input circuit for short to power
B113E23	External Boot/Trunk Release Switch	<ul style="list-style-type: none"> External luggage compartment lid release switch digital input circuit - signal stuck low 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check external luggage compartment lid release switch digital input circuit for short to ground
B11D949	Vehicle Battery	<ul style="list-style-type: none"> Vehicle battery damaged/worn out 	Check battery is in fully charged and serviceable condition using the Midtronics battery tester and the battery care manual
B11DB49	Battery Monitoring Module	<ul style="list-style-type: none"> Internal electronic failure 	Suspect the battery monitoring module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B11DB87	Battery Monitoring Module	<ul style="list-style-type: none"> Battery monitoring module connector dis-connected/poor connection Battery monitoring module to RJB LIN circuit - open circuit 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. If additional DTCs B108783, B108786, B108787 are logged, suspect the RJB. Check and install a new RJB as required, refer to the new module/component installation note at the top of the DTC Index. If additional DTCs B108783, B108786, B108787 are NOT logged, check for good/clean contact at battery monitoring module

DTC	Description	Possible Causes	Action
		<ul style="list-style-type: none"> Battery monitoring module to battery positive monitor circuit - open circuit Battery monitoring module/RJB failure 	connector, refer to electrical circuit diagrams and check battery monitoring module to RJB LIN circuit and battery monitoring module to battery positive monitor circuit for open circuit. Clear DTC and repeat automated diagnostic procedure using manufacturer approved diagnostic system. If DTC remains suspect the battery monitoring module, check and install a new battery monitoring module as required, refer to the new module/component installation note at the top of the DTC Index
B123A11	Left Front Turn Indicator	<ul style="list-style-type: none"> Left front turn signal lamp control circuit - short to ground 	Refer to the electrical circuit diagrams and check left front turn signal lamp control circuit for short to ground
B123A12	Left Front Turn Indicator	<ul style="list-style-type: none"> Left front turn signal lamp control circuit - short to power 	Refer to the electrical circuit diagrams and check left front turn signal lamp control circuit for short to power
B123A13	Left Front Turn Indicator	<ul style="list-style-type: none"> Left front turn signal lamp control circuit - open circuit 	Refer to the electrical circuit diagrams and check left front turn signal lamp control circuit for open circuit
B123A-15	Left Front Turn Indicator - circuit short to battery or open	<ul style="list-style-type: none"> Left front turn signal lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check left front turn signal lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B123B11	Right Front Turn Indicator	<ul style="list-style-type: none"> Right front turn signal lamp control circuit - short to ground 	Refer to the electrical circuit diagrams and check right front turn signal lamp control circuit for short to ground
B123B12	Right Front Turn Indicator	<ul style="list-style-type: none"> Right front turn signal lamp control circuit - short to power 	Refer to the electrical circuit diagrams and check right front turn signal lamp control circuit for short to power
B123B13	Right Front Turn Indicator	<ul style="list-style-type: none"> Right front turn signal lamp control circuit - open circuit 	Refer to the electrical circuit diagrams and check right front turn signal lamp control circuit for open circuit
B123B-15	Right Front Turn Indicator - circuit short to battery or open	<ul style="list-style-type: none"> Right front turn signal lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check right front turn signal lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B124711	Left Rear Turn Indicator	<ul style="list-style-type: none"> Left rear turn signal lamp control circuit - short to ground 	Refer to the electrical circuit diagrams and check left rear turn signal lamp control circuit for short to ground
B124712	Left Rear Turn Indicator	<ul style="list-style-type: none"> Left rear turn signal lamp control circuit - short to power 	Refer to the electrical circuit diagrams and check left rear turn signal lamp control circuit for short to power
B124713	Left Rear Turn Indicator	<ul style="list-style-type: none"> Left rear turn signal lamp control circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and check left rear turn signal lamp control circuit for open circuit
B1247-15	Left Rear Turn Indicator - circuit short to battery or open	<ul style="list-style-type: none"> Left rear turn signal lamp control circuit - short circuit to power, open circuit, high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check left rear turn signal lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B124811	Right Rear Turn Indicator	<ul style="list-style-type: none"> Right rear turn signal lamp control circuit - short to ground 	Refer to the electrical circuit diagrams and check right rear turn signal lamp control circuit for short to ground

DTC	Description	Possible Causes	Action
B124812	Right Rear Turn Indicator	<ul style="list-style-type: none"> Right rear turn signal lamp control circuit - short to power 	Refer to the electrical circuit diagrams and check right rear turn signal lamp control circuit for short to power
B124813	Right Rear Turn Indicator	<ul style="list-style-type: none"> Right rear turn signal lamp control circuit - open circuit 	Refer to the electrical circuit diagrams and check right rear turn signal lamp control circuit for open circuit
B1248-15	Right Rear Turn Indicator - circuit short to battery or open	<ul style="list-style-type: none"> Right rear turn signal lamp control circuit - short circuit to power; open circuit, high resistance 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check right rear turn signal lamp control circuit for short circuit to power, open circuit, high resistance. Repair wiring harness as required. Clear DTC and retest
B126113	Fuel Flap/Door Release Switch	<ul style="list-style-type: none"> Fuel filler flap digital input signal circuit - open circuit 	Refer to the electrical circuit diagrams and check fuel filler flap digital input signal circuit for open circuit
B1A7911	Rear Fog Lamp	<ul style="list-style-type: none"> Rear fog lamp control circuit - short to ground 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check rear fog lamp control circuit for short to ground
B1A7912	Rear Fog Lamp	<ul style="list-style-type: none"> Rear fog lamp control circuit - short to power 	Refer to the electrical circuit diagrams and check rear fog lamp control circuit for short to power
B1A7913	Rear Fog Lamp	<ul style="list-style-type: none"> Rear fog lamp control circuit - open circuit 	Refer to the electrical circuit diagrams and check rear fog lamp control circuit for open circuit
B1C5512	Horn Relay	<ul style="list-style-type: none"> Horn control circuit - short to power 	Refer to the electrical circuit diagrams and check horn control circuit for short to power
B1C5514	Horn Relay	<ul style="list-style-type: none"> Horn control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check horn control circuit for short to ground, open circuit
B1C8312	Rear Defog Relay	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is short to power 	Refer to the electrical circuit diagrams and check heated rear window power supply circuit for short to power
B1C8314	Rear Defog Relay	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is short to ground, open circuit 	Refer to the electrical circuit diagrams and check heated rear window power supply circuit for short to ground, open circuit
B1C8393	Rear Defog Relay	<ul style="list-style-type: none"> High Side output not driven - diagnosis feedback indicates output is at open load or short to power 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check heated rear window power supply circuit for open load and short to power
B1C9112	Fuel Flap/Door Lock Relay Coil Circuit	<ul style="list-style-type: none"> Fuel filler flap locking motor control circuit - short to power 	Refer to the electrical circuit diagrams and check fuel filler flap locking motor control circuit for short to power
B1C9114	Fuel Flap/Door Lock Relay Coil Circuit	<ul style="list-style-type: none"> Fuel filler flap locking motor control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check fuel filler flap locking motor control circuit for short to ground, open circuit
B1D3512	Hazard Switch	<ul style="list-style-type: none"> Hazard warning lamp switch digital input circuit - short to power 	Refer to the electrical circuit diagrams and check hazard warning lamp switch digital input circuit for short to power

DTC	Description	Possible Causes	Action
B1D3523	Hazard Switch	<ul style="list-style-type: none"> Hazard warning lamp switch digital input circuit - signal stuck low 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check hazard warning lamp switch digital input circuit for short to ground
U001988	Low Speed CAN Communication Bus	<ul style="list-style-type: none"> Bus off 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U014000	Lost Communication With Body Control Module	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U015500	Lost Communication With Instrument Panel Cluster (IPC) Control Module	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U015900	Lost Communication With Parking Assist Control Module "A"	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U016400	Lost Communication With HVAC Control Module	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U021400	Lost Communication With Remote Function Actuation	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U030046	Internal Control Module Software Incompatibility	<ul style="list-style-type: none"> Calibration/parameter memory failure 	Suspect the RJB. Check and install a new RJB as required, refer to the new module/component installation note at the top of the DTC Index
U100000	Solid State Driver Protection Active -Driver Disabled	<ul style="list-style-type: none"> No sub type information 	Carry out any pinpoint test associated with this DTC using the manufacturer approved diagnostic system
U1A1449	CAN Initialisation Failure	<ul style="list-style-type: none"> Internal electronic failure 	Suspect the RJB. Check and install a new RJB as required, refer to the new module/component installation note at the top of the DTC Index
U300049	Control Module	<ul style="list-style-type: none"> Internal electronic failure 	Suspect the RJB. Check and install a new RJB as required, refer to the new module/component installation note at the top of the DTC Index
U300055	Control Module	<ul style="list-style-type: none"> Not configured 	Re-configure the RJB using the manufacturer approved diagnostic system

Module Communications Network - Auxiliary Junction Box (AJB)

Removal and Installation

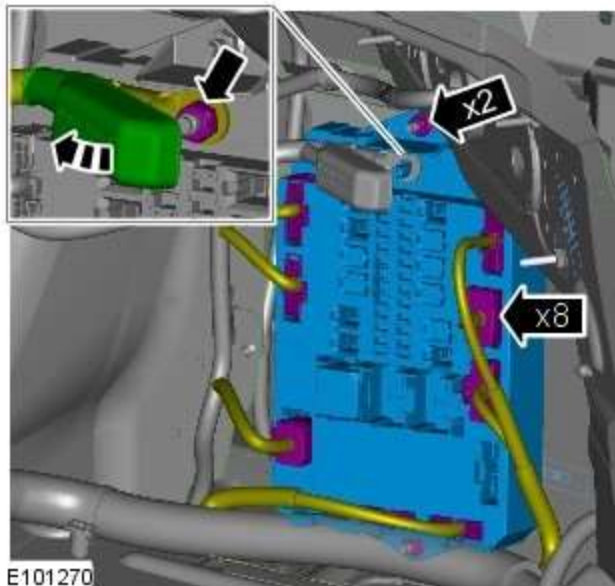
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Loadspace Trim Panel RH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3.



Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Module Communications Network - Central Junction Box (CJB)

Removal and Installation

Removal



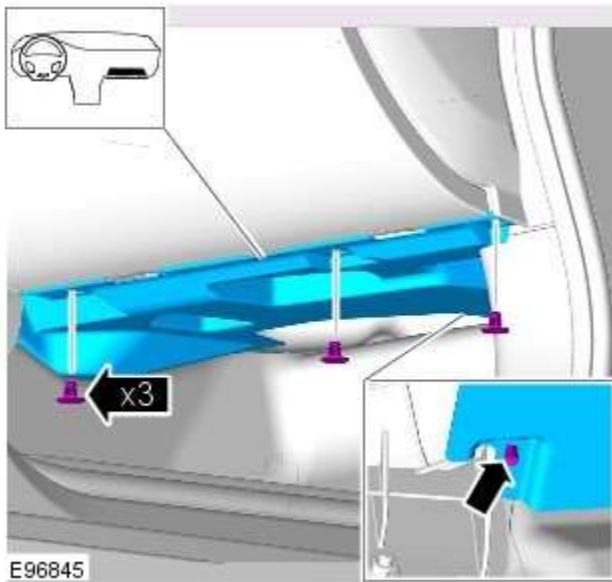
NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Cowl Side Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

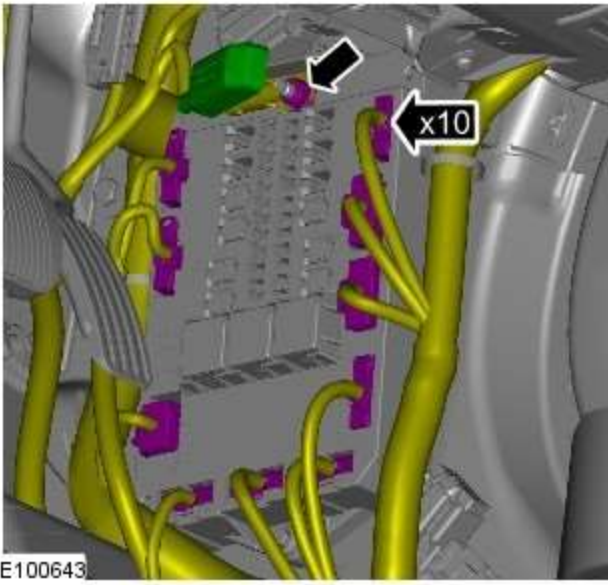
Left-hand drive vehicles

3.

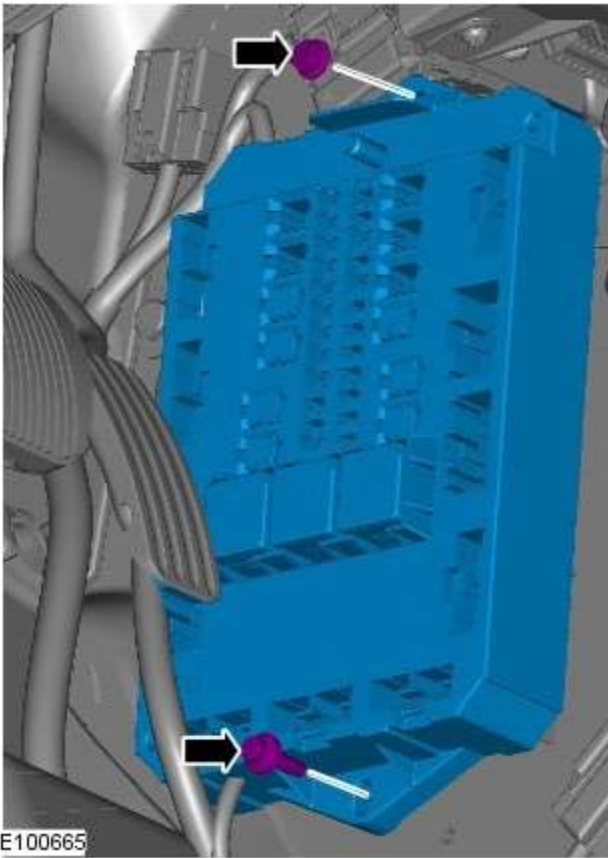


All vehicles

4.



5.



Installation

1. To install, reverse the removal procedure.
2. Configure the CJB using the diagnostic tool.

Wiring Harnesses - Wiring Harness

Description and Operation

Introduction



CAUTION: Do **not** use any other heat shrink sleeve other than the approved glue lined heat shrink sleeve mentioned in the repair procedure.

The purpose of this document is to promote quick and efficient minor repair to harness connectors or cables using approved methods. Repairs may only be made to cables and connectors which have been mechanically, **not electrically** damaged. It also applies where the whole extent of the damage can be clearly identified and rectified.

Care and neatness are essential requirements in making a perfect repair.

Caution:

This harness repair guide, does not approve repairs to any of the following circuits:

1. Any media orientated system transport network harnesses.
2. Supplement restraint system (SRS) firing circuits (Air bags).
3. Link lead assemblies, which are unique to safety critical circuits such as anti-lock brake system (ABS) and thermocouple circuits. An example of this is the ABS wheel speed sensors with moulded connectors.
4. 4. Screened cables, leads and wiring harness(s).

If any harness(s) with defective electrical connector terminals or wires from the above circuits are a concern, new components must be installed.

Repair Components



CAUTION: Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

The wiring harness repair components comprises:

- Pre-terminated wiring harness(s) of different sizes and types
- Three sizes of butt splice connectors
- A selection of colored cable identification sleeves
- Two sizes of glue lined heat shrink sleeves

A suitable heat source, for shrinking heat shrink sleeves will be required.

The pre-insulated diamond grip range of electrical connector terminals and in-line, butt splice connectors are the **only** acceptable product for the repairs of wiring harnesses. The butt connectors not only grip the wire but also the insulation, making a very secure joint.

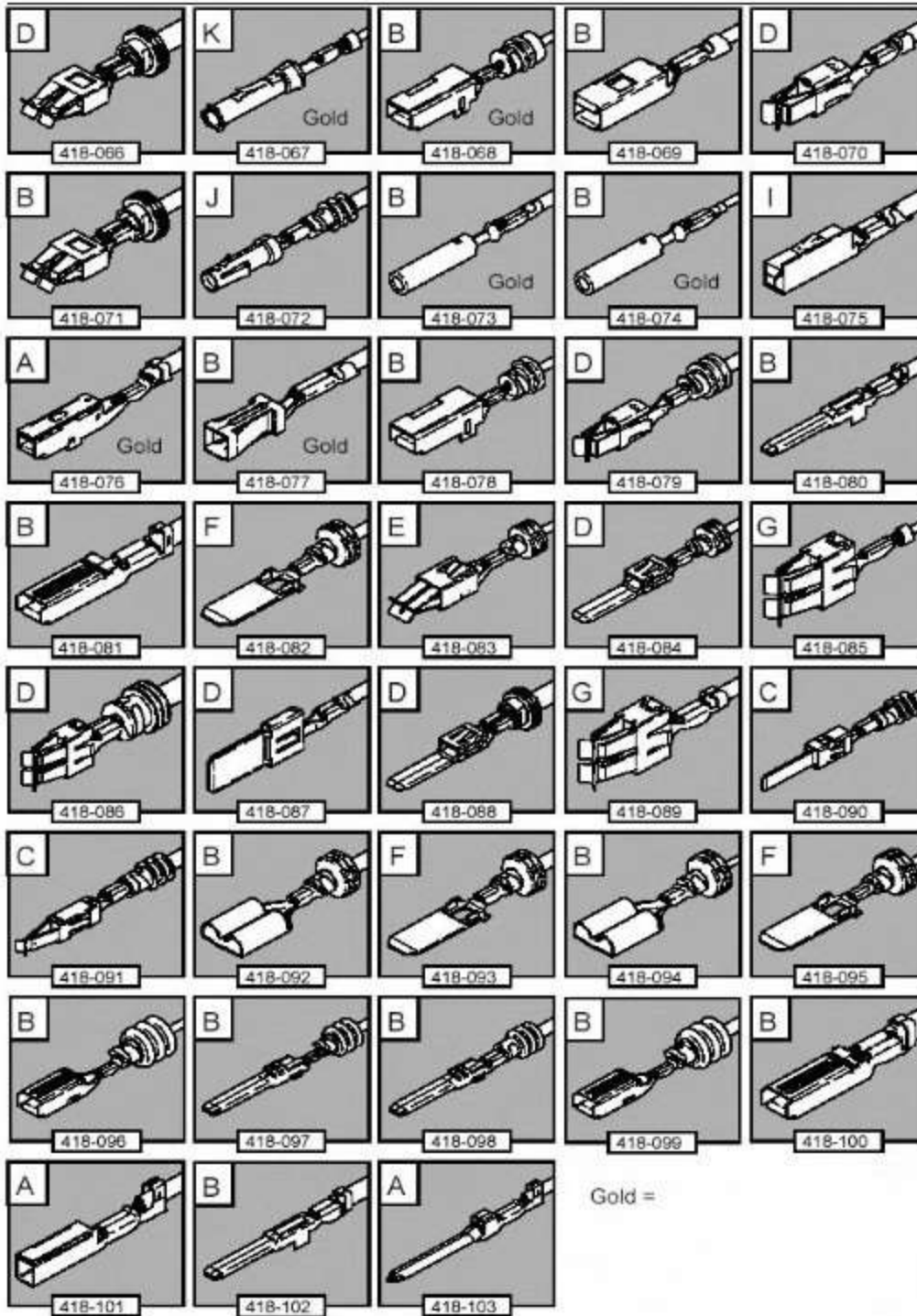
If an electrical connector terminal is not available approval for the repair is **NOT** given and in these circumstances a new wiring harness must be installed.

Pre-Terminated Wiring Harness(s) and Butt Splice Connectors

The pre-terminated wiring harness(s) are supplied with the insulation in one of three colors, red, blue or yellow. The colors do not apply to any particular circuit but to the harness wire size. See the Relationship Table in the Repair Method section.

Butt splice connectors are also supplied with red, blue or yellow coverings, which must be matched to the pre-terminated wiring harness insulation color.

Pre-Terminated Wiring Harness(s)



E130741

The illustration shows:

- The pre-terminated wiring harness(s) which are available via Jaguar/Land Rover authorised parts.
- The part number of the pre-terminated wiring harness
- The letter showing the extractor tip which must be used to remove this type of electrical connector terminal
- Those electrical connector terminals which are gold

Some of the pre-terminated wiring harness(s) have seals installed to the insulation for sealed connector applications. It is

essential for prevention of moisture ingress that a sealed pre-terminated wiring harness must be used where a sealed terminal was removed.



CAUTION: Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

Two sizes of heat shrink sleeving are available. Each heat shrink sleeve contains a sealant glue. These must be used when connecting wiring harness(s) or electrical connector terminal(s) at all times. The smaller diameter heat shrink sleeve is to be used with the red and blue butt splice connectors and the larger diameter sleeve with the yellow butt splice connectors.

For ease and speed, some of the pre-terminated wiring harness(s) may already have the insulation partly stripped at the splice end. If the repair requires insulation to be stripped from the cable, refer to the Relationship Table for the correct length of insulation to be stripped.

The Pre-Terminated Wiring Harness(s) illustration shows the electrical connector terminal type, the part number of the pre-terminated wiring harness and the letter of the extractor tip which must be used to extract the electrical connector terminal from the connector housing. Additionally, those electrical connector terminal(s) which are gold are identified, all others are therefore, tinned and not gold.

Wiring Harness Cable Identification Sleeves

A selection of colored sleeves are available for maintaining the wiring harness cable identification on the pre-terminated wiring harness. Place the correct colored sleeve(s) over the pre-terminated wiring harness insulation as near to the electrical connector as possible with the main wiring harness cable color nearest to the electrical connector.

For example, if the original wiring harness cable color is pink with a black trace put the pink wiring harness cable identification sleeve on the pre-terminated wiring harness first followed by a black sleeve, and slide both along the wiring harness cable to the electrical connector terminal.

List of Parts

Description	Part Number	Quantity
Pre-Terminated Wiring Harness(s)	418-066 to 418-103 inclusive	10 each
Glue Lined Heat Shrink Pack – small diameter	418-104	25 per pack
Glue Lined Heat Shrink Pack – larger diameter	418-105	10 per pack
Case Assembly Comprising – carry case, lid, inner lid, base, insert, trays foam spacers	418-106	1
Butt Splice Connector – Red	418-107	50 per pack
Butt Splice Connector – Blue	418-108	50 per pack
Butt Splice Connector – Yellow	418-109	20 per pack
Sleeve Identification Pack – for Red insulation	418-112	500
Sleeve Identification Pack – for Blue insulation	418-113	500
Sleeve Identification Pack – for Yellow insulation	418-114	500

Harness repair components can be ordered from Jaguar/Land Rover authorised parts.

Repair Tools

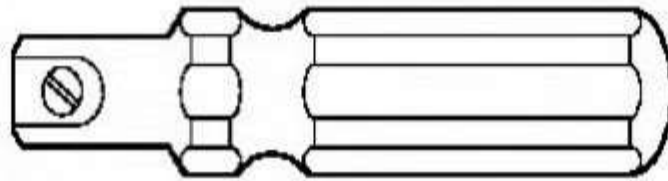
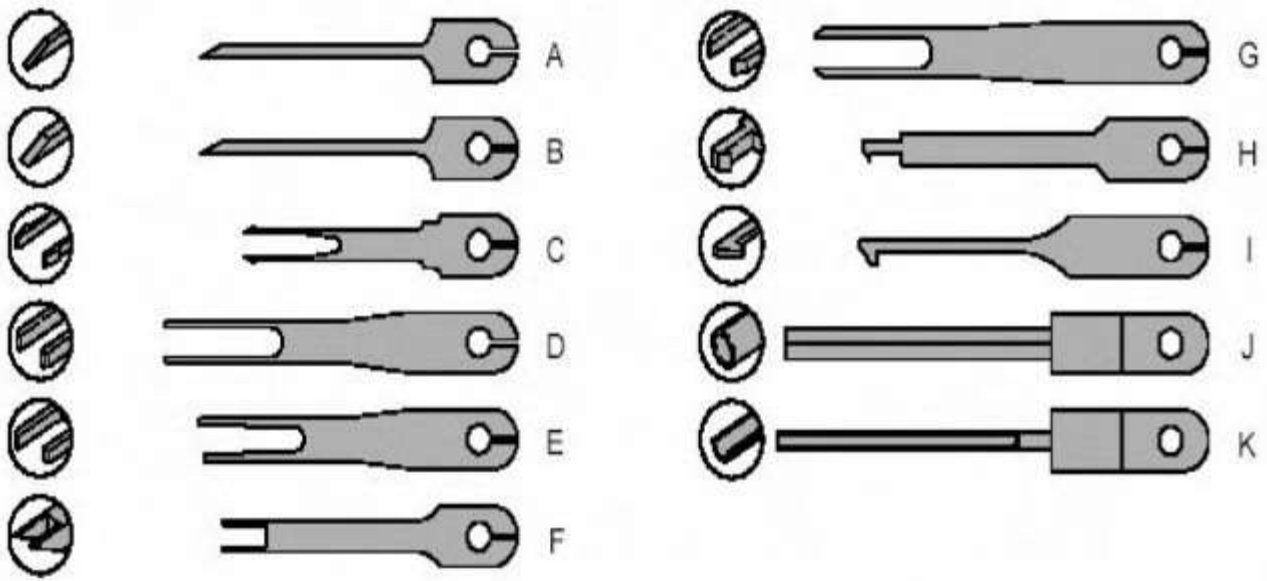
The wiring harness repair tools comprises:

- Crimping pliers
- A wire cutter and insulation stripper
- An electrical connector terminal extraction handle and tips

Extraction Handle and Tips

The extraction handle, in conjunction with the correct tip, is used to remove a terminal from an electrical connector. Each tip is marked with an identification letter, A to K inclusive. Each tip has been specially designed to extract a particular type of electrical connector terminal. The use of any other tool is **not** recommended and is liable to cause damage to the electrical connector. The tip is fastened to the handle by a screw which holds the tip firmly yet allows it to be easily replaced.

Extraction Handle and Tips

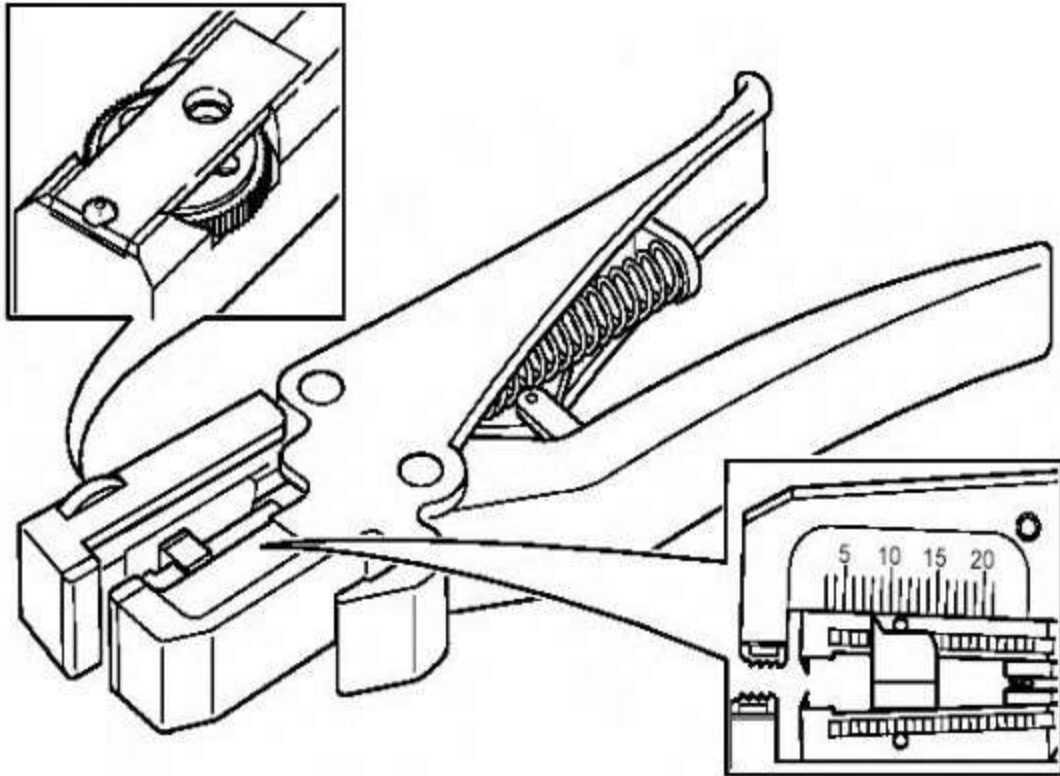


E130742

Insulation Stripper

The moving jaw has an adjuster wheel which has a series of holes in it. Turning the wheel and placing the cable in the matching size hole will automatically adjust the jaw to the correct pressure. Note that some wiring harness(s) may have a harder insulation and slight adjustment of the wheel may be needed to make a clean strip but exercise care not to damage the wire.

Insulation Stripper

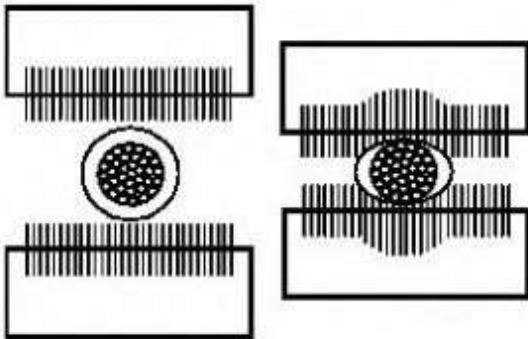


E130743

By pressing the outer edges of the wiring harness cable length stop together the adjuster can be slid up or down the jaw. This decreases or increases the length by which the wiring harness cable insulation will be stripped from the pre-terminated wiring harness or wiring harness wire. The adjuster has a position indicator to align with a graduated scale and this sets the correct length in millimetres, of insulation to be stripped. The amount of insulation to be stripped is shown in the Relationship Table.

The illustration shows the insulation stripper tool and a wiring harness correctly gripped in the jaws. A wire cutter is provided on the outer side of the fixed jaw.

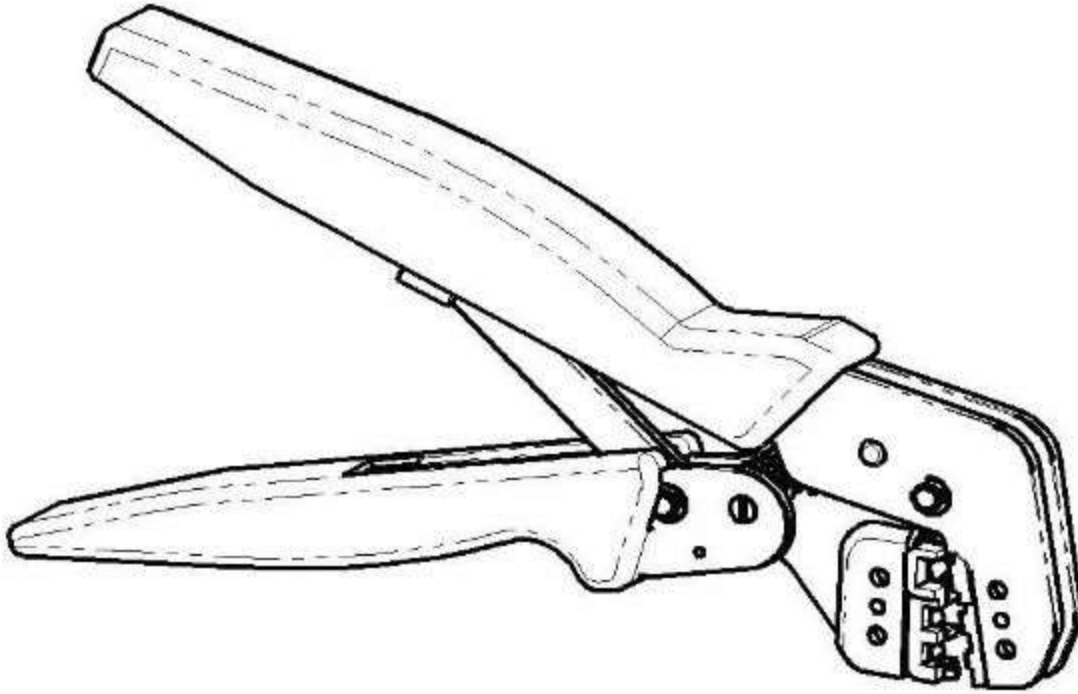
Cable Correctly Gripped in Stripper Blades



E130744

Crimping Pliers

Crimping Pliers



E130745

The crimping pliers have a moving jaw and a stationary jaw, with three different sized crimping enclosures. Each of the enclosures is identified by a red, blue or yellow coloured dot which corresponds to the three colours of the pre-terminated wiring harness(s) and butt splice connector colors.

Description	Part Number	Quantity
Extraction Tool Handle	418-110	1
Extraction Tip Pack consists of 2 spare screws plus	418-S111	1
Tip A	418-118	1
Tip B	418-119	1
Tip C	418-120	1
Tip D	418-121	1
Tip E	418-122	1
Tip F	418-123	1
Tip G	418-124	1
Tip H	418-125	1
Tip I	418-126	1
Tip J	418-127	1
Tip K	418-128	1
Crimping Pliers	YRW500010	1
Wire Stripping Tool	418-117	1

Harness repair tools can be ordered from:

Bosch Automotive Service Solutions

Ironstone Way

Brixworth Industrial Estate

Brixworth

Northants

NN6 9UD

United Kingdom

Telephone: +44 (0) 1327 303400

Fax: +44 (0) 1327 303499

Email: css.uk@bosch-automotive.com

Repair Methods



CAUTION: Several different types and sizes of terminal may be found in a single electrical connector housing.

It is necessary to identify:

- The conductor (wire) size of the affected wiring harness
- The electrical connector range from which the damaged wiring harness is to be removed
- The terminal type

Use of the approved diagnostic tool will greatly assist in the quick identification of electrical connectors and faulty pin terminal(s).

Reference can also be made to the vehicle Electrical Guides, held by Dealers, to identify wiring harness(s) and electrical connector(s).

By using the Relationship Table, the wiring harness conductor (wire) size can be related to a suitable pre-terminated wiring harness by the color of the insulation. Also, the correct length of insulation to be stripped from the wiring harness lead is identified.

Relationship Table

CABLE RANGE	SPLICE	STRIP LENGTH
0.35 mm ² to 1.50 mm ²	RED	6.00 to 7.00 mm
1.00 mm ² to 2.50 mm ²	BLUE	6.00 to 7.00 mm
4.00 mm ² to 6.00 mm ²	YELLOW	9.00 to 9.50 mm

Electrical Connector Terminal Extraction

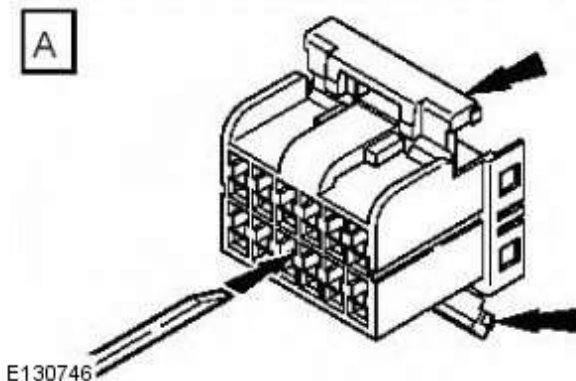
It must be noted that some electrical connector(s) have anti-backout devices which prevent the terminals from being removed from the electrical connector. Some examples of these are shown in following illustrations. The anti-backout device must be released before attempting to remove the terminal from the electrical connector. Some anti-backout devices require a special tip to release the device. Most can be released by carefully using a suitable small screwdriver.

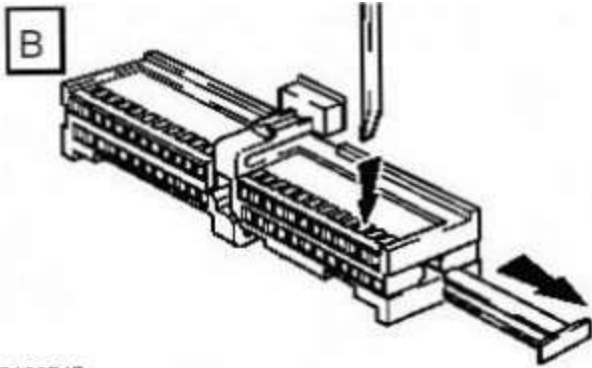
Various types of electrical connector have seals installed internally or externally to prevent moisture ingress. These normally do not have to be removed but make sure that they are installed when the electrical connectors are connected.

The illustrations show examples of each tip used on different types of electrical connector(s). There are a large number of different types of electrical connector used on vehicles therefore only one example using each tip is shown. Technicians experience and judgement will dictate which type of tip should be used for those electrical connector(s) which are not shown. Care should be exercised to avoid further damage when removing the terminals from the electrical connector.

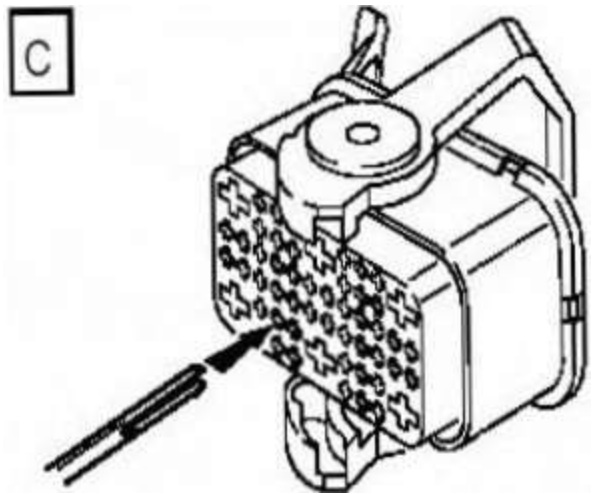


NOTE: Examples of the extraction tips and anti-backout tips.

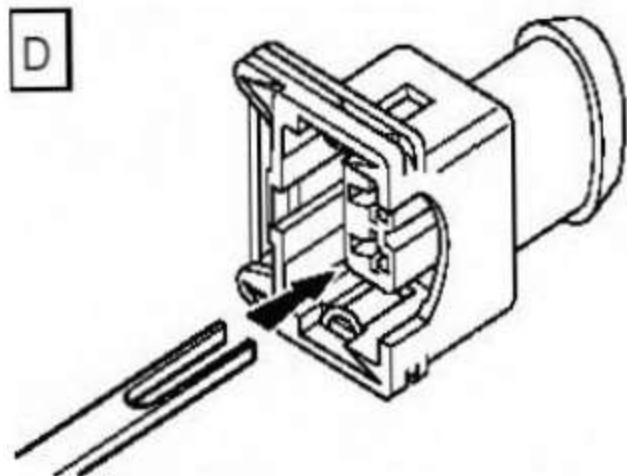
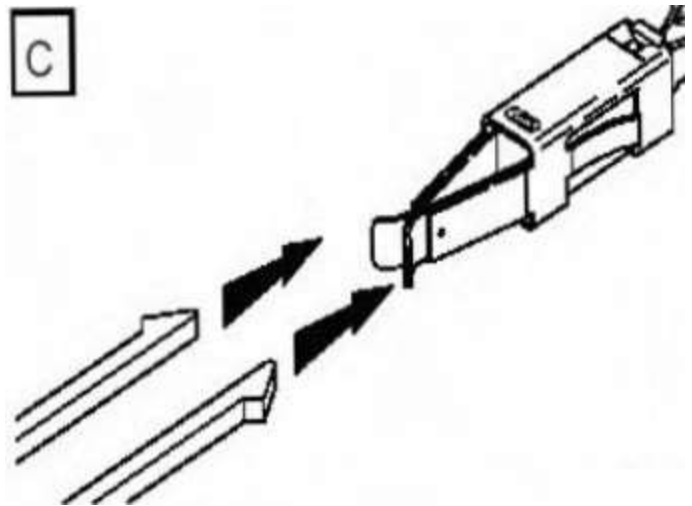




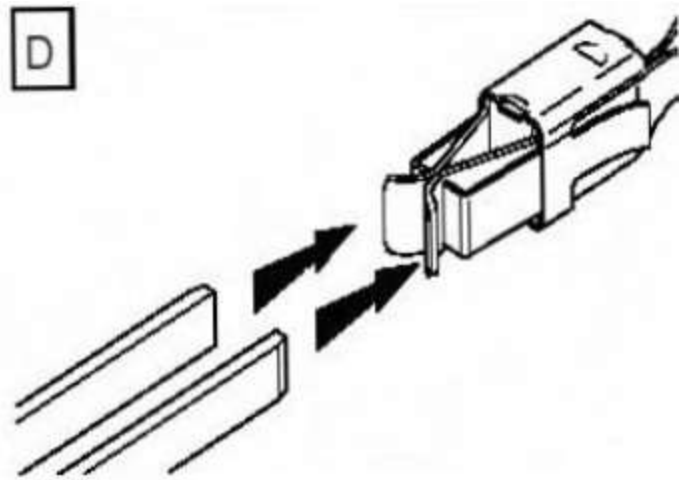
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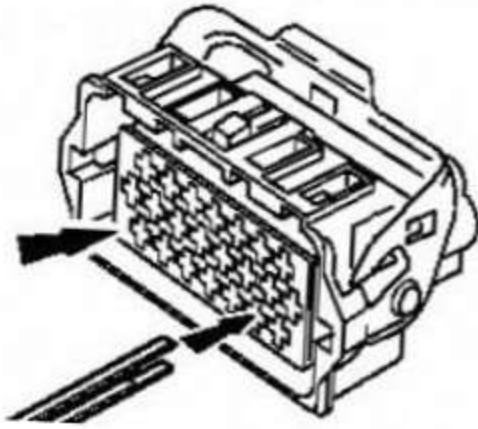
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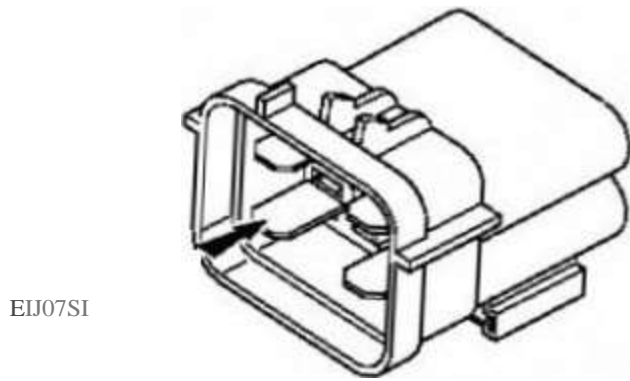
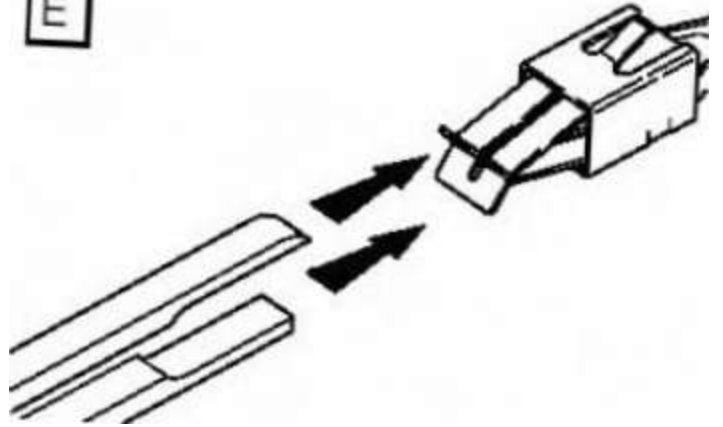


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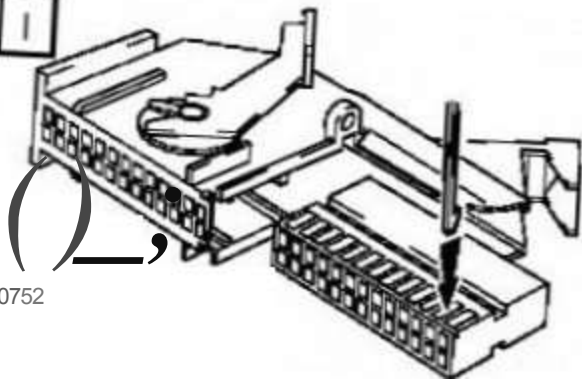
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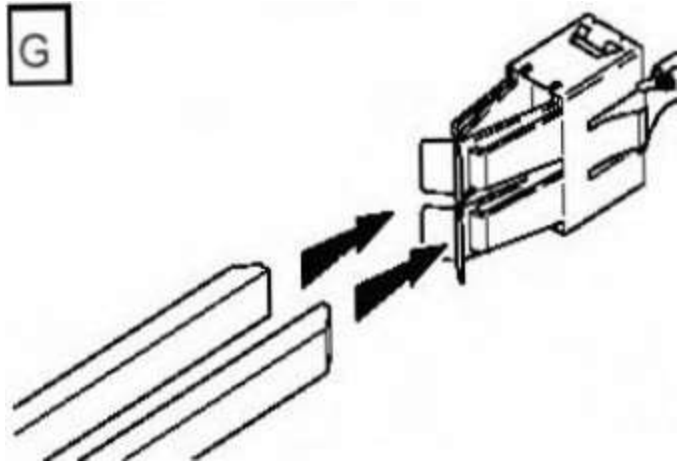
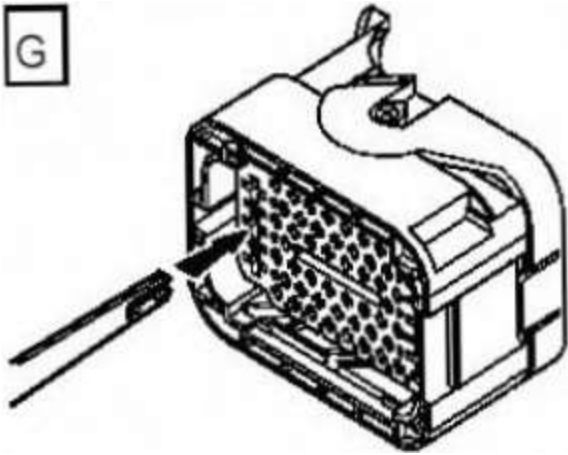


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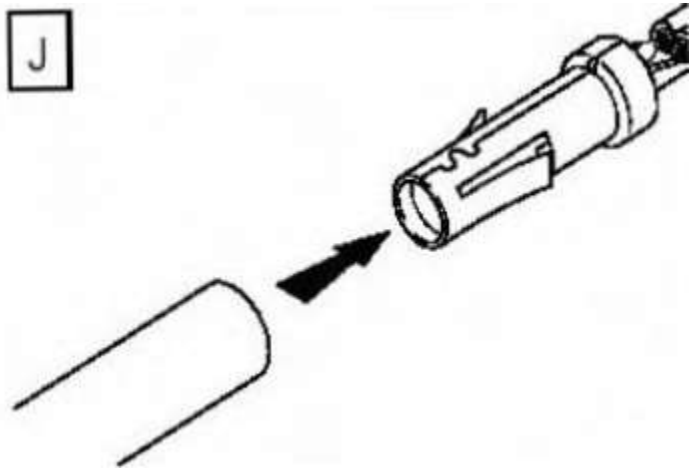
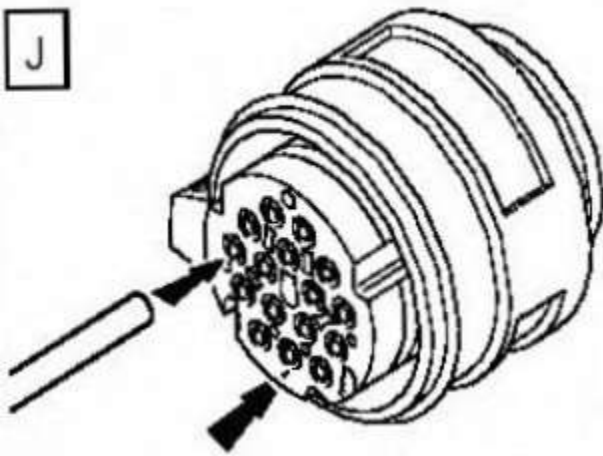
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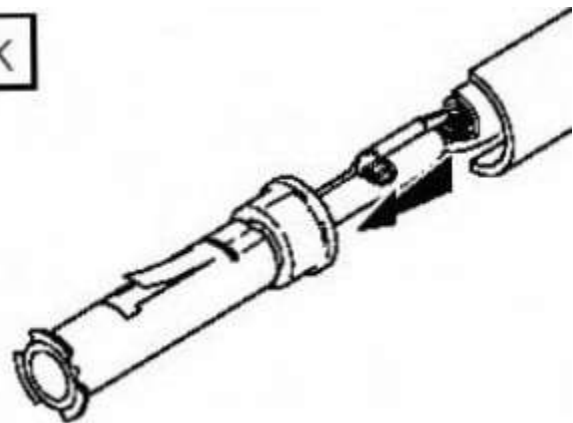
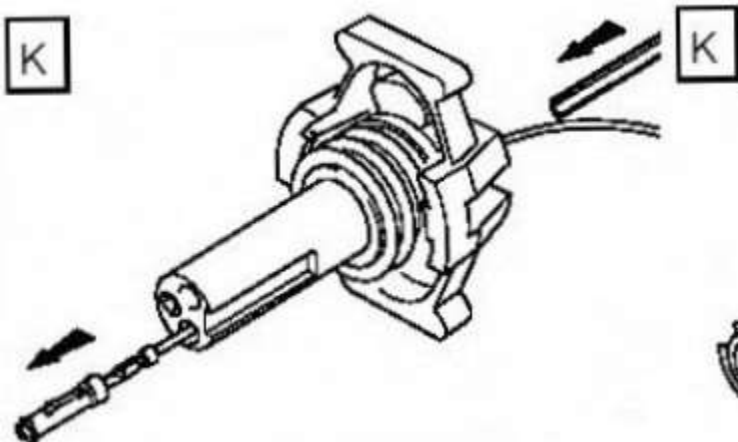
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131753



131754



131755



NOTE: The chart shows the electrical connector types, terminal pins/sockets, extractor tip and anti-backout tip.

Electrical connector terminal type	Pin or socket	Extractor tip	Anti-backout tip
Multilock 040 series	D	A	
Multilock 040 series	B	A	
Multilock 070 series	B	B	
Multilock 040 series	D	B	
Econoseal III 070 series	D	B	
Econoseal III 070 series	B	B	
Econoseal III 070 series	B	B	
Econoseal III J2	D	B	
Econoseal III 250 series	B	F	
Econoseal III 250 series	D	B	
Econoseal III 250 series	B	F	
Econoseal III 250 series	D	B	
Micro-timer II 1.5mm	D	C	
Micro-timer II 1.5mm	B	C	
Std power timer 4.8 flat	D	G	
Std power timer 5.8 flat	B	D	
Std power timer 5.8 flat	B	D	
Std power timer 2.8 flat	D	D	
Std power timer 4.8 flat	D	G	
Std power timer 5.8 flat	B	D	
Ford 2.8 flat	D	E	H
Multilock 070 series	D	B	
Multilock 070 series	B	B	
Junior power timer 2.8 flat	D	D	
Sumitomo TS90 connector	B	B	H
Modu IV gold plated	D	B	
Multilock 040 series gold plated	D	A	
Micro qualock	D	I	
EECV	D	B	
EECV	D	B	
Kostal dia 1.50 series	D	J	
AMP 6.3 flat	D	B	
Junior power timer 2.8 flat	D	D	
2.8 series	D	B	I
Sumitomo TS90 connector	D	B	H
Ducon 0.60 gold plated	D	K	
AMP 6.3 flat	D	D	
Econoseal III 250 series	B	F	

Repair Procedure

CAUTIONS:




Do not use crimping pliers, insulation strippers, butt splice connectors, heat shrink sleeves or pre-terminated wiring harness(s) that are not supplied with by authorised Jaguar/Land Rover parts. Each part has been designed to be used only with the other parts available from Jaguar/Land Rover parts.



Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

It is not correct to make more than five repair joints on the wiring harness to any electrical connector and if more damage is found at the same electrical connector then a new wiring harness must be installed.

1. Remove the faulty terminal from the electrical connector using the extractor tool and correct tip. Make sure that any anti-backout device is released before trying to remove the terminal.
2.  CAUTION: A number of electrical connector terminals are gold plated or gold flashed. When defective, they must be installed with a gold pre-terminated wiring harness(s). It is not always easy to identify the female as gold but the male pins are visually easier, therefore always check both male and female terminals to identify those which are gold. Under no circumstances are gold and tin terminals to be mixed as this will lead to early failure of the electrical contact.



NOTE: Never use a harness lead with a smaller diameter than the original harness lead.

Select the correct size and type of pre-terminated wiring harness and butt splice connector.

3. Using the wire cutter on the stripping tool, cut the pre-terminated wiring harness and the harness cable to the required

length.

4.  **NOTE: See illustration: Stripping Insulation**


From the Relationship Table, find the correct length of insulation to be stripped from the pre-terminated wiring harness and set the adjustable cable length stop to the correct length. Place the pre-terminated wiring harness in the wire stripper and remove the insulation.

5. Put the cable identification sleeve(s) on to the wiring harness with the main cable colour nearest to the terminal.
6. During this next step do not over tighten. Place the selected butt splice connector in the crimping tool, matching the aperture and the butt connector colours. Make sure that the window indentation in the butt connector is resting over the guide bar on the lower jaw. Partially close the grip until the butt connector is securely held in the aperture. This will give support to the butt connector while the pre-terminated wiring harness is inserted into it.

7.  **NOTE: See illustration: Splice Correctly Located**

Insert the pre-terminated wiring harness into the butt connector and make sure that the wire is against the wire stop. Close the grip firmly, crimping the lead to the butt connector. When the handles have been completely closed the butt connector will be freed from the tool as the handles are released. If the handles have not been completely closed then the jaws will hold the butt connector and it cannot be removed from the tool until the crimp is fully made by closing the handles completely.

8. Make sure that the harness cable has been squarely cut and the correct length of insulation removed. If more than one splice is needed the butt connectors must not be crimped to the wiring harness at the same distance from the connector. The splices must be staggered to prevent a bulk of splices in the same area of the wiring harness.
9. It is preferable to cover the butt splice joint with heat shrink sleeve. This is desirable not essential, except where the electrical connector is a sealed electrical connector. Use the smaller diameter sleeve for red and blue pre-terminated wiring harness(s) and the large diameter sleeve for the yellow pre-terminated wiring harness(s). It is advisable to place the heat shrink over the completed joint but in some instances the sleeve will not pass over the terminal. Check, and if required, place the correct size sleeve onto the harness cable or pre-terminated wiring harness before crimping the butt splice to the wiring harness.
10. Place the harness cable into the butt splice with the splice window over the guide bar. Make sure that the cable harness wire is against the stop in the butt splice, crimp the butt splice connector to the wiring harness.
11. Gently pull the harness cables each side of the butt splice to make sure that a secure joint has been made.

12.  **WARNING: Do not use a naked flame in areas where fuel or oil have been spilt. Clean the area of residual oil and fuel and wait until the fuel spill has fully evaporated.**

CAUTIONS:



When using a heat source make sure that it is localised and causes no damage to surrounding materials.

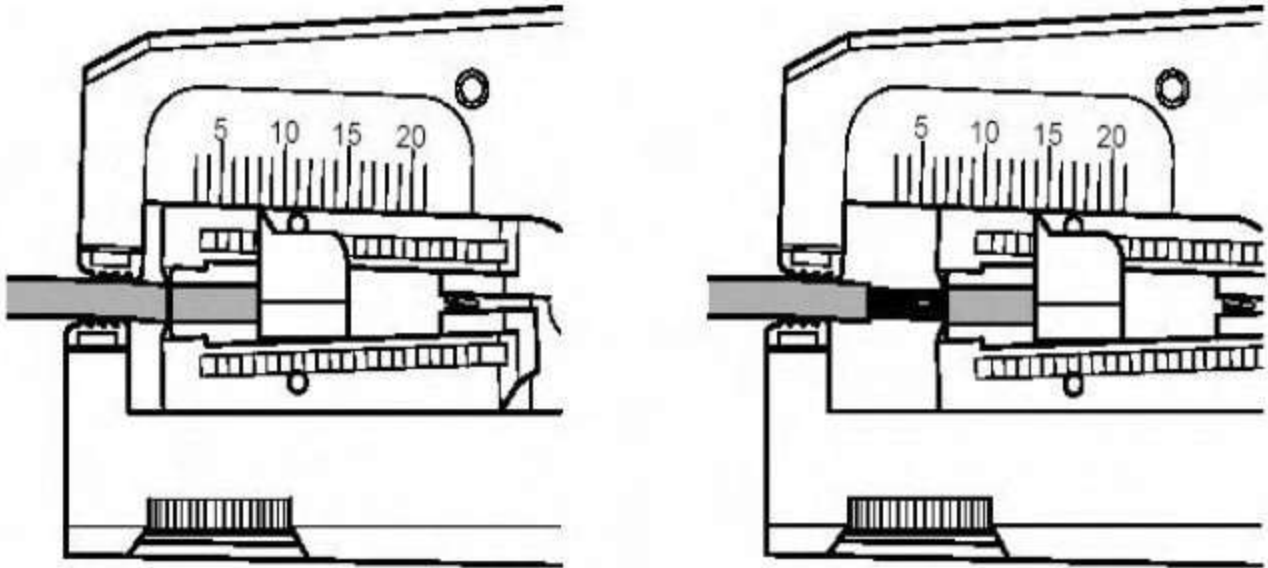


Where the repair procedure indicates that a glue lined heat shrink sleeve should be applied, apply sufficient heat to the glue lined heat shrink to melt the glue in order to provide a water tight seal. Do **not** over heat the glue lined heat shrink sleeve so that the wiring harness insulation becomes damaged.

Using a suitable heat source, shrink the sleeve over the butt splice.

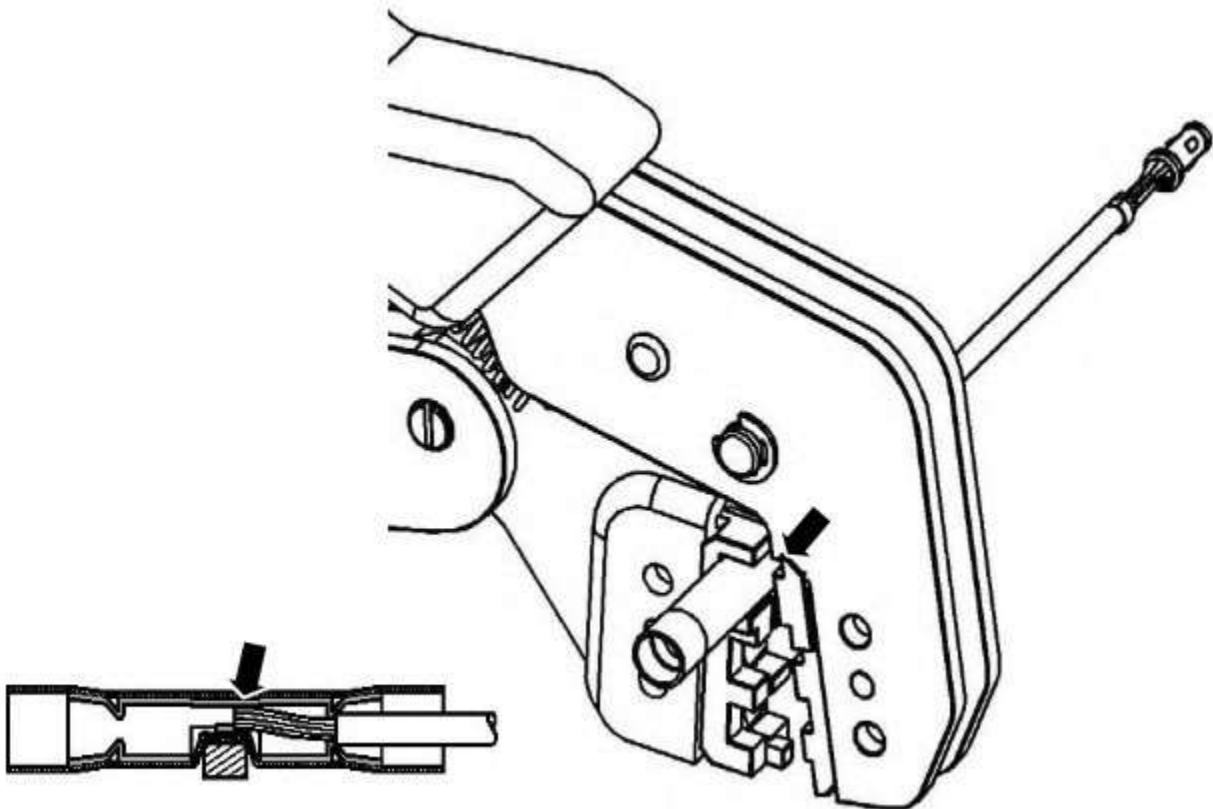
13. If further pre-terminated wiring harness(s) are to be installed to the same electrical connector, make sure that the lead is cut at a different length to the previous joint. This makes sure that the splices will, where possible, be staggered on the wiring harness and prevent a bulk of splices in one area.
14. When all of the splices have been made, fit the terminal(s) to the electrical connector, taking care that the terminals are correctly orientated.
15. Install the wiring harness cover and secure with adhesive electrical tape. Do not cover the wiring harness right to the electrical connector as the terminals must have a little movement and not be firmly bound to the electrical connector or wiring harness. Make sure that the cable identification sleeve(s) are showing at the wiring harness electrical connector.

Stripping Insulation



E130756

Splice Correctly Located



E130757

Wiring Harnesses - Wiring Harness Repair

General Procedures

1. For additional information, refer to: [Wiring Harness](#) (418-02 Wiring Harnesses, Description and Operation).

Wiring Harnesses - Luggage Compartment Lid Wiring Harness

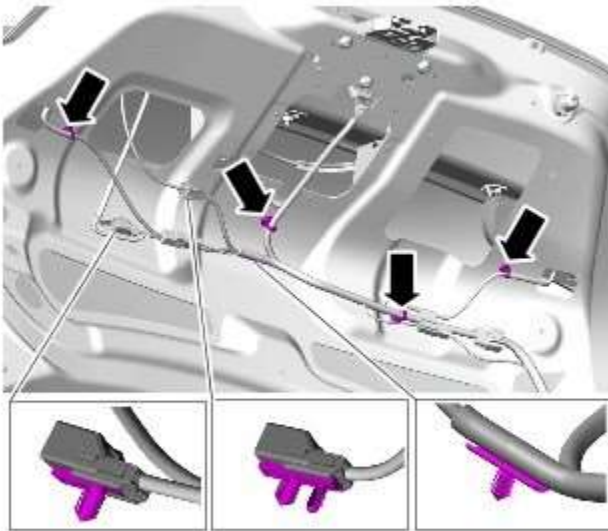
Removal and Installation

Removal

1. Remove the luggage compartment lid trim panel.

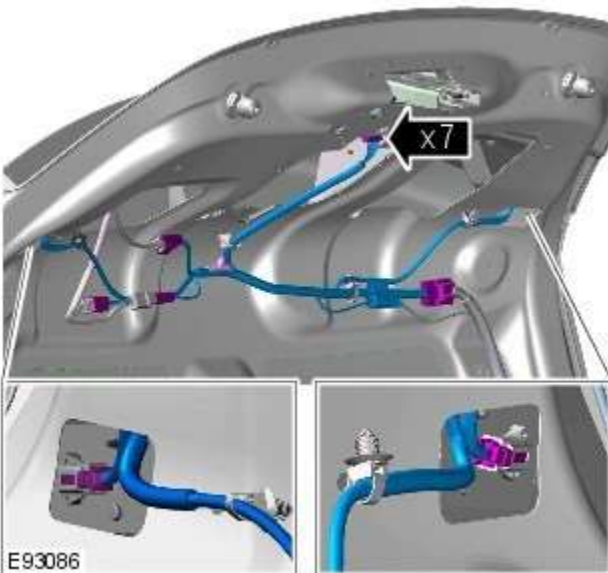
Refer to: [Luggage Compartment Lid Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

- 2.



E93085

- 3.



E93086

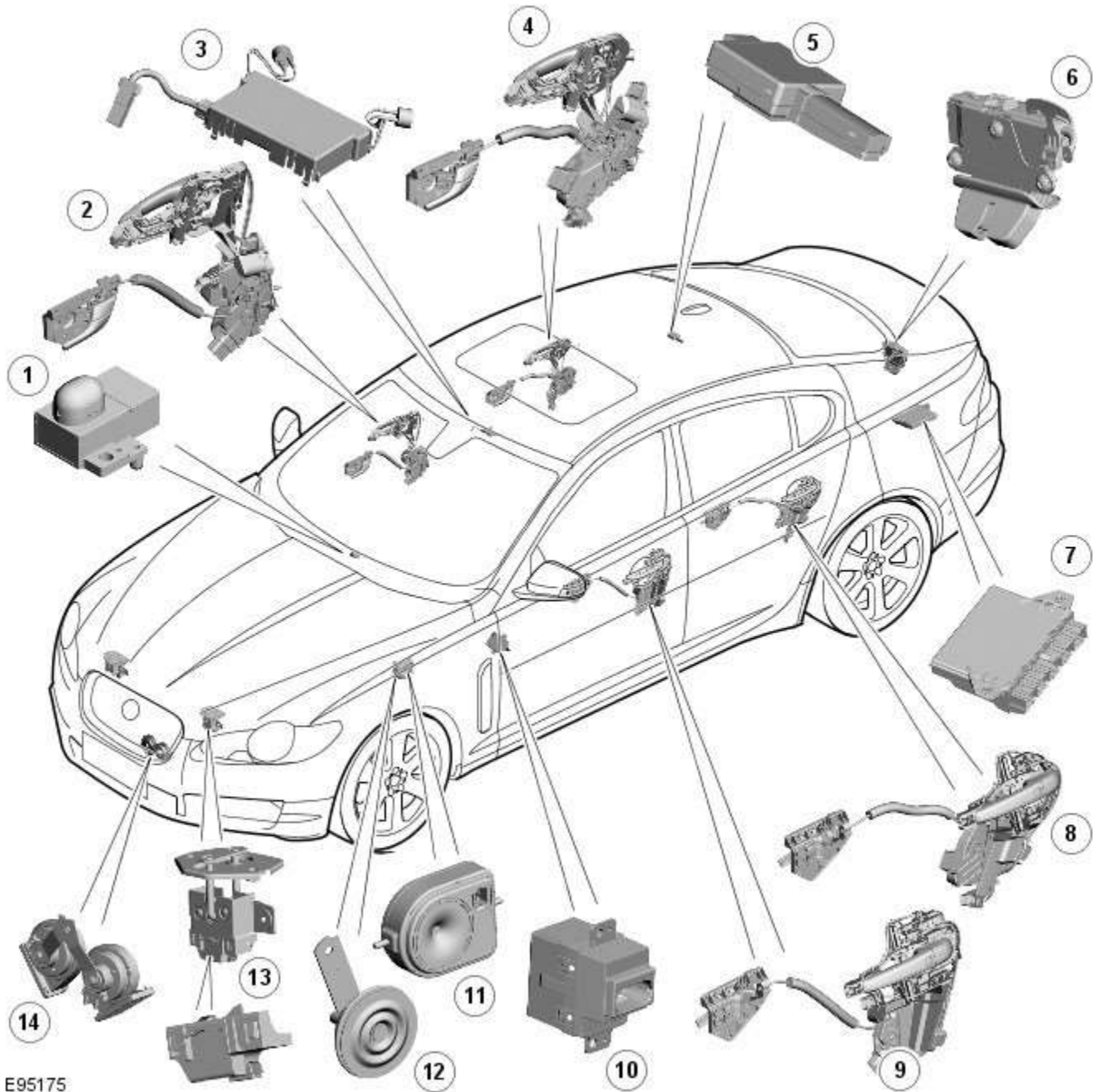
Installation

1. To install, reverse the removal procedure.

Anti-Theft - Active - Anti-Theft - Active - Component Location

Description and Operation

Component Location



E95175

Item	Description
1	Alarm indicator
2	Latch mechanism - front door
3	Intrusion detection module
4	Latch mechanism - rear door
5	Central locking Radio Frequency (RF) receiver
6	Luggage compartment lid latch mechanism
7	Keyless vehicle module
8	Latch mechanism - rear door
9	Latch mechanism - front door

10	Start control unit
11	Battery backed sounder
12	Passive sounder
13	Hood latch mechanism
14	Vehicle horn

Anti-Theft - Active - Anti-Theft - Active - Overview

Description and Operation

Overview

The active anti-theft system is available with three different levels of vehicle protection depending on market specification:

- Hinged panel sensing
- Hinged panel and intrusion sensing
- Hinged panel, intrusion and inclination sensing.

The **CJB (central junction box)** automatically arms and disarms the active anti-theft system when it functions the central locking system.

Refer to: [Handles, Locks, Latches and Entry Systems](#) (501-14 Handles, Locks, Latches and Entry Systems, Description and Operation).

Depending on market specification two modes of protection are used: perimeter mode and volumetric mode.

Perimeter mode

Perimeter mode, monitors the security of the hinged panels, which include:

- all doors,
- luggage compartment lid, and
- engine compartment lid.

When perimeter mode is active, the CJB monitors the panel ajar switches in the latch mechanisms of the hinged panels.

Volumetric mode

In volumetric mode the CJB monitors the interior of the vehicle for movement using an ultrasonic sound wave sensor.

If the battery backed sounder incorporates an inclination sensor the vehicle will also be monitored for unauthorised tilting; for example towing or jacking.

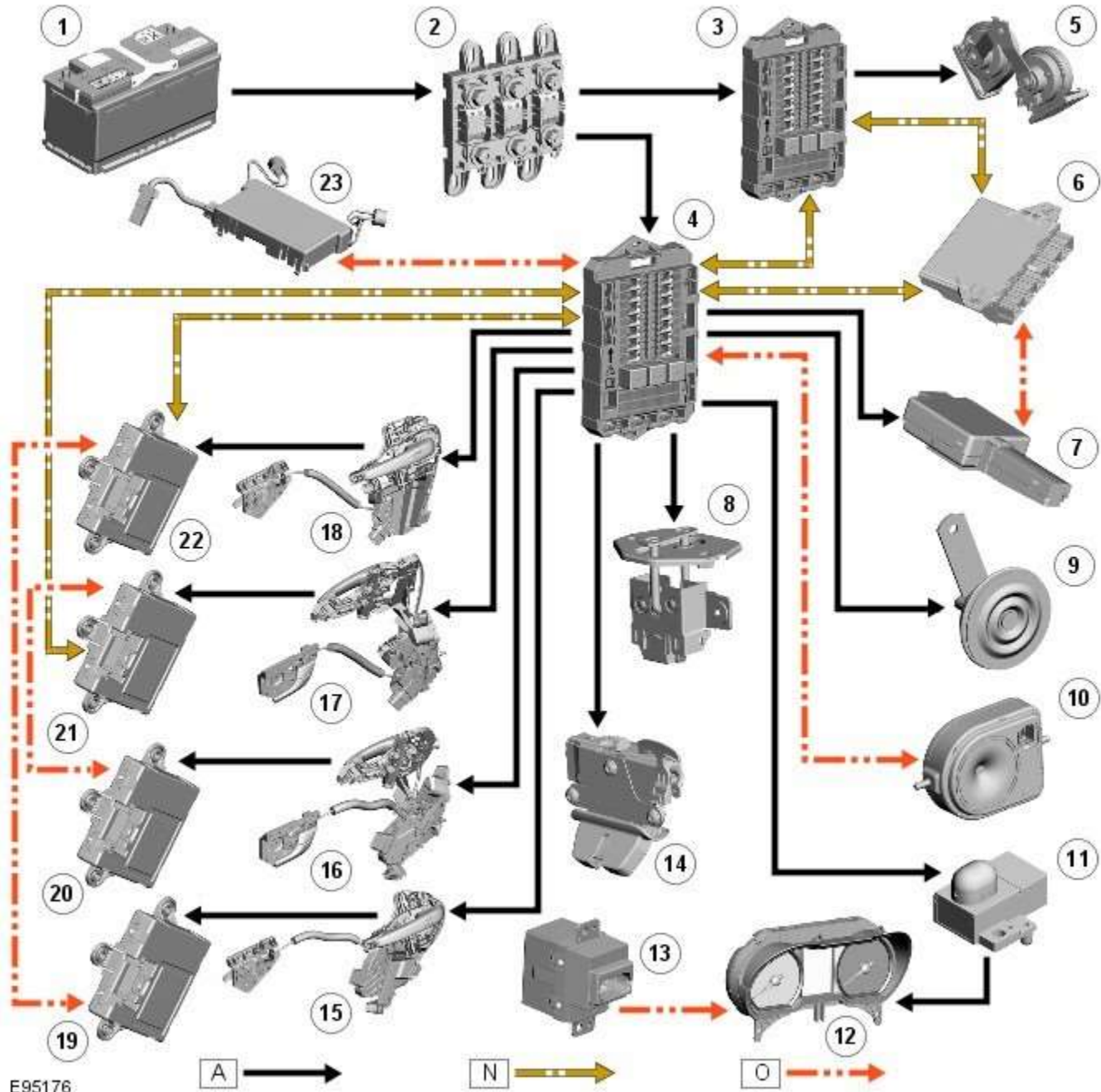
Anti-Theft - Active - Anti-Theft - Active - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **N** = Medium speed CAN; **O** = LIN bus



E95176

Item	Description
1	Battery
2	Megafuse (250 amp)
3	RJB (rear junction box)
4	CJB (central junction box)
5	Vehicle horn
6	Keyless vehicle module

7	Central locking - Radio Frequency (RF) receiver
8	Engine compartment lid - latch mechanism
9	Passive sounder
10	Battery backed sounder
11	Alarm indicator
12	Instrument cluster
13	Start control unit
14	Luggage compartment lid - latch mechanism
15	Door latch mechanism - LH (left-hand) rear
16	Door latch mechanism - RH (right-hand) rear
17	Door latch mechanism - RH front
18	Door latch mechanism - LH front
19	Door module - LH rear
20	Door module - RH rear
21	Door module - RH front
22	Door module - LH front
23	Intrusion detection module

System Operation

Anti-Theft - Active

The active anti-theft system is available with three different levels of vehicle protection depending on market specification:

- Hinged panel sensing
- Hinged panel and intrusion sensing
- Hinged panel, intrusion and inclination sensing.

The system is controlled by software in the [CJB](#) and [RJB](#) and indicates a trigger condition:

- Visually, using the direction indicators, and
- Audibly, using the vehicle horn and either a passive or active sounder to indicate a trigger condition.

The passive sounder takes the form of an anti-theft disc horn located at the rear of the engine compartment on the [LH](#) side. The active sounder takes the form of a battery backed sounder located in the same position.

Depending on market specification, the battery backed sounder may be fitted with an inclination sensor. Both types of battery backed sounder are visually identical and can only be identified by their part number. Both are also intelligent units, and communicate to the CJB over a [LIN \(local interconnect network\)](#) bus connection.

Monitoring of the hinged panels is carried out using switches located in each door latch assembly, the engine-compartment-lid latch assembly, and the luggage-compartment-lid latch assembly. The condition of the switches is monitored by the CJB.

Monitoring of front door lock status is carried out using switches located in the door latch mechanisms. The condition of the switches is monitored by the front door modules and transmitted to the CJB over the medium speed [CAN \(controller area network\)](#) bus.

Monitoring of the cabin interior is carried out using an intrusion detection module mounted behind the roof console. The intrusion detection module comprises an ultrasonic sound wave sensor to determine if there is movement within the cabin.

Information from the intrusion detection module is communicated to the CJB over a LIN bus connection.

CAUTIONS:



The intrusion detection module electrical connections, particularly those to the sensors mounted in the roof console, are very delicate and must be handled with care.



The intrusion detection module is an electro-statically sensitive part and should only be handled in an electro-statically controlled environment.

When armed, the active anti-theft system can be triggered in one of the following ways:

- A door ajar switch indicates a door has been opened.
- The engine compartment lid or luggage compartment lid ajar switches indicate that either has been opened.
- Either front door latch mechanism indicates a door has been unlocked.
- The emergency key blade is used to open either the LH front door or luggage compartment.
- The CJB or RJB are disconnected (this may result in only a partial trigger).
- An attempt is made to start the engine without a valid signal from the Smart Key.
Refer to: [Anti-Theft - Passive](#) (419-01B Anti-Theft - Passive, Description and Operation).

- The battery backed sounder is disconnected (partial trigger only).
- The vehicle battery is disconnected on a vehicle fitted with a battery backed sounder (partial trigger only).
- The inclination sensor detects a change in vehicle attitude.
- The intrusion detection module detects movement within the cabin.

Component Description

Door Modules

The door modules provide the interface between the door latch-motors, the door latch-switches and the CJB. The door modules provide door switch status information and enable the door latch-motors on request from the CJB or the keyless vehicle module.

Keyless Vehicle Module

The keyless vehicle module interfaces with the Central locking, Radio Frequency (RF) receiver and collects RF signal information which is transmitted from the Smart Key. This information is translated into commands which are passed on the medium speed CAN bus to the:

- CJB,
- RJB,
- door modules, and
- instrument cluster.

The keyless vehicle module also monitors:

- 2 interior antennae,
- 1 luggage compartment antenna,
- a rear bumper antenna, and
- 4 door handle antennae if the passive entry system is fitted.

On vehicles with passive entry, the additional fast latch motors are controlled via the keyless vehicle module and the locking status is passed to the CJB on the medium speed CAN bus.

Instrument Cluster

The instrument cluster controls the alarm indicator, and in conjunction with the [ECM \(engine control module\)](#), the engine immobilization. The ECM controls the engine crank and fuel functions and the instrument cluster processes the valid transponder information.

Alarm Indicator

The alarm indicator is a [LED \(light emitting diode\)](#) located in the body of the sunload/light sensor. When the ignition is off the indicator gives a visual indication of the active anti-theft system to show if the alarm system is active or not active. Operation of the alarm indicator is controlled by the instrument cluster which varies the flash rate of the LED to indicate the system status of the alarm and the immobilization systems.

When the ignition is on, the indicator provides a visual indication of the status of the passive anti-theft (engine immobilization) system. If the immobilization system is operating correctly, the LED will be illuminated for 3 seconds at ignition on and then extinguish. If a fault exists in the immobilization system, the LED will be either permanently illuminated or flashing for 60 seconds. This indicates that a fault exists and fault code has been recorded. After the 60 second period the LED will flash at different frequencies which indicate the nature of the fault.

Refer to: [Anti-Theft - Passive](#) (419-01B Anti-Theft - Passive, Description and Operation).

Passive Anti-Theft Horn

The passive anti-theft horn is hardwired to the CJB which activates the horn when the alarm is triggered.

Battery Backed Sounder

Operation of the battery backed sounder is controlled by the CJB on the LIN bus. The sounder is also connected with a permanent battery supply via the CJB. An integral, rechargeable battery powers the sounder if the battery power supply from the CJB is interrupted.

Dependant on vehicle, a inclination sensor is incorporated into the battery backed sounder, to monitor vehicle attitude, see Inclination Sensor.

Inclination Sensor

The CJB monitors the inclination sensor and will activate the alarm system if the vehicle is being raised.

Intrusion Detection Module

The intrusion detection module comprises an ultrasonic sound wave sensor which monitors the vehicle's interior.

The intrusion detection module is activated with volumetric mode which in turn is enabled when the vehicle is double locked. The vehicle can be locked and alarmed with the module de-activated if a pet is to be left in the vehicle for example by single-

locking the active anti-theft system. The intrusion detection modules can also be de-activated by deselecting the 'Alarm Sensors' option in the 'Vehicle Settings' screen on the Touch Screen Display.



NOTE: The Touch Screen method of de-activation of the intrusion detection module is only for one arm cycle, it will revert to active once the engine is next started.

When the volumetric mode is active and the vehicle battery voltage falls below 9 volts, the CJB will ignore any inputs from the intrusion detection module to prevent false alarm activation.

Anti-Theft - Active - Anti-Theft - Active

Diagnosis and Testing

Principles of Operation

For a detailed description of the anti-theft - active system, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (419-01A Anti-Theft - Active)

[Anti-Theft - Active](#) (Description and Operation),
[Anti-Theft - Active](#) (Description and Operation),
[Anti-Theft - Active](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Door latch micro switches • Hood ajar switch • Passive anti-theft alarm horn (if installed) • Battery backed sounder (if installed) or battery backed sounder with tilt sensor (if installed) • Vehicle horns 	<ul style="list-style-type: none"> • Fuse(s) • Electrical connector(s) • Wiring Harness

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the relevant DTC Index. For additional diagnosis and testing information, refer to the relevant Diagnosis and Testing section in the workshop manual
 REFER to: [Remote Keyless Entry \(RKE\) Module](#) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).

DTC Index



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required.

DTC	Description	Possible Causes	Action
B1087-83	LIN Bus "A" - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> Checksum of the received LIN frame from battery backed sounder, roof header console, and/or rain/light sensor is incorrect 	<ul style="list-style-type: none"> Check operation of rain/light sensor by covering sensor or applying water to screen, install a new sensor as required
B1087-88	LIN Bus "A" - Bus off	<ul style="list-style-type: none"> Bus off. Battery backed sounder, roof header console, and/or rain/light sensor LIN circuit - short to ground, power 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check battery backed sounder, roof header console, and rain/light sensor LIN circuit for short to ground, power
B108F-23	Cabin Lock/Unlock Switch - Signal stuck low	<ul style="list-style-type: none"> Cabin lock/unlock switch signal stuck Switch pressed for longer than 20 seconds Switch circuit short circuit to power or ground Switch failure 	<ul style="list-style-type: none"> Check the switch operation and serviceability. Refer to the electrical circuit diagrams and check the switch circuit
B109C-11	Front Courtesy Light - Circuit short to ground	<ul style="list-style-type: none"> Short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test front courtesy light circuit for short to ground
B109C-15	Front Courtesy Light - Circuit short to battery or open	<ul style="list-style-type: none"> Short to power or open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test front courtesy light circuit for short to power or open circuit
B10EB-11	Driver Door Double Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> Driver door double locking motor control circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test driver door double locking motor control circuit for short ground
B10EB-15	Driver Door Double Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> Driver door double locking motor control circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver door double locking motor control circuit for short to power or open circuit
B10EC-11	Passenger Door Double Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> Passenger door double locking motor control circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test passenger door double locking motor control circuit for short ground
B10EC-15	Passenger Door Double Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> Passenger door double locking motor control circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test passenger door double locking motor control circuit for short to power or open circuit
B10ED-11	Rear Door Driver Side Double Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> Rear door driver side double locking motor control circuit - short to ground 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test rear door driver side double locking motor control circuit for short ground
B10ED-15	Rear Door Driver Side Double Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> Rear door driver side double locking motor control circuit - short to power, open circuit 	<ul style="list-style-type: none"> Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test rear door driver side double locking motor control circuit for short power, open circuit

DTC	Description	Possible Causes	Action
B10EE-11	Rear Door Passenger Side Double Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Rear door passenger side double locking motor control circuit - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test rear door passenger side double locking motor control circuit for short ground
B10EE-15	Rear Door Passenger Side Double Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Rear door passenger side double locking motor control circuit - short to power, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test rear door passenger side double locking motor control circuit for short power, open circuit
B10F1-11	Key In Switch - Circuit short to ground	<ul style="list-style-type: none"> • Keyless vehicle module, key IN status circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check keyless vehicle module, key IN status circuit for short to ground
B10F1-12	Key In Switch - Circuit short to battery	<ul style="list-style-type: none"> • Keyless vehicle module, key IN status circuit - short to power 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check keyless vehicle module, key IN status circuit for short to power
B10F1-13	Key In Switch - Circuit open	<ul style="list-style-type: none"> • Keyless vehicle module, key IN status circuit - open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check keyless vehicle module, key IN status circuit for open circuit
B1108-11	Driver Door Central Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Driver door central locking motor control circuit - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test driver door central locking motor control circuit for short ground
B1108-15	Driver Door Central Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver door central locking motor control circuit - short to power, open circuit 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver door central locking motor control circuit for short to power, open circuit
B1109-11	Passenger Door Central Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test passenger door central locking motor circuit for short to ground
B1109-15	Passenger Door Central Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test passenger door central locking motor circuit for short to power or open circuit
B110A-11	Rear Door Driver Side Central Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Rear driver door central locking motor control circuit - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test rear driver door central locking motor control circuit for short ground
B110A-15	Rear Door Driver Side Central Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Rear driver door central locking motor control circuit - short to power, open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test rear driver door central locking motor control circuit for short to power, open circuit
B110B-11	Rear Door Passenger Side Central Locking Motor - Circuit short to ground	<ul style="list-style-type: none"> • Rear passenger door central locking motor circuit short circuit to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the circuit
B110B-15	Rear Door Passenger Side Central Locking Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Rear passenger door central locking motor circuit short circuit to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the circuit
B1163-11	Left Mirror Heater Output Short To Ground - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test left mirror heater output circuit for short to ground


DTC	Description	Possible Causes	Action
B1163-15	Left Mirror Heater Output Short To Power - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test left mirror heater output circuit for short to power or open circuit
B1164-11	Right Mirror Heater Output Short To Ground - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test right mirror heater output circuit for short to ground
B1164-15	Right Mirror Heater Output Short To Power - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test right mirror heater output circuit for short to power or open circuit
B1165-11	Left Front Puddle Lamp Output Short To Ground - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test left front puddle lamp output circuit for short to ground
B1165-15	Left Front Puddle Lamp Output Open Load Or Short To Power - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test left front puddle lamp output circuit for short to power or open circuit
B1166-11	Right Front Puddle Lamp Output Short To Ground - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test right front puddle lamp output circuit for short to ground
B1166-15	Right Front Puddle Lamp Output Open Load Or Short To Battery - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test right front puddle lamp output circuit for short to power or open circuit
B1175-13	Driver Door Ajar Switch - Circuit open	<ul style="list-style-type: none"> • Driver door ajar switch signal circuit - open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check driver door ajar switch signal circuit for open circuit
B1176-13	Passenger Door Ajar Switch - Circuit open	<ul style="list-style-type: none"> • Passenger door ajar switch signal circuit - open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check passenger door ajar switch signal circuit for open circuit
B117C-07	Rear Power Window Up - Mechanical failures	<ul style="list-style-type: none"> • Set when window is reversed during window up due to mechanical problems, window channel restriction preventing window closure or Window mechanism fault 	<ul style="list-style-type: none"> • Check for mechanical problems with the window operation. Check for obstructions in the window channels and that the glass is not restricted in the full range of travel
B117C-72	Rear Power Window Up - Actuator stuck open	<ul style="list-style-type: none"> • Door module internal relay sticking open 	<ul style="list-style-type: none"> • Renew the relevant rear door module. Refer to the warranty policy and procedures manual if a module is suspect
B117C-73	Rear Power Window Up - Actuator stuck closed	<ul style="list-style-type: none"> • Door module internal relay sticking closed 	<ul style="list-style-type: none"> • Renew the relevant rear door module. Refer to the warranty policy and procedures manual if a module is suspect
B117C-92	Rear Power Window Up - Performance or incorrect operation	<ul style="list-style-type: none"> • Set when auto window up was interrupted (e.g. by pressing local switch) 	<ul style="list-style-type: none"> • Check the window operation. Clear the DTC and retest
B117D-72	Rear Power Window Down - Actuator stuck open	<ul style="list-style-type: none"> • Door module internal relay sticking open 	<ul style="list-style-type: none"> • Renew the relevant rear door module. Refer to the warranty policy and procedures manual if a module is suspect
B117D-73	Rear Power Window Down - Actuator stuck closed	<ul style="list-style-type: none"> • Door module internal relay sticking closed 	<ul style="list-style-type: none"> • Renew the relevant rear door module. Refer to the warranty policy and procedures manual if a module is suspect

DTC	Description	Possible Causes	Action
B117E-07	Front Power Window Up - Mechanical failures	<ul style="list-style-type: none"> Set when window is reversed during window up due to mechanical problems, window channel restriction preventing window closure or Window mechanism fault 	<ul style="list-style-type: none"> Check for mechanical problems with the window operation. Check for obstructions in the window channels and that the glass is not restricted in the full range of travel
B117E-72	Front Power Window Up - Actuator stuck open	<ul style="list-style-type: none"> Door module internal relay sticking open 	<ul style="list-style-type: none"> Renew the relevant front door module. Refer to the warranty policy and procedures manual if a module is suspect
B117E-73	Front Power Window Up - Actuator stuck closed	<ul style="list-style-type: none"> Door module internal relay sticking closed 	<ul style="list-style-type: none"> Renew the relevant front door module. Refer to the warranty policy and procedures manual if a module is suspect
B117E-92	Front Power Window Up - Performance or incorrect operation	<ul style="list-style-type: none"> Set when auto window up was interrupted (e.g. by pressing local switch) 	<ul style="list-style-type: none"> Check the window operation. Clear the DTC and retest
B117F-72	Front Power Window Down - Actuator stuck open	<ul style="list-style-type: none"> Door module internal relay sticking open 	<ul style="list-style-type: none"> Renew the relevant front door module. Refer to the warranty policy and procedures manual if a module is suspect
B117F-73	Front Power Window Down - Actuator stuck closed	<ul style="list-style-type: none"> Door module internal relay sticking closed 	<ul style="list-style-type: none"> Renew the relevant front door module. Refer to the warranty policy and procedures manual if a module is suspect
B1189-29	Front Window Position Sensor - Signal invalid	<ul style="list-style-type: none"> Missing signal from position sensor 1 or 2 Sensor circuit fault Position sensor fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the position sensor circuit between the door module and window motor. Repair as necessary. If the problem persists, renew the window motor
B118A-29	Rear Window Position Sensor - Signal invalid	<ul style="list-style-type: none"> Missing signal from position sensor 1 or 2 Sensor circuit fault Position sensor fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the position sensor circuit between the door module and window motor. Repair as necessary. If the problem persists, renew the window motor
B11C0-13	Driver Side Rear Door Ajar Switch - Circuit open	<ul style="list-style-type: none"> Left rear door ajar switch signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check left rear door ajar switch signal circuit for open circuit
B11C1-13	Passenger Side Rear Door Ajar Switch - Circuit open	<ul style="list-style-type: none"> Right rear door ajar switch signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check right rear door ajar switch signal circuit for open circuit
B11D1-83	LIN Bus "C" - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> LIN Bus checksum error; driver switchpack internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the LIN Bus circuit between the driver door window switch and the door module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the driver door window switch
B11D1-86	LIN Bus "C" - Signal invalid	<ul style="list-style-type: none"> LIN Bus header error; driver switchpack internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the LIN Bus circuit between the driver door window switch and the door module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the driver door window switch
B11D1-87	LIN Bus "C" - Missing message	<ul style="list-style-type: none"> Slave node communication missing; driver switchpack internal fault 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the LIN Bus circuit between the driver door window switch and the door module. Check the connectors for integrity and

DTC	Description	Possible Causes	Action
			security. Clear the DTC and retest. If the problem persists, renew the driver door window switch
B11F6-11	Driver Folding Mirror Motor - Circuit short to ground	<ul style="list-style-type: none"> • Driver folding mirror motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror fold circuit between the drivers door module and the mirror assembly. Repair as necessary
B11F6-15	Driver Folding Mirror Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver mirror heater output circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror fold circuit between the drivers door module and the mirror assembly. Repair as necessary
B11F7-11	Passenger Folding Mirror Motor - Circuit short to ground	<ul style="list-style-type: none"> • Passenger folding mirror motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror fold circuit between the passenger door module and the mirror assembly. Repair as necessary
B11F7-15	Passenger Folding Mirror Motor - Circuit short to battery or open	<ul style="list-style-type: none"> • Passenger mirror heater output circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror fold circuit between the passenger door module and the mirror assembly. Repair as necessary
B1222-23	Master Lock/Unlock Switch - Signal stuck low	<ul style="list-style-type: none"> • Master lock or unlock switch digital input circuit - signal stuck low 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check master lock and unlock switch digital input circuits for short to ground, open circuit
B1A98-83	LIN Bus Circuit #1 - Value of signal protection calculation incorrect	<ul style="list-style-type: none"> • Value of signal protection calculation incorrect 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the LIN Bus circuit between the rear door control unit and the Driver Door Module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the rear door control module
B1A98-86	LIN Bus Circuit #1 - Signal invalid	<ul style="list-style-type: none"> • Signal invalid 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the LIN Bus circuit between the rear door control unit and the Driver Door Module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the rear door control module
B1A98-87	LIN Bus Circuit #1 - Missing message	<ul style="list-style-type: none"> • Missing message 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the LIN Bus circuit between the rear door control unit and the Driver Door Module. Check the connectors for integrity and security. Clear the DTC and retest. If the problem persists, renew the rear door control module
B1C09-11	Driver Left/Right Mirror Motor Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to ground • Mirror left/right motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the drivers door module and the mirror assembly. Repair as necessary
B1C09-15	Driver Left/Right Mirror Motor Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to power or open circuit • Mirror left/right motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the drivers door module and the mirror assembly. Repair as necessary
B1C10-11	Driver Up/Down Mirror Motor Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the drivers door module and the mirror assembly. Repair as necessary

DTC	Description	Possible Causes	Action
B1C10-15	Driver Up/Down Mirror Motor Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the drivers door module and the mirror assembly. Repair as necessary
B1C11-11	Passenger Left/Right Mirror Motor Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary
B1C11-15	Passenger Left/Right Mirror Motor Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary
B1C12-11	Passenger Up/Down Mirror Motor Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary
B1C12-15	Passenger Up/Down Mirror Motor Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary
B1C13-11	Driver Up/Down Mirror Motor Feedback Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the driver door module and the mirror assembly. Repair as necessary
B1C13-15	Driver Up/Down Mirror Motor Feedback Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the driver door module and the mirror assembly. Repair as necessary
B1C14-11	Driver Left/Right Mirror Motor Feedback Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the driver door module and the mirror assembly. Repair as necessary
B1C14-15	Driver Left/Right Mirror Motor Feedback Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Driver mirror adjustment motor circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the driver door module and the mirror assembly. Repair as necessary
B1C15-11	Passenger Up/Down Mirror Motor Feedback Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary
B1C15-15	Passenger Up/Down Mirror Motor Feedback Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary
B1C16-11	Passenger Left/Right Mirror Motor Feedback Circuit - Circuit short to ground	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to ground • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary
B1C16-15	Passenger Left/Right Mirror Motor Feedback Circuit - Circuit short to battery or open	<ul style="list-style-type: none"> • Passenger mirror adjustment motor circuit short circuit to power or open circuit • Mirror motor failure 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the mirror motor circuit between the passenger door module and the mirror assembly. Repair as necessary

DTC	Description	Possible Causes	Action
B1C39-29	Key Lock Switch - Signal invalid	<ul style="list-style-type: none"> • Key lock switch signal invalid, stuck/jammed • Switch held for longer than 20 seconds • Key lock switch circuit short to ground (where connected) • Key lock switch failure • Central Junction Box fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and the key lock switch circuit. Clear the DTC and retest. If no other DTCs are present, ignore this fault. If the DTC returns, suspect an internal fault with the Central Junction Box. Refer to the warranty policy and procedures manual if a module is suspect
B1D06-11	Left Turn Indicator - Circuit short to ground	<ul style="list-style-type: none"> • Left turn signal short circuit to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check left turn signal for short circuit to ground
B1D06-15	Left Turn Indicator - Circuit short to battery or open	<ul style="list-style-type: none"> • Left turn signal short circuit to power • Left turn signal high resistance, open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check left turn signal for short circuit high resistance, open circuit
B1D07-11	Right Turn Indicator - Circuit short to ground	<ul style="list-style-type: none"> • Right turn signal short circuit to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check right turn signal for short circuit to ground
B1D07-15	Right Turn Indicator - Circuit short to battery or open	<ul style="list-style-type: none"> • Right turn signal circuit short circuit to power • Right turn signal circuit high resistance, open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check right turn signal for short circuit high resistance, open circuit
B1D17-11	Battery Backed Sounder - Circuit short to ground	<ul style="list-style-type: none"> • Battery backed sounder inclination sensor control circuit - short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check battery backed sounder inclination sensor control circuit for short to ground
B1D18-11	Volumetric Sensor - Circuit short to ground	<ul style="list-style-type: none"> • Intrusion sensor module supply circuit - short to ground 	<ul style="list-style-type: none"> • Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check intrusion sensor module supply circuit for short to ground
B1D97-96	Tilt Sensor - Component internal failure	<ul style="list-style-type: none"> • Component internal failure 	<ul style="list-style-type: none"> • Suspect the battery backed sounder, check and install a new battery backed sounder as required
C1B14-11	Sensor Supply #1 - Circuit short to ground	<ul style="list-style-type: none"> • Short to ground 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test window sensor supply circuit for short to ground
C1B14-15	Sensor Supply #1 - Circuit short to battery or open	<ul style="list-style-type: none"> • Short to power or open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and test window sensor supply circuit for short to power or open circuit
C1B15-11	Sensor Supply Voltage A - Circuit short to ground	<ul style="list-style-type: none"> • Position sensor supply circuit short to ground • Position sensor fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the position sensor supply circuit between the rear door module and the window motor. If the problem persists, renew the window motor
C1B15-15	Sensor Supply Voltage A - Circuit short to battery or open	<ul style="list-style-type: none"> • Position sensor supply circuit short to power or open circuit • Position sensor fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the position sensor supply circuit between the rear door module and the window motor. If the problem persists, renew the window motor
P1624-13	Anti-Theft System - Circuit open	<ul style="list-style-type: none"> • RJB anti-theft signal circuit - open circuit 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check RJB anti-theft signal circuit for open circuit

DTC	Description	Possible Causes	Action
P254F-13	Engine Hood Switch Circuit/Open - Circuit open	<ul style="list-style-type: none"> Hood ajar switch signal circuit - open circuit 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check hood ajar switch signal circuit for open circuit
U0010-00	Medium Speed CAN Communication Bus - No sub type information	<ul style="list-style-type: none"> Medium speed CAN communication Bus 	<ul style="list-style-type: none"> Carry out network integrity test using manufacturer approved diagnostic system. Refer to electrical circuit diagrams and test Medium speed CAN network for open, short circuit and high resistance
U0140-00	Lost Communication With CJB - No sub type information	<ul style="list-style-type: none"> Logged when subscribed CAN message missing from CJB 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test power and ground supplies to Central Junction Box. Check CAN network between Driver Door Module and Central Junction Box. Carry out network integrity test using manufacturer approved diagnostic system
U0208-00	Lost Communication With Driver Seat Module (DSM) - No sub type information	<ul style="list-style-type: none"> Missing message 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and test power and ground supplies to Driver Seat Module. Check CAN network between Driver Door Module and Driver Seat Module. Carry out network integrity test using manufacturer approved diagnostic system
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> Car configuration file mismatch with vehicle specification 	 <p>NOTE: After updating the car configuration file, set the ignition to on and wait 30 seconds before clearing the DTCs</p> <ul style="list-style-type: none"> Using the manufacturer approved diagnostic system, check and up-date the car configuration file as necessary
U2002-24	Switch - Signal stuck high	<ul style="list-style-type: none"> Signal stuck high 	<ul style="list-style-type: none"> Clear DTC and re-test. If DTC remains, install a new passenger side window switch
U2004-24	Auxiliary Switch Pack - Signal stuck high	<ul style="list-style-type: none"> Signal stuck high Left or right rear door local switch pressed for longer than 20 seconds Switch circuit short to ground or power 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the left and right door switch circuits
U2010-11	Switch Illumination - Circuit short to ground	<ul style="list-style-type: none"> Switch illumination circuit short to ground 	<ul style="list-style-type: none"> Refer to electrical circuit diagrams and check the switch illumination circuit
U2012-08	Car Configuration Parameter(s) - Bus signal/message failures	<ul style="list-style-type: none"> Bus signal/message failures 	<ul style="list-style-type: none"> Cycle the ignition status and re-test. If DTC remains, re-configure the RJB using the manufacturer approved diagnostic system
U2013-24	Switch Pack - Signal stuck high	<ul style="list-style-type: none"> Signal stuck high 	<ul style="list-style-type: none"> Clear DTC and re-test. If DTC remains, install a new driver side window switch pack
U2014-44	Control Module Hardware - Data memory failure	<ul style="list-style-type: none"> Data Memory Failure 	<ul style="list-style-type: none"> Install a new DDM/PDM, Refer to the warranty policy and procedures manual if a module is suspect
U2100-00	Initial Configuration Not Complete - No sub type information	<ul style="list-style-type: none"> Driver/passenger door module is not configured correctly 	<ul style="list-style-type: none"> Re-configure the DDM/PDM using the manufacturer approved diagnostic system
U2101-00	Control Module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> Car configuration file mismatch with vehicle specification 	<ul style="list-style-type: none"> Re-configure the module using the manufacturer approved diagnostic system. Check the configuration of the Car Configuration File (CCF)

DTC	Description	Possible Causes	Action
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"><li>• Mis-match of battery voltage, of 2 volts or lower, between DDM/PDM and RJB	<ul style="list-style-type: none"><li>• Check vehicle battery and charging system. Refer to the relevant section in the workshop manual. Refer to the electrical circuit diagrams and check the power and ground supply circuits to both modules

Anti-Theft - Active - Anti-Theft Alarm Horn

Removal and Installation

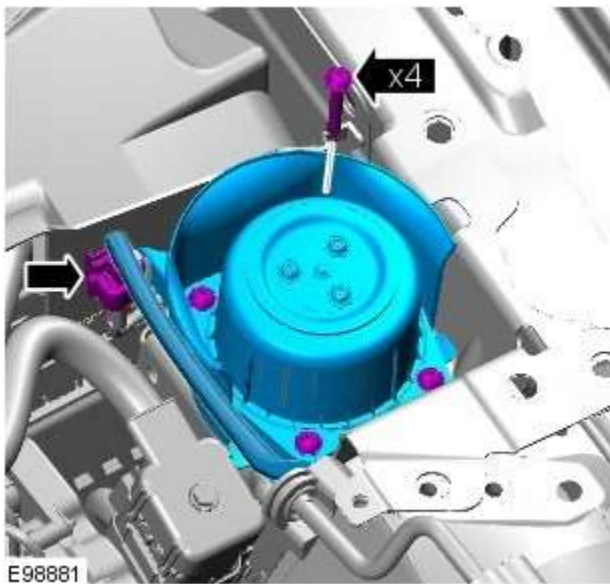
Removal

1. Remove the cowl vent screen.
For additional information, refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).

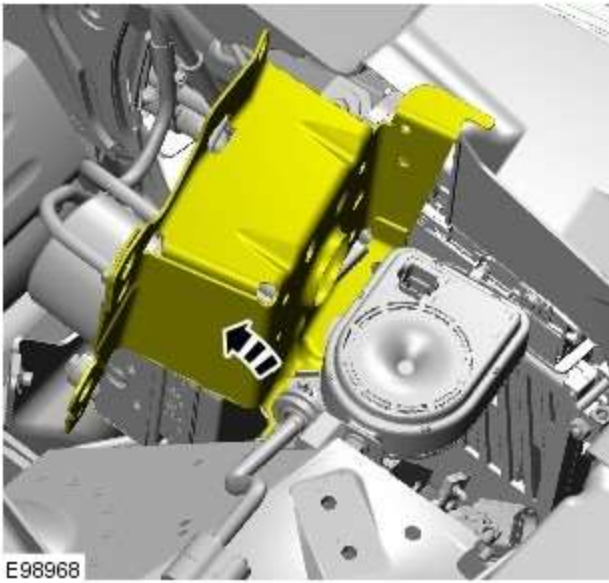


2. Remove the engine compartment brace.

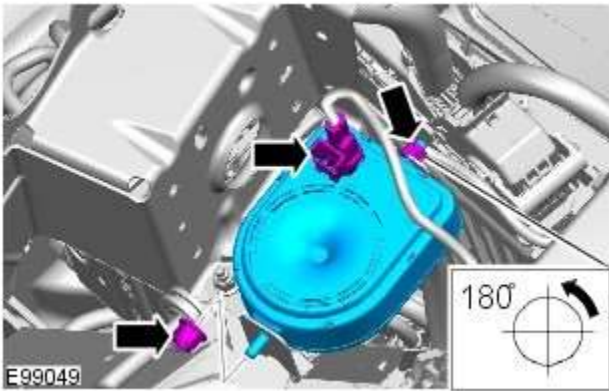
3. Remove the secondary bulkhead LH panel.
For additional information, refer to: [Secondary Bulkhead Panel LH - 3.0L NA V6 - AJ27](#) (501-02 Front End Body Panels, Removal and Installation).



4. Remove the pedestrian protection actuator.
 - Reposition the pedestrian protection hood actuator.

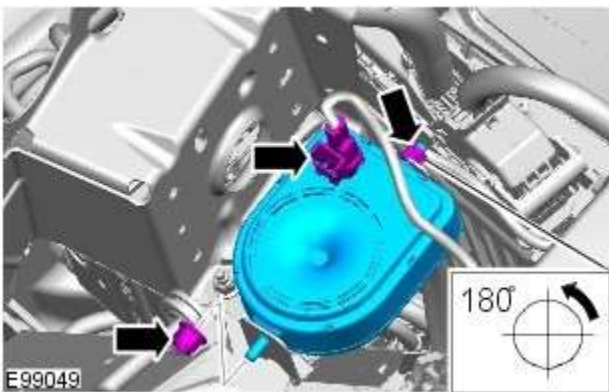


5. Release the pedestrian protection actuator bracket.

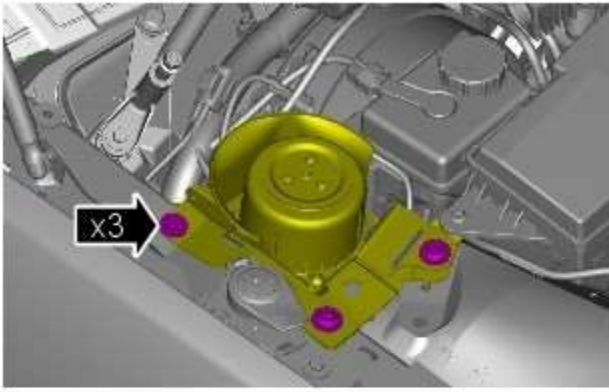


6. Remove the anti-theft alarm horn.

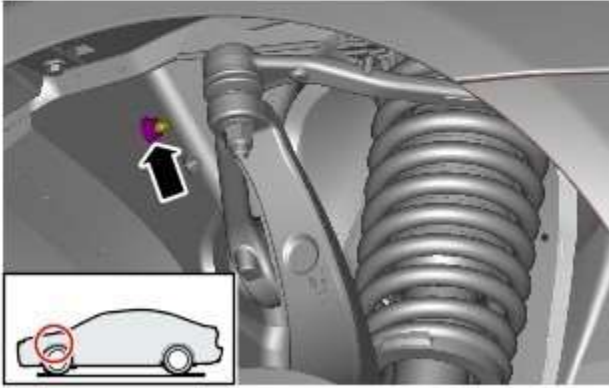
Installation



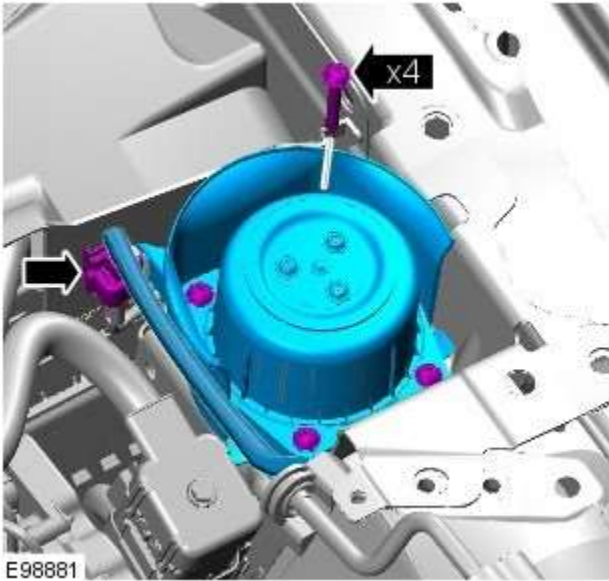
1. Install is the reverse of removal.
• Tighten to 7 Nm.



2. Tighten to 25 Nm.



E98989



3. Tighten to 8 Nm.

E98881

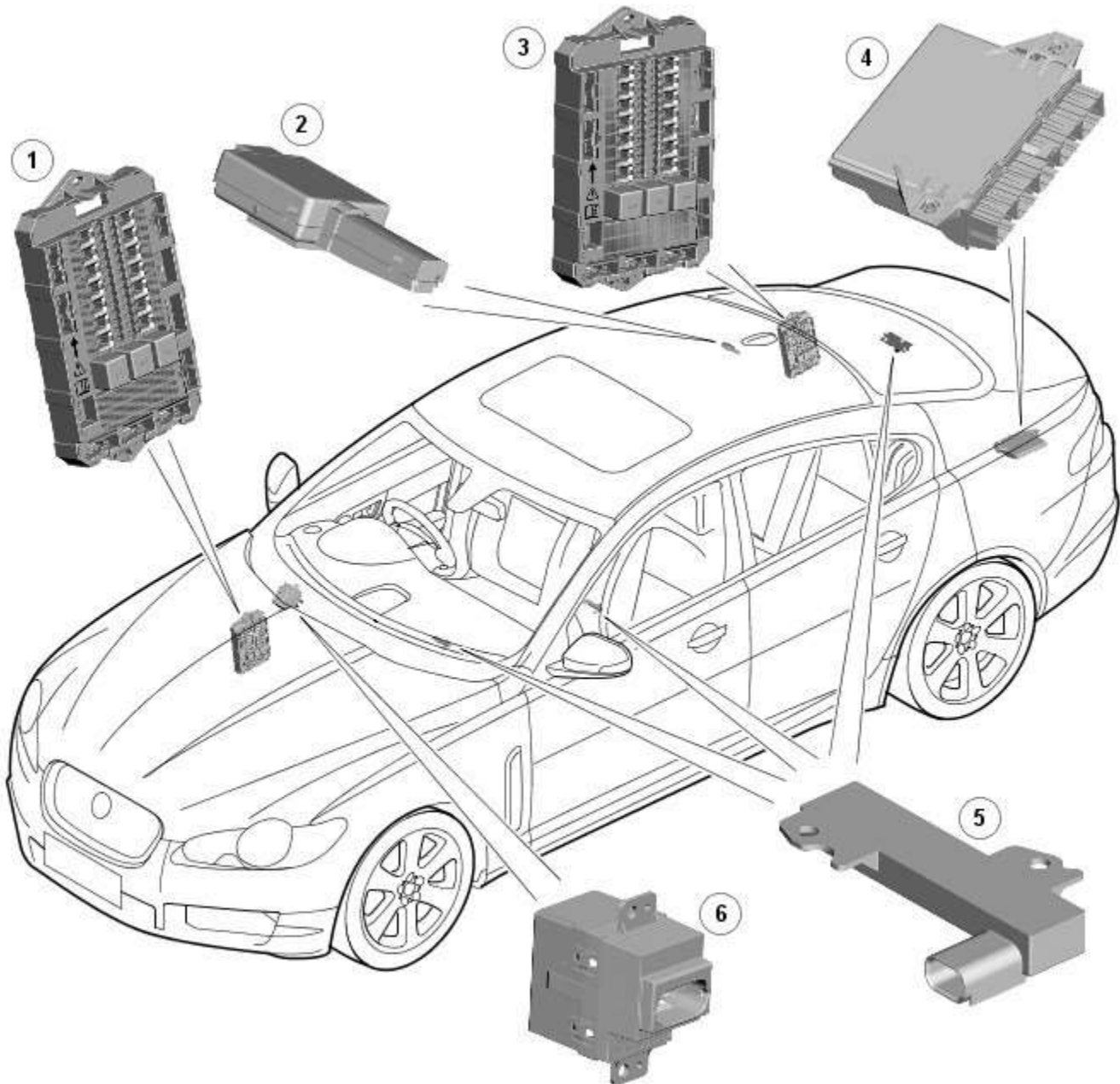


4. Tighten to 25 Nm.

Anti-Theft - Passive - Anti-Theft - Passive - Component Location

Description and Operation

Component Location



E94900

Item	Description
1	CJB (central junction box)
2	Radio frequency receiver
3	RJB (rear junction box)
4	Keyless vehicle module
5	Low frequency antennae (3 off)
6	Start control module

Anti-Theft - Passive - Anti-Theft - Passive - Overview

Description and Operation

Overview

The PATS (passive anti-theft system) prevents the vehicle's engine from being started by unauthorized persons.

Engine starting is prevented by inhibiting the fuel, engine (spark, injectors and crank) and ignition systems from operating.

This is achieved by using a uniquely coded Smart Key and an encoded data exchange between multiple control modules.

The system is automatic and requires no input from the driver.

The engine start system is initiated when the encoded data between the Smart Key and vehicle control modules is verified. The engine can then be started when the drive selector is in the 'Park' position, and the start/stop switch and the brake pedal are pressed simultaneously.

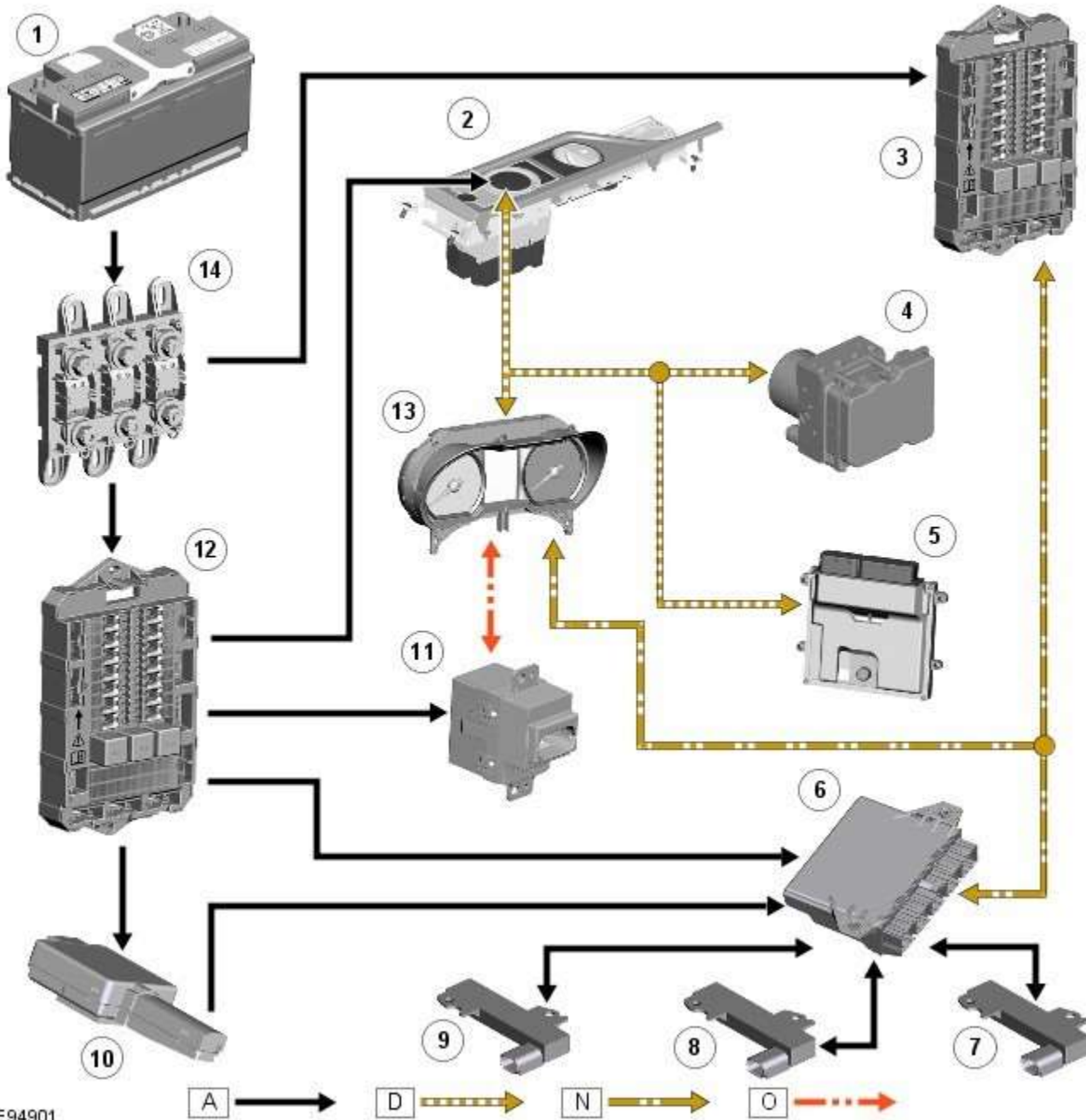
Anti-Theft - Passive - Anti-Theft - Passive - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **D** = High speed CAN; **N** = Medium speed CAN; **O** = LIN bus



E94901

Item	Description
1	Battery
2	Drive selector
3	RJB (rear junction box)
4	ABS (anti-lock brake system)
5	ECM (engine control module)
6	Keyless vehicle module

7	Low frequency antenna - front
8	Low frequency antenna - center
9	Low frequency antenna - rear
10	Radio frequency receiver
11	Start control module
12	CJB (central junction box)
13	Instrument cluster
14	Megafuse (250 amp)

System Operation

The passive start function prevents the vehicle from being started by unauthorized persons. It does this by immobilizing the ignition, fuel and engine crank functions. The system is automatic and requires no input from the driver.

At the request of the [CJB](#), the keyless vehicle module prompts each of the Low Frequency (LF) antennae to output a signal. When the Smart Key is in the vehicle cabin, it detects the LF signals and responds with a Radio Frequency (RF) data-identification signal back to the keyless vehicle module via the RF receiver.

If the data received matches that stored in the keyless vehicle module it continues the passive start process by communicating a 'Smart Key valid' signal to the CJB via the medium speed [CAN \(controller area network\)](#) bus.

Once the CJB receives the authorization and confirms a response with an internal calculation, it passes the result to the instrument cluster on the medium speed CAN bus.

Before the instrument cluster sends a mobilization signal to the [ECM](#) it will exchange encrypted data with:

- The electric steering lock mechanism to authorize unlocking the steering column.
- The [RJB](#) to authorize fuel pump operation. Once the RJB receives the authorization and confirms the response with an internal calculation, it will enable the [FPDM \(fuel pump driver module\)](#).
- The CJB to authorize the ignition status. If the drive selector is in the park position and the driver presses the brake pedal and simultaneously presses the start/stop switch, the CJB interprets this as an engine crank request. Before the engine crank request is allowed, the CJB compares a brake pressure signal received from the [ABS](#) module. The brake pressure signal is compared to an internally stored threshold value within the CJB. If the signal is greater than the stored threshold value, a crank request signal is sent to the ECM on the high speed CAN bus.

Once these factors have been confirmed, and the vehicle is in 'Park', the engine can be started by pressing the brake pedal and the Stop/Start button simultaneously.

NOTES:



If the keyless vehicle module fails to locate the Smart Key, the message 'SMART KEY NOT FOUND PLEASE INSERT IN SLOT' will appear in the instrument cluster message center. When inserted the start control module will read the transponder within the Smart Key. If the transponder identification is valid, authorization will be transmitted to the instrument cluster on the [LIN \(local interconnect network\)](#) bus.



When the vehicle is delivered from the factory the passive start function is inhibited. In this condition the vehicle can only be started by placing the Smart Key in the start control module. The system should be switched on during the Pre-Delivery Inspection (PDI) using the Jaguar approved diagnostic system. For additional information, refer to the PDI Manual.

To ensure optimum long term reliability of the smart key the battery must be replaced with a brand new, unused battery. If a used battery is installed the "SMART KEY BATTERY LOW" message may not be cleared. To avoid contamination of the contacts the battery should be removed from its packaging and installed into the smart key while wearing gloves. To confirm that the replacement battery is working correctly press the unlock button twice while holding the smart key outside the vehicle, then enter the vehicle with the smart key, press the start button and confirm that the "SMART KEY BATTERY LOW" message is not displayed.

Component Description

Start Control Module

The start control module is used if the keyless vehicle module is unable to authorise the Smart Key.

If the keyless vehicle module is unable to identify the Smart Key, for example if the Smart Key battery voltage is low or there is local RF interference, the transponder within the Smart Key can be read in the conventional manner. The driver will be alerted to this by a chime and a message in the instrument cluster message center 'SMART KEY NOT FOUND PLEASE INSERT IN SLOT'.

Once inserted the start control module will read the transponder within the Smart Key. If the transponder identification is valid, authorization will be transmitted to the instrument cluster on the [LIN](#) bus.



NOTE: Inserting the Smart Key into the start control module will not charge the Smart Key battery. The battery is non-chargeable and must be replaced if defective.

A message 'REMOVE SMART KEY' will be displayed if the Smart Key is still in the start control module and the driver's door is opened.

Low Frequency Antenna

Three Low Frequency (LF) antennae for the passive start system are positioned in specific locations in the vehicle; refer to Component Location graphic.



NOTE: On vehicles with the passive entry system, five additional antennae are used; one integrated into the rear bumper and one in each door handle assembly. These are only used by the passive entry system and have no function in the passive start system.

The keyless vehicle module transmits an LF signal via the antennae which is received by the Smart Key. The Smart Key then responds by transmitting a Radio Frequency (RF) signal which is received by the RF receiver and passed to the keyless vehicle module for authorization.

Keyless Vehicle Module

The keyless vehicle module controls signal transmissions to and from the Smart Key and provides authorization to allow the vehicle to be started. The module has a medium speed CAN connection to the CJB for authorizing vehicle starting.

Radio Frequency Receiver

The Radio Frequency (RF) receiver transmission is received from the Smart Key to enable key identification.

Anti-Theft - Passive - Anti-Theft - Passive

Diagnosis and Testing

Principle of Operation

For a detailed description of the Anti-Theft - Passive system, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (419-01B Anti-Theft - Passive)

[Anti-Theft - Passive](#) (Description and Operation),
[Anti-Theft - Passive](#) (Description and Operation),
[Anti-Theft - Passive](#) (Description and Operation).

Inspection and Verification

Anti-theft - Passive

The best method to confirm the correct operation of the Passive Anti-Theft System (PATS) is to check the LED (located in the center of the instrument panel). The LED should illuminate solid for 3 seconds, when the ignition status is set to ON, and then extinguish. This validates all PATS functions (i.e. the key transponder matches a stored key code, the challenge/response sequence between the respective modules was successful resulting in the EMS being enabled).

Ignition fails to operate

Check that the smart key is located within the vehicle interior, and that it is the correct one for the vehicle.

Insert the smart key into the start control unit (located at out board side of driver instrument panel lower panel), this is an alternative method to allow Ignition On/Engine Start.



Check that the start button circuit to the CJB is not open circuit or short circuit to power.

Check that the Low Speed CAN network is not malfunctioning, i.e. open circuit or short circuit. This would mean that the remote keyless entry module, Central Junction Box (CJB) and instrument cluster would be unable to communicate.

Engine fails to crank

If a PATS fault is detected, the LED will flash for 60 seconds at 4Hz with a 50% duty cycle. At the end of this period, the LED will flash a 2 digit code; this code is repeated 10 times. The meaning of these fault codes along with the frequency of flashing is given in the accompanying table. As a general rule a fault code of 16 or less will cause the vehicle not to crank. Additionally, the manufacturer approved diagnostic system should be used to check the instrument cluster, CJB & ECM for Diagnostic Trouble Codes (DTCs).

One potential occurrence for failing to crank could be due to the P & N start switch (input to the ECM).

Check the Crank Request output from the CJB to ECM is not short circuit to ground or open circuit.

Check the Starter Relay circuit.



NOTE: On petrol engine variants, due to Smart Start, both sides of Relay Coil are switched directly from ECM (If conditions correct). On diesel engine variants the low side only is switched directly from the ECM.

Check that the Steering Column Lock correctly operates and the steering wheel can turn freely.

Check that the High Speed CAN network is not malfunctioning, i.e. the CAN circuit is open or short circuit. This would mean that the instrument cluster and ECM would be unable to communicate resulting in no Challenge being performed to enable the ECM. This would be supported by LED Flash Code 24, see PATS Fault Code Table.

Also check the CAN network between the ABS module and the CJB. The CJB uses the CAN_BrakePressureTMC signal to determine if the brake pedal has been pressed in order to allow an engine crank. The CJB uses a value of 0x05, if the CJB sees a value less than this, it will not enable the Crank Request Output.

Engine cranks but will not start

If the Engine is cranking it means that the ECM has passed the authorisation required with the Instrument Cluster. If this authorisation failed, the ECM would not engage the starter relay. This could be confirmed by verifying the PATS LED prove out (illuminated solid for 3 seconds) or by reading DTCs from the instrument cluster and ECM.

In this case, the fuel pump circuit should be verified. The Fuel Pump Delivery Module (FPDM), which is supplied via the RJB (authentication required with the instrument cluster) and controlled by the ECM, supplies the fuel pump.

In all cases of suspected non-start issues, the most logical failure modes should be eliminated first. i.e.

1. Check all relevant supplies and grounds to the relevant modules listed herein.
2. Note any unusual behaviour from other systems/functionality.
3. Note any functions that are not operating as expected.

PATS Fault Codes

For the various PATS modes/faults listed in the table, the instrument cluster will store a DTC and indicate this to the customer during the detection period defined in the 'when logged' column, by illuminating the indicator as described for 60 seconds and then flashing the LED 10 times as appropriate. The indication will stop immediately the ignition status is set to OFF any time during the fault indication sequence. Up to 4 DTCs could be stored per key read sequence (1-10 read attempts). No DTCs will be stored until all retry attempts are complete. Only the highest priority fault code will be flashed.

To determine the fault code from the LED: The LED will flash initially ten times with 1.5 seconds between. The LED will remain OFF for 2.5 seconds then flash a number of times with 0.5 seconds between (the number of times the LED flashes represents the first digit of the code), the LED will remain OFF for 1.5 seconds then flash a number of times with 1.5 seconds between (the number of times the LED flashes represents the second digit of the code).

The PATS LED will be commanded on as shown under 'indication'. Normal PATS operations are complete within 400ms of the ignition switch transition from OFF to ON or START, worst case for ECM communication problems will be less than 2 seconds. If PATS is not complete during the 2 seconds the ECM will terminate PATS and await the next ignition ON or START event. PATS faults will be indicated via the LED as soon as possible and will terminate the LED prove out. At ignition OFF all previous flashing will cease and the perimeter anti-theft system will control the LED when the vehicle is locked and armed.

PATS Fault Code Table

Mode of Operation/Fault	When Logged	Ignition Status	DTC	LED Fault Code	Indication
Prove out	N/A	Transition from OFF to ON	N/A	N/A	3 Seconds of steady illumination
Perimeter Anti-theft Control	N/A	OFF - Vehicle locked and armed	N/A	N/A	Off or 0.5Hz flashing at 5% duty cycle ± 20% until Off
Start Control Unit already programmed	Key Insert	Any	B1B0105	N/A	No Indication
Start Control Unit status = invalid response	Key Insert	Any	B1B0167	N/A	No Indication
Start Control Unit programming error	Key Insert	Any	B1B0151	N/A	No Indication
Start Control Unit challenge response error	Key Insert	OFF	B1B0162	N/A	No Indication
Key Programming timer expired or Key Auth Timer expired	Key Insert	Any	B1B0187	N/A	No Indication
Transponder challenge response error	Key Insert	Any	B1B0164	N/A	No Indication
Transponder keys stored below minimum number required	B&A/Dealer	Any	B1B0100	N/A	No Indication
Transponder not programmed	B&A/Dealer	Any	B1B0155	N/A	No Indication
If the instrument cluster sends a 'theft' key status to the ECM or the ECM returns a status message containing the data 'Disabled/Theft', the instrument cluster will set this DTC	EMS CAN communication	OFF to ON	B1B3364	16	60 seconds of 4Hz flashing at 50% duty cycle followed by fault code 16 flashing 10 times

Mode of Operation/Fault	When Logged	Ignition Status	DTC	LED Fault Code	Indication
During manufacturing a Target ID is transferred from the ECM when requested by the instrument cluster. The instrument cluster stores this unique vehicle number in EEPROM. If this ID fails to store in EEPROM correctly, the instrument cluster will set this DTC	B&A/Dealer	OFF to ON	B1B3305	22	60 seconds of steady indication followed by fault code 22 flashing 10 times
If the status message received from the ECM contains the data challenge response error, the instrument cluster will set this DTC	Challenge/Response	OFF to ON	B1B3362	23	60 seconds of steady indication followed by fault code 23 flashing 10 times
After the instrument cluster has transmitted its first PATS idle message, it will start a 2 second timer running. If the PATS sequence does not complete (Cluster received the Enable msg) within this time period the instrument cluster will set this DTC	Idle message missing	OFF to ON	B1B3387	24	60 seconds of steady indication followed by fault code 24 flashing 10 times

1. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
2. If the cause is not visually evident, verify the symptom and refer to the manufacturer approved diagnostic system.

Telematics - Telematics

Diagnosis and Testing

The complexity of the electronics involved with the JaguarNet system, of which the GPS antenna and navigation display are parts, and the multiplexed communication network which are connected to it preclude the use of workshop general electrical test equipment. Therefore, reference should be made to the approved Jaguar diagnostic system for detailed instructions on testing the VEMS unit.

The approved Jaguar diagnostic system tests and analyses all functions of the VEMS and the various systems affected by it.

Where a fault is indicated, some basic diagnostic methods may be necessary to confirm that connections are good and that wiring is not damaged before installing a new component.

Navigation System - Navigation System

Diagnosis and Testing

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage, water ingress and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Navigation system DVD player Mechanism 	<ul style="list-style-type: none"> • Navigation system display • Navigation system module • GPS antenna • Wiring harness for damage and corrosion • ABS Module • Electrical connector(s) • Audio unit

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

Symptom Chart

Symptom	Possible Cause	Action
Poor satellite reception	<ul style="list-style-type: none"> • Electrical harness open/short circuit, dis-connected • Component failure • No reception from satellite 	GO to Pinpoint Test A.
Map disc will not insert/eject	<ul style="list-style-type: none"> • Electrical harness open/short circuit, dis-connected • Component failure • Map disc failure 	GO to Pinpoint Test B.
Black screen (navigation map screen does not display)	<ul style="list-style-type: none"> • Electrical harness open/short circuit, dis-connected • Component failure • GVIF cable 	GO to Pinpoint Test C.
Navigation map screen color is abnormal	<ul style="list-style-type: none"> • Electrical harness open/short circuit, dis-connected • Component failure • GVIF cable 	GO to Pinpoint Test D.

Symptom	Possible Cause	Action
Vehicle's current position mark turns independently	<ul style="list-style-type: none"> Electrical harness open/short circuit, dis-connected Component failure Vehicle on a turntable in a parking building 	GO to Pinpoint Test E.
Car current position not stable	<ul style="list-style-type: none"> Electrical harness open/short circuit, dis-connected Component failure 	GO to Pinpoint Test E.
Map display is incomplete	<ul style="list-style-type: none"> Map disc contaminated/damaged Electrical harness open/short circuit, dis-connected Incorrect market map disc Component failure 	GO to Pinpoint Test G.
No navigation voice guidance	<ul style="list-style-type: none"> Voice guidance soft key set to OFF position Volume level set too low Component failure 	GO to Pinpoint Test H.
No response to pressing navigation menu	<ul style="list-style-type: none"> Interruption during map disc update Electrical harness open/short circuit, dis-connected Incorrect Navigation Control Module (NCM) installed Incorrect car configuration data received 	GO to Pinpoint Test I.
'NO DVD PLEASE INSERT MAP DVD' message is displayed	<ul style="list-style-type: none"> A disc other than the map disc is inserted 	Insert the correct map disc
'UNABLE TO READ DATA CONSULT YOUR DEALER' message is displayed	<ul style="list-style-type: none"> DVD player abnormality 	Check and install a new Navigation Control Module (NCM) as required. Refer to the new module/component installation note at top of DTC Index.
'UNABLE TO READ DATA TEMPERATURE IS TOO HIGH' message is displayed	<ul style="list-style-type: none"> Operating temperature has been exceeded Navigation Control Module (NCM) internal temperature is high 	Move the vehicle to a cool location, and turn the engine OFF. Wait for a while, then verify conditions again. If the temperature around the Navigation Control Module (NCM) is high, take measures to lower temperature
'UNABLE TO READ DVD CORRECTLY CHECK IF THE DVD IS DAMAGED OR DIRTY' message is displayed	<ul style="list-style-type: none"> Check map disc for contamination, deformation, cracks, scratches or non-genuine disc 	Clean the map disc and retest, replace the map disc
'UNABLE TO READ DATA CHECK IF MAP DVD IS CORRECT' message is displayed	<ul style="list-style-type: none"> Incorrect DVD map disc is inserted 	Insert a map disc with the correct part number

Pinpoint Tests

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval Program is in operation, prior to the installation of a new module/component.



Navigation Diagnostic Screen Access

1. With the vehicle at rest, place the ignition switch in either "ACC", "ON", or start the engine.
2. On the "Menu" screen, press the top center of the screen for more than three seconds.
3. Enter the PIN code, and then touch "OK". 660: Diagnosis Menu screen 661: System Check screen (DTC code verification screen) 662: GPS Information screen.
4. The diagnostics screen will be displayed.

PINPOINT TEST A : POOR SATELLITE RECEPTION

PINPOINT TEST B : MAP DISC WILL NOT INSERT/EJECT

NOTE: Ensure the parking brake is applied, and ignition status is set to Auxiliary or ON.

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK NAVIGATION DISC SLOT SHUTTER	
	1 Check the navigation map disc slot shutter is open.
	Is the navigation map disc slot shutter is open? Yes GO to B2. No Open the map disc slot shutter. GO to B2.
B2: CHECK NAVIGATION MAP DISC WILL INSERT/EJECT	
	1 Check that it is possible to insert/eject navigation map disc.
	Is it possible to insert/eject navigation map disc? Yes Operation is normal. No Refer to the electrical circuit diagrams and check power supply and ground connections to the Navigation Control Module (NCM). If power supply and ground connections are good, install a new Navigation Control Module (NCM) as required. Refer to the new module/component installation note at top of DTC Index.

PINPOINT TEST C : BLACK SCREEN (NAVIGATION MAP SCREEN DOES NOT DISPLAY)

NOTE: Ensure the parking brake is applied, and ignition status is set to Auxiliary or ON.

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK SCREEN SAVER FUNCTION	
	1 Check the screen saver function operation.
	Does the screen saver function operate? Yes Press the display panel button. GO to C2. No GO to C2.
C2: CHECK DISPLAY BACKLIGHT	
	1 Check the display backlight operation.
	Does the display backlight operate? Yes Refer to the electrical circuit diagrams and check the GVIF cable between Navigation Control Module (NCM) and HLDF screen is properly connected. If the GVIF cable between Navigation Control Module (NCM) and HLDF screen is properly connected, check and install a new GVIF cable as required. Refer to the new module/component installation note at top of DTC Index. If the GVIF cable between Navigation Control Module (NCM) and HLDF screen is properly connected and NOT damaged, check and install a new Navigation Control Module (NCM) as required. Refer to the new module/component installation note at top of DTC Index. Re-check the system. No Check the HLDF display. Re-check the system.

PINPOINT TEST D : NAVIGATION MAP SCREEN COLOUR IS ABNORMAL

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: COLOUR BAR CHECK	
	1 Carry out the display diagnostics 'colour bar check' (PIN code 660).
	Are the results of the display diagnostics 'colour bar check' normal? Yes Check the HLDF display. Re-check the system. No Check the condition of the map disc for dirt or scratches. Refer to the electrical circuit diagrams and check the GVIF cable between Navigation Control Module (NCM) and HLDF screen is properly connected. If the GVIF cable between Navigation Control Module (NCM) and HLDF screen is properly connected, check and install a new GVIF cable as required. Refer to the new module/component installation note at top of DTC Index. If the GVIF cable between Navigation Control Module (NCM) and HLDF screen is properly connected and NOT damaged, check and install a new Navigation Control Module (NCM) as required. Refer to the new

module/component installation note at top of DTC Index.
Re-check the system.

PINPOINT TEST E : VEHICLE'S CURRENT POSITION MARK TURNS INDEPENDENTLY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: VEHICLES CURRENT POSITION MARK TURNS INDEPENDENTLY	
1	Determine if the ignition status was turned to Auxiliary or On, while the vehicle was in motion with steering turned such as after an engine stall.
	Was ignition status set to Auxiliary or On? Yes The angular speed of the vehicle at the time of the ignition status change will be logged as the standard value. To re-set the standard value, turn ignition status to 'OFF' then to 'Auxiliary' or 'On' with the vehicle stationary. Re-test the vehicle. No Check and install a new Navigation Control Module (NCM) as required. Refer to the new module/component installation note at top of DTC Index.

PINPOINT TEST F : CAR CURRENT POSITION NOT STABLE


TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: SYSTEM CHECK FOR DTCS	
1	Check the system for DTCS which may be logged.
	Are any system DTCS logged? Yes Carry out repair actions to correct the DTCS logged. Re-check the system for car current position not stable. No GO to F2.
F2: VEHICLE SPEED INPUT CHECK	
1	Select Vehicle Sensor from the navigation diagnostic menu screen (PIN code 660), check Current speed. The current speed must match the speedometer.
	From the Vehicle Sensor screen, does the current speed must match the speedometer? Yes GO to F3. No Carry out MOST ring circuit checks. Check the Anti-Lock Brake System Module for related DTCS and refer to the relevant DTC Index. Carry out network integrity tests using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and check CAN circuits if required. Repair wiring harness as required.
F3: CHECK NUMBER OF SATELLITES	
1	From the navigation diagnostic GPS information screen (PIN code 662), check the number of satellites displayed.
	Is the number of satellites displayed on the screen 0? Yes Carry out pinpoint test A "Poor Satellite Reception" No GO to F4.
F4: CHECK IF SYMPTOMS ARE OCCURRING IN PARTICULAR LOCATIONS	
1	Confirm if the 'car current position not stable' symptom is occurring in particular locations.
	Is the 'car current position not stable' symptom occurring in particular locations? Yes Signal reflections from buildings or a particular location may be responsible. No Carry out pinpoint test A "Poor Satellite Reception"

PINPOINT TEST G : MAP DISPLAY IS INCOMPLETE


TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: SYSTEM CHECK FOR DTCS	
1	Check the system for DTCS which may be logged.
	Are any system DTCS logged? Yes Carry out repair actions to correct the DTCS logged. Re-check the system for 'Map display is incomplete'. No GO to G2.
G2: CHECK MAP DISC	
1	Check map disc for contamination, deformation, cracks, scratches or non-genuine disc and correct market.

	<p>Has a fault been identified with the map disc?</p> <p>Yes Replace the map disc. Re-check the system for 'Map display is incomplete'.</p> <p>No Check and install a new Navigation Control Module (NCM) as required. Refer to the new module/component installation note at top of DTC Index.</p>
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PINPOINT TEST H : NO NAVIGATION VOICE GUIDANCE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: CHECK ALL AUDIO OUTPUT SYSTEMS	
	1 Check audio output across all systems.
	Is there sound output across all systems?
	Yes GO to H2.
	No GO to H3.
H2: CHECK VOICE GUIDANCE SOFT KEY	
	1 Check navigation screen menu, voice guidance soft key is not set to OFF position.
	Is the voice guidance soft key set to OFF position?
	Yes Set the voice guidance soft key to ON position. Re-check the system
	No GO to H3.
H3: VOLUME LEVEL CHECK	
	1 Check the volume level is not set too low.
	Is the volume level set too low?
	Yes Increase the volume level and re-test vehicle.
	No Refer to electrical circuit diagrams and check integrity of amplifier and speaker system wiring harness and connectors. GO to H4.
H4: NAVIGATION VOICE ONLY NOT AUDIBLE	
	 NOTE: Only the navigation voice cannot be heard.
	1 Press the 'Navigation voice repeat' soft key.
	After the navigation voice repeat soft key is pressed, can voice still not be heard even though it has become louder?
	Yes Check and install a new Navigation Control Module (NCM) as required. Refer to the new module/component installation note at top of DTC Index.
	No Operation is normal.

PINPOINT TEST I : NO RESPONSE TO PRESSING NAVIGATION MENU

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
I1: NO RESPONSE TO PRESSING NAVIGATION MENU	
	 NOTE: 15 minutes are required for the program to update. If the engine is accidentally turned OFF, start the engine again, and wait for 15 minutes.
	1 Check that the engine was not turned 'OFF' during a navigation software update.
	Was the engine turned 'OFF' during a navigation software update?
	Yes Check the correct map disc is inserted into the Navigation Control Module (NCM). Start the engine and allow to idle for 15 minutesTurn the engine 'OFF', and then start the engine again.Verify that the navigation screen displays. Navigation was in the program update mode.
	No GO to I3.
I2: NO RESPONSE TO PRESSING NAVIGATION MENU	
	1 Check that the engine was not turned 'OFF' after inserting the new map disc.
	Was the engine turned 'OFF' after inserting the new map disc?
	Yes Check the correct map disc is inserted into the Navigation Control Module (NCM). Start the engine and allow to idle for 15 minutesTurn the engine 'OFF', and then start the engine again.
	No GO to I3.
I3: NO RESPONSE TO PRESSING NAVIGATION MENU	

	1 Check the "Loading" button on the navigation diagnostics screen (PIN code 660) has been pressed, and "YES" has been selected.
	Has the "Loading" button on the navigation diagnostics screen been pressed, and has "YES" been selected? Yes Check the correct map disc is inserted into the Navigation Control Module (NCM). Start the engine and allow to idle for 15 minutes. Turn the engine 'OFF', and then start the engine again. No Refer to electrical circuit diagrams and check integrity of navigation system wiring harness and connectors. GO to 14.
I4: SYSTEM CHECK FOR DTCs	
	1 Check the system for DTCs which may be logged.
	Is DTC U300055 logged? Yes Using the manufacturer approved diagnostic system check/amend the Car Configuration File parameter in block 2, byte 127 to match vehicle market/specification. If the DTC remains check navigation system module part number and ensure the correct component is installed to vehicle market/specification. No GO to 15.
I5: NO RESPONSE TO PRESSING NAVIGATION MENU	
	1 Turn the engine 'OFF', wait for a moment, and then turn the engine 'ON' again.
	Does the navigation screen fail to display even if the navigation button is pressed? Yes Check the HLDF is installed correctly. Check the Navigation Control Module (NCM) is installed correctly. No Operation is normal.

DTC Index

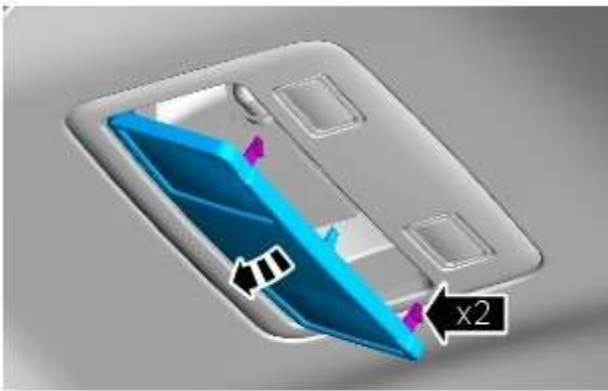
For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Navigation Control Module (NCM) (100-00, Description and Operation).

Navigation System - Navigation System Antenna

Removal and Installation

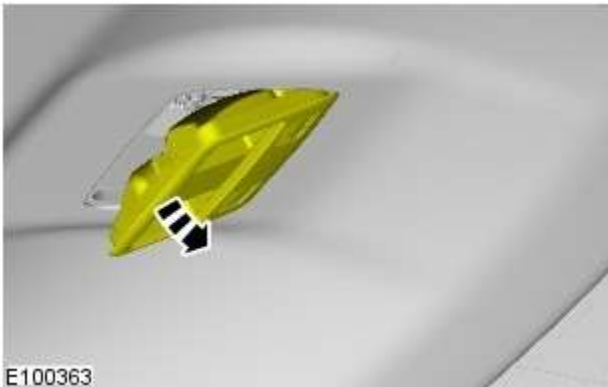
Removal

1. Remove the interior lamp lens.

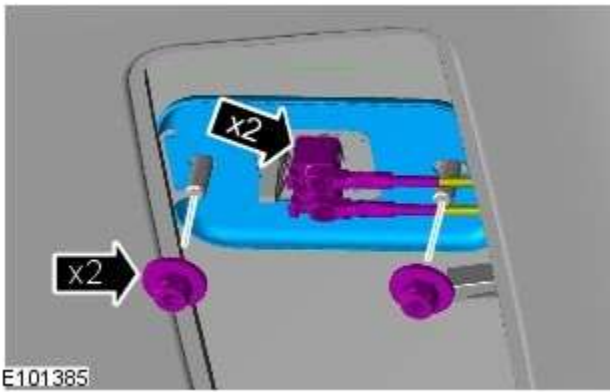


E99917

2. Release the interior lamp.



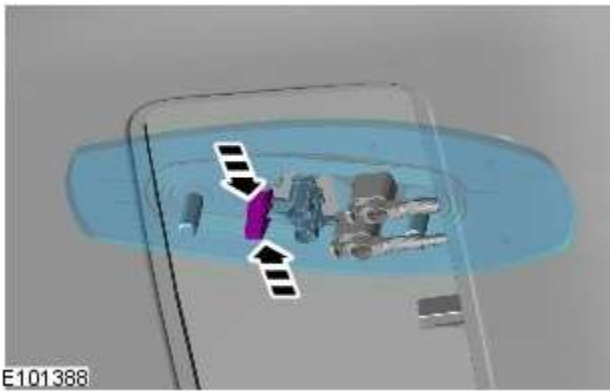
E100363



3. **CAUTION:** Make sure that the latch is pressed before disconnecting the electrical connector.

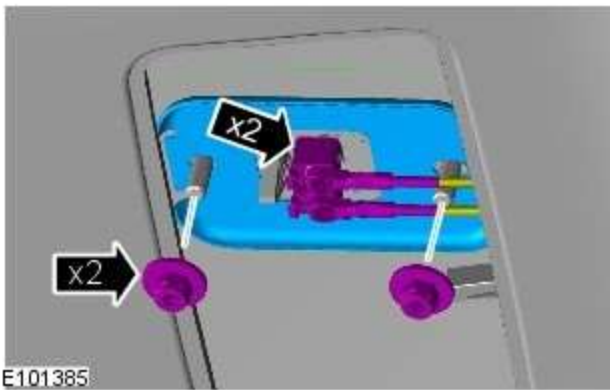
Release and disconnect the 2 electrical connectors.

- Remove the 2 nuts.
- Remove the reinforcement plate.



4. Remove the global positioning sensor (GPS) antenna.

Installation



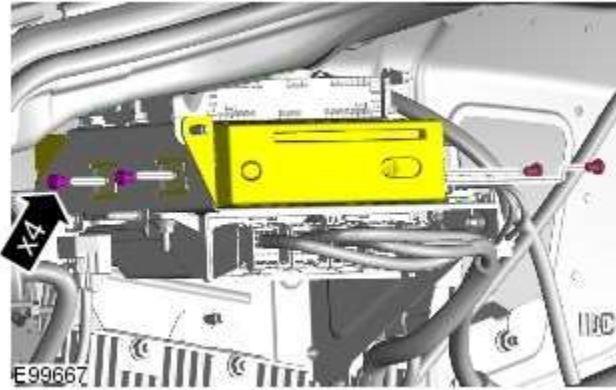
1. To install, reverse the removal procedure.
 - Tighten to 6 Nm.

Navigation System - Navigation System Module

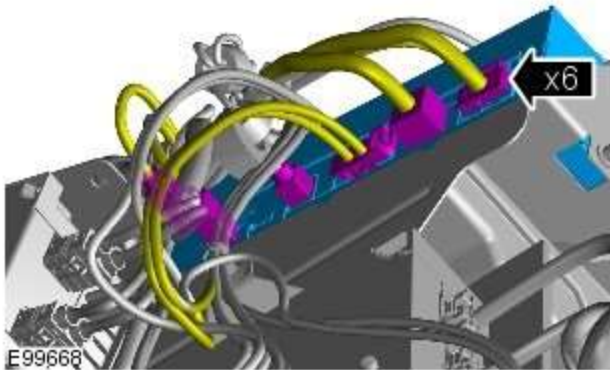
Removal and Installation

Removal

1. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Remove the LH luggage compartment side trim panel.
For additional information, refer to: [Loadspace Trim Panel LH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Release the navigation system module.

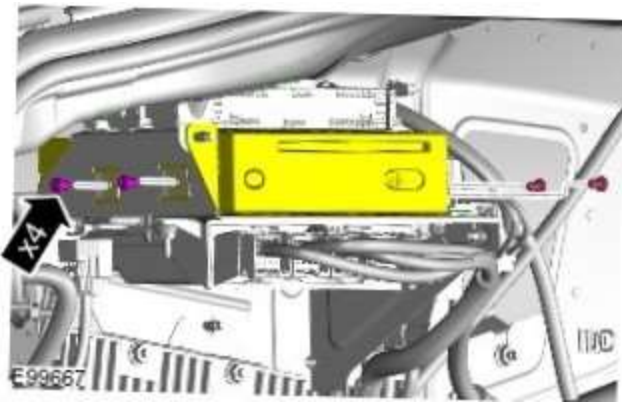


4. Remove the navigation system module.



Installation

1. Install is the reverse of removal.



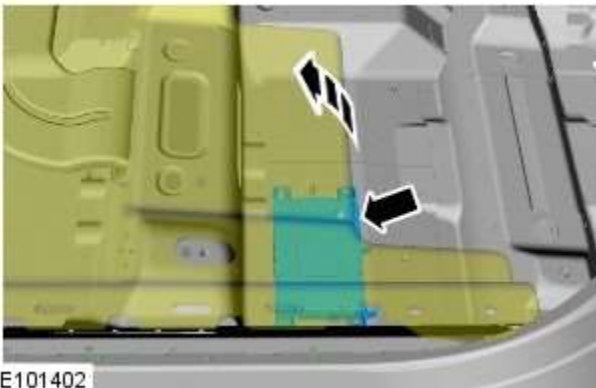
2. Tighten to 10 Nm.

Cellular Phone - Bluetooth Module

Removal and Installation

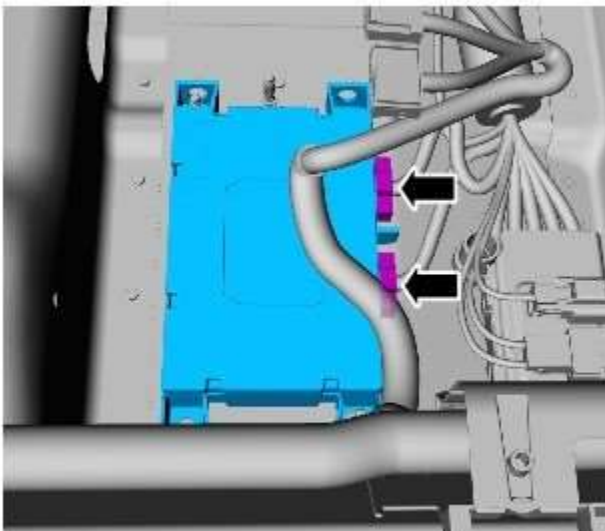
Removal

1. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Remove the left hand front seat.
3. Lift the carpet for access.



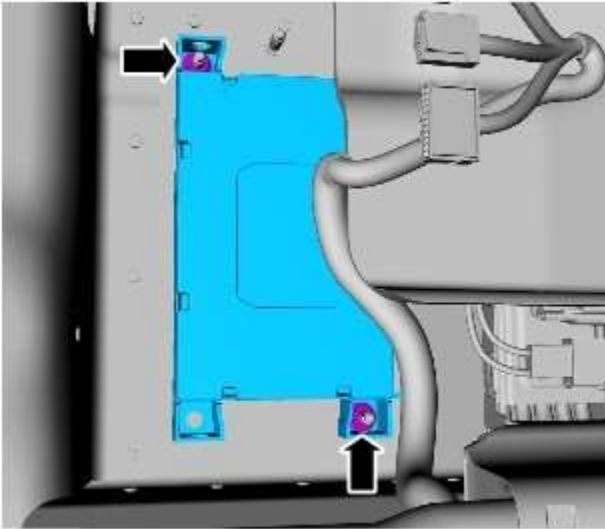
E101402

4. Disconnect the 2 electrical connectors.



E101404

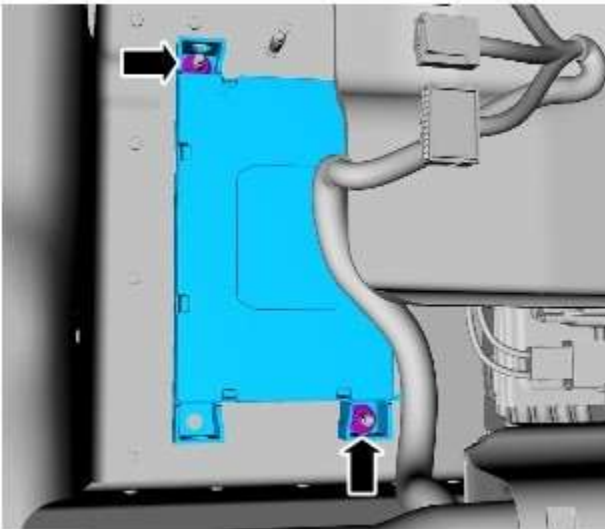
5. Remove the bluetooth module.



E101403

Installation

1. Install is the reverse of removal.
 - Tighten to 10 Nm.



E101403

Multifunction Electronic Modules -

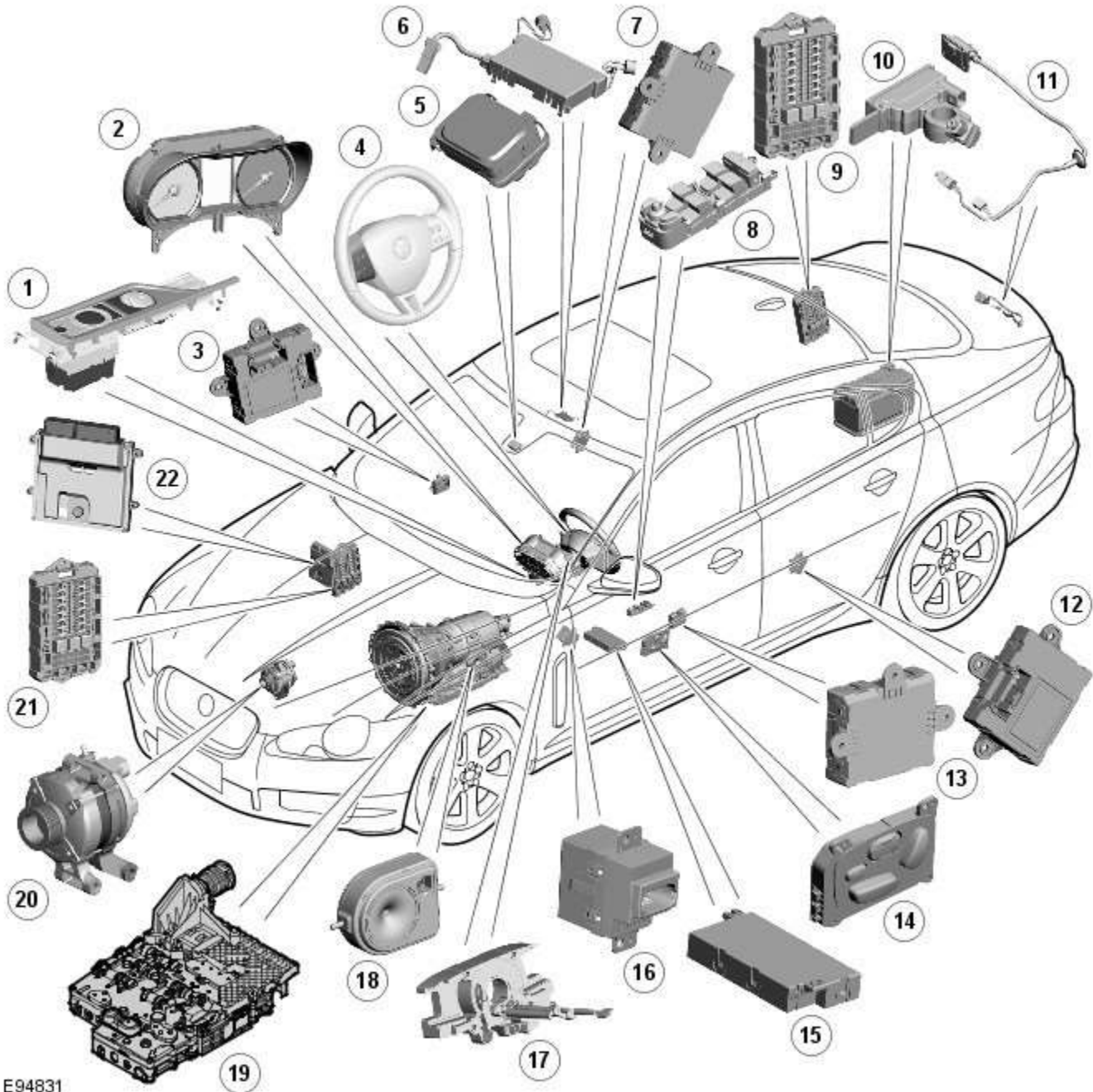
Torque Specifications

Description	Nm	lb-ft	lb-in
Rear electronic module retaining bolts	10	7	89
Multifunction voice activated module retaining bolts	10	7	89
Front electronic module retaining bolts	10	7	89

Multifunction Electronic Modules - Module Controlled Functions - Component Location

Description and Operation

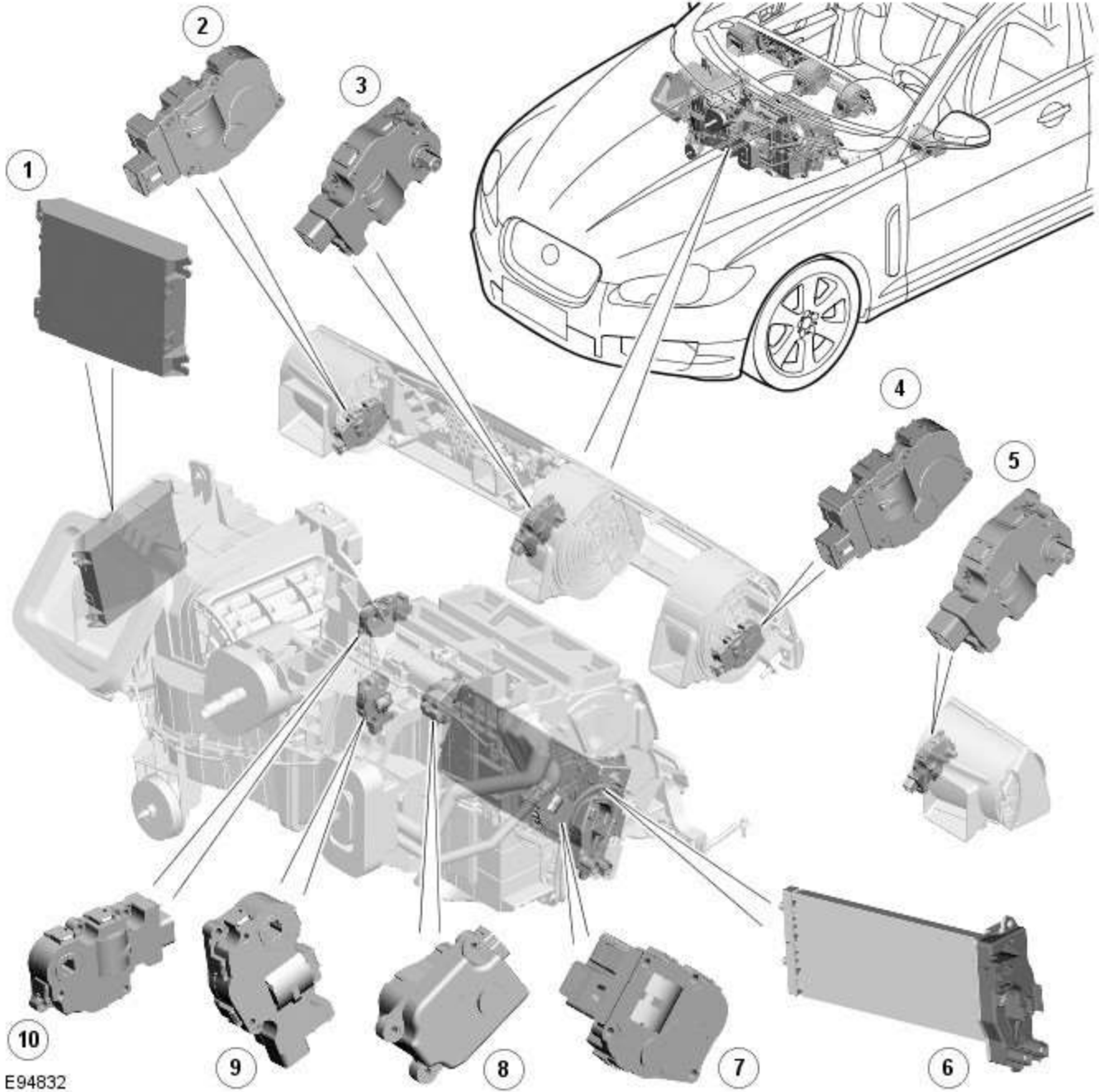
COMPONENT LOCATION - LIN BUS (Sheet 1 of 2)



E94831

Item	Description
	NOTE: LHD (left-hand drive) vehicle shown
1	Electronic transmission selector
2	Instrument cluster
3	Passenger door module
4	Steering wheel switches
5	Rain/light sensor
6	Intrusion detection module
7	Passenger side rear door module

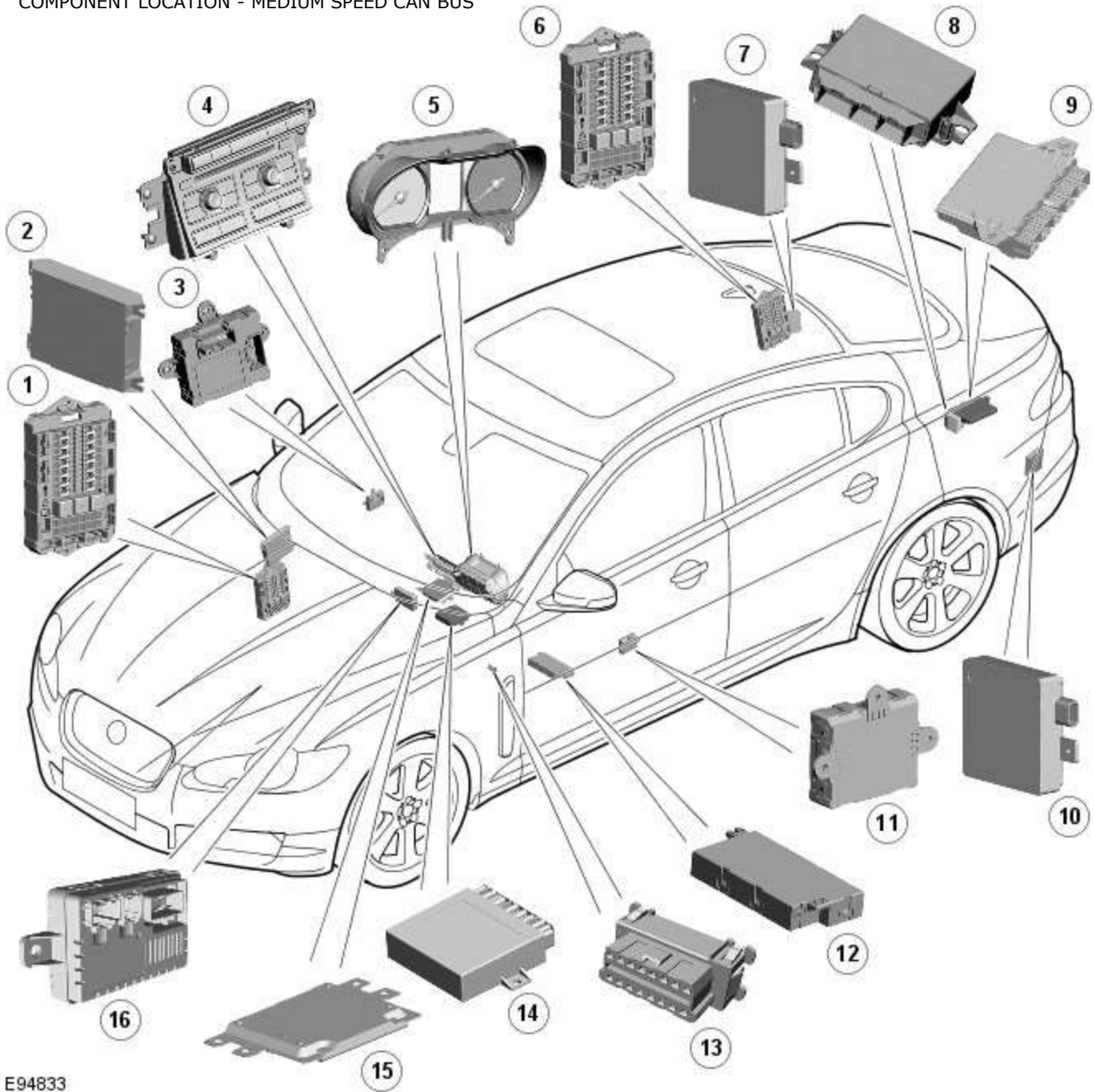
8	Driver's door switches
9	RJB (rear junction box)
10	Battery monitoring system module
11	Rear view camera
12	Driver's side rear door module
13	Driver's door module
14	Driver's seat switches
15	Driver's seat module
16	Start control module
17	Clockspring
18	Battery backed sounder
19	TCM (transmission control module)
20	Generator
21	CJB (central junction box)
22	ECM (engine control module)



E94832

Item	Description
NOTE: LHD vehicle shown	
1	ATC (automatic temperature control) module
2	RH (right-hand) outer face level vent
3	RH inner face level vent
4	LH (left-hand) inner face level vent
5	LH outer face level vent
6	Electric booster heater
7	Stepper motor - LH temperature blend
8	Stepper motor - windshield defrost
9	Stepper motor - RH temperature blend
10	Stepper motor - face/feet

COMPONENT LOCATION - MEDIUM SPEED CAN BUS

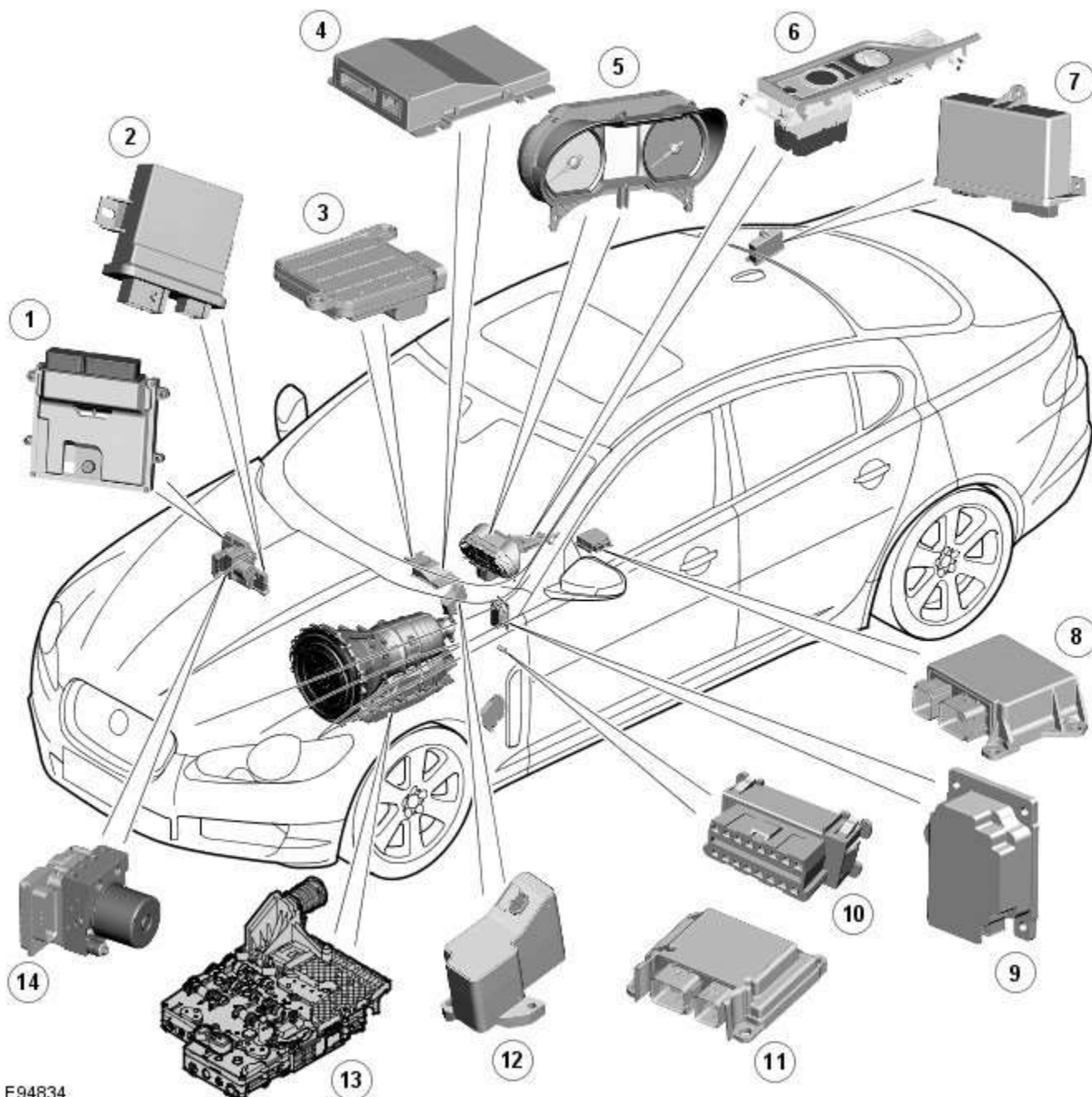


E94833

Item	Description
NOTE: LHD vehicle shown	
1	CJB
2	ATC module
3	Passenger door module
4	Audio system control panel
5	Instrument cluster
6	RJB
7	RH blind spot monitoring module
8	Parking aid module
9	Keyless vehicle module
10	LH blind spot monitoring module
11	Driver's door module
12	Driver's seat module
13	Diagnostic socket

14	Tire Pressure Monitoring System (TPMS) control module
15	Entertainment system control module
16	Climate seat module

COMPONENT LOCATION - HIGH SPEED CAN BUS

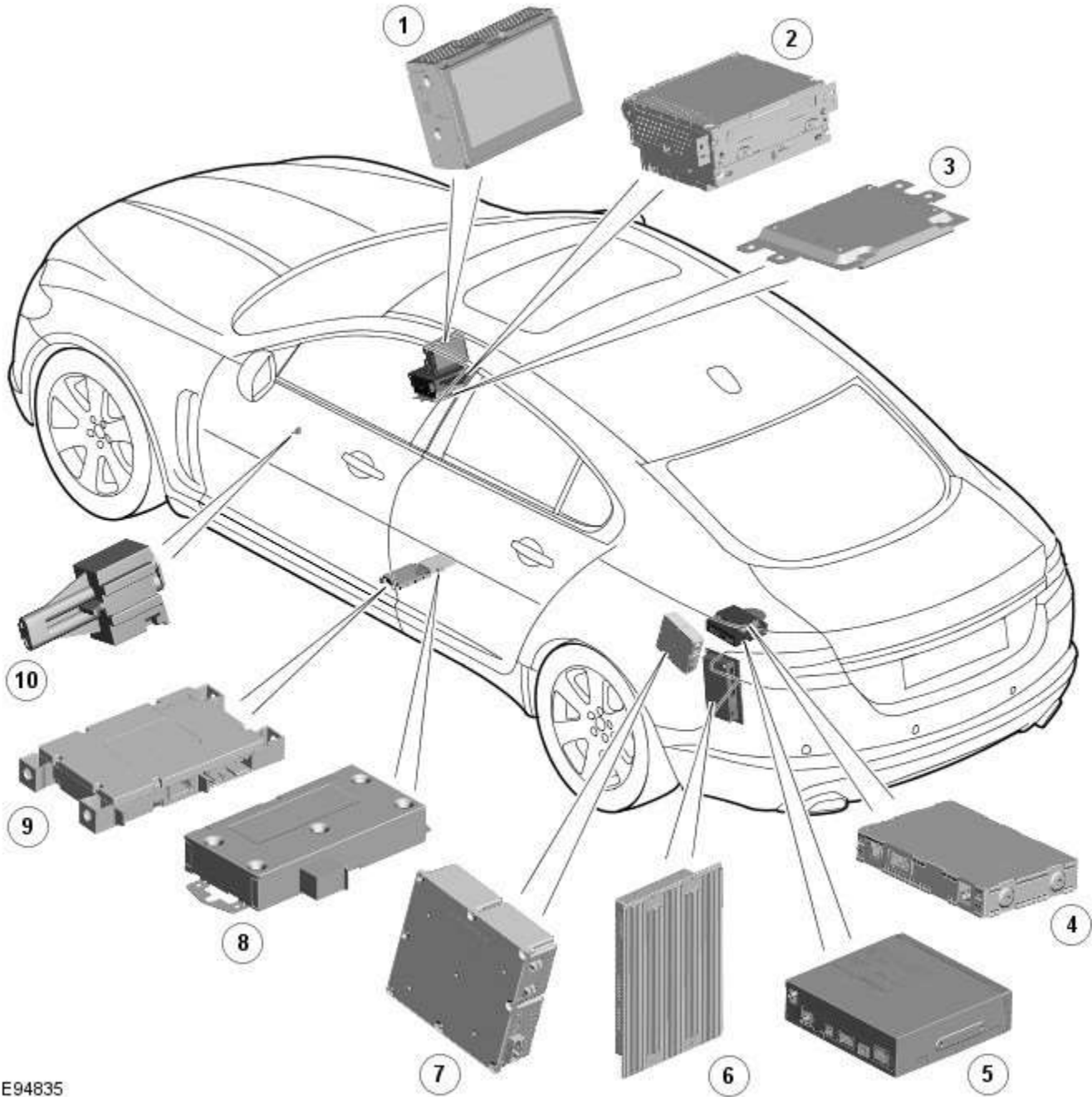


E94834

Item	Description
	NOTE: LHD vehicle shown
1	ECM - V8 shown
2	Headlamp leveling control module
3	Occupant classification system control module
4	Adaptive damping control module
5	Instrument cluster
6	Electronic transmission selector
7	Electronic Parking Brake (EPB) module
8	RCM (restraints control module)

9	Adaptive speed control module
10	Diagnostic socket
11	Pedestrian protection control module
12	Electric steering column lock
13	TCM
14	ABS (anti-lock brake system) module

COMPONENT LOCATION - MOST



E94835

Item	Description
	NOTE: LHD vehicle shown
1	Touch Screen Display (TSD)
2	Integrated audio module
3	Entertainment system control module
4	Digital Audio Broadcast (DAB)/Satellite Digital Audio Radio System (SDARS)
5	Multimedia module

6	Audio system amplifier
7	Television (TV) tuner
8	Portable audio interface
9	Blue tooth phone module
10	Software download socket

Multifunction Electronic Modules - Module Controlled Functions - Overview

Description and Operation

OVERVIEW

The vehicle electrical system comprises a number of control modules which are interconnected via several network systems.

The following network systems are used on the vehicle:

- High speed [CAN \(controller area network\)](#) bus
- Medium speed [CAN](#) bus
- [LIN \(local interconnect network\)](#) bus
- K Bus
- Media Orientated Systems Transport (MOST) ring.

Multifunction Electronic Modules - Module Controlled Functions - System Operation and Component Description

Description and Operation

System Operation

MODULE CONTROLLED FUNCTIONS

Refer to the relevant section for details of system operation.

Component Description

MODULES, SYSTEMS AND FUNCTION

The **CJB (central junction box)** is the 'gateway' for the network systems which allows information to be exchanged between networks.

The entertainment system components are connected on a fiber optic MOST ring. The MOST ring can send and receive information to/from the other network systems via a 'gateway' in the Integrated Control Module.

The following table shows each vehicle control module, the network system to which it is connected, its function and location in the vehicle.

Module	Network System	Function	Vehicle Location
Instrument cluster	High speed CAN (controller area network) bus	Receives data from other vehicle systems to provide information to the driver. Also functions as the gateway for the bus systems.	Instrument panel.
Steering column	High speed CAN bus	Controls the locking and unlocking of the steering column.	Upper steering column.
Diagnostic socket	High speed CAN bus	Allows the transfer of vehicle information using a Jaguar approved diagnostic system or other diagnostic tool.	In the lower instrument panel on the driver's side, adjacent to the start control module.
RCM (restraints control module)	High speed CAN bus	Controls the deployment of the supplementary restraint components.	At rear of floor console.
TCM (transmission control module)	High speed CAN bus	Controls automatic transmission operation.	Inside the transmission and accessible via the fluid pan.
ECM (engine control module)	High speed CAN bus	Controls engine management and fuel system operation.	Rear of the engine compartment on the bulkhead.
ABS (anti-lock brake system)	High speed CAN bus	Controls all aspects of the braking system	Rear of the engine compartment on the bulkhead.
Headlamp leveling module	High speed CAN bus	Controls the static dynamic headlamp leveling function.	In the lower instrument panel, behind the glovebox.
Occupant classification system control module (NAS only)	High speed CAN bus	Detects when a passenger is in the front passenger seat and can determine their size and weight.	Below the front passenger seat.
Adaptive damping control module	High speed CAN bus	Controls the adjustment of the dampers.	Below the front passenger seat.
Electronic Parking Brake (EPB) module	High speed CAN bus	Controls the application and release of the electronic parking brake.	In the luggage compartment, above the RH (right-hand) wheel arch.
Pedestrian protection module	High speed CAN bus	Controls and monitors the pedestrian protection system.	LH (left-hand) 'A' pillar.
Adaptive speed control module	High speed CAN bus	Controls the vehicle's road speed in relation to other vehicles when in speed control mode.	Behind the instrument panel on the driver's side.
Electronic transmission selector	High speed CAN bus	Allows the driver to electronically select the required automatic transmission mode. Transmits driver selections to the TCM .	In the floor console.
Jaguar Drive control module	High speed CAN bus	Controls the Jaguar Drive function and communicates with other system modules.	Integral with the electronic transmission selector software in the floor console.
CJB	Medium speed CAN bus	Controls body functions and power distribution.	On RH 'A' pillar.
Diagnostic socket	Medium speed CAN bus	Allows the transfer of vehicle information using a Jaguar approved diagnostic system or other diagnostic tool.	In the lower instrument panel on the driver's side, adjacent to the start control module.
Passenger door module	Medium speed CAN bus	Controls window and locking functions.	In the front passenger door.
Parking aid module	Medium speed CAN bus	Controls the parking aid system.	In the LH side of the luggage compartment, adjacent to the keyless vehicle module.

Module	Network System	Function	Vehicle Location
Driver's seat module	Medium speed CAN bus	Controls driver's seat positioning and also memory functions of other personalized functions.	Below the driver's seat.
Instrument cluster	Medium speed CAN bus	Receives data from other systems to provide driver information.	In the instrument panel.
Driver's door module	Medium speed CAN bus	Controls window and locking functions.	In the driver's door.
ATC (automatic temperature control) module	Medium speed CAN bus	Contains controls for the heating and air conditioning systems.	On the end of the air conditioning evaporator and blower assembly.
Information control module	Medium speed CAN bus	Contains controls for the entertainment systems.	In the instrument panel below the integrated control panel.
Integrated control panel	Medium speed CAN bus	Contains controls for the entertainment systems and gateway between audio system and other vehicle systems.	In the instrument panel.
Front seat climate control module	Medium speed CAN bus	Controls the temperature requirements of the driver and passenger front seats.	Below the RH front seat.
LH blind spot monitoring module	Medium speed CAN bus	Controls the operating parameters of the system and provides driver indications and fault monitoring.	Behind the outer part of the rear bumper, rearward of the rear wheel.
RH blind spot monitoring module	Medium speed CAN bus	Controls the operating parameters of the system and provides driver indications and fault monitoring.	Behind the outer part of the rear bumper, rearward of the rear wheel.
Keyless vehicle module	Medium speed CAN bus	Allows the vehicle to be opened and closed without the use of a key.	In the LH side of the luggage compartment, adjacent to the parking aid module.
RJB (rear junction box)	Medium speed CAN bus	Controls body functions and power distribution.	RH of luggage compartment.
Tire pressure monitoring control module	Medium speed CAN bus	Monitors the vehicle tires to warn of deflation.	Below the rear of the floor console.
TCM	K Bus	Data transfer between TCM and diagnostic socket. NOTE: Only fitted to early build vehicles.	Inside the transmission and accessible by removal of the fluid pan.
Driver's side rear door module	LIN (local interconnect network)	Controls window and locking operation.	In the driver's side rear door.
Passenger side rear door module	LIN	Controls window and locking operation.	In the passenger side rear door.
Driver's door module	LIN	Memory/adjustment functions for seat, steering column and mirrors and door security functions.	In the driver's door.
Passenger front door module	LIN	Memory/adjustment functions for seat, steering column and mirrors and door security functions.	In the passenger door.
Driver's door switches	LIN	Transmit driver selections to the driver's door module.	In the driver's door panel.
ECM	LIN	Receives a load signal from the generator.	In the engine compartment on the bulkhead.
Generator	LIN	Provide load signal to the ECM .	On the LH side at the front of the engine.
Driver's seat module	LIN	Control position of driver's seat.	Below the driver's seat on the floor pan.
Driver's seat switches	LIN	Provide driver selection inputs to the driver's seat module.	On the outside of the trim panel on the driver's seat.
Air quality sensor	LIN	Measures quality of air entering the vehicle interior.	At the front of the vehicle, behind the air intake grill.
Windshield (defrost) stepper motor	LIN	Moves flaps within the heater assembly to direct air flow to the windshield.	On the heater assembly.
Face/feet stepper motor	LIN	Moves flaps within the heater assembly to direct air flow to instrument panel vents and/or footwell.	On the heater assembly.
LH temperature blend stepper motor	LIN	Moves flaps within the heater assembly to control temperature in LH side footwell.	On the heater assembly.
RH temperature blend stepper motor	LIN	Moves flaps within the heater assembly to direct air flow to RH side footwell.	On the heater assembly.
Electric booster heater	LIN	Controls operation of the electric booster heater.	Inside the heater assembly.
LH outer face level vent	LIN	Controls the operation of the face level vent stepper motor.	In the instrument panel.
LH inner face level vent	LIN	Controls the operation of the face level vent stepper motor.	In the instrument panel.
RH inner face level vent	LIN	Controls operation of the face level vent stepper motor.	In the instrument panel.
RH outer face level vent	LIN	Controls operation of the face level vent stepper motor.	In the instrument panel.
ATC module	LIN	Controls operation of the climate system functions.	In the instrument panel.
Steering wheel audio switches	LIN	Converts analogue signals from steering wheel switches into digital messages.	On the steering wheel.

Module	Network System	Function	Vehicle Location
Steering wheel clockspring	LIN	Passes digital messages from the steering wheel audio switches to the instrument cluster.	Behind the steering wheel, on the upper steering column.
Instrument cluster	LIN	Receives digital signals from other vehicle systems.	On the driver's side of the instrument panel.
Battery backed sounder	LIN	Activated by CJB when alarm trigger is received.	In the LH side of the engine compartment, near the bulkhead.
CJB	LIN	Controls body functions and power distribution.	On the RH 'A' pillar.
RJB	LIN	Controls body functions and power distribution.	On the RH of the luggage compartment.
Battery monitoring system module	LIN	Monitors the condition and charge of the vehicle battery.	On the vehicle battery positive terminal in the luggage compartment.
Intrusion detection module	LIN	Detects movement in the vehicle interior and activates the anti-theft system.	In the front overhead console.
Rain/light sensor	LIN	Detects ambient light levels and moisture on the windscreen for operation of the automatic headlamps and wiper systems.	On the inside of the windshield behind the interior rear view mirror.
Start control module	LIN	Used to identify the Smart Key - component of the keyless start system.	In the lower instrument panel on the driver's side.
Rear view camera	LIN	Passes digital images data from the rear view camera to the RJB	In the luggage compartment lid trim finisher.
Driver's window switch	LIN	Controls operation of the driver's window.	In the driver's door trim panel.
Electronic transmission selector	LIN	Sends selector position to the TCM .	In the floor console.
TCM	LIN	Receives selector position information to control the transmission.	Inside the transmission and accessible by removal of the fluid pan.
Information control module	Media Oriented System Transport (MOST)	Contains controls for the entertainment system and gateway between audio system and other vehicle systems.	In the instrument panel below the integrated control panel.
Integrated control panel	MOST	Contains controls for the entertainment system.	In the instrument panel.
Digital Audio Broadcast (DAB) receiver (SDARS NAS only)	MOST	Receives digital radio broadcasts.	In the LH side of the luggage compartment, above the keyless vehicle module.
Bluetooth® phone module	MOST	Controls operation of the Bluetooth® phone system.	Below the LH front seat, adjacent to the portable audio module.
Amplifier/tuner	MOST	Provides amplification for the entertainment systems and reception of radio RF broadcasts.	In the LH side of the luggage compartment.
Navigation computer	MOST	Reads map data from a DVD (digital versatile disc) to calculate and display visual route guidance information via the TSD and audible guidance via the amplifier to the driver.	In the LH side of the luggage compartment.
Touch Screen Display (TSD)	MOST	Provides the driver interface to the entertainment, navigation and driver personalization functions.	In the center of the instrument panel.
TV tuner	MOST	Controls the reception of television signals and audio/visual inputs.	In the LH side of the luggage compartment.
Portable Audio Module	MOST	Controls the auxiliary inputs for additional audio inputs via the portable audio interface.	Below the LH front seat, adjacent to the Bluetooth® phone module.
MOST diagnostic connector	MOST	Allows for diagnostic fault detection of the MOST ring.	Below the air ducting in the floor console.

Refer to Communications Network section for further details.

Refer to: [Communications Network](#) (418-00 Module Communications Network, Description and Operation).

Multifunction Electronic Modules - Driver Door Module (DDM)

Diagnosis and Testing

Description and Operation

For a detailed description of the multifunction electronic control modules, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (419-10 Multifunction Electronic Modules)

[Module Controlled Functions](#) (Description and Operation),
[Module Controlled Functions](#) (Description and Operation),
[Module Controlled Functions](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Electrical
<ul style="list-style-type: none"> • Fuse(s) • Electrical connector(s) • Wiring Harness

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B10EB11	Driver door double locking motor	<ul style="list-style-type: none"> • Driver door double locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test driver door double locking motor control circuit for short ground

DTC	Description	Possible Cause	Action
B10EB15	Driver door double locking motor	<ul style="list-style-type: none"> Driver door double locking motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver door double locking motor control circuit for short to power or open circuit
B10EC11	Passenger door double locking motor	<ul style="list-style-type: none"> Passenger door double locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger door double locking motor control circuit for short ground
B10EC15	Passenger door double locking motor	<ul style="list-style-type: none"> Passenger door double locking motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test passenger door double locking motor control circuit for short to power or open circuit
B10ED11	Rear door driver side double locking motor	<ul style="list-style-type: none"> Rear door driver side double locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test rear door driver side double locking motor control circuit for short ground
B10ED15	Rear door driver side double locking motor	<ul style="list-style-type: none"> Rear door driver side double locking motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test rear door driver side double locking motor control circuit for short power, open circuit
B10EE11	Rear door passenger side double locking motor	<ul style="list-style-type: none"> Rear door passenger side double locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test rear door passenger side double locking motor control circuit for short ground
B10EE15	Rear door passenger side double locking motor	<ul style="list-style-type: none"> Rear door passenger side double locking motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test rear door passenger side double locking motor control circuit for short power, open circuit
B110811	Driver door central locking motor	<ul style="list-style-type: none"> Driver door central locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test driver door central locking motor control circuit for short ground
B110815	Driver door central locking motor	<ul style="list-style-type: none"> Driver door central locking motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver door central locking motor control circuit for short to power, open circuit
B110A11	Rear door driver side central locking motor	<ul style="list-style-type: none"> Rear driver door central locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test rear driver door central locking motor control circuit for short ground
B110A15	Rear door driver side central locking motor	<ul style="list-style-type: none"> Rear driver door central locking motor control circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and test rear driver door central locking motor control circuit for short to power, open circuit
B116311	Left Mirror Heater Output	<ul style="list-style-type: none"> Left mirror heater control circuit - short to ground 	Refer to the electrical circuit diagrams and test left mirror heater control circuit for short to ground
B116315	Left Mirror Heater Output	<ul style="list-style-type: none"> Left mirror heater control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test left mirror heater control circuit for short to power, open circuit
B116411	Right Mirror Heater Output	<ul style="list-style-type: none"> Right mirror heater control circuit - short to ground 	Refer to the electrical circuit diagrams and test right mirror heater control circuit for short to ground
B116415	Right Mirror Heater Output	<ul style="list-style-type: none"> Right mirror heater control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test right mirror heater control circuit for short to power, open circuit
B116511	Left Front Puddle Lamp Output	<ul style="list-style-type: none"> Left front puddle lamp control circuit - short to ground 	Refer to the electrical circuit diagrams and test left front puddle lamp control circuit for short to ground

DTC	Description	Possible Cause	Action
B116515	Left Front Puddle Lamp Output	<ul style="list-style-type: none"> Left front puddle lamp control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test left front puddle lamp control circuit for short to power, open circuit
B116611	Right Front Puddle Lamp Output	<ul style="list-style-type: none"> Right front puddle lamp control circuit - short to ground 	Refer to the electrical circuit diagrams and test right front puddle lamp control circuit for short to ground
B116615	Right Front Puddle Lamp Output	<ul style="list-style-type: none"> Right front puddle lamp control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test right front puddle lamp control circuit for short to power, open circuit
B117C07	Rear Power Window Up	<ul style="list-style-type: none"> Mechanical failure 	Check rear window mechanism for mechanical failure
B117C72	Rear Power Window Up	<ul style="list-style-type: none"> Actuator stuck open 	Suspect the rear door module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B117C73	Rear Power Window Up	<ul style="list-style-type: none"> Actuator stuck closed 	Suspect the rear door module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B117C92	Rear Power Window Up	<ul style="list-style-type: none"> Performance or incorrect operation 	Refer to the electrical circuit diagrams and check rear door module power and ground supplies
B117D72	Rear Power Window Down	<ul style="list-style-type: none"> Actuator stuck open 	Suspect the rear door module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B117D73	Rear Power Window Down	<ul style="list-style-type: none"> Actuator stuck closed 	Suspect the rear door module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B117E07	Front Power Window Up	<ul style="list-style-type: none"> Mechanical failure 	Check front window mechanism for mechanical failure
B117E72	Front Power Window Up	<ul style="list-style-type: none"> Actuator stuck open 	Suspect the DDM. Check and install a new DDM as required, refer to the new module/component installation note at the top of the DTC Index
B117E73	Front Power Window Up	<ul style="list-style-type: none"> Actuator stuck closed 	Suspect the DDM. Check and install a new DDM as required, refer to the new module/component installation note at the top of the DTC Index
B117F72	Front Power Window Down	<ul style="list-style-type: none"> Actuator stuck open 	Suspect the DDM. Check and install a new DDM as required, refer to the new module/component installation note at the top of the DTC Index
B117F73	Front Power Window Down	<ul style="list-style-type: none"> Actuator stuck closed 	Suspect the DDM. Check and install a new DDM as required, refer to the new module/component installation note at the top of the DTC Index
B118929	Front Window Position Sensor	<ul style="list-style-type: none"> Front window hall position sensor - signal invalid 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B118A29	Rear Window Position Sensor	<ul style="list-style-type: none"> Rear window hall position sensor - signal invalid 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B11D183	LIN Bus Circuit "C"	<ul style="list-style-type: none"> Value of signal protection calculation incorrect 	Suspect driver switchpack. Check and install a new driver switchpack as required, refer to the new module/component installation note at the top of the DTC Index
B11D186	LIN Bus Circuit "C"	Signal invalid	Suspect driver switchpack. Check and install a new driver switchpack as required, refer to the new module/component installation note at the top of the DTC Index
B11D187	LIN Bus Circuit "C"	Missing message	Suspect driver switchpack. Check and install a new driver switchpack as required, refer to the new module/component installation note at the top of the DTC Index
B11F611	Driver Folding Mirror Motor	<ul style="list-style-type: none"> Driver folding mirror motor control circuit - short to ground 	Refer to the electrical circuit diagrams and check driver folding mirror motor control circuit for short to ground
B11F615	Driver Folding Mirror Motor	<ul style="list-style-type: none"> Driver folding mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver folding mirror motor control circuit for short to power, open circuit

DTC	Description	Possible Cause	Action
B1A9883	LIN Bus Circuit #1	<ul style="list-style-type: none"> Value of signal protection calculation incorrect 	Refer to the electrical circuit diagrams and check LIN circuit between DDM and rear door module for short/open circuits
B1A9886	LIN Bus Circuit #1	<ul style="list-style-type: none"> Signal invalid 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check LIN circuit between DDM and rear door module for short/open circuits
B1A9887	LIN Bus Circuit #1	<ul style="list-style-type: none"> Missing message 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check LIN circuit between DDM and rear door module for short/open circuits
B1C0911	Driver Left/Right Mirror Motor Circuit	<ul style="list-style-type: none"> Driver left/right mirror motor control circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver left/right mirror motor control circuit for short to ground
B1C0915	Driver Left/Right Mirror Motor Circuit	<ul style="list-style-type: none"> Driver left/right mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver left/right mirror motor control circuit for short to power, open circuit
B1C1011	Driver Up/Down Mirror Motor Circuit	<ul style="list-style-type: none"> Driver up/down mirror motor control circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver up/down mirror motor control circuit for short to ground
B1C1015	Driver Up/Down Mirror Motor Circuit	<ul style="list-style-type: none"> Driver up/down mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver up/down mirror motor control circuit for short to power, open circuit
B1C1311	Driver Up/Down Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> Driver up/down mirror motor feedback circuit - short to ground 	Refer to the electrical circuit diagrams and test driver up/down mirror motor feedback circuit for short to ground
B1C1315	Driver Up/Down Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> Driver up/down mirror motor feedback circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver up/down mirror motor feedback circuit for short to power, open circuit
B1C1411	Driver Left/Right Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> Driver left/right mirror motor feedback circuit - short to ground 	Refer to the electrical circuit diagrams and test driver left/right mirror motor feedback circuit for short to ground
B1C1415	Driver Left/Right Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> Driver left/right mirror motor feedback circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver left/right mirror motor feedback circuit for short to power, open circuit
B1D0611	Left Turn Indicator	<ul style="list-style-type: none"> Left side turn indicator repeater lamp circuit - short to ground 	Refer to the electrical circuit diagrams and check left side turn indicator repeater lamp circuit for short to ground
B1D0615	Left Turn Indicator	<ul style="list-style-type: none"> Left side turn indicator repeater lamp circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left side turn indicator repeater lamp circuit for short to power, open circuit
B1D0711	Right Turn Indicator	<ul style="list-style-type: none"> Right side turn indicator repeater lamp circuit - short to ground 	Refer to the electrical circuit diagrams and check right side turn indicator repeater lamp circuit for short to ground
B1D0715	Right Turn Indicator	<ul style="list-style-type: none"> Right side turn indicator repeater lamp circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and check right side turn indicator repeater lamp circuit for short to power, open circuit
C1B1411	Sensor Supply #1	<ul style="list-style-type: none"> Window position hall sensors supply circuit - short to ground 	Refer to the electrical circuit diagrams and test window position hall sensors supply circuit for short to ground

DTC	Description	Possible Cause	Action
C1B1415	Sensor Supply #1	<ul style="list-style-type: none"> Window position hall sensors supply circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test window position hall sensors supply circuit for short to power, open circuit
C1B1511	Sensor Supply #2	<ul style="list-style-type: none"> Hall sensor supply circuit - short to ground 	Refer to the electrical circuit diagrams and test window position hall sensors supply circuit for short to ground
C1B1515	Sensor Supply #2	<ul style="list-style-type: none"> Hall sensor supply circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test window position hall sensors supply circuit for short to power, open circuit
U001000	Medium Speed CAN Communication Bus	<ul style="list-style-type: none"> Bus off 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U014000	Lost Communication With Body Control Module	<ul style="list-style-type: none"> Missing message from CJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U020800	Lost Communication With Seat Control Module "A"	<ul style="list-style-type: none"> Missing message from driver seat module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U030000	Internal Control Module Software Incompatibility	<ul style="list-style-type: none"> Invalid configuration message is received 	Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC remains suspect the DDM. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U200224	Switch	<ul style="list-style-type: none"> Signal stuck high 	Clear DTC and re-test. If DTC remains, suspect the passenger side window switch. Check and install a new passenger side window switch
U200424	Auxiliary Switch Pack	<ul style="list-style-type: none"> Left or right rear door local switch - signal stuck high 	Check for stuck rear window switch. Refer to the electrical circuit diagrams and check left or right rear door local switch circuit for short circuit
U201011	Switch illumination	<ul style="list-style-type: none"> Rear window switch illumination circuit - short to ground 	Refer to the electrical circuit diagrams and check rear window switch illumination circuit for short to ground
U201208	Car Configuration Parameter(s)	<ul style="list-style-type: none"> Bus signal/message failures 	Cycle the ignition status and re-test. If DTC remains, re-configure the RJB using the manufacturer approved diagnostic system
U201324	Switch Pack	<ul style="list-style-type: none"> Signal stuck high 	Clear DTC and re-test. If DTC remains, install a new driver door switch pack
U201444	Control Module Hardware	<ul style="list-style-type: none"> Data memory failure 	Suspect the DDM. Check and install a new DDM as required, refer to the new module/component installation note at the top of the DTC Index
U210000	Initial Configuration Not Complete	<ul style="list-style-type: none"> No sub type information 	Re-configure the DDM using the manufacturer approved diagnostic system
U300049	Control Module	<ul style="list-style-type: none"> Internal electronic failure 	Suspect the DDM. Check and install a new DDM as required, refer to the new module/component installation note at the top of the DTC Index
U300255	Vehicle Identification Number	<ul style="list-style-type: none"> Not configured 	Re-configure the DDM as new using the manufacturer approved diagnostic system and re-test. If DTC remains install a new module, refer to the new module/component installation note at the top of the DTC Index
U300281	Vehicle Identification Number (VIN)	<ul style="list-style-type: none"> Vehicle/component mis-match. Corrupt VIN data being transmitted, module previously installed to other vehicle 	Check and install correct/new module as required, refer to the new module/component installation note at the top of the DTC Index
U300362	Battery voltage	<ul style="list-style-type: none"> Mis-match in battery voltage, of 2 volts or more, between DDM and RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

Multifunction Electronic Modules - Remote Keyless Entry (RKE) Module

Diagnosis and Testing

Principles of Operation

For a detailed description of the Remote Keyless Entry system, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (419-10 Multifunction Electronic Modules)

[Module Controlled Functions](#) (Description and Operation),
[Module Controlled Functions](#) (Description and Operation),
[Module Controlled Functions](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Misaligned door(s), hood or luggage compartment lid • Door latch(s) • Actuating rod(s) • Exterior door handle(s) • Interior door handle(s) • Door lock cylinder • Cable(s) • Luggage compartment lid exterior release switch 	<ul style="list-style-type: none"> • Fuse(s) • Wiring harness • Electrical connector(s) • Door lock actuator(s) • Remote transmitter batteries • Vehicle battery • Remote transmitter • Door lock switch(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B102B00	Passive Key	<ul style="list-style-type: none"> Response Error - general failure 	Using the manufacturer approved diagnostic system, clear all passive keys, re-learn all passive keys
B10C100	Left Front Unlock Pull Switch	<ul style="list-style-type: none"> No subtype information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B10C124	Left Front Unlock Pull Switch	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check for stuck left front unlock switch. Refer to the electrical circuit diagrams and check left front unlock switch circuit for short to ground
B10C200	Left Rear Unlock Pull Switch	<ul style="list-style-type: none"> No subtype information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B10C224	Left Rear Unlock Pull Switch	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check for stuck left rear unlock switch. Refer to the electrical circuit diagrams and check left rear unlock switch circuit for short to ground
B10C300	Right Front Unlock Pull Switch	<ul style="list-style-type: none"> No subtype information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B10C324	Right Front Unlock Pull Switch	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check for stuck right front unlock switch. Refer to the electrical circuit diagrams and check right front unlock switch circuit for short to ground
B10C400	Right Rear Unlock Pull Switch	<ul style="list-style-type: none"> No subtype information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B10C424	Right Rear Unlock Pull Switch	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check for stuck right rear unlock switch. Refer to the electrical circuit diagrams and check right front unlock switch circuit for short to ground
B10C524	Trunk Unlock Pull Switch	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check for stuck luggage compartment lid unlock switch. Refer to the electrical circuit diagrams and check luggage compartment lid unlock switch circuit for short to ground
B10C61F	Exterior Trunk Antenna	<ul style="list-style-type: none"> Circuit intermittent - general electrical error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check exterior luggage compartment antenna circuits for short to ground, power, open circuit
B10C71F	Interior Trunk Antenna	<ul style="list-style-type: none"> Circuit intermittent - general electrical error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check interior luggage compartment antenna circuits for short to ground, power, open circuit
B10C81F	Interior Center Antenna	<ul style="list-style-type: none"> Circuit intermittent - general electrical error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check interior center antenna circuits for short to ground, power, open circuit
B10C91F	Interior Front Antenna	<ul style="list-style-type: none"> Circuit intermittent - general electrical error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check interior front antenna circuits for short to ground, power, open circuit
B10CA1F	Left Rear Door Handle Antenna	<ul style="list-style-type: none"> Circuit intermittent - general electrical error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left rear door handle antenna circuits for short to ground, power, open circuit
B10CB1F	Right Rear Door Handle Antenna	<ul style="list-style-type: none"> Circuit intermittent - general electrical error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check right rear door handle antenna circuits for short to ground, power, open circuit
B10CC24	Left Front Latch Clutch Switch	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Check for stuck left front door latch clutch switch. Refer to the electrical circuit diagrams and check left front door latch clutch switch circuit for short to ground
B10CD24	Left Rear Latch Clutch Switch	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Check for stuck left rear door latch clutch switch. Refer to the electrical circuit diagrams and check left rear door latch clutch switch circuit for short to ground

DTC	Description	Possible Cause	Action
B10CE24	Right Front Latch Clutch Switch	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Check for stuck right front door latch clutch switch. Refer to the electrical circuit diagrams and check right front door latch clutch switch circuit for short to ground
B10CF24	Right Rear Latch Clutch Switch	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Check for stuck right rear door latch clutch switch. Refer to the electrical circuit diagrams and check right rear door latch clutch switch circuit for short to ground
B10D124	Left Front Lock Button	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Check for stuck left front door handle lock switch. Refer to the electrical circuit diagrams and check left front door handle lock switch circuit for short to ground
B10D224	Left Rear Lock Button	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Check for stuck left rear door handle lock switch. Refer to the electrical circuit diagrams and check left rear door handle lock switch circuit for short to ground
B10D324	Right Front Lock Button	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Check for stuck right front door handle lock switch. Refer to the electrical circuit diagrams and check right front door handle lock switch circuit for short to ground
B10D424	Right Rear Lock Button	<ul style="list-style-type: none"> Signal stuck high - button stuck in active position 	Check for stuck right rear door handle lock switch. Refer to the electrical circuit diagrams and check left front door handle lock switch circuit for short to ground
U001000	Medium Speed CAN Communication Bus	<ul style="list-style-type: none"> No subtype information 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system
U014000	Lost Communication With Body Control Module	<ul style="list-style-type: none"> Missing message from CJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check power and ground supplies to CJB
U014200	Lost Communication With Body Control Module "B"	<ul style="list-style-type: none"> Missing message from RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check power and ground supplies to RJB
U015500	Lost Communication With Instrument Panel Cluster (IPC) Control Module	<ul style="list-style-type: none"> Missing message from instrument cluster 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Carry out CAN network integrity test using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check power and ground supplies to instrument cluster
U030000	Internal Control Module Software Incompatibility	<ul style="list-style-type: none"> Invalid configuration message is received 	Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC is still logged suspect the remote keyless entry module, refer to the new module installation note at the top of the DTC Index
U201F00	External Receiver	<ul style="list-style-type: none"> No subtype information - communication error 	Suspect the RF receiver, check and install a new RF receiver as required, refer to the new module/component installation note at top of DTC Index
U201F13	External Receiver	<ul style="list-style-type: none"> Line open 	Refer to the electrical circuit diagrams and test RF receiver communication circuit to remote keyless entry module for short to ground or open circuit
U201F87	External Receiver	<ul style="list-style-type: none"> Transmission error 	Refer to the electrical circuit diagrams and check the data line between the RF receiver and the remote keyless entry module for short, open circuit. Suspect the RF receiver or remote keyless entry module, check and install a new RF receiver or remote keyless entry module as required, refer to the new module/component installation note at top of DTC Index
U210000	Initial Configuration Not Complete	<ul style="list-style-type: none"> No subtype information 	Configure the Remote Keyless Entry module using the manufacturer approved diagnostic system
U210100	Control Module Configuration Incompatible	<ul style="list-style-type: none"> No subtype information 	Re-configure the RJB using the manufacturer approved diagnostic system
U300049	Control Module	<ul style="list-style-type: none"> Internal electronic failure 	Install a new remote keyless entry module, refer to the new module installation note at the top of the DTC Index
U300281	Vehicle Identification Number	<ul style="list-style-type: none"> Vehicle/component mis-match. Module previously installed to other vehicle 	Install correct/new module to vehicle specification, refer to the new module/component installation note at the top of the DTC Index

DTC	Description	Possible Cause	Action
U300362	Battery Voltage	<ul style="list-style-type: none"><li>• Mis-match in battery voltage, of 2 volts or more, between remote keyless entry module and RJB	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

Multifunction Electronic Modules - Passenger Door Module (PDM)

Diagnosis and Testing

Description and Operation

For a detailed description of the multifunction electronic control modules, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (419-10 Multifunction Electronic Modules)

[Module Controlled Functions](#) (Description and Operation),
[Module Controlled Functions](#) (Description and Operation),
[Module Controlled Functions](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Electrical
<ul style="list-style-type: none"> • Fuse(s) • Electrical connector(s) • Wiring Harness

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B10EB11	Driver door double locking motor	<ul style="list-style-type: none"> • Driver door double locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test driver door double locking motor control circuit for short ground

DTC	Description	Possible Cause	Action
B10EB15	Driver door double locking motor	<ul style="list-style-type: none"> Driver door double locking motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver door double locking motor control circuit for short to power or open circuit
B10EC11	Passenger door double locking motor	<ul style="list-style-type: none"> Passenger door double locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger door double locking motor control circuit for short ground
B10EC15	Passenger door double locking motor	<ul style="list-style-type: none"> Passenger door double locking motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test passenger door double locking motor control circuit for short to power or open circuit
B10ED11	Rear door driver side double locking motor	<ul style="list-style-type: none"> Rear door driver side double locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test rear door driver side double locking motor control circuit for short ground
B10ED15	Rear door driver side double locking motor	<ul style="list-style-type: none"> Rear door driver side double locking motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test rear door driver side double locking motor control circuit for short power, open circuit
B10EE11	Rear door passenger side double locking motor	<ul style="list-style-type: none"> Rear door passenger side double locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test rear door passenger side double locking motor control circuit for short ground
B10EE15	Rear door passenger side double locking motor	<ul style="list-style-type: none"> Rear door passenger side double locking motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test rear door passenger side double locking motor control circuit for short power, open circuit
B110911	Passenger door central locking motor	<ul style="list-style-type: none"> Passenger door central locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger door central locking motor control circuit for short ground
B110915	Passenger door central locking motor	<ul style="list-style-type: none"> Passenger door central locking motor control circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and test passenger door central locking motor control circuit for short to power, open circuit
B110B11	Rear door passenger side central locking motor	<ul style="list-style-type: none"> Rear passenger door central locking motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test rear passenger door central locking motor control circuit for short ground
B110B15	Rear door passenger side central locking motor	<ul style="list-style-type: none"> Rear passenger door central locking motor control circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and test rear passenger door central locking motor control circuit for short to power, open circuit
B116311	Left Mirror Heater Output	<ul style="list-style-type: none"> Left mirror heater control circuit - short to ground 	Refer to the electrical circuit diagrams and test left mirror heater control circuit for short to ground
B116315	Left Mirror Heater Output	<ul style="list-style-type: none"> Left mirror heater control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test left mirror heater control circuit for short to power, open circuit
B116411	Right Mirror Heater Output	<ul style="list-style-type: none"> Right mirror heater control circuit - short to ground 	Refer to the electrical circuit diagrams and test right mirror heater control circuit for short to ground
B116415	Right Mirror Heater Output	<ul style="list-style-type: none"> Right mirror heater control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test right mirror heater control circuit for short to power, open circuit
B116511	Left Front Puddle Lamp Output	<ul style="list-style-type: none"> Left front puddle lamp control circuit - short to ground 	Refer to the electrical circuit diagrams and test left front puddle lamp control circuit for short to ground

DTC	Description	Possible Cause	Action
B116515	Left Front Puddle Lamp Output	<ul style="list-style-type: none"> Left front puddle lamp control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test left front puddle lamp control circuit for short to power, open circuit
B116611	Right Front Puddle Lamp Output	<ul style="list-style-type: none"> Right front puddle lamp control circuit - short to ground 	Refer to the electrical circuit diagrams and test right front puddle lamp control circuit for short to ground
B116615	Right Front Puddle Lamp Output	<ul style="list-style-type: none"> Right front puddle lamp control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test right front puddle lamp control circuit for short to power, open circuit
B117C07	Rear Power Window Up	<ul style="list-style-type: none"> Mechanical failure 	Check rear window mechanism for mechanical failure
B117C72	Rear Power Window Up	<ul style="list-style-type: none"> Actuator stuck open 	Suspect the rear door module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B117C73	Rear Power Window Up	<ul style="list-style-type: none"> Actuator stuck closed 	Suspect the rear door module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B117C92	Rear Power Window Up	<ul style="list-style-type: none"> Performance or incorrect operation 	Refer to the electrical circuit diagrams and check rear door module power and ground supplies
B117D72	Rear Power Window Down	<ul style="list-style-type: none"> Actuator stuck open 	Suspect the rear door module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B117D73	Rear Power Window Down	<ul style="list-style-type: none"> Actuator stuck closed 	Suspect the rear door module. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
B117E07	Front Power Window Up	<ul style="list-style-type: none"> Mechanical failure 	Check the front window mechanism for mechanical failure
B117E72	Front Power Window Up	<ul style="list-style-type: none"> Actuator stuck open 	Suspect the PDM. Check and install a new PDM as required, refer to the new module/component installation note at the top of the DTC Index
B117E73	Front Power Window Up	<ul style="list-style-type: none"> Actuator stuck closed 	Suspect the PDM. Check and install a new PDM as required, refer to the new module/component installation note at the top of the DTC Index
B117F72	Front Power Window Down	<ul style="list-style-type: none"> Actuator stuck open 	Suspect the PDM. Check and install a new PDM as required, refer to the new module/component installation note at the top of the DTC Index
B117F73	Front Power Window Down	<ul style="list-style-type: none"> Actuator stuck closed 	Suspect the PDM. Check and install a new PDM as required, refer to the new module/component installation note at the top of the DTC Index
B118929	Front Window Position Sensor	<ul style="list-style-type: none"> Front window hall position sensor - signal invalid 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B118A29	Rear Window Position Sensor	<ul style="list-style-type: none"> Rear window hall position sensor - signal invalid 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B11D183	LIN Bus Circuit "C"	<ul style="list-style-type: none"> Value of signal protection calculation incorrect 	Suspect driver switchpack. Check and install a new driver switchpack as required, refer to the new module/component installation note at the top of the DTC Index
B11D186	LIN Bus Circuit "C"	Signal invalid	Suspect driver switchpack. Check and install a new driver switchpack as required, refer to the new module/component installation note at the top of the DTC Index
B11D187	LIN Bus Circuit "C"	Missing message	Suspect driver switchpack. Check and install a new driver switchpack as required, refer to the new module/component installation note at the top of the DTC Index
B11F711	Passenger Folding Mirror Motor	<ul style="list-style-type: none"> Passenger folding mirror motor control circuit - short to ground 	Refer to the electrical circuit diagrams and check passenger folding mirror motor control circuit for short to ground
B11F715	Passenger Folding Mirror Motor	<ul style="list-style-type: none"> Passenger folding mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check passenger folding mirror motor control circuit for short to power, open circuit

DTC	Description	Possible Cause	Action
B1A9883	LIN Bus Circuit #1	<ul style="list-style-type: none"> Value of signal protection calculation incorrect 	Refer to the electrical circuit diagrams and check LIN circuit between DDM and rear door module for short/open circuits
B1A9886	LIN Bus Circuit #1	<ul style="list-style-type: none"> Signal invalid 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check LIN circuit between DDM and rear door module for short/open circuits
B1A9887	LIN Bus Circuit #1	<ul style="list-style-type: none"> Missing message 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check LIN circuit between DDM and rear door module for short/open circuits
B1C1111	Passenger Left/Right Mirror Motor Circuit	<ul style="list-style-type: none"> Passenger left/right mirror motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger left/right mirror motor control circuit for short to ground
B1C1115	Passenger Left/Right Mirror Motor Circuit	<ul style="list-style-type: none"> Passenger left/right mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test passenger left/right mirror motor control circuit for short to power, open circuit
B1C1211	Passenger Up/Down Mirror Motor Circuit	<ul style="list-style-type: none"> Passenger up/down mirror motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger up/down mirror motor control circuit for short to ground
B1C1215	Passenger Up/Down Mirror Motor Circuit	<ul style="list-style-type: none"> Passenger up/down mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test passenger up/down mirror motor control circuit for short to power, open circuit
B1C1511	Passenger Up/Down Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> Passenger up/down mirror motor feedback circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger up/down mirror motor feedback circuit for short to ground
B1C1515	Passenger Up/Down Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> Passenger up/down mirror motor feedback circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and test passenger up/down mirror motor feedback circuit for short to power, open circuit
B1C1611	Passenger Left/Right Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> Passenger left/right mirror motor feedback circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger left/right mirror motor feedback circuit for short to ground
B1C1615	Passenger Left/Right Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> Passenger left/right mirror motor feedback circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and test passenger left/right mirror motor feedback circuit for short to power, open circuit
B1D0611	Left Turn Indicator	<ul style="list-style-type: none"> Left side turn indicator repeater lamp circuit - short to ground 	Refer to the electrical circuit diagrams and check left side turn indicator repeater lamp circuit for short to ground
B1D0615	Left Turn Indicator	<ul style="list-style-type: none"> Left side turn indicator repeater lamp circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check left side turn indicator repeater lamp circuit for short to power, open circuit
B1D0711	Right Turn Indicator	<ul style="list-style-type: none"> Right side turn indicator repeater lamp circuit - short to ground 	Refer to the electrical circuit diagrams and check right side turn indicator repeater lamp circuit for short to ground
B1D0715	Right Turn Indicator	<ul style="list-style-type: none"> Right side turn indicator repeater lamp circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and check right side turn indicator repeater lamp circuit for short to power, open circuit
C1B1411	Sensor Supply #1	<ul style="list-style-type: none"> Front window position hall sensor supply circuit - short to ground 	Refer to the electrical circuit diagrams and test front window position hall sensor supply circuit for short to ground

DTC	Description	Possible Cause	Action
C1B1415	Sensor Supply #1	<ul style="list-style-type: none"> Front window position hall sensor supply circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test front window position hall sensor supply circuit for short to power, open circuit
C1B1511	Sensor Supply #2	<ul style="list-style-type: none"> Hall sensor supply circuit - short to ground 	Refer to the electrical circuit diagrams and test window position hall sensors supply circuit for short to ground
C1B1515	Sensor Supply #2	<ul style="list-style-type: none"> Hall sensor supply circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test window position hall sensors supply circuit for short to power, open circuit
U001000	Medium Speed CAN Communication Bus	<ul style="list-style-type: none"> Bus off 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U014000	Lost Communication With Body Control Module	<ul style="list-style-type: none"> Missing message from CJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U020800	Lost Communication With Seat Control Module "A"	<ul style="list-style-type: none"> Missing message from driver seat module 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U030000	Internal Control Module Software Incompatibility	<ul style="list-style-type: none"> Invalid configuration message is received 	Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC remains suspect the PDM. Check and install a new module as required, refer to the new module/component installation note at the top of the DTC Index
U200224	Switch	<ul style="list-style-type: none"> Signal stuck high 	Clear DTC and re-test. If DTC remains, suspect the passenger side window switch. Check and install a new passenger side window switch
U200424	Auxiliary Switch Pack	<ul style="list-style-type: none"> Left or right rear door local switch - signal stuck high 	Check for stuck rear window switch. Refer to the electrical circuit diagrams and check left or right rear door local switch circuit for short circuit
U201011	Switch illumination	<ul style="list-style-type: none"> Rear window switch illumination circuit - short to ground 	Refer to the electrical circuit diagrams and check rear window switch illumination circuit for short to ground
U201208	Car Configuration Parameter(s)	<ul style="list-style-type: none"> Bus signal/message failures 	Cycle the ignition status and re-test. If DTC remains, re-configure the RJB using the manufacturer approved diagnostic system
U201324	Switch Pack	<ul style="list-style-type: none"> Signal stuck high 	Clear DTC and re-test. If DTC remains, install a new driver door switch pack
U201444	Control Module Hardware	<ul style="list-style-type: none"> Data memory failure 	Suspect the PDM. Check and install a new PDM as required, refer to the new module/component installation note at the top of the DTC Index
U210000	Initial Configuration Not Complete	<ul style="list-style-type: none"> No sub type information 	Re-configure the PDM using the manufacturer approved diagnostic system
U300049	Control Module	<ul style="list-style-type: none"> Internal electronic failure 	Suspect the PDM. Check and install a new PDM as required, refer to the new module/component installation note at the top of the DTC Index
U300255	Vehicle Identification Number	<ul style="list-style-type: none"> Not configured 	Re-configure the PDM as new using the manufacturer approved diagnostic system and re-test. If DTC remains install a new module, refer to the new module/component installation note at the top of the DTC Index
U300281	Vehicle Identification Number (VIN)	<ul style="list-style-type: none"> Vehicle/component mis-match. Corrupt VIN data being transmitted, module previously installed to other vehicle 	Check and install correct/new module as required, refer to the new module/component installation note at the top of the DTC Index
U300362	Battery voltage	<ul style="list-style-type: none"> Mis-match in battery voltage, of 2 volts or more, between PDM and RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

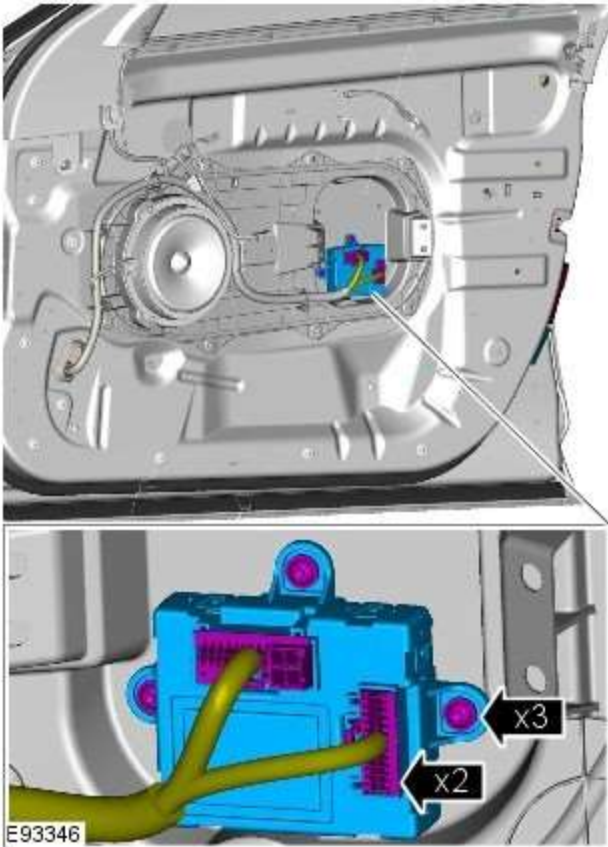
Multifunction Electronic Modules - Driver Door Module (DDM)

Removal and Installation

Removal

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Front Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3.



Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Multifunction Electronic Modules - Driver Seat Module (DSM)

Removal and Installation

Removal



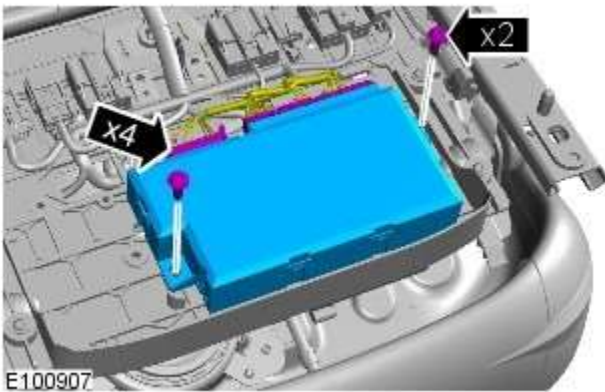
NOTE: Removal steps in this procedure may contain installation details.

1. Make the air bag supplemental restraint system (SRS) safe.

Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

2. Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).

3.



Installation

1. To install, reverse the removal procedure.

2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Multifunction Electronic Modules - Passenger Door Module (PDM)

Removal and Installation

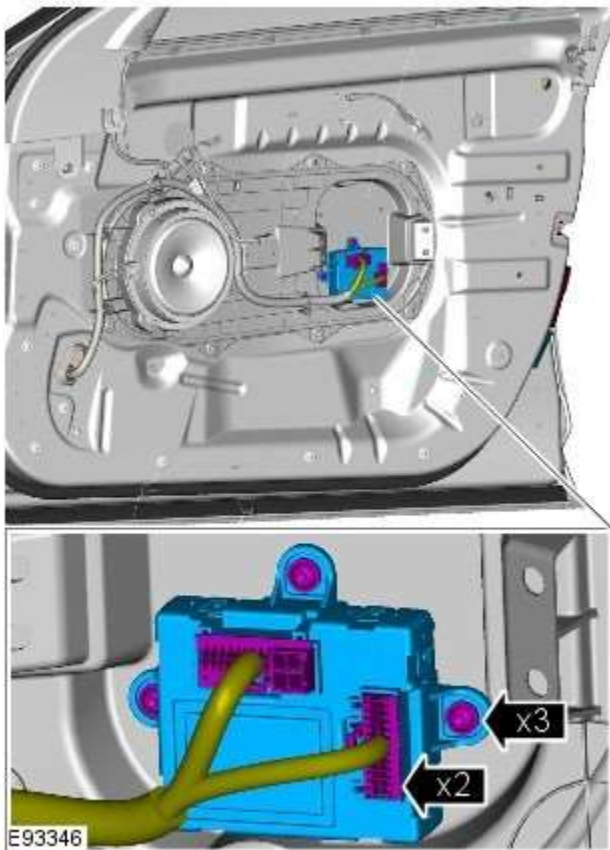
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Front Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3.



Installation

1. To install, reverse the removal procedure.

Multifunction Electronic Modules - Rear Door Module (RDM)

Removal and Installation

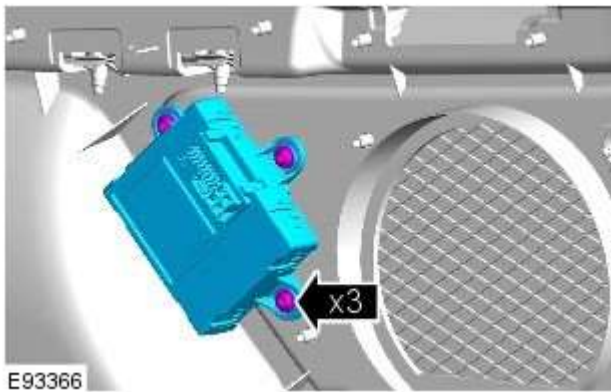
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Rear Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3. Torque: 1.5 Nm



Installation

1. To install, reverse the removal procedure.


Front End Body Panels -

Description	Nm	lb-ft	lb-in
Air deflector retaining nuts	7	-	62
Air deflector retaining bolts	7	-	62
Engine rear undershield retaining bolts	7	-	62
Secondary bulkhead left-hand panel retaining bolts	5	-	44
Secondary bulkhead right-hand panel retaining bolts	5	-	44

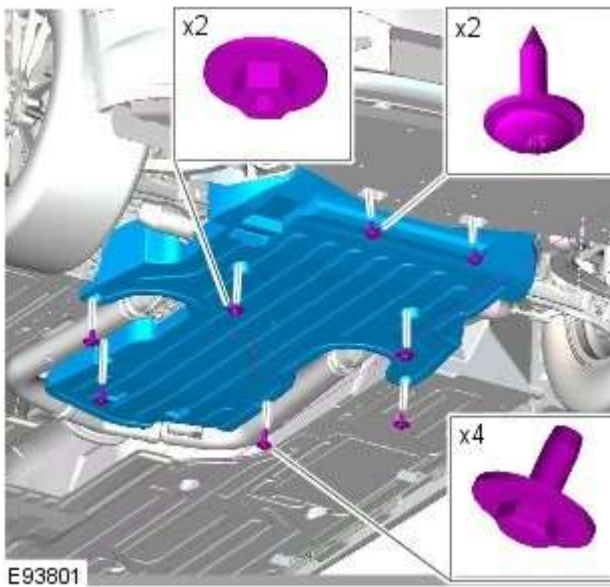
Front End Body Panels - Air Deflector

Removal and Installation

Removal

1.  **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.



2.  **NOTE:** Note the fitted position of the washers.

Torque: 7 Nm

Installation

1. To install, reverse the removal procedure.

Front End Body Panels - Cowl Vent Screen

Removal and Installation

Removal



CAUTION: Always protect paintwork and glass when removing exterior components.



NOTE: Removal steps in this procedure may contain installation details.

1. For additional information, refer to: [Windshield Wiper Pivot Arm](#) (501-16 Wipers and Washers, Removal and Installation).

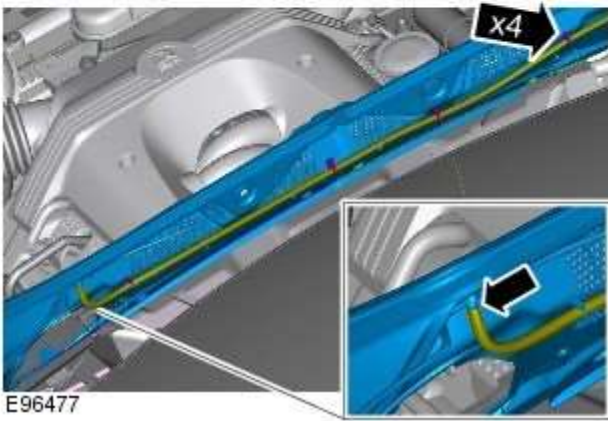
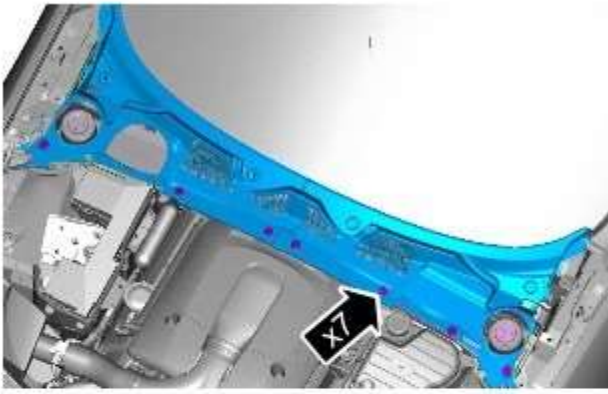
2.



3.



4.



E96477

5.



E96478

Installation

1. To install, reverse the removal procedure.


Front End Body Panels - Engine Rear Undershield

Removal and Installation

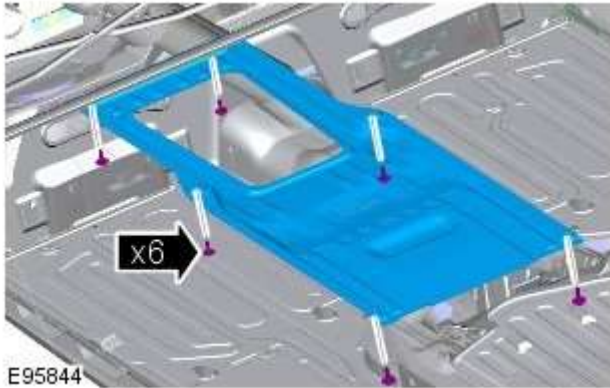
Removal



NOTE: Removal steps in this procedure may contain installation details.

1.  WARNING: Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

2. Torque: 7 Nm



Installation

1. To install, reverse the removal procedure.

Front End Body Panels - Fender Splash Shield

Removal and Installation

Removal

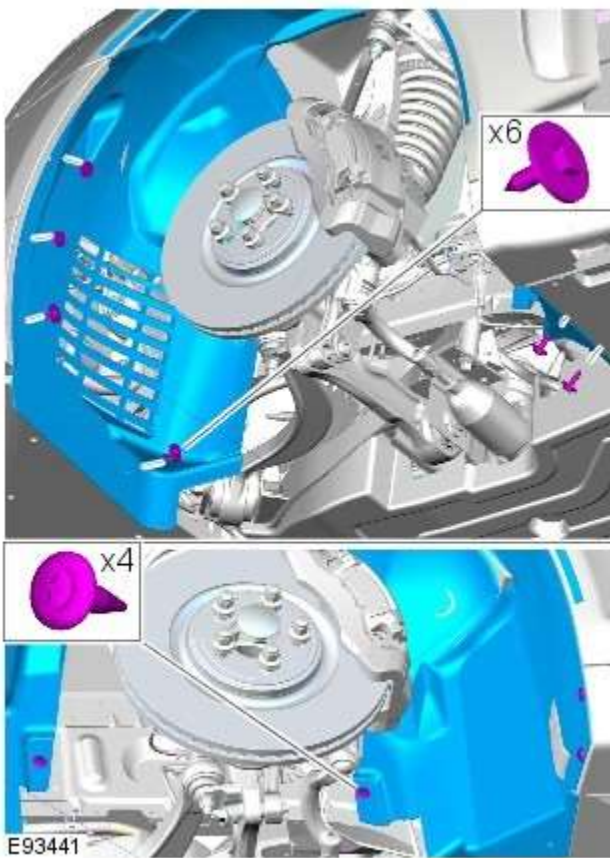


NOTE: Removal steps in this procedure may contain installation details.



1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
2. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

3.



Installation

1. To install, reverse the removal procedure.

Front End Body Panels - Hood

Removal and Installation

Removal



E102844

1. **NOTE:** The hood is manufactured from aluminium. The hood is serviced as a separate bolt-on panel.



2. **WARNING:** The hood and its associated components form part of the pedestrian protection system, it is essential that any repair or replacement operations do not affect the safe working of the system.

For additional information relating to the pedestrian safety system please see the following:

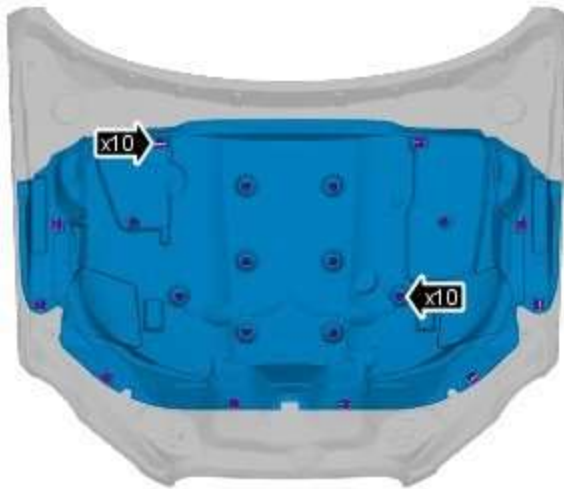
For additional information, refer to: [Pedestrian Protection System](#) (501-20C Pedestrian Protection System, Description and Operation).


3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).



4. NOTE: This step requires the aid of another technician.

Release the clips and disconnect the struts and remove the retaining nuts.

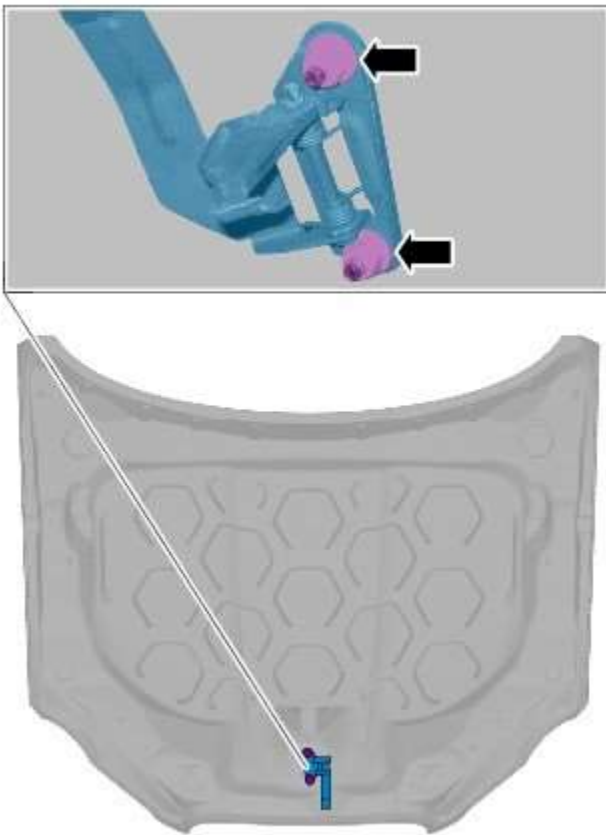


5.  NOTE: Do not disassemble further if the component is removed for access only.

Remove the hood pad.

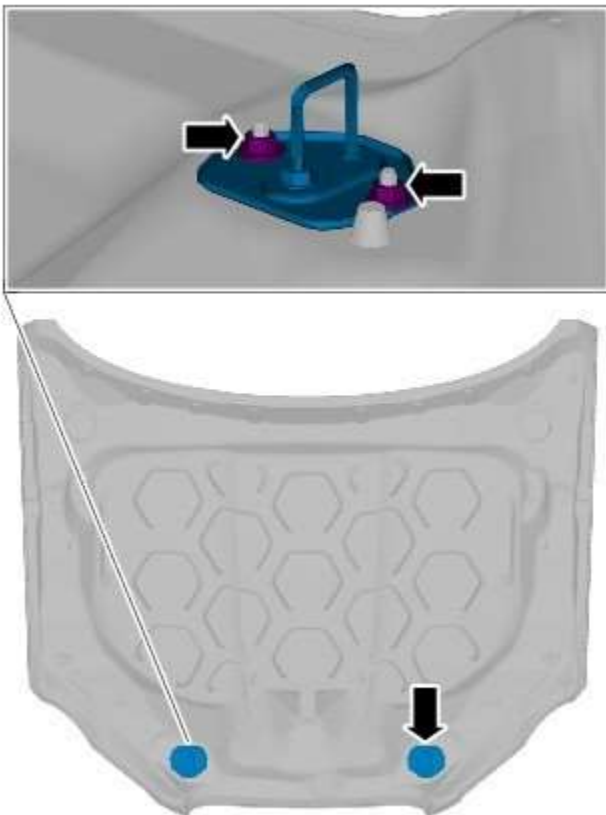
E102846

6. Remove the hood safety hook.



E102847

7. Remove the hood strikers.



E102848

Installation

1. NOTES:



If the hood hinges are deformed as a result of the pedestrian protection system deployment, they will need to be replaced.



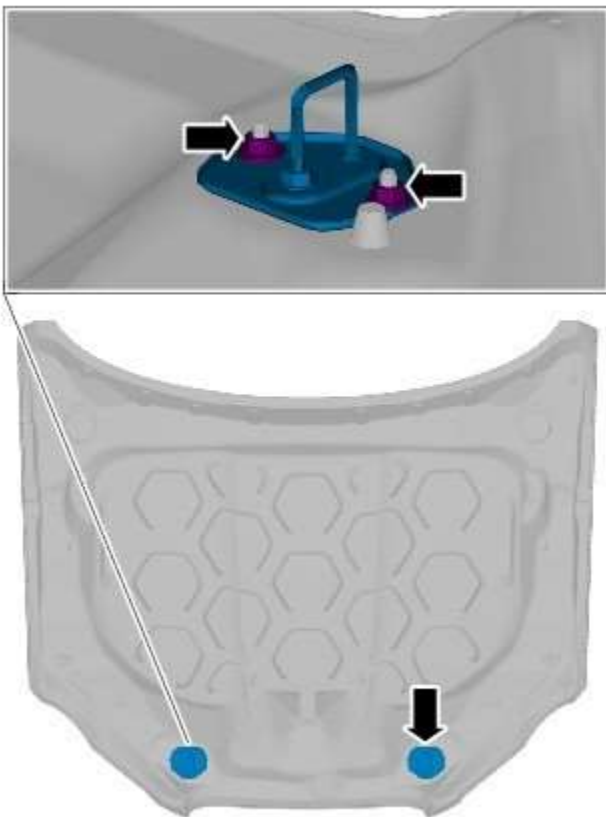
This step requires the aid of another technician.

Offer up the panel and loosely install the hood hinge retaining nuts.

2. Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.

3. Tighten the hood hinge retaining nuts to 17 Nm and connect the struts and secure with the clips.

4. Loosely install both hood strikers.



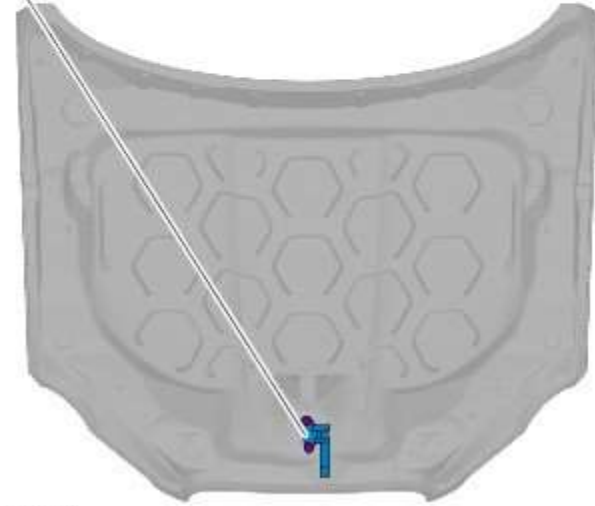
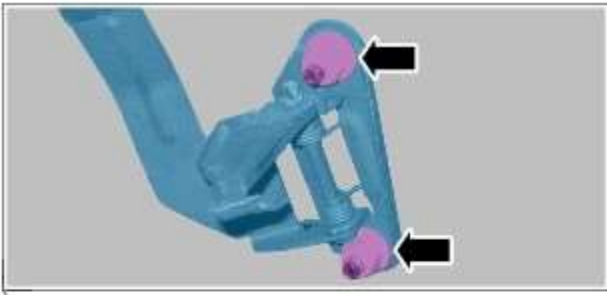
E102848

5. Gently close the hood so that the strikers are aligned to the latches.

6. Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.

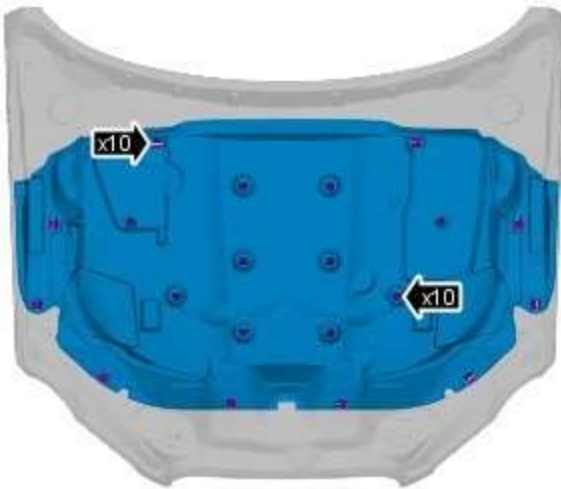
7. Tighten the hood striker nuts to 17 Nm.

8. Install the hood safety hook.
• Tighten to 17 Nm.



E102847

9. Install the hood pad.



E102846

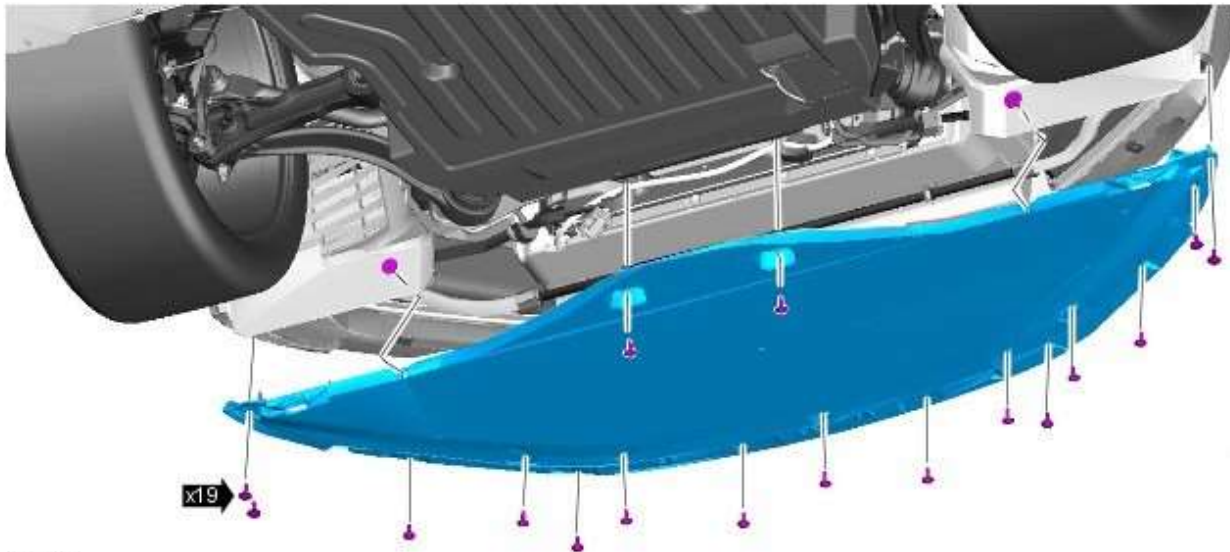
Front End Body Panels - Radiator Splash Shield

Removal and Installation

Removal



1. **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.



2.

E93528

Installation

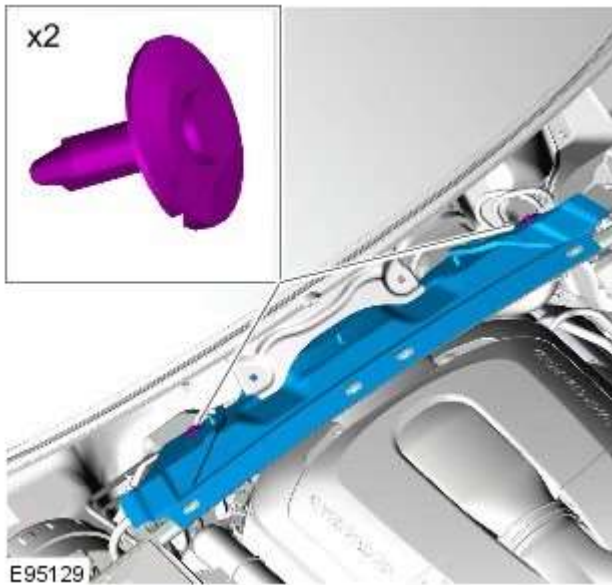
1. To install, reverse the removal procedure.

Front End Body Panels - Secondary Bulkhead Center Panel

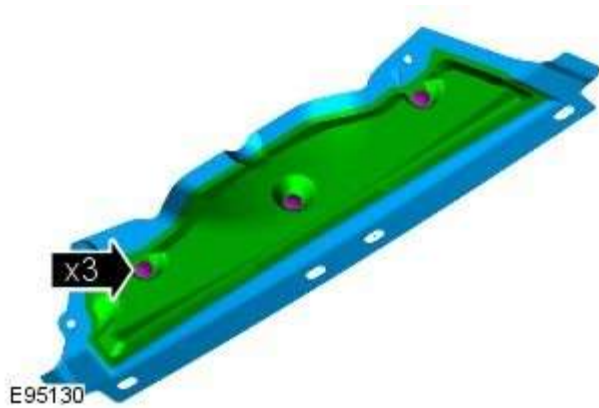
Removal and Installation


Removal

1. Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).



2.



3.  NOTE: Do not disassemble further if the component is removed for access only.

Installation

1. To install, reverse the removal procedure.

Front End Body Panels - Secondary Bulkhead Panel LH TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

All vehicles

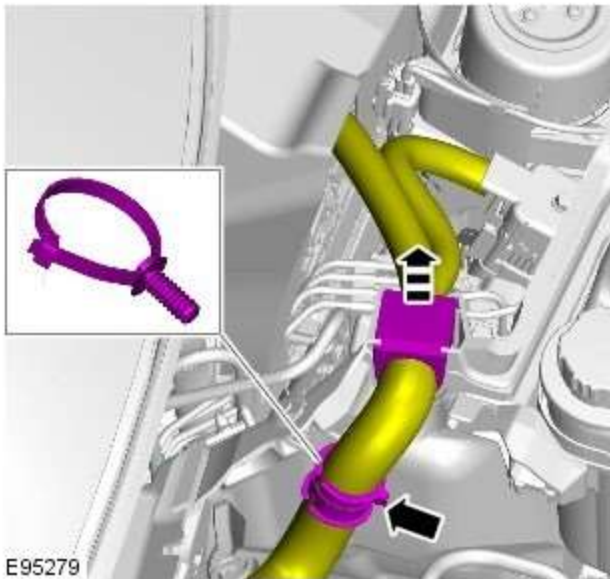
1. Refer to: [Secondary Bulkhead Center Panel](#) (501-02 Front End Body Panels, Removal and Installation).



2.

- Torque: 25 Nm

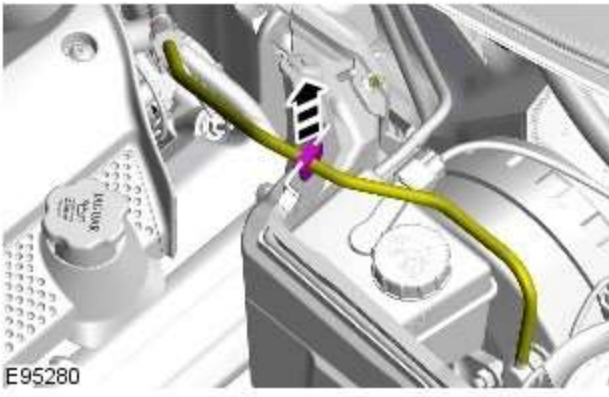
Right-hand drive vehicles



3.

Left-hand drive vehicles

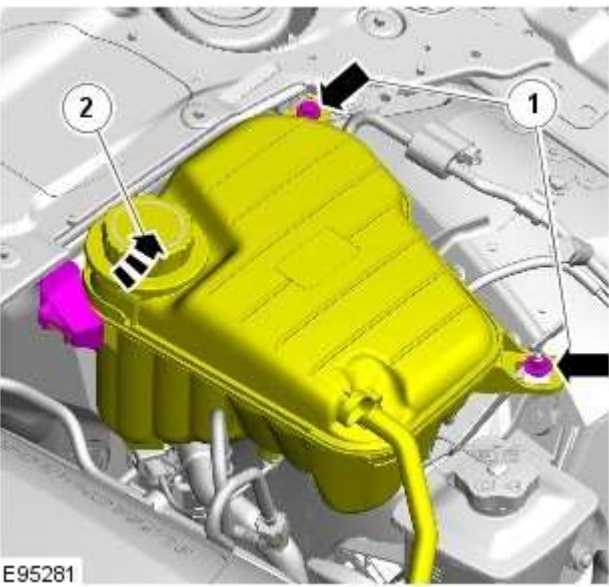
4.



Vehicles with 5.0L

5.

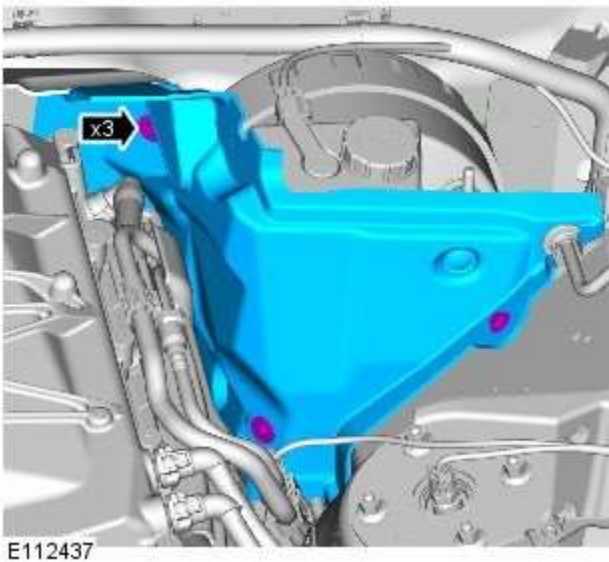
- Torque: 7 Nm




All vehicles

6.

- Torque: 5 Nm



7.  NOTE: Do not disassemble further if the component is removed for access only.



E112438

Installation

1. To install, reverse the removal procedure.

Front End Body Panels - Secondary Bulkhead Panel RH TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

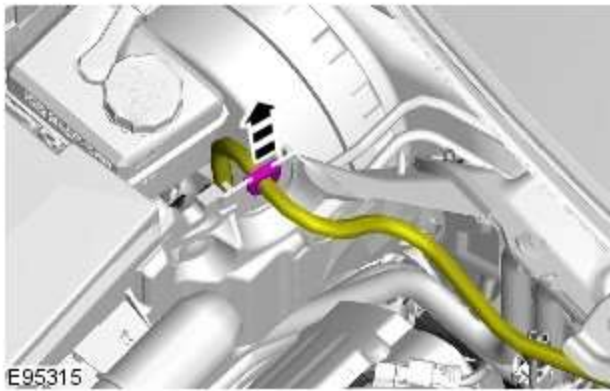
All vehicles

1. Refer to: [Secondary Bulkhead Center Panel](#) (501-02 Front End Body Panels, Removal and Installation).

2. Torque: 25 Nm



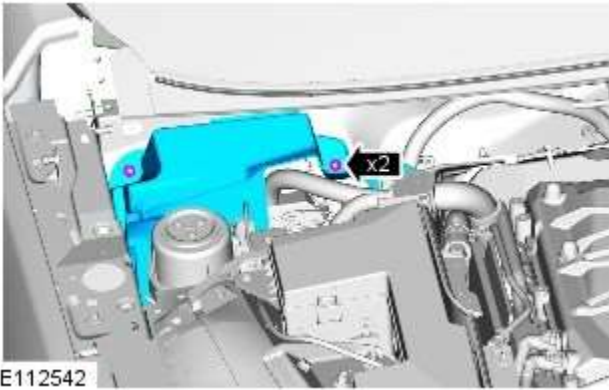
Right-hand drive vehicles




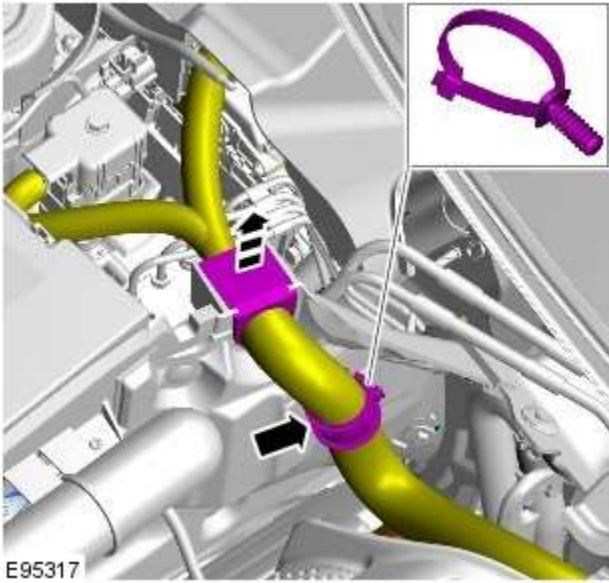
3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Left-hand drive vehicles

4.



5.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

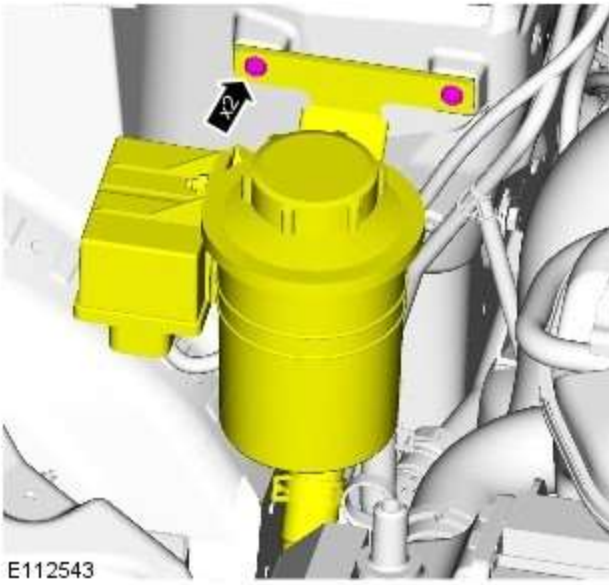


Vehicles with 5.0L

6. Refer to: Air Cleaner RH (303-12G, Removal and Installation).

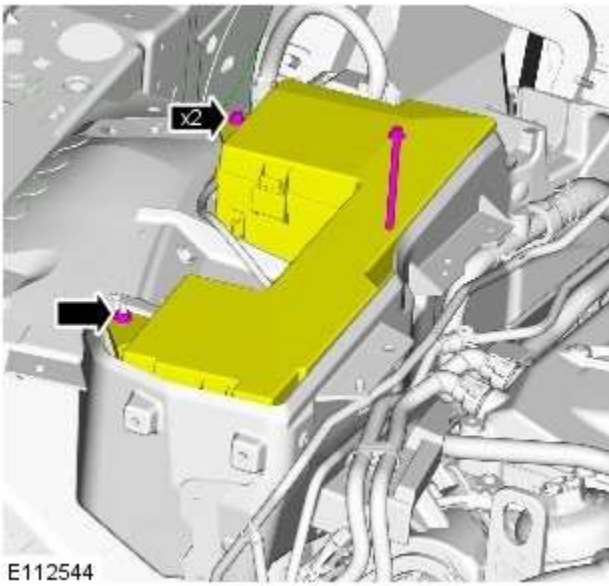
Vehicles with diesel engine

7.

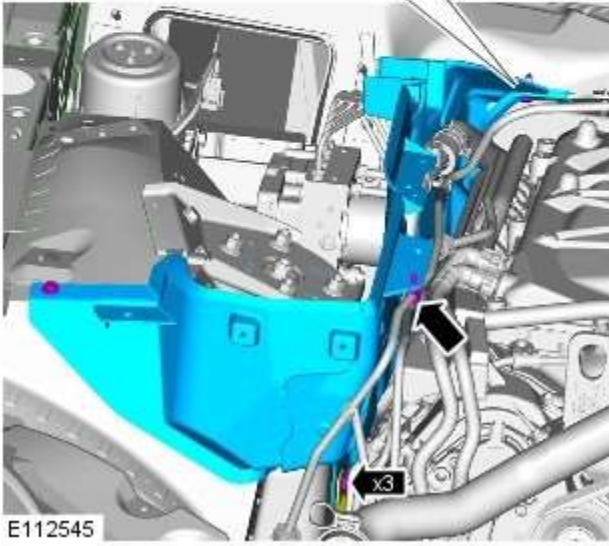
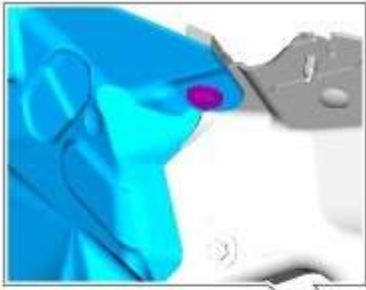


All vehicles

8.



9.



E112545

Installation

1. To install, reverse the removal procedure.

Body Closures - Front Door

Removal and Installation

Removal



E 106476

1. **NOTE:** The front door is manufactured from mild steel, it contains a side impact reinforcement manufactured from boron steel.

The front door is serviced as a separate bolt-on panel.

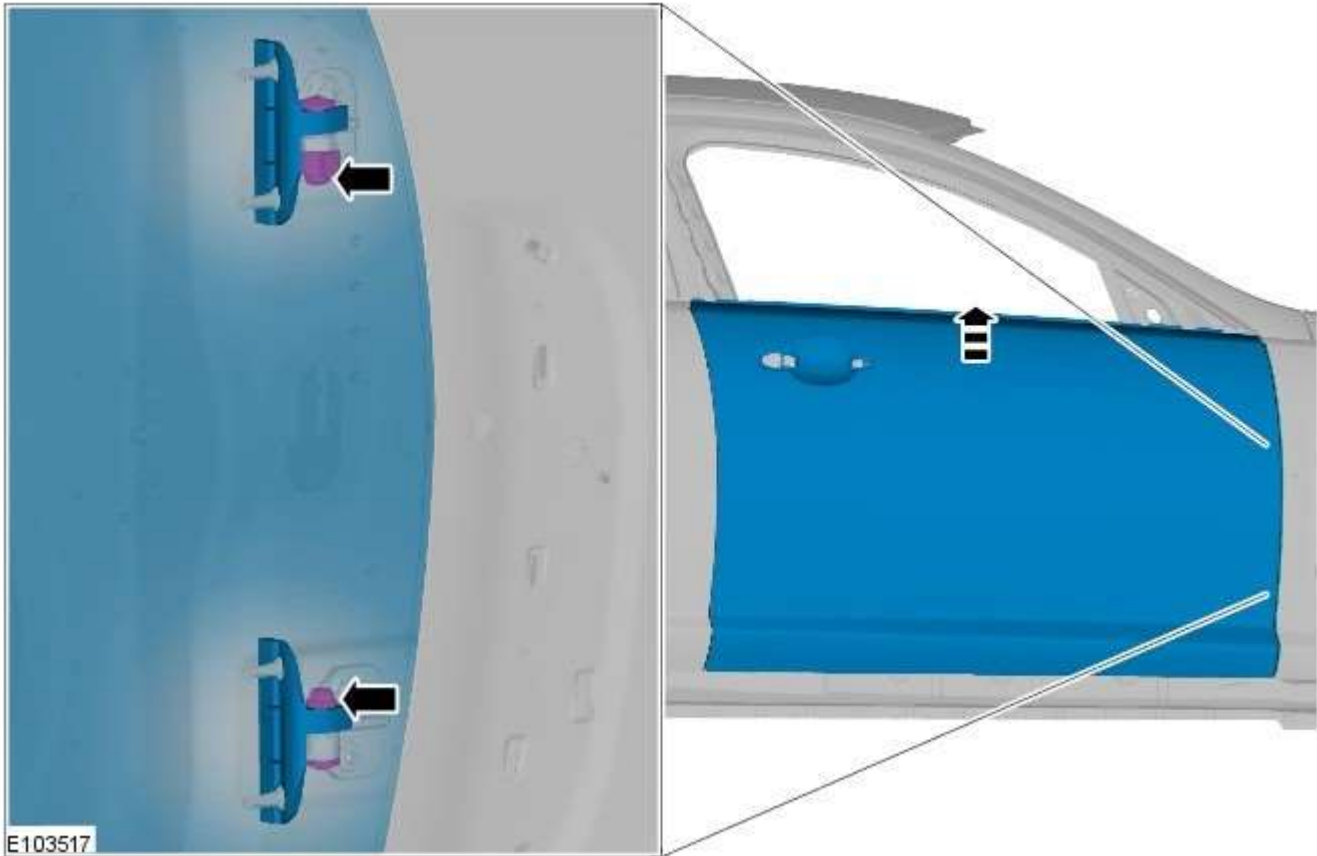
2. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
3. **NOTE:** If the procedure includes removal of the front door components, the battery can remain connected to aid their removal and disconnected afterwards.

Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
4. **NOTE:** For new front door installation, this step may be carried out later in the removal procedure.

Disconnect the front door wiring harness, accessed behind the grommet on the A-pillar.
5. **NOTE:** For new front door installation, this step may be carried out later in the removal procedure.

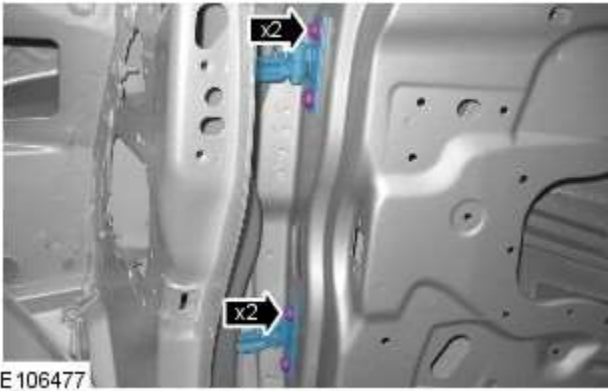
Release the front door check strap from the body.
6. **NOTE:** This step is for removing the fully trimmed front door for access only, for installing a new front door, continue to removal step 7.


Remove the front door upper and lower hinge pivot bolts and lift the front door to remove.



7. Remove the front door window regulator and motor.
For additional information, refer to: [Front Door Window Regulator and Motor](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).
8. Remove the exterior mirror.
For additional information, refer to: [Exterior Mirror](#) (501-09 Rear View Mirrors, Removal and Installation).
9. Remove the front door latch.
For additional information, refer to: [Front Door Latch](#) (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).
10. Remove the front door outer window frame mouldings.
11. Remove the front door weatherstrips.
12. Remove the front door wiring harness.
13. Remove the front door impact absorbers.
14. Remove the front door check strap.
15. Remove the front door glass run felt.

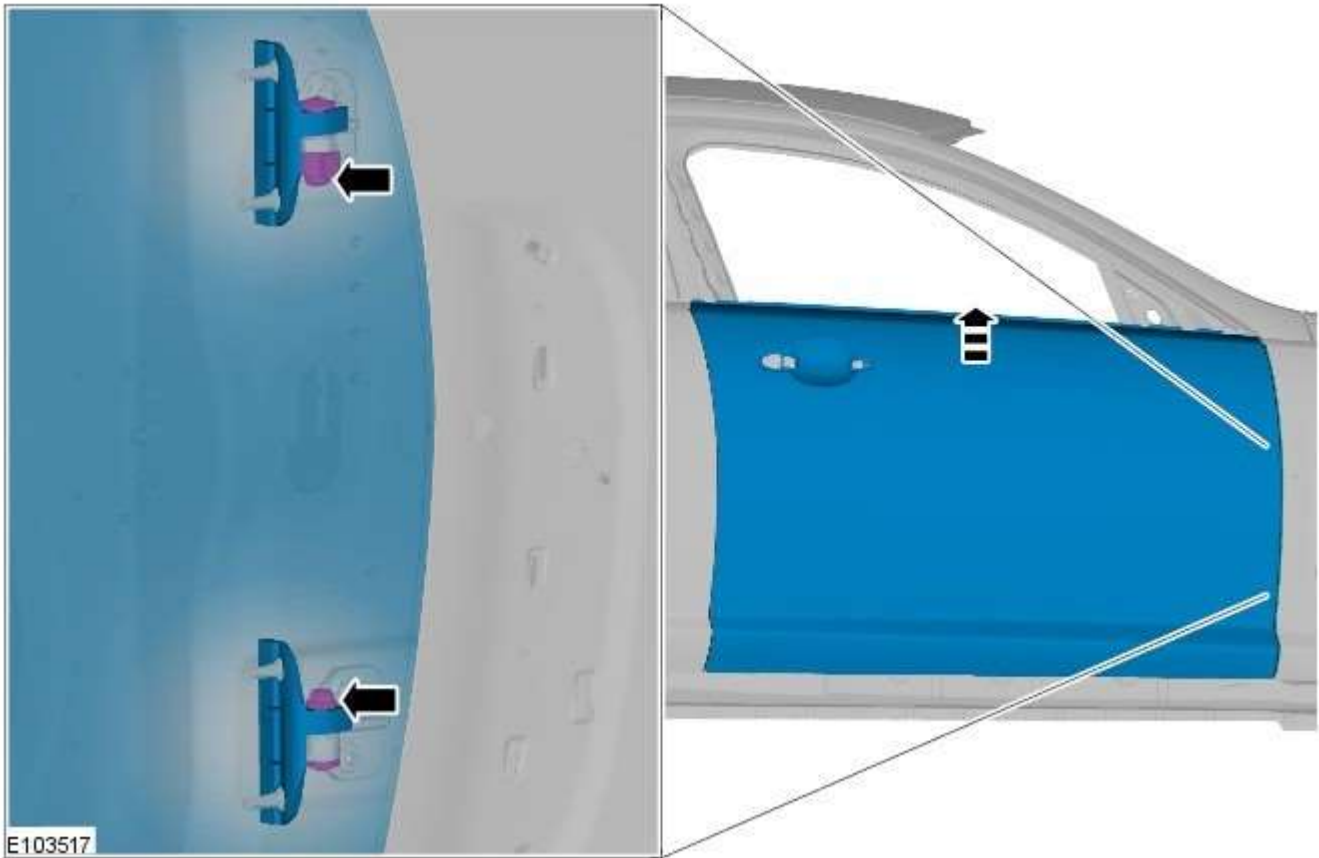
16. Remove any miscellaneous front door clips, grommets and blanking covers.



17.  NOTE: If new hinges are being installed, install the complete hinges to the A-pillar. To align the hinges at the A-pillar it will be necessary to remove the front fender.
Remove the upper and lower front door hinge fixing bolts and remove the front door.

Installation

1. NOTE: If the front door has been removed for access only, it can be installed back on to its upper and lower hinge pivots and secured with the upper and lower hinge pivot bolts.
Offer up the front door and loosely install the front door hinge bolts.
2. Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.
3. Tighten the front door hinge bolts to 30 Nm.
4. When correctly aligned and with the front door hinge bolts tightened, the new front door can be removed at its upper and lower hinge pivot bolts for refinishing.



5. **NOTE:** Install the front door upper frame weatherstrip prior to installing the front door.

The installation of associated panels and components is the reversal of removal procedure.

- Tighten the front door upper and lower hinge pivot bolts to 30 Nm.

Body Closures - Fuel Filler Door

Removal and Installation

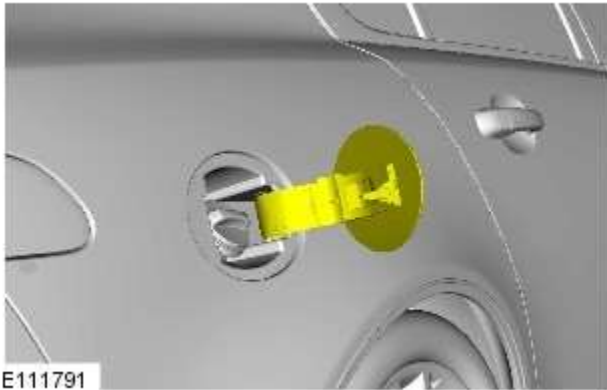
Removal



CAUTION: Do not align the bowl using the hinge arm.

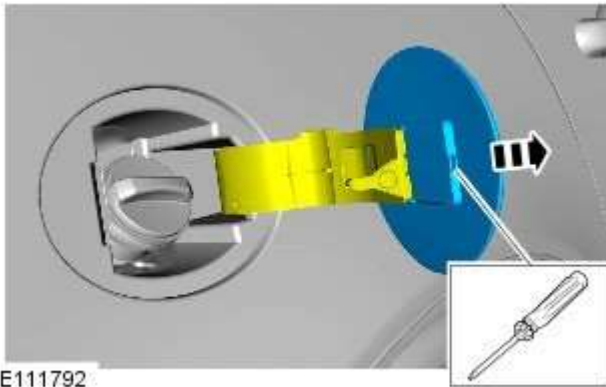


NOTE: Removal steps in this procedure may contain installation details.




E111791

1.



E111792

2.  **CAUTION:** Protect the surrounding paintwork to avoid damage.

- Release the clip.

Installation

1. To install, reverse the removal procedure.

Body Closures - Fuel Filler Door Assembly

Removal and Installation

Removal



CAUTION: Do not align the bowl using the hinge arm.



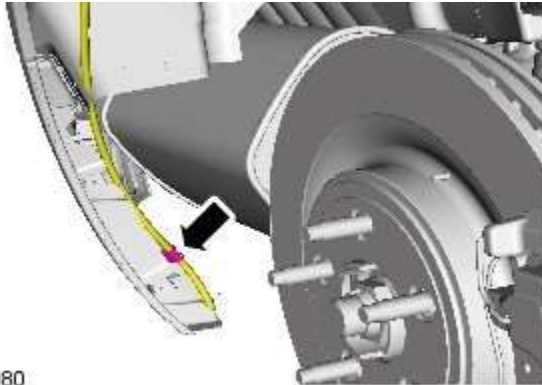
NOTE: Removal steps in this procedure may contain installation details.



1. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

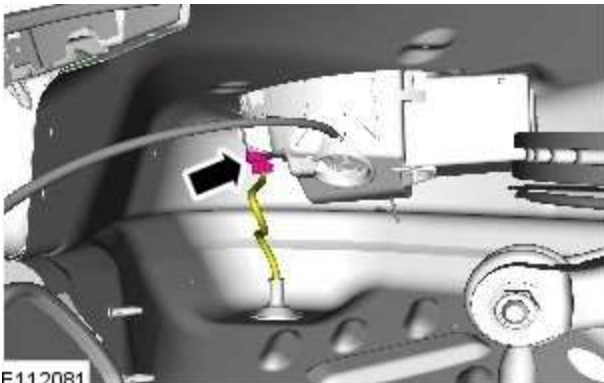
Raise and support the vehicle.

2. Refer to: Fuel Tank Filler Pipe (310-01, Removal and Installation).



E112080

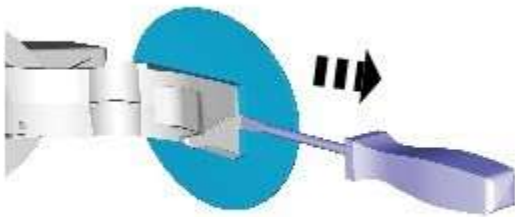
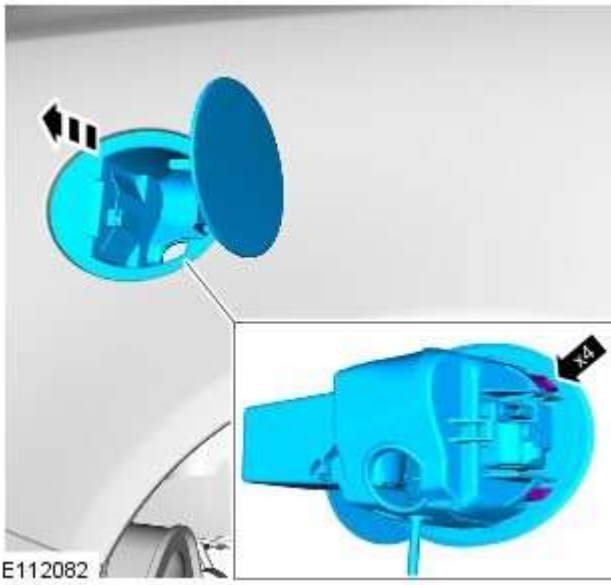
3.



E112081

4.

5.



6.

Installation

1. To install, reverse the removal procedure.



CAUTION: Protect the surrounding paintwork to avoid damage.



NOTE: Do not disassemble further if the component is removed for access only.

- Release the clip.

Body Closures - Luggage Compartment Lid

Removal and Installation

Removal

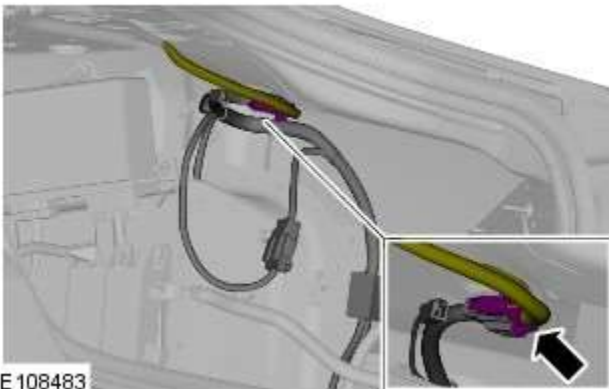


E 103477

1. **NOTE:** The luggage compartment lid is manufactured from mild steel.

The luggage compartment lid is serviced as a separate bolt-on panel, less its hinges.

2. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
3. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
4. Remove the loadspace trim panel RH.
For additional information, refer to: [Loadspace Trim Panel RH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
5. Disconnect the luggage compartment lid wiring harness.



E 108483

6.  **NOTE:** This step requires the aid of another technician.

Remove the luggage compartment lid.




E103478

7. **NOTE:** Do not disassemble further if the component is removed for access only.

Remove the luggage compartment lid moulding.

For additional information, refer to: [Luggage Compartment Lid Moulding](#) (501-08 Exterior Trim and Ornamentation, Removal and Installation).

8. Remove the luggage compartment lid latch actuator.
For additional information, refer to: [Luggage Compartment Lid Latch Actuator](#) (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).
9. Remove both rear fog lamps.
For additional information, refer to: [Rear Fog Lamp](#) (417-01 Exterior Lighting, Removal and Installation).
10. Remove both luggage compartment lid buffers.
11. Remove the luggage compartment lid wiring harness.
For additional information, refer to: [Luggage Compartment Lid Wiring Harness](#) (418-02 Wiring Harnesses, Removal and Installation).

12.  **NOTE:** Where it is not practical to re-use the luggage compartment lid badges, they should be renewed, therefore removal is not required.

Remove the luggage compartment lid badges.

Installation

1. **NOTE:** This step requires the aid of another technician.

Offer up the panel and loosely install the luggage compartment lid hinge retaining nuts.

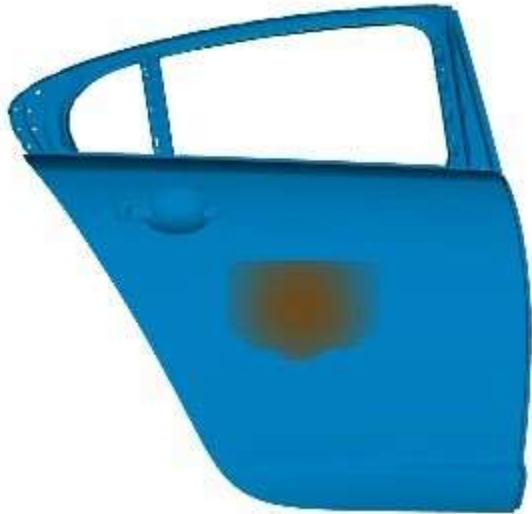


2. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
3. Tighten the luggage compartment lid hinge retaining nuts to 25 Nm.
4. The installation of associated panels and components is the reversal of removal procedure.

Body Closures - Rear Door

Removal and Installation

Removal



E 106478

1. **NOTE:** The rear door is manufactured from mild steel, it contains a side impact reinforcement manufactured from boron steel.

The rear door is serviced as a separate bolt-on panel.

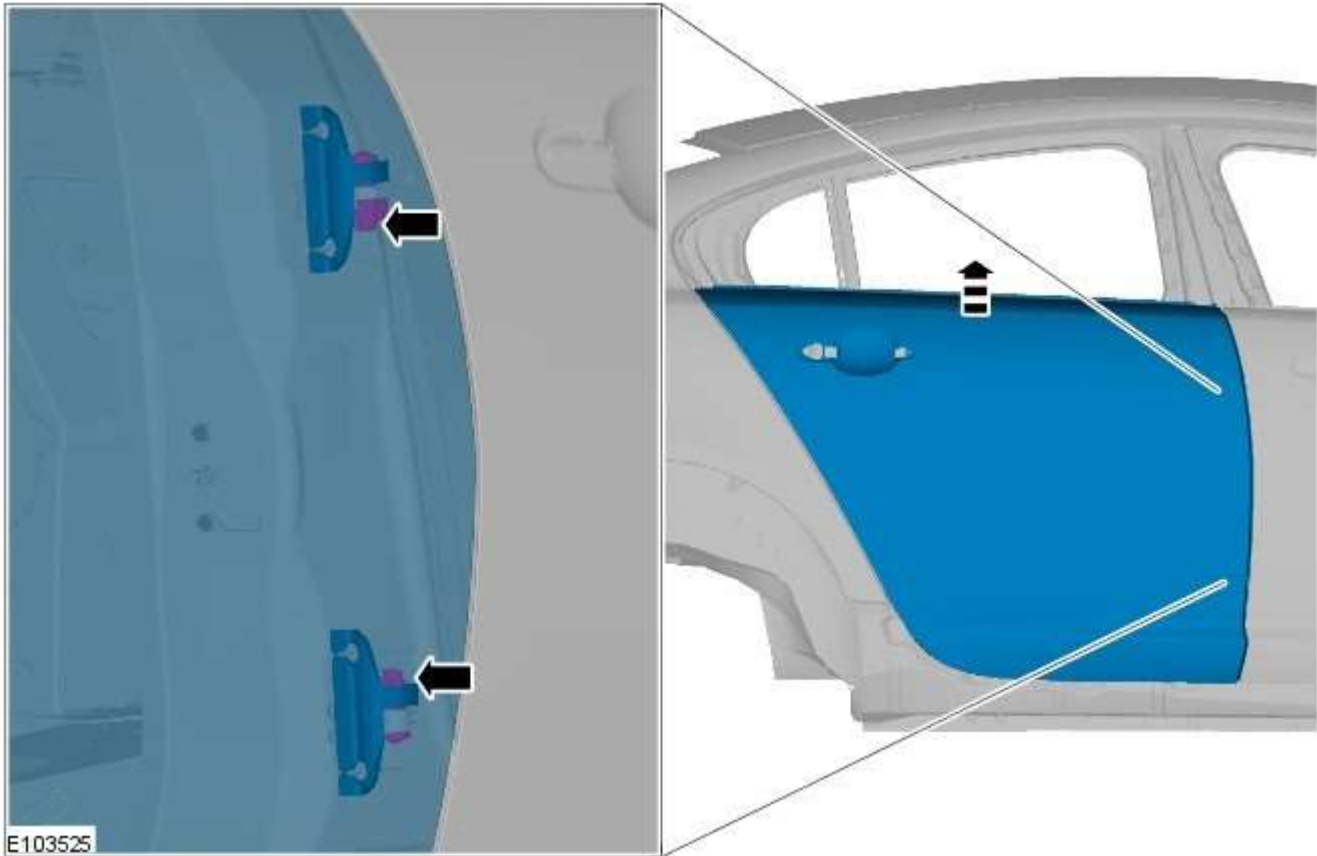
2. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
3. **NOTE:** If the procedure includes removal of the rear door components, the battery can remain connected to aid their removal and disconnected afterwards.

Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
4. **NOTE:** For new rear door installation, this step may be carried out later in the removal procedure.

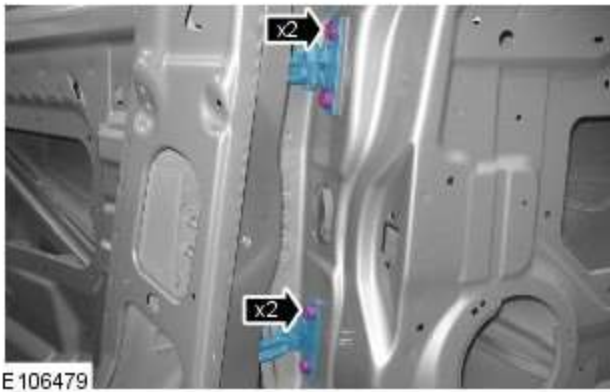
Disconnect the rear door wiring harness, accessed behind the grommet on the B-pillar.
5. **NOTE:** For new rear door installation, this step may be carried out later in the removal procedure.


Release the rear door check strap from the body.
6. **NOTE:** This step is for removing the fully trimmed rear door for access only, for installing a new front door, continue to removal step 7.

Remove the rear door upper and lower hinge pivot bolts and lift the rear door to remove.



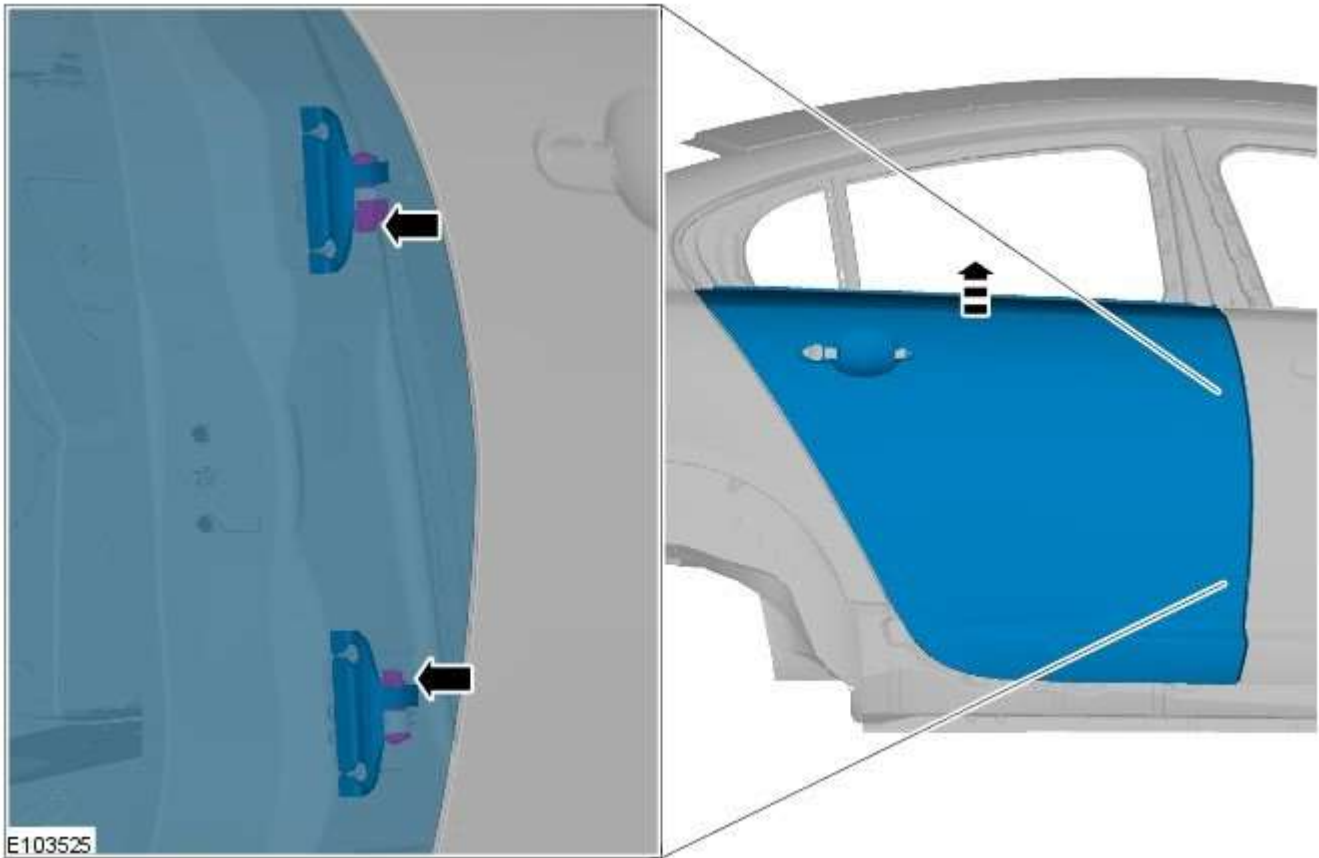
7. Remove the rear door fixed window glass.
For additional information, refer to: [Rear Door Fixed Window Glass](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).
8. Remove the rear door latch.
For additional information, refer to: [Rear Door Latch](#) (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).
9. Remove the rear door outer window frame mouldings.
10. Remove the rear door weatherstrips.
11. Remove the rear door wiring harness.
12. Remove the rear door impact absorbers.
13. Remove the rear door check strap.
14. Remove the rear door glass run felt.
15. Remove any miscellaneous rear door clips, grommets and blanking covers.



16.  NOTE: If new hinges are being fitted, install the complete hinges to the B-pillar.
- Remove the upper and lower rear door hinge bolts and remove the rear door.

Installation

1. NOTE: If the rear door has been removed for access only, it can be installed back on to its upper and lower hinge pivots and secured with the upper and lower hinge pivot bolts.
Offer up the rear door and loosely install the rear door hinge bolts.
2. Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.
3. Tighten the rear door hinge bolts to 30 Nm.
4. When correctly aligned and with the rear door hinge bolts tightened, the new rear door can be removed at its upper and lower hinge pivot bolts for refinishing.



5. The installation of associated panels and components is the reversal of removal procedure.
 - Tighten the rear door upper and lower hinge pivot bolts to 30 Nm.

Interior Trim and Ornamentation -

Description	Nm	lb-ft	lb-in
Front Safety belt shoulder height adjuster retaining bolt	25	19	-
Rear safety belt lower retaining bolt	40	30	-

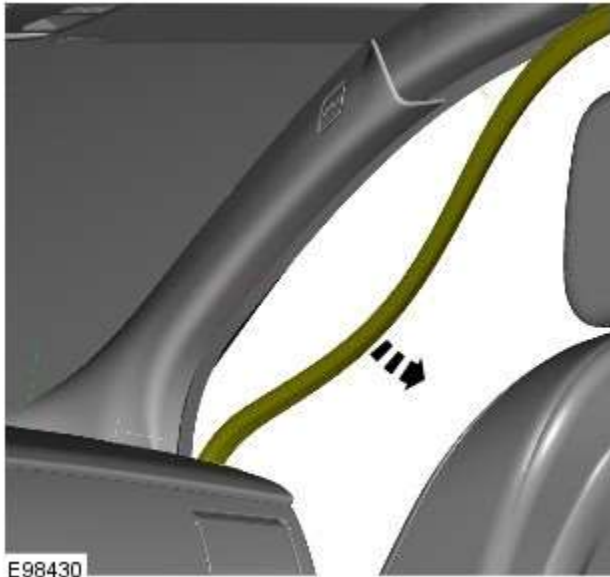
Interior Trim and Ornamentation - A-Pillar Trim Panel

Removal and Installation

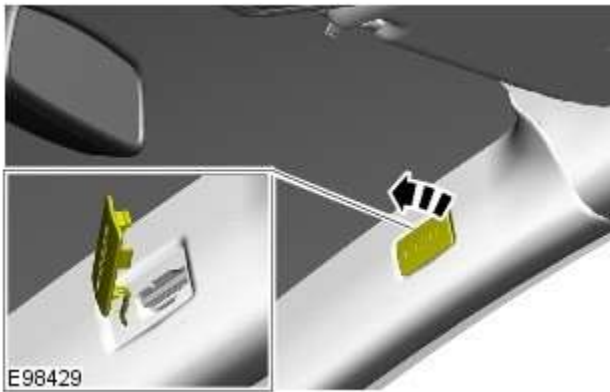
Removal



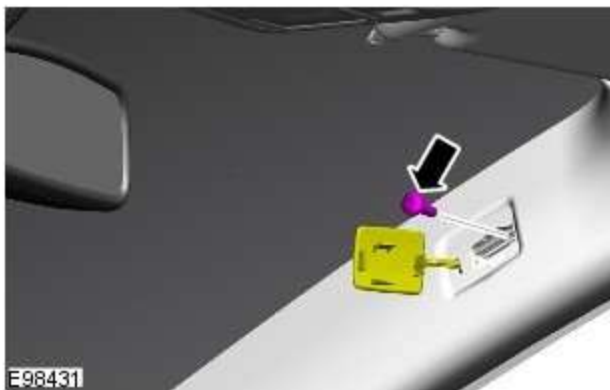
NOTE: Removal steps in this procedure may contain installation details.



1.



2.



3. Torque: 6 Nm



4.

Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - B-Pillar Lower Trim Panel

Removal and Installation

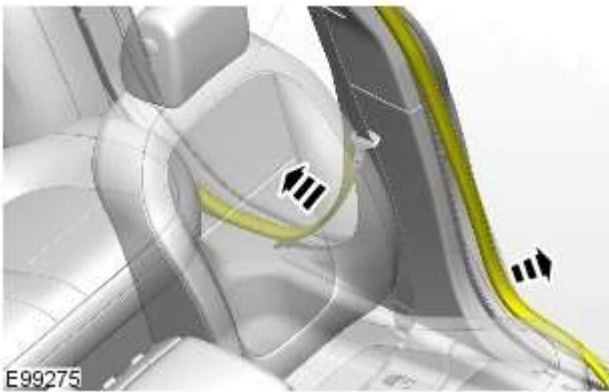
Removal



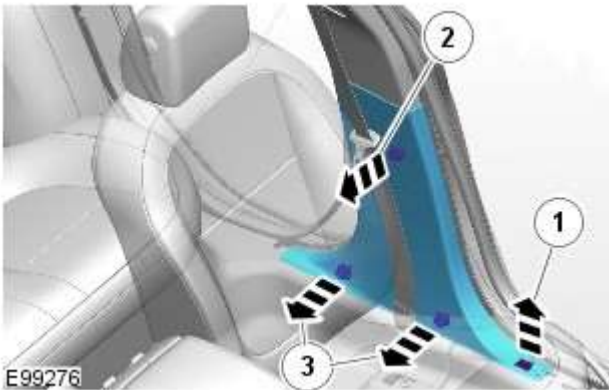
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Front Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Refer to: [Rear Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3.



4.  CAUTION: Make sure that the clips are correctly located.



Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - B-Pillar Upper Trim Panel

Removal and Installation

Removal



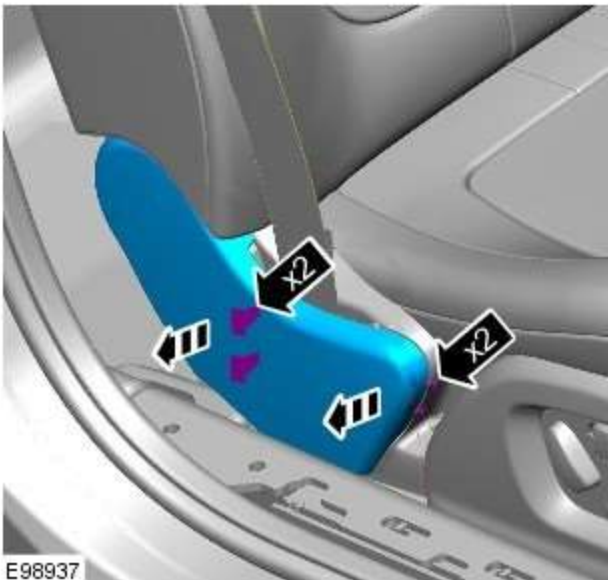
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [B-Pillar Lower Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

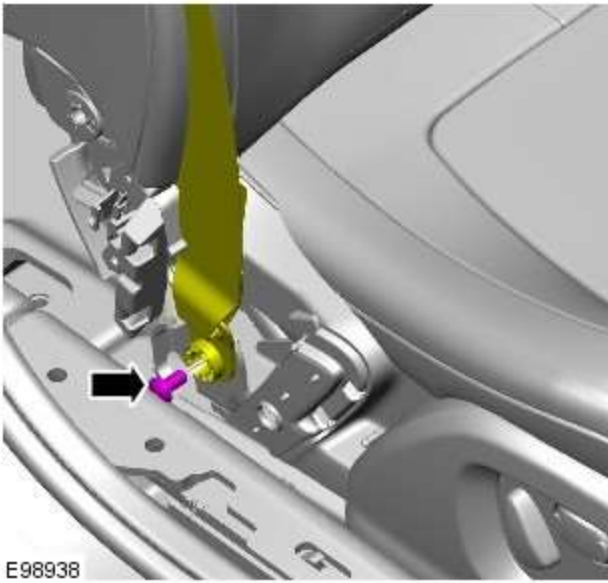
2.



3.

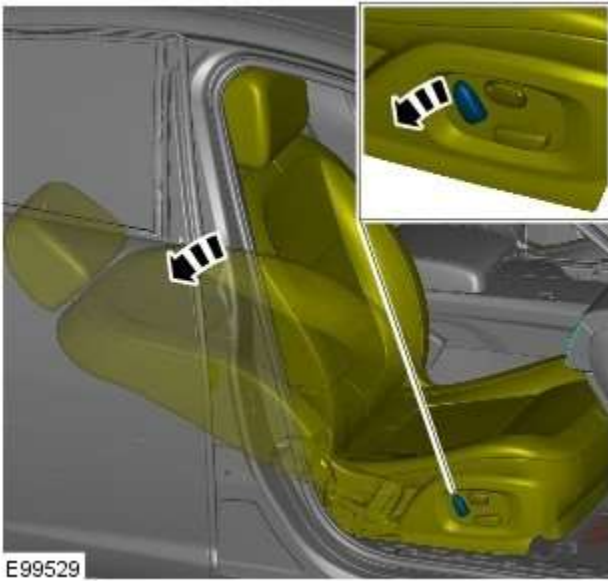


4. Torque: 40 Nm



E98938

5.



E99529

6.



E98933

7. Torque: 6 Nm



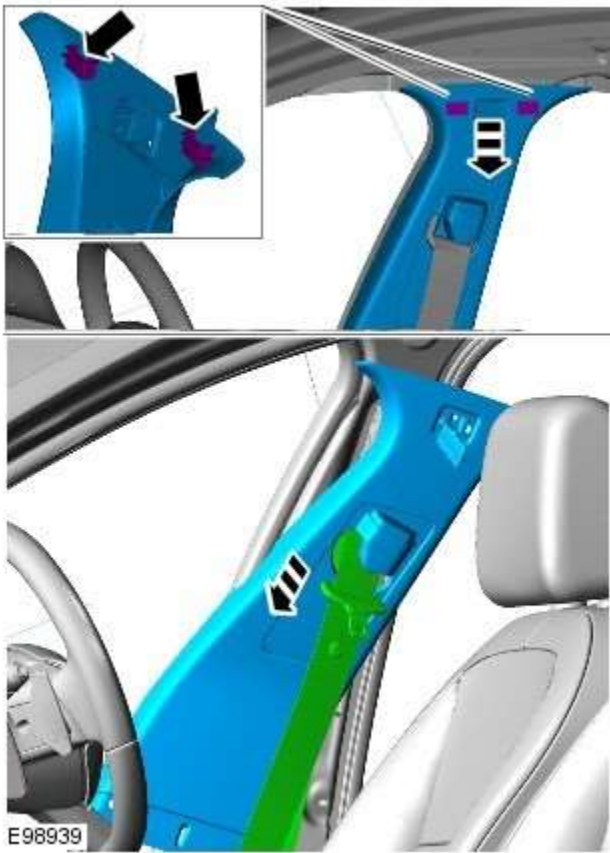
E98934





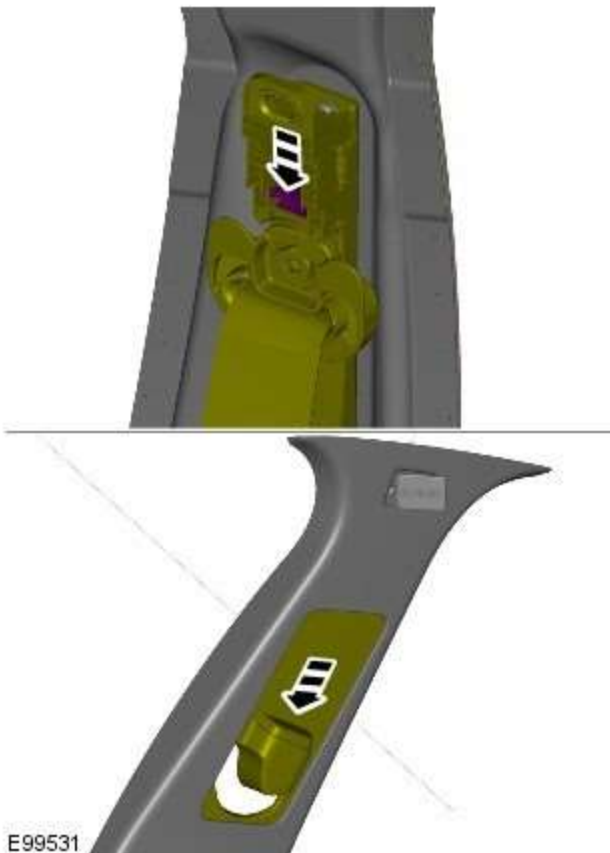
8.




9.



10.  **WARNING:** Failure to follow this instruction may cause damage to the vehicle.
-  **CAUTION:** Make sure the locating dowels are installed correctly.



11.  **CAUTION:** Make sure that these components are installed to the noted removal position.

Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - C-Pillar Lower Trim Panel

Removal and Installation

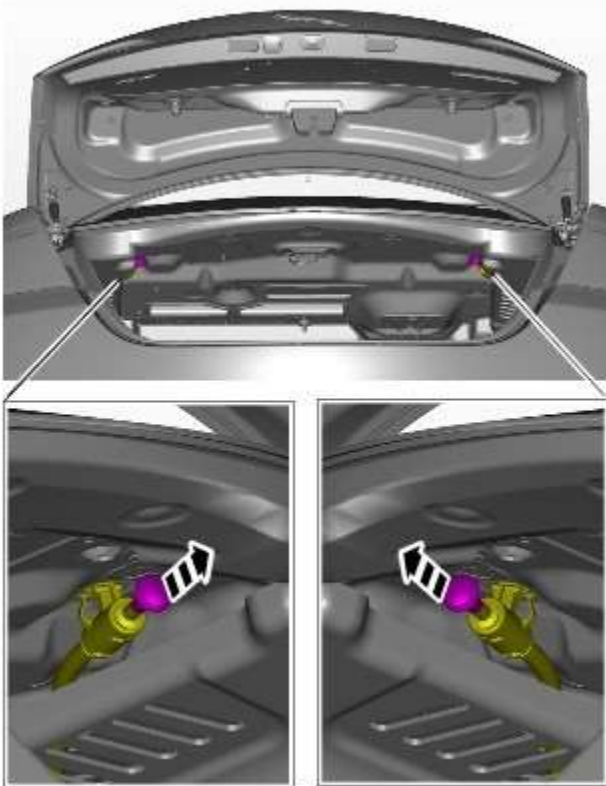
Removal



NOTE: Removal steps in this procedure may contain installation details.

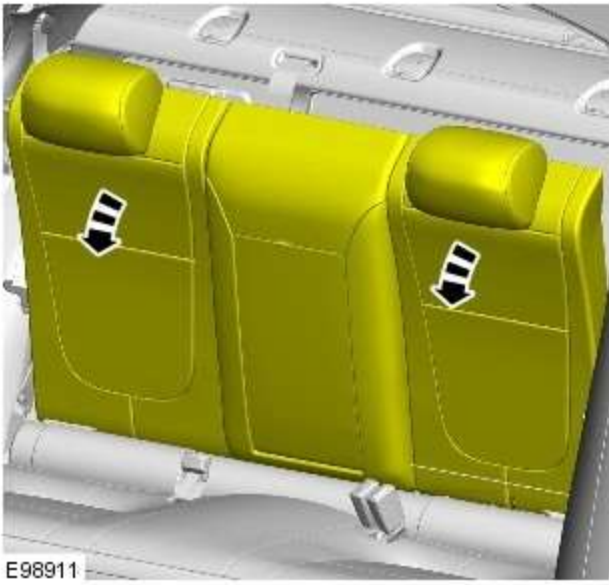
1. Refer to: [C-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.

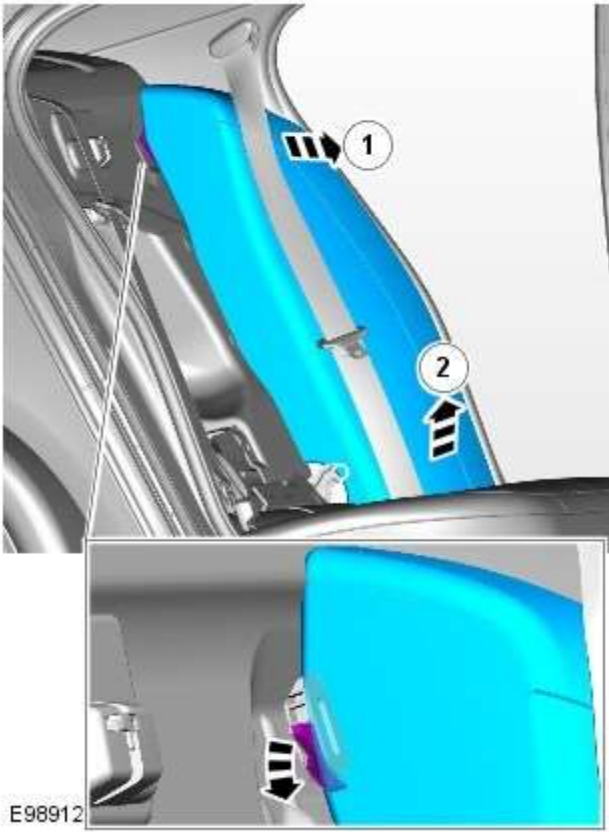


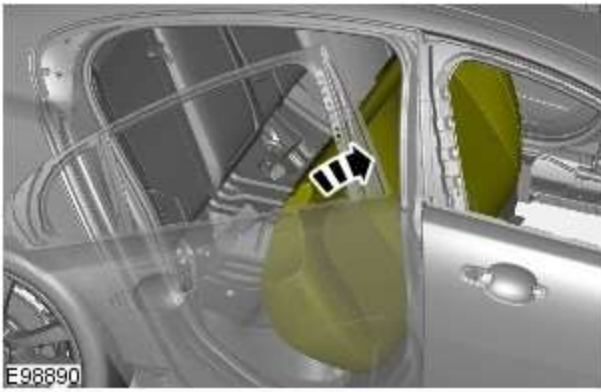
E98909

3.

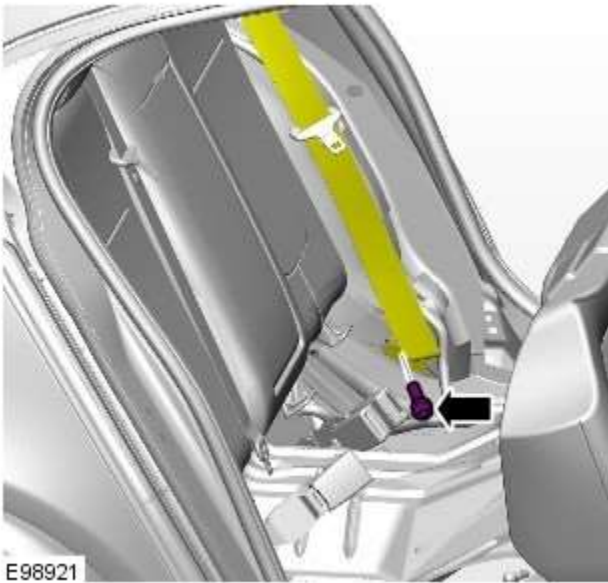


4.

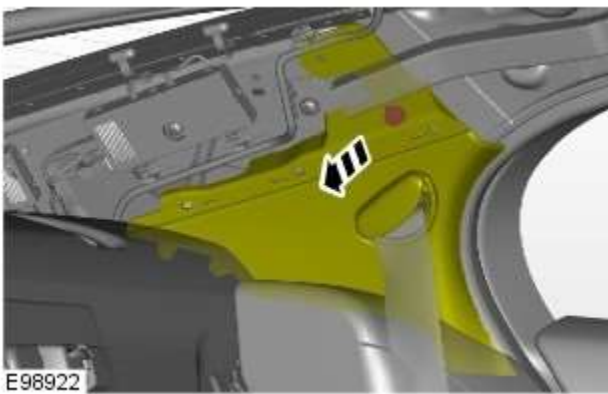




5.



6. *Torque: 40 Nm*



7. CAUTIONS:



Note the fitted position of the component prior to removal.

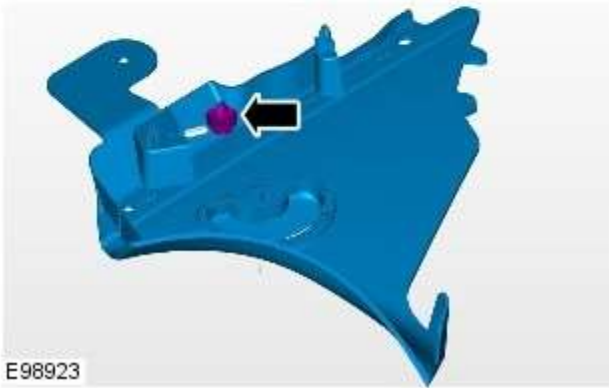


Make sure that these components are installed to the noted removal position.

Torque: 9 Nm



8.  CAUTION: Make sure the locating dowels are installed correctly.



E98923

Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - C-Pillar Trim Panel

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Loadspace Trim Panel RH - Sportbrake (501-05, Removal and Installation).

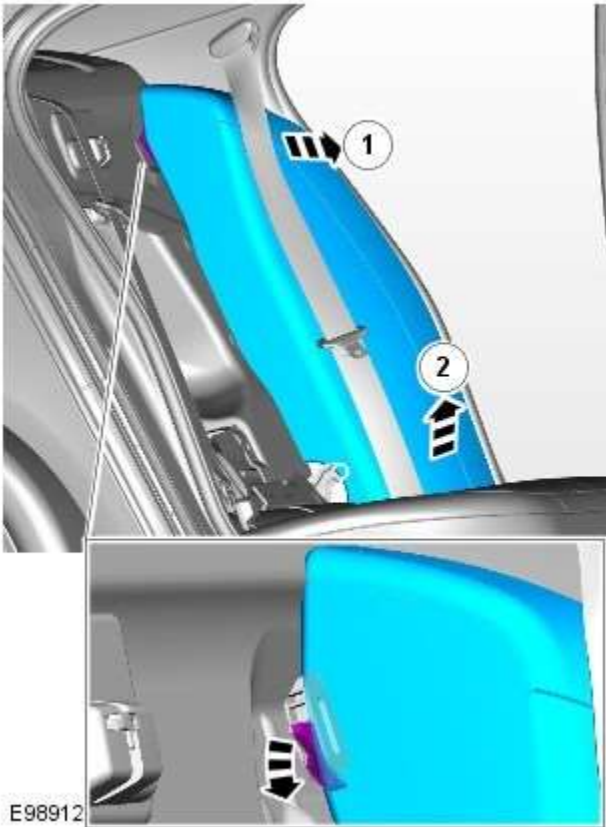
2. CAUTIONS:



Note the fitted position of the component prior to removal.



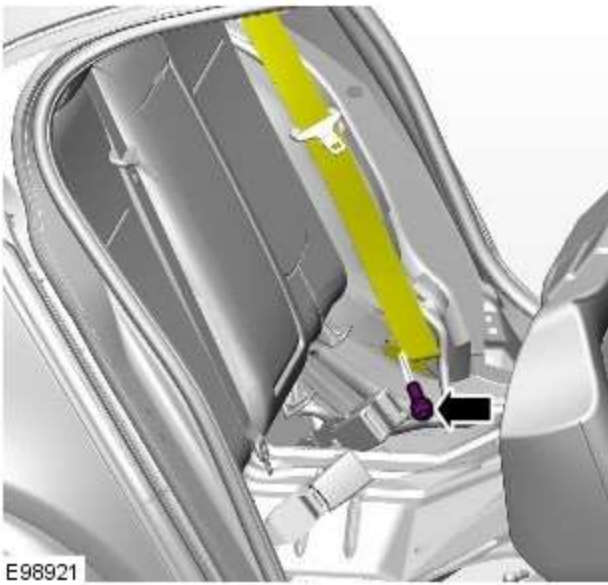
Make sure that the clips are correctly located.



3.

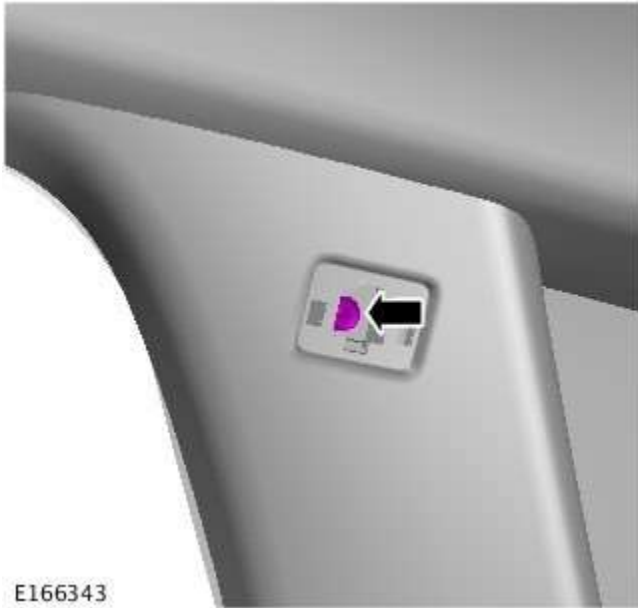


4. Torque: 40 Nm



5.

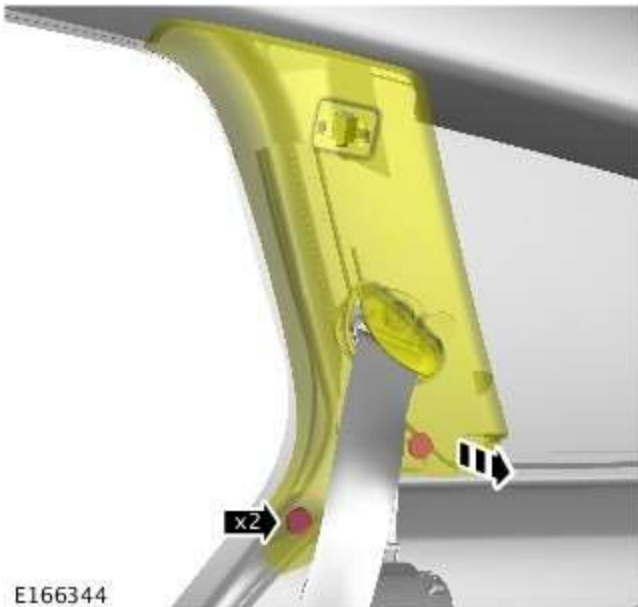






6. CAUTIONS:

-  Make sure the locating dowels are installed correctly.
-  Make sure that the clips are correctly located.



Torque: 6 Nm

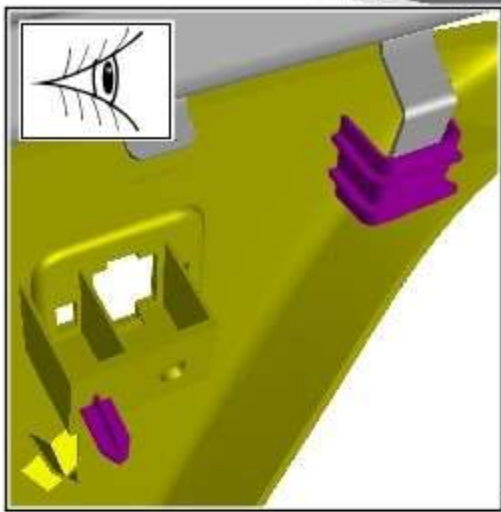


7. CAUTIONS:

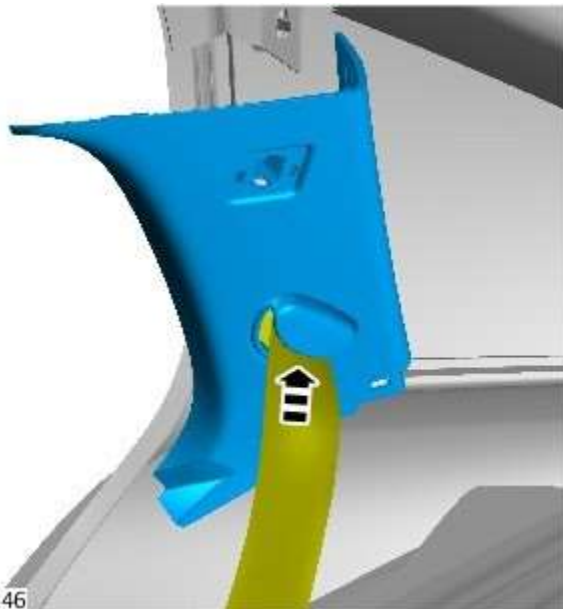
-  Note the fitted position of the component prior to removal.
-  Make sure that the clips are correctly located.

8. CAUTIONS:

-  Note the fitted position of the component prior to removal.
-  Make sure that the clips are correctly located.



E166345



E166346

9.  CAUTION: Note the fitted position of the component prior to removal.

Installation

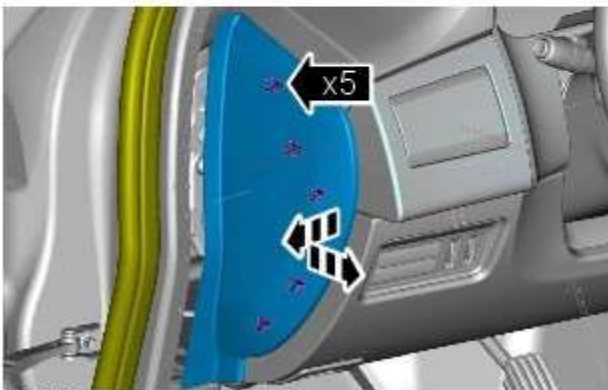
1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - Cowl Side Trim Panel

Removal and Installation

Removal

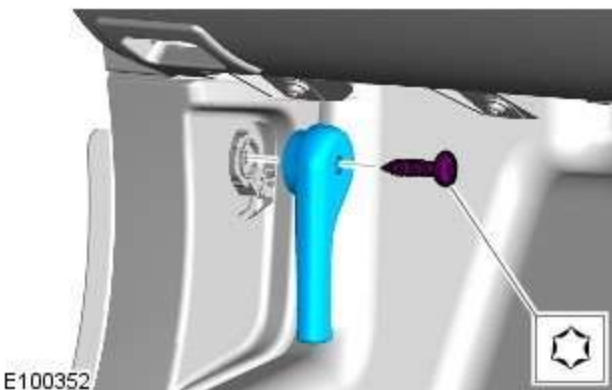
1. Refer to: [Front Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



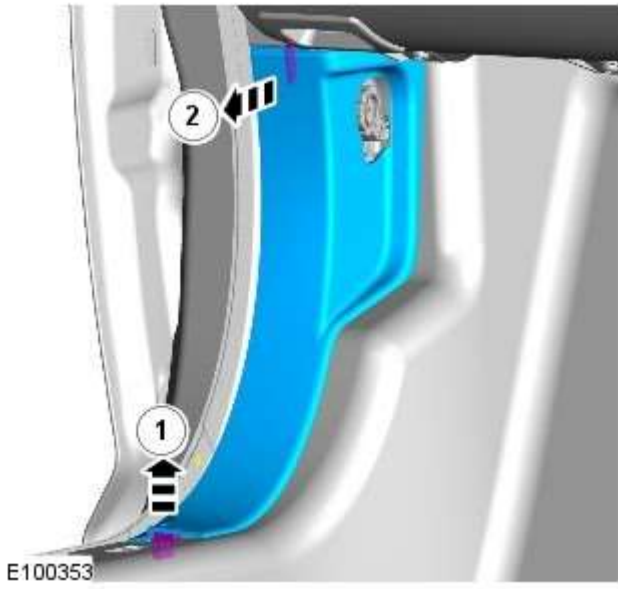
E95489

2.  NOTE: Left-hand shown, right-hand similar.

3.
 - LH side only: Remove the hood release lever.



E100352



4.  NOTE: Left-hand shown, right-hand similar.

Installation

1. To install, reverse the removal procedure.

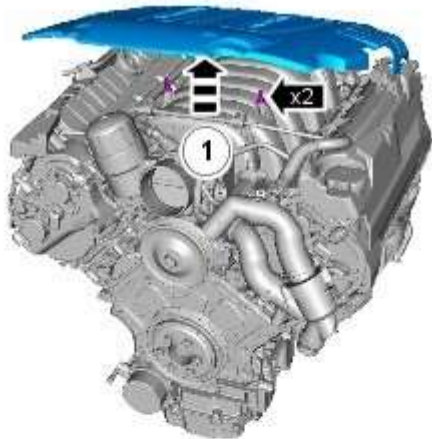
Interior Trim and Ornamentation - Engine Cover V8 5.0L Petrol/V8 S/C 5.0L


Petrol

Removal and Installation

Removal

 NOTE: Removal steps in this procedure may contain installation details.



1.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E134600

Installation

1. To install, reverse the removal procedure.

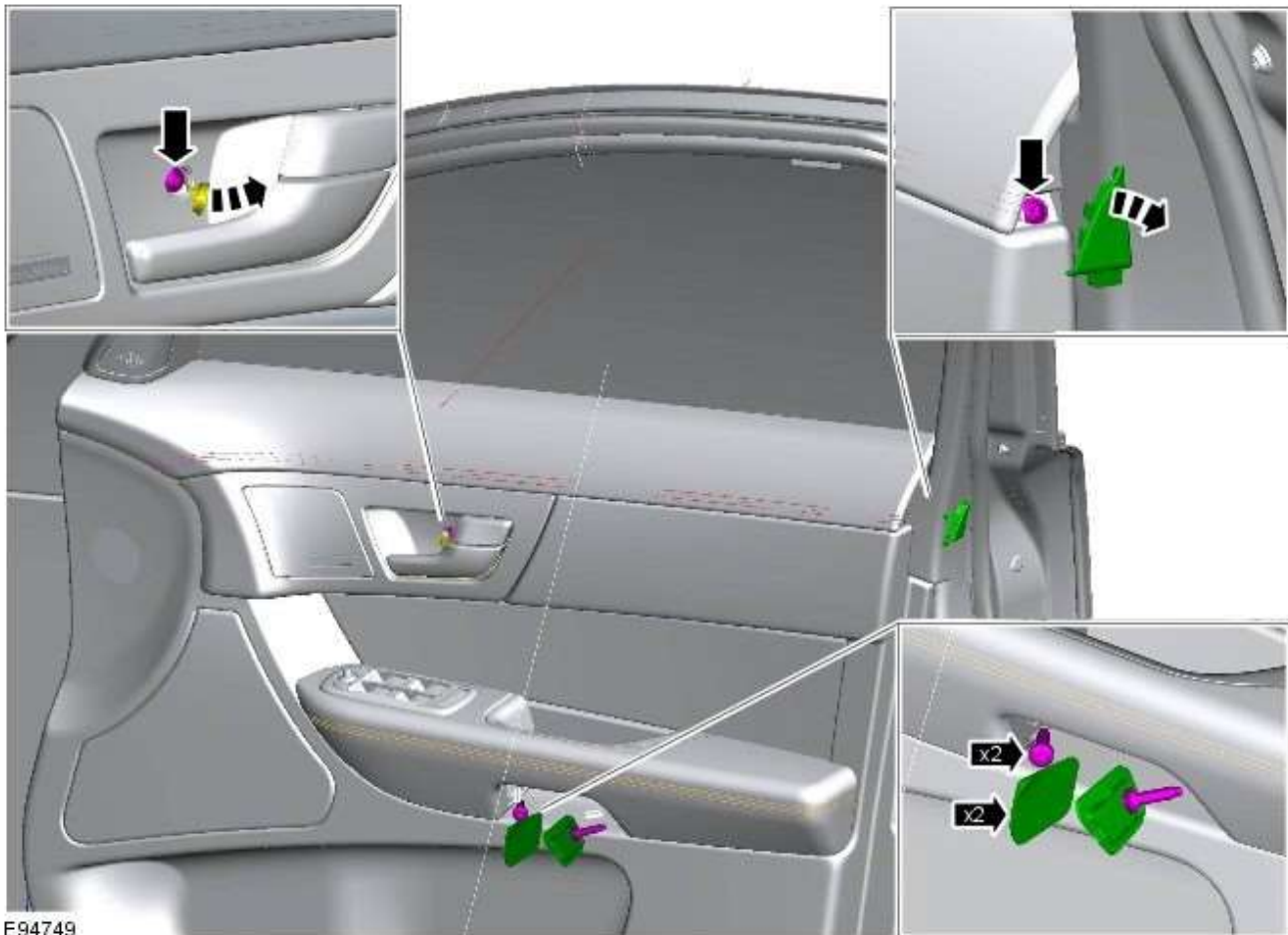
Interior Trim and Ornamentation - Front Door Trim Panel

Removal and Installation

Removal

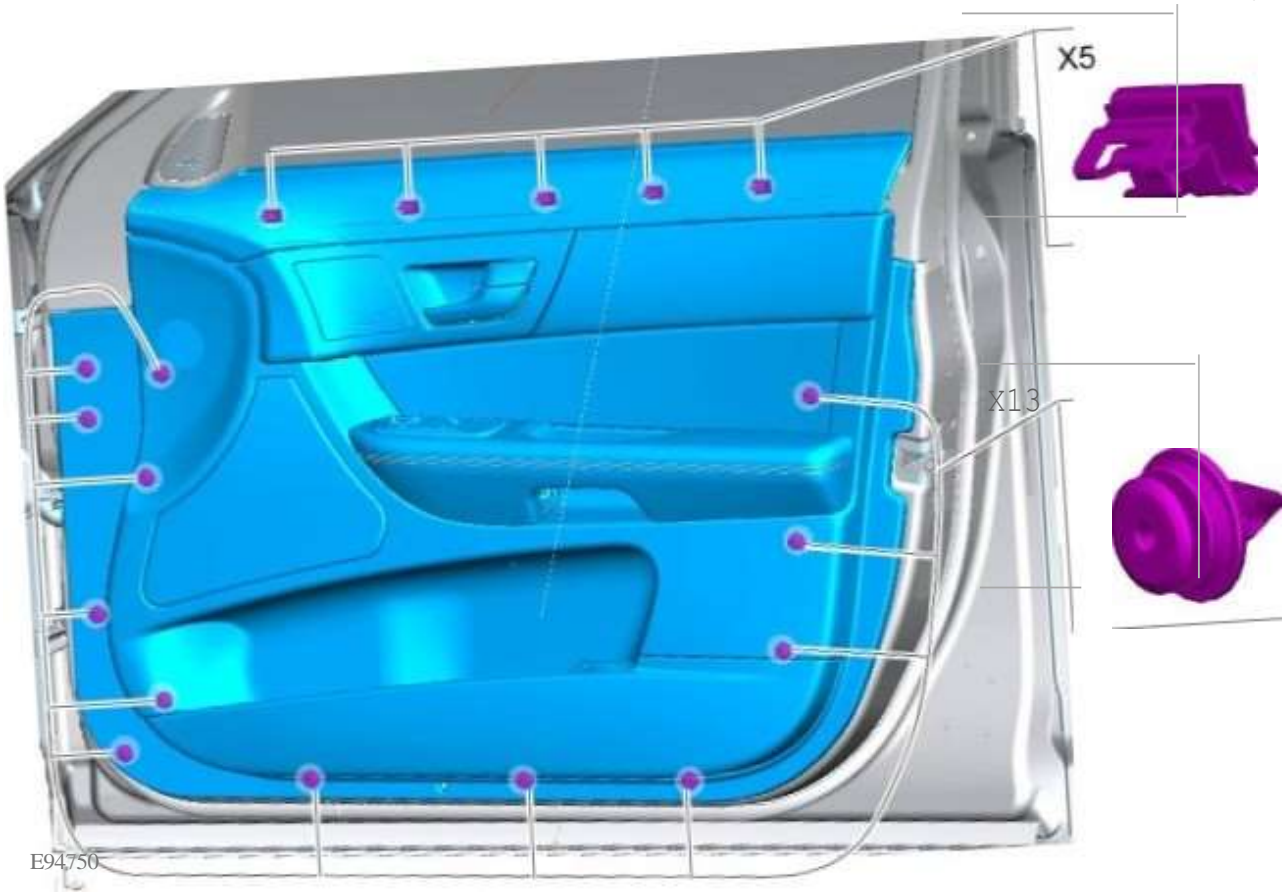
 NOTE: Removal steps in this procedure may contain installation details.

1.

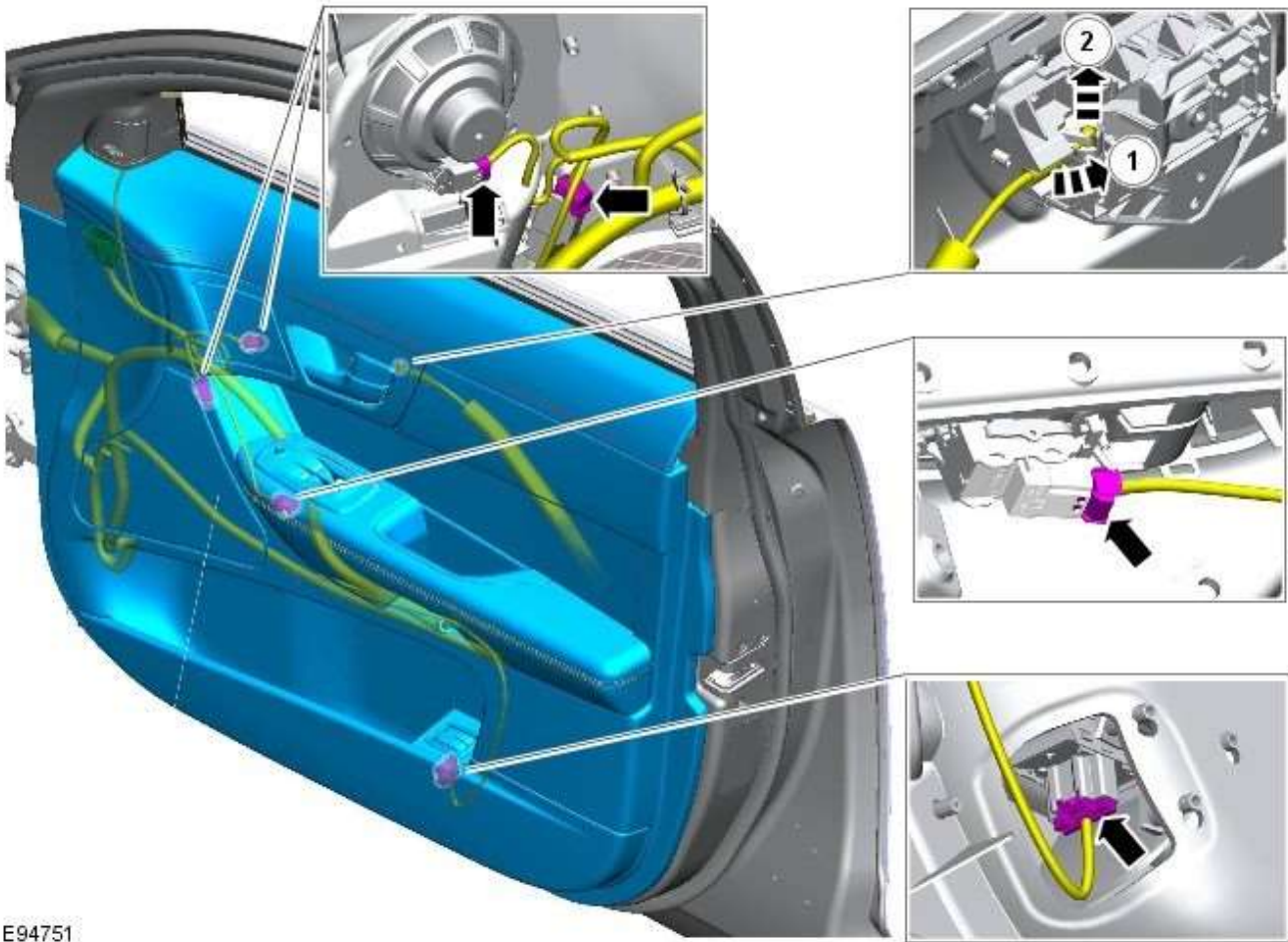


E94749

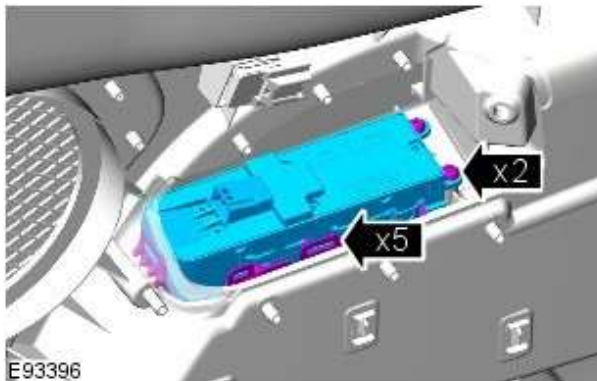
2.



E94750



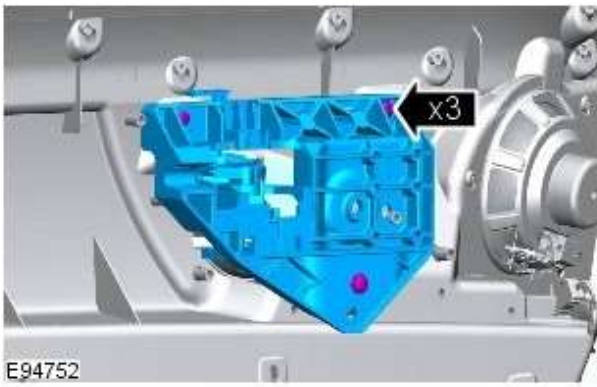
E94751



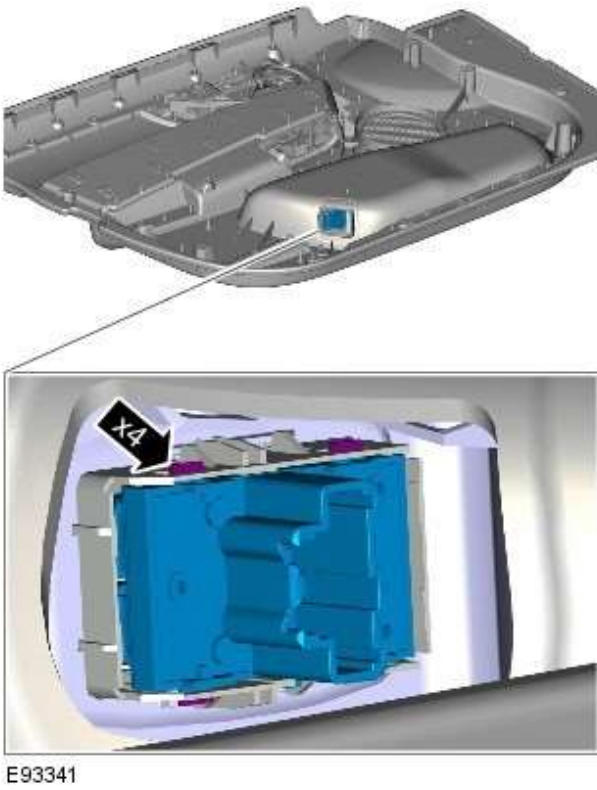
E93396

4.  NOTE: Do not disassemble further if the component is removed for access only.

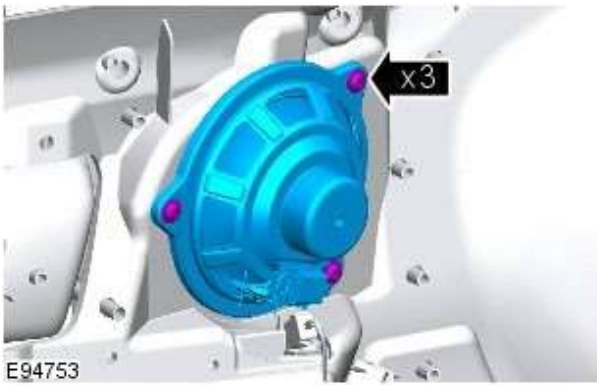
5.



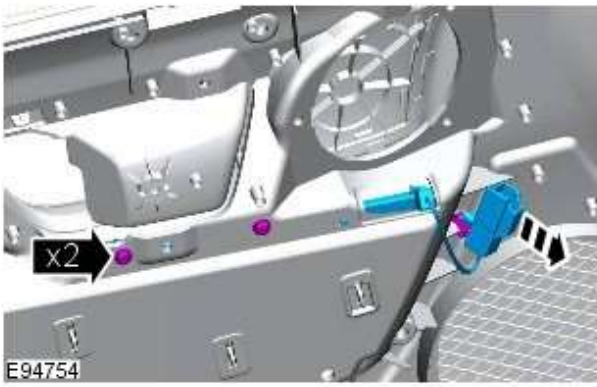
6.



7.



8.



Installation

1. To install, reverse the removal procedure.

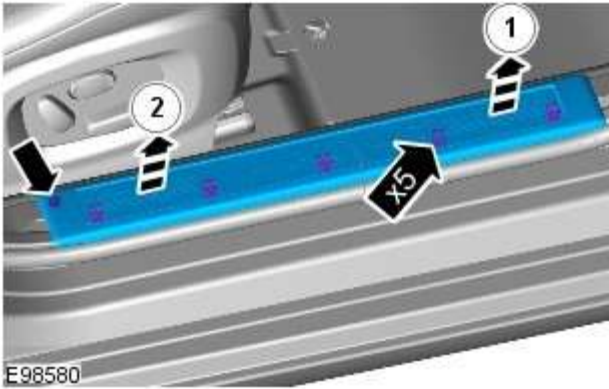
Interior Trim and Ornamentation - Front Scuff Plate Trim Panel

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.



1. CAUTIONS:



Care must be taken when releasing the trim panel from the retaining clips.



Make sure that the component is correctly located on the locating dowels.

Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - Instrument Panel Speaker Grille

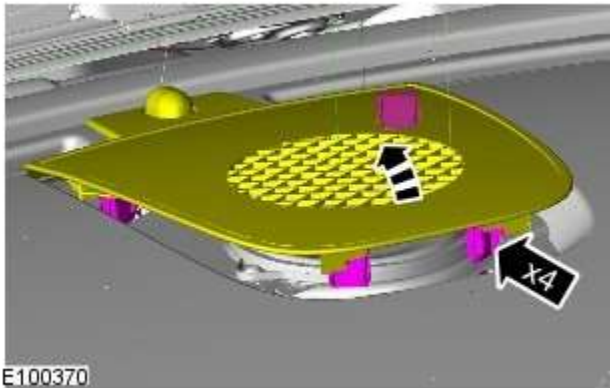
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



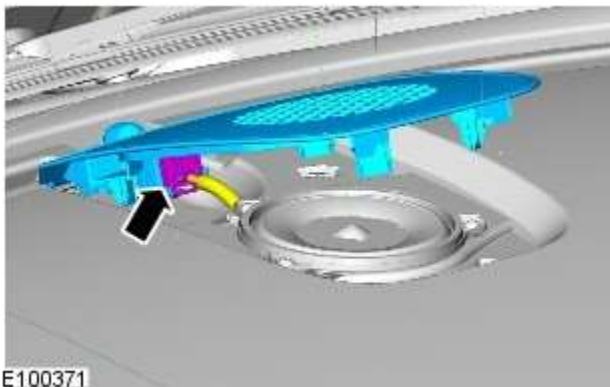
2. CAUTIONS:



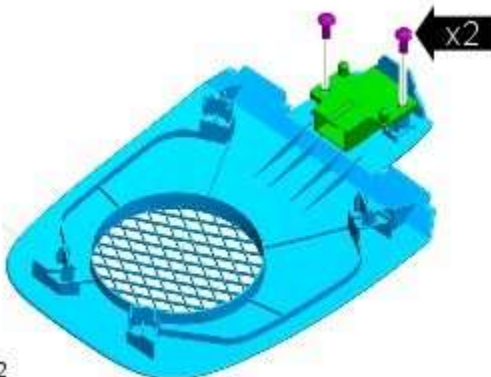
Protect the surrounding trim to avoid damage.




Make sure that the clips are correctly located.



- 3.



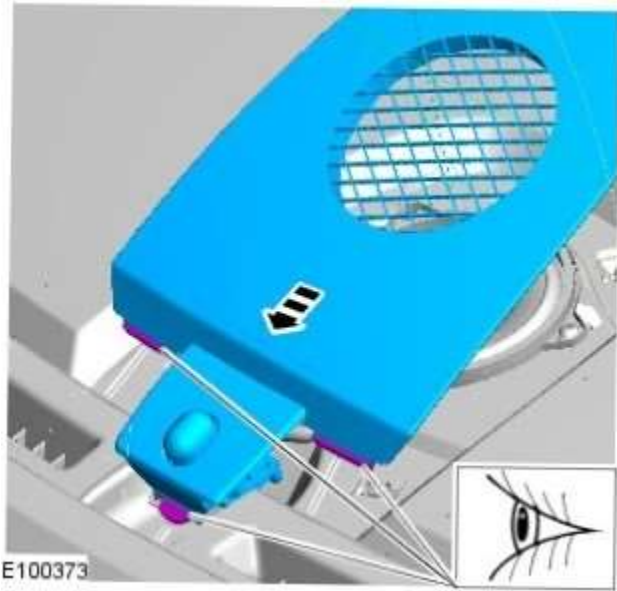
4.  CAUTION: Make sure that the component is correctly located on the locating dowels.



NOTE: Do not disassemble further if the component is removed for access only.

Torque: 2 Nm

Instollation



1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - Headliner

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Interior Rear View Mirror](#) (501-09 Rear View Mirrors, Removal and Installation).
3. Refer to: [Overhead Console](#) (501-12 Instrument Panel and Console, Removal and Installation).
4.
 - Remove both sun visors.

Refer to: [Sun Visor](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
5.
 - Remove both A-pillar trim panels.

Refer to: [A-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
6.
 - Remove both B-pillar upper trim panels.

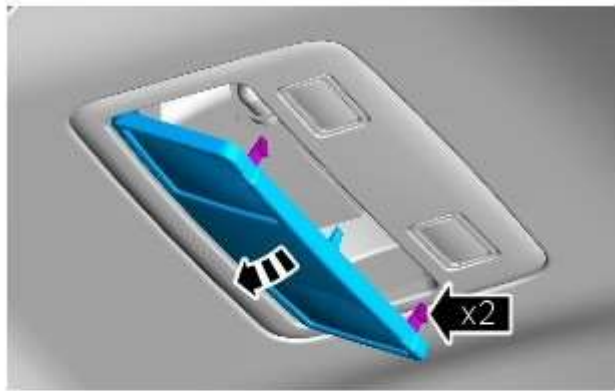
Refer to: [B-Pillar Upper Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
7.
 - Remove both C-pillar trim panels.

Refer to: [C-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
8.
 - Remove both front seats.

Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
9. Refer to: [Rear Seat Cushion](#) (501-10 Seating, Removal and Installation).



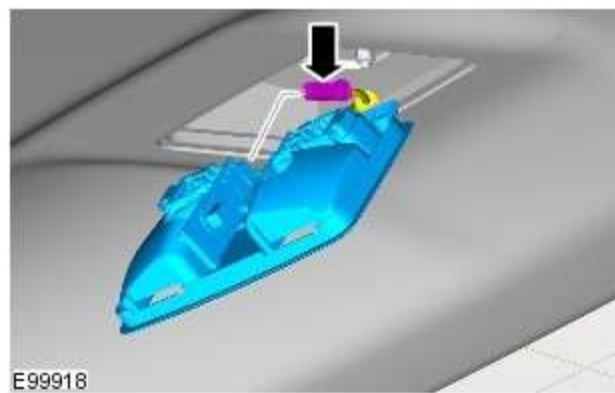
10. Torque: 2 Nm



11.

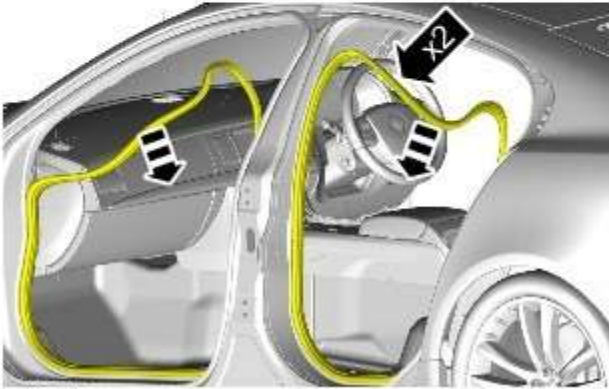
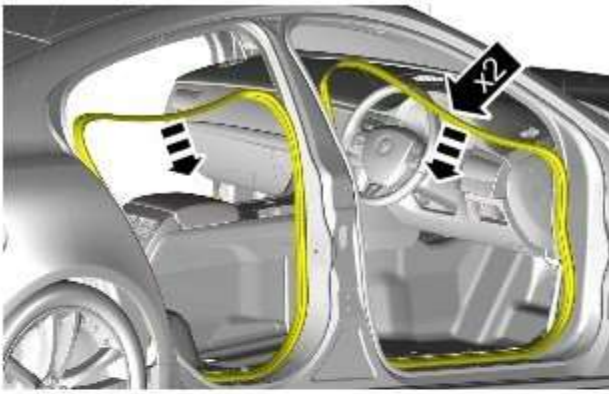


E99917



12.

13.




E100343

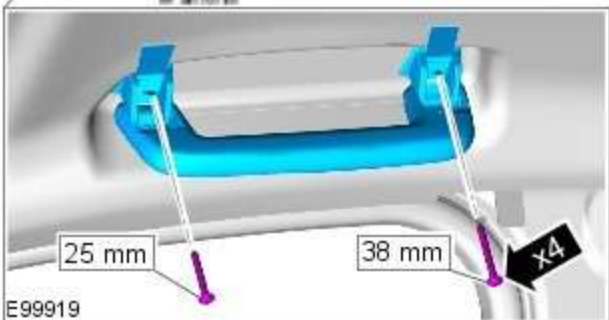
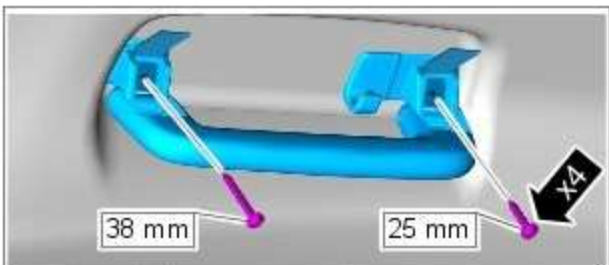
Vehicles with roof opening panel

14. NOTES:

 Note the different lengths of screws.

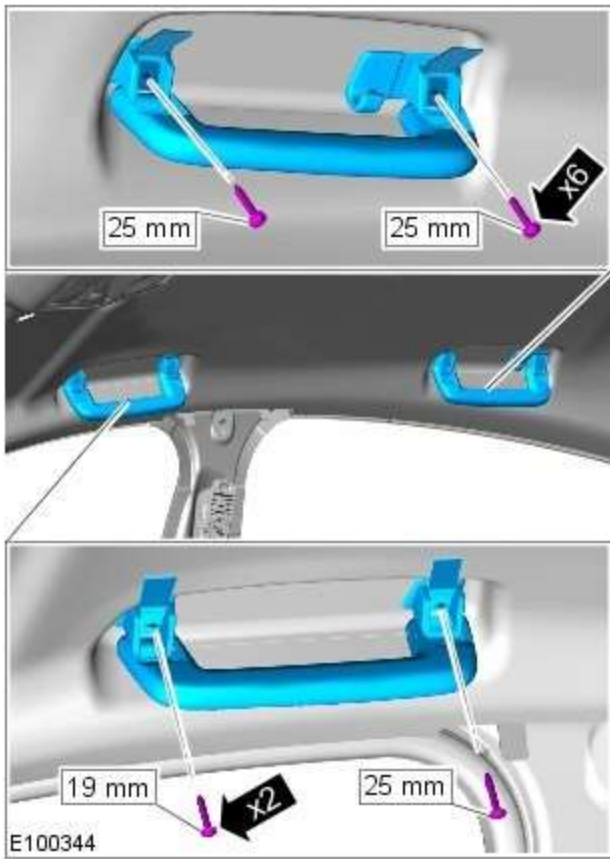
 Make sure that the component is installed to the position noted on removal.

Torque: 2 Nm




E99919

Vehicles without roof opening panel



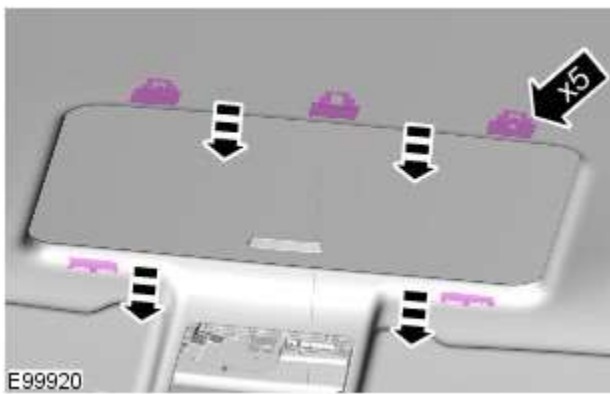
15. NOTES:

 Note the different lengths of screws.

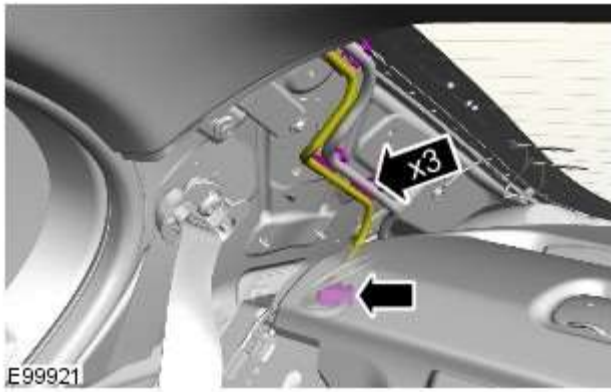
 Make sure that the component is installed to the position noted on removal.

Torque: 2 Nm

All vehicles



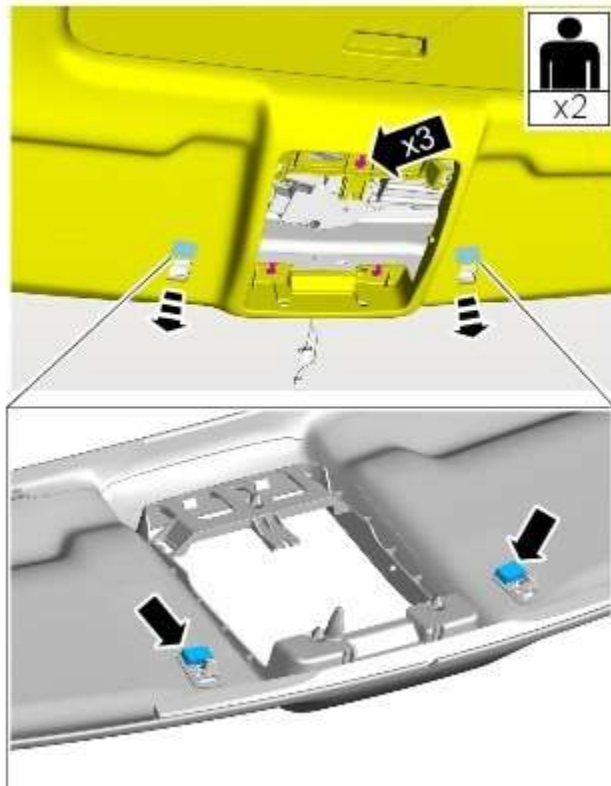
16.



17.



18.  **WARNING:** This step requires the aid of another technician.

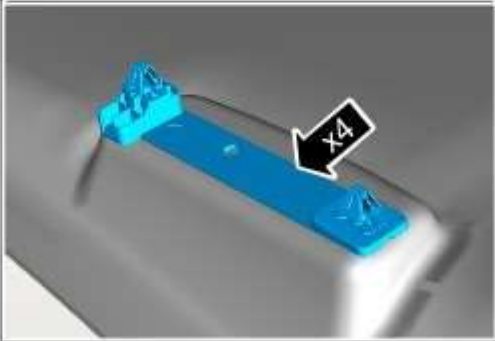


19.  **WARNING:** This step requires the aid of another technician.

CAUTIONS:


 Note the fitted position of the component prior to removal.

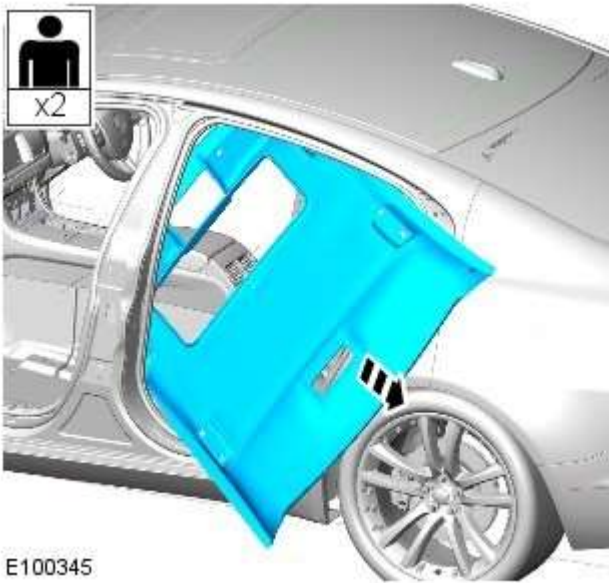
 Make sure that these components are installed to the noted removal position.



E99924

20.  **CAUTION:** Note the fitted position of the component prior to removal.

 **NOTE:** Make sure that the component is installed to the position noted on removal.



E100345

21.  **WARNING:** This step requires the aid of another technician.

Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - Loadspace Scuff Plate Trim Panel

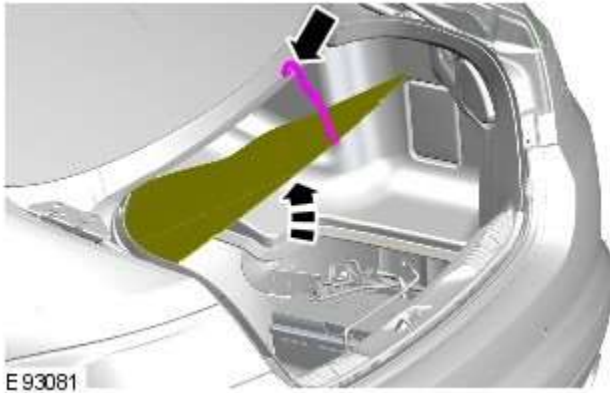
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1.



2.



Installation

1. To install, reverse the removal procedure.

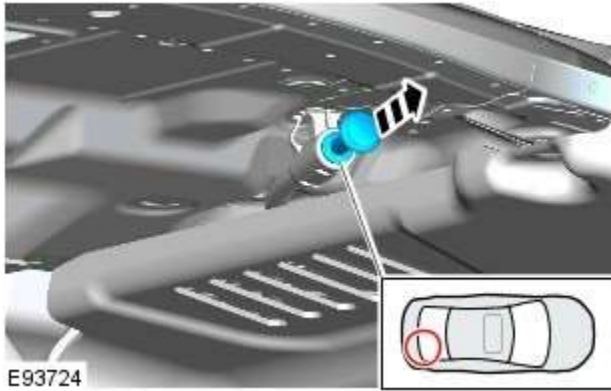
Interior Trim and Ornamentation - Loadspace Trim Panel

Removal and Installation

Removal

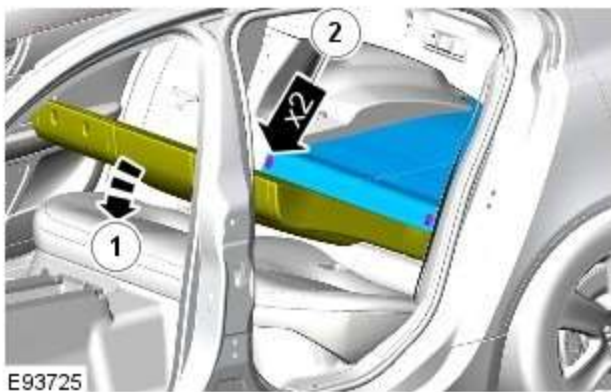


NOTE: Removal steps in this procedure may contain installation details.

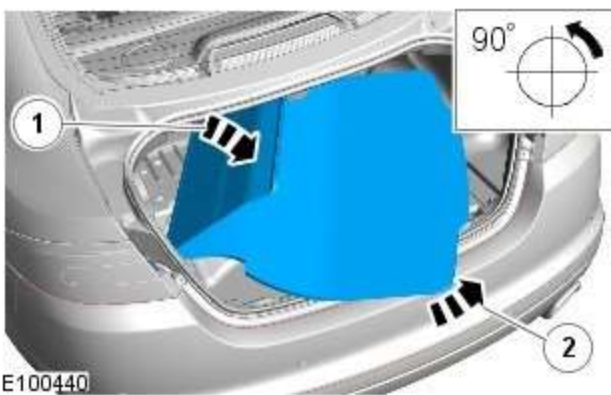


- Repeat the above procedure for the other side.

1.



2.



3.

Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - Loadspace Trim Panel LH

Removal and Installation

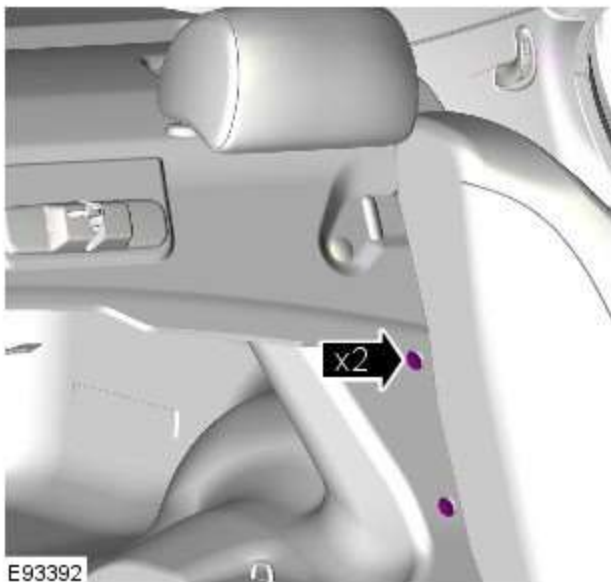
Removal



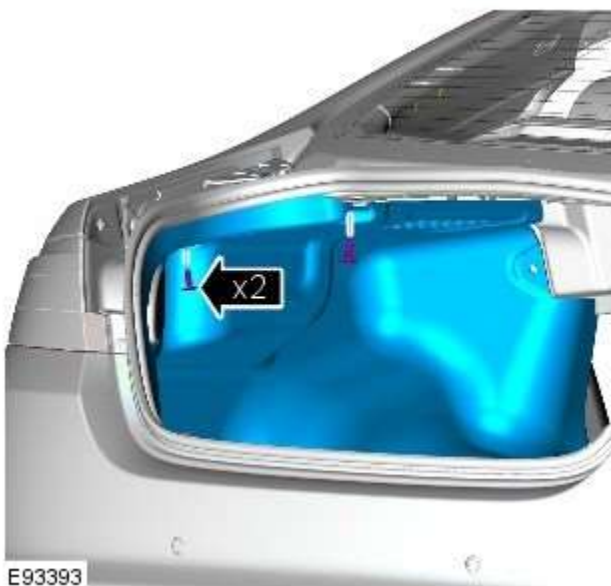
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Loadspace Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Refer to: [Loadspace Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3.



4.



Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - Loadspace Trim Panel RH

Removal and Installation

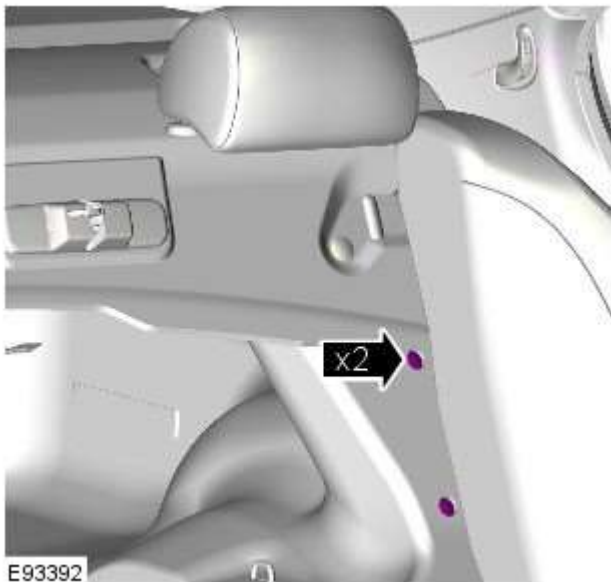
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Loadspace Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Refer to: [Loadspace Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

3.



4.



NOTE: LH illustration shown, RH is similar.



Installation

1. To install, reverse the removal procedure.

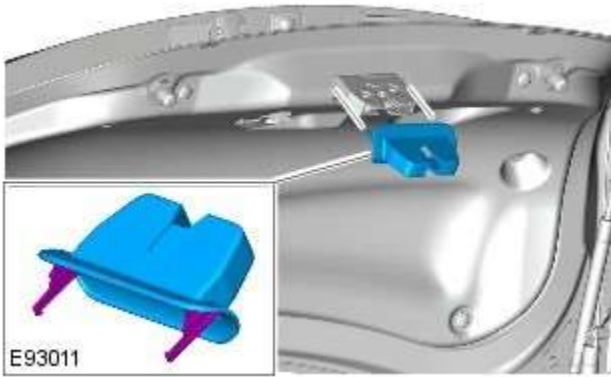
Interior Trim and Ornamentation - Luggage Compartment Lid Trim Panel

Removal and Installation

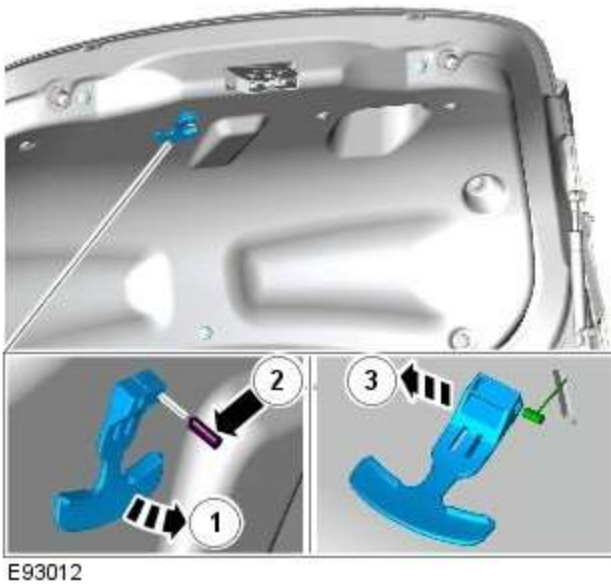
Removal

 NOTE: Removal steps in this procedure may contain installation details.

1.



2.



3.



Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - Parcel Shelf

Removal and Installation

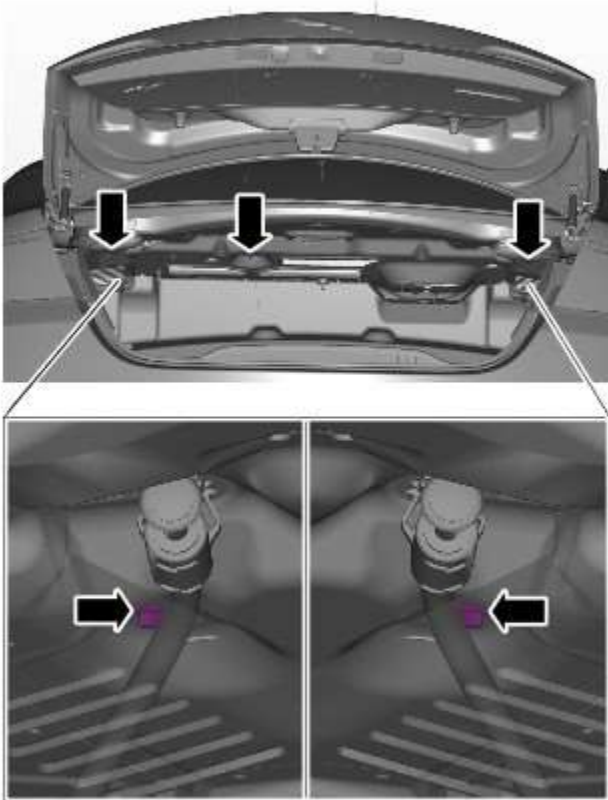
Removal



NOTE: Removal steps in this procedure may contain installation details.

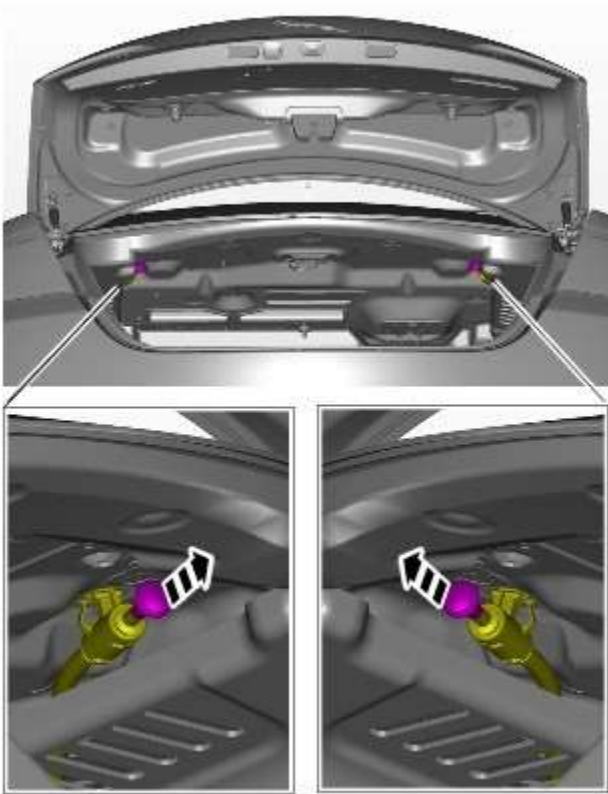
1. Refer to: [C-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. Torque: 12 Nm



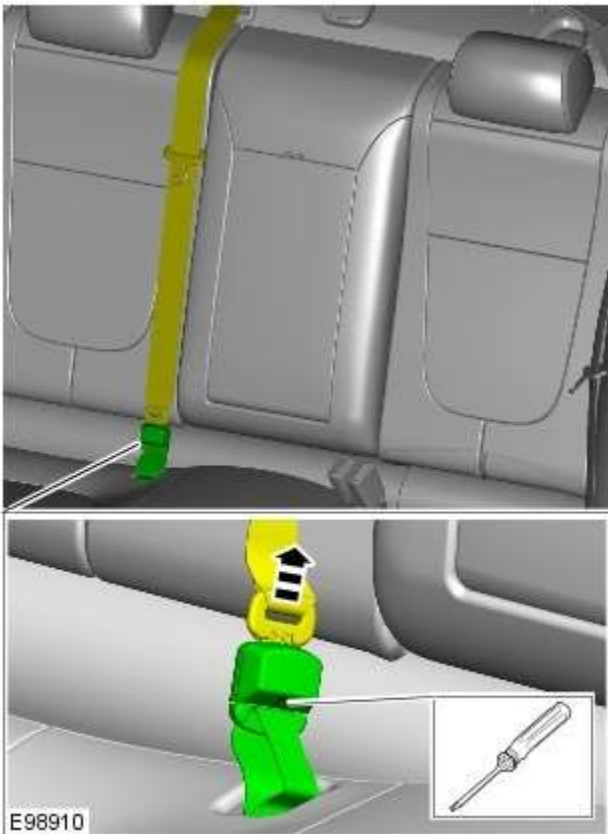
E98908

3.

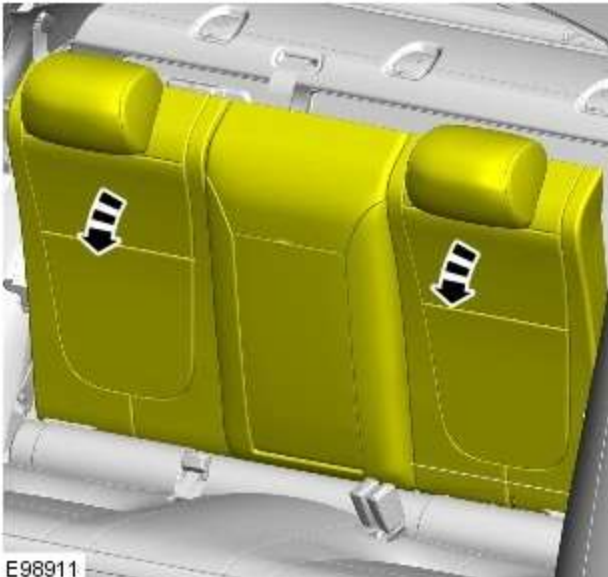


E98909

4.

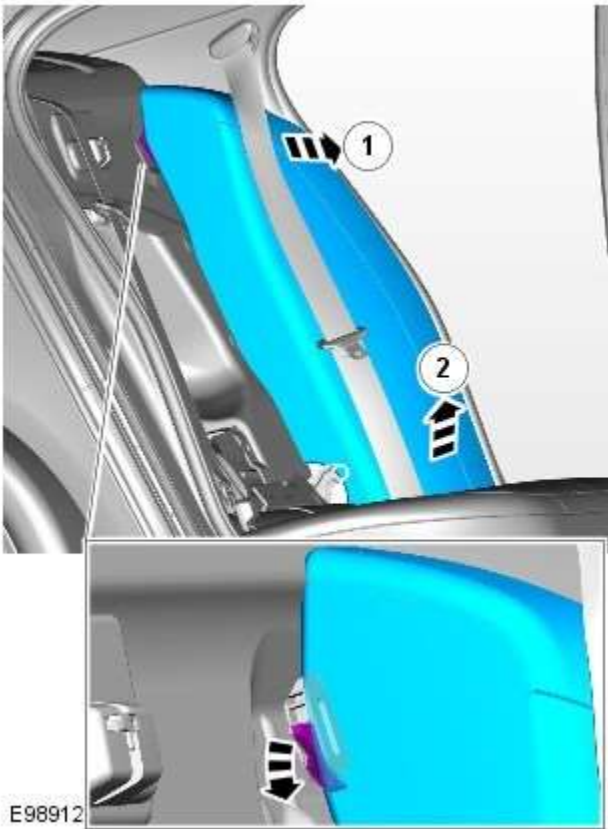


E98910



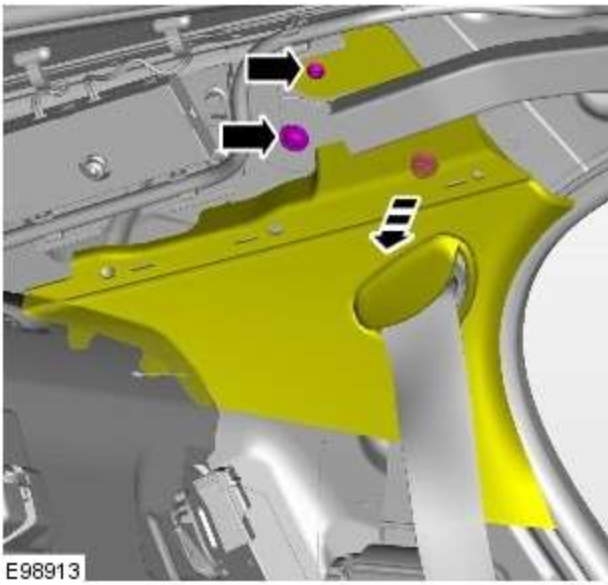
E98911

5.



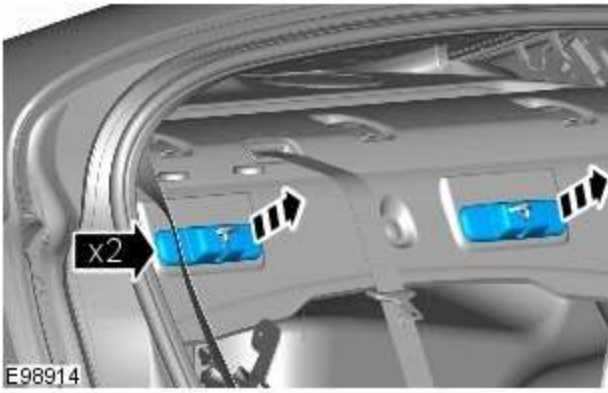
E98912

6.  NOTE: The procedure must be carried out on both sides of the seat.



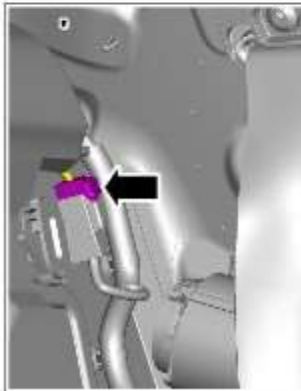
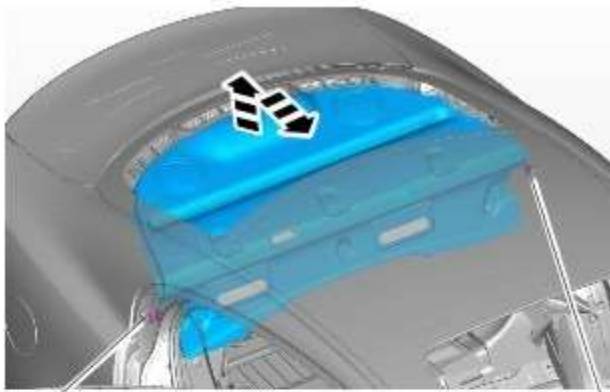
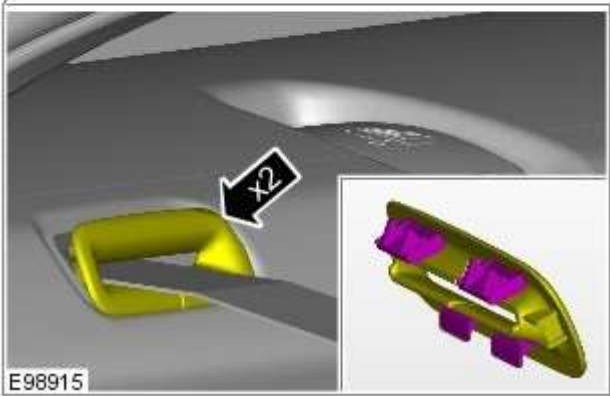
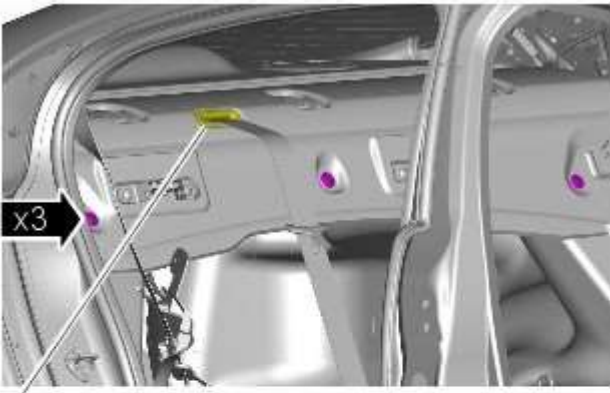
7.  NOTE: The procedure must be carried out on both sides of the seat.


Torque: 6 Nm

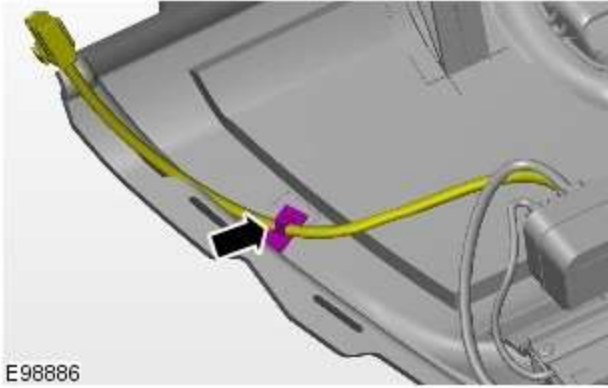



- 8.

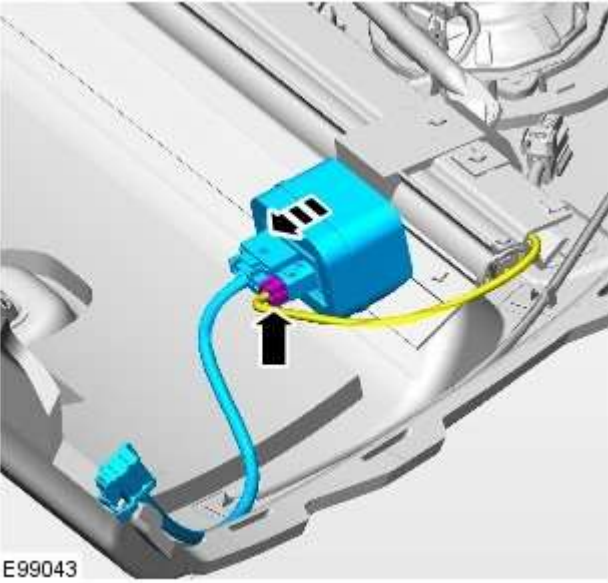
9.



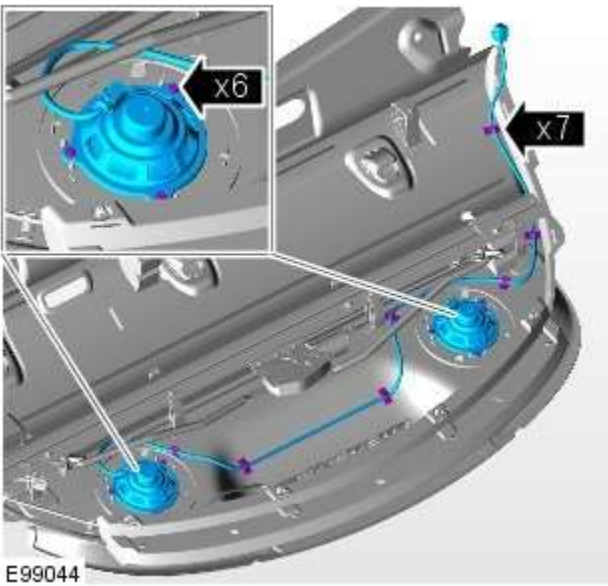
10.  NOTE: On installation, use a suitable tool to make sure that the parcel shelf is located underneath the rear window blind.



11.  NOTE: Do not disassemble further if the component is removed for access only.

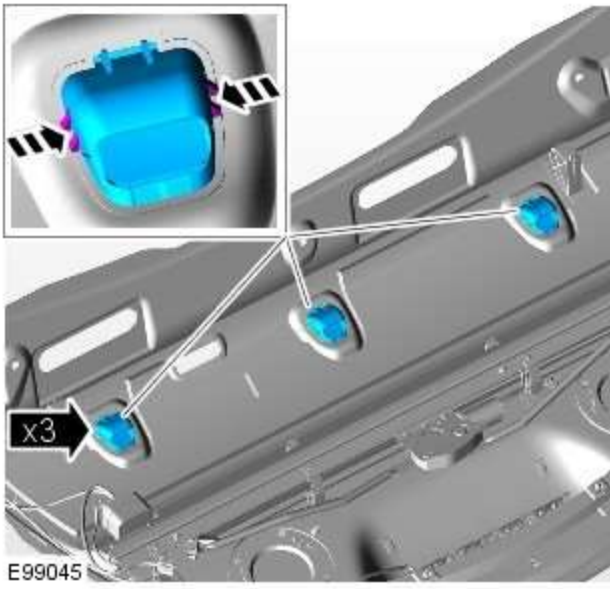


- 12.

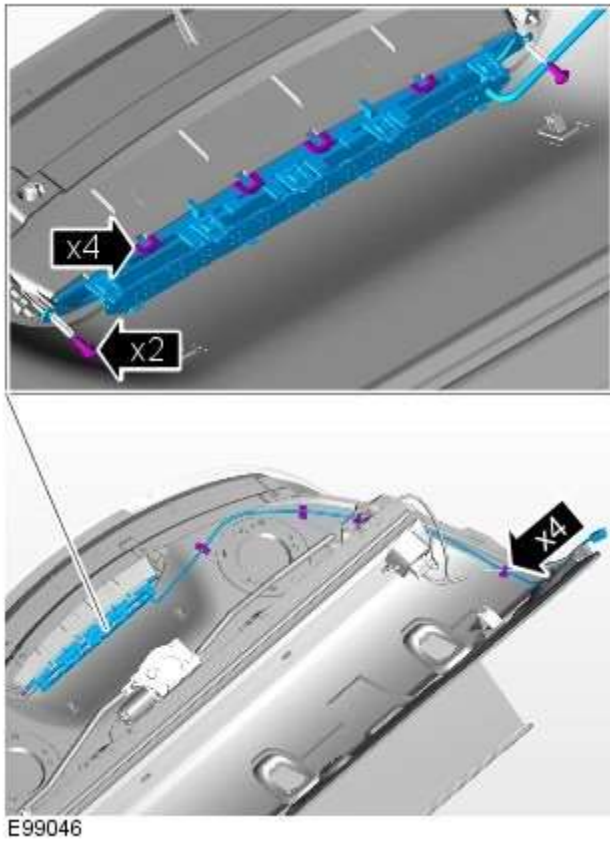


- 13.

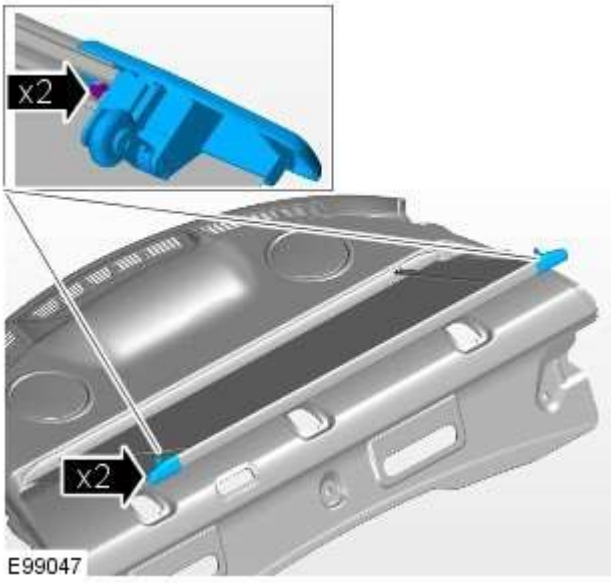
14.



15.



16.



Installation

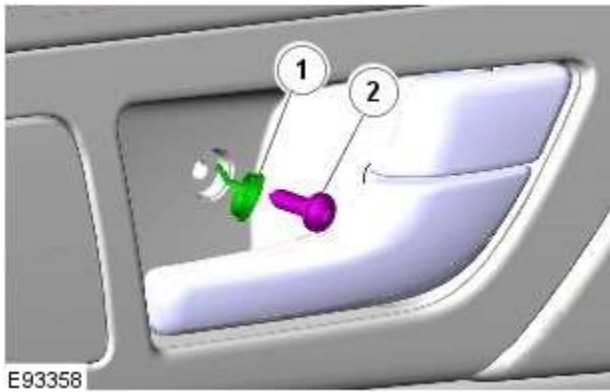
1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - Rear Door Trim Panel

Removal and Installation

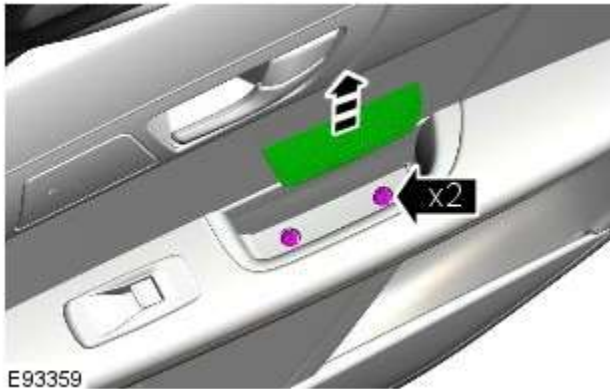
Removal

1.



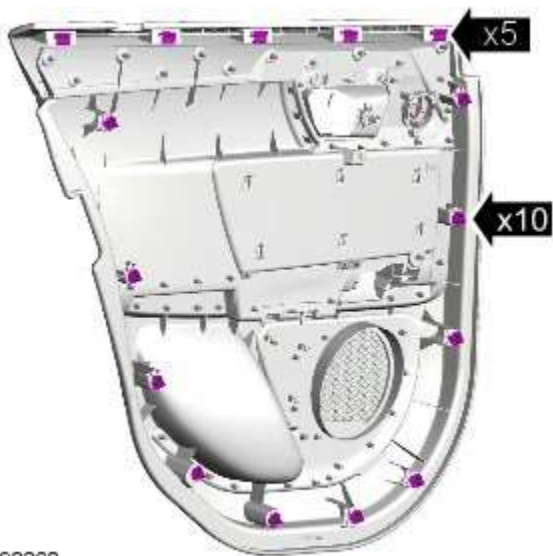
E93358

2.



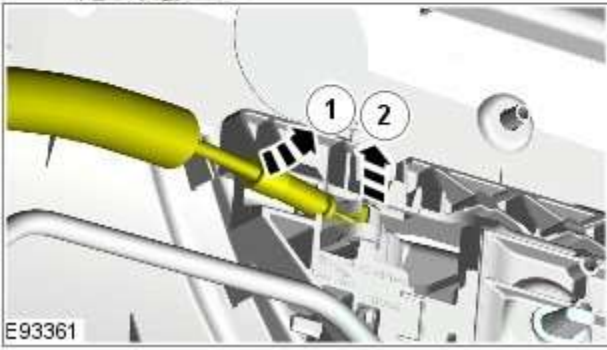
E93359

3.

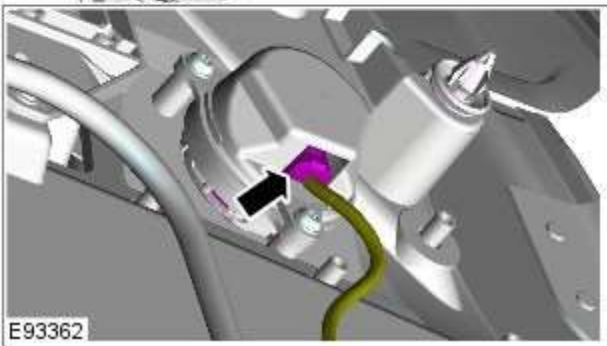


E93360

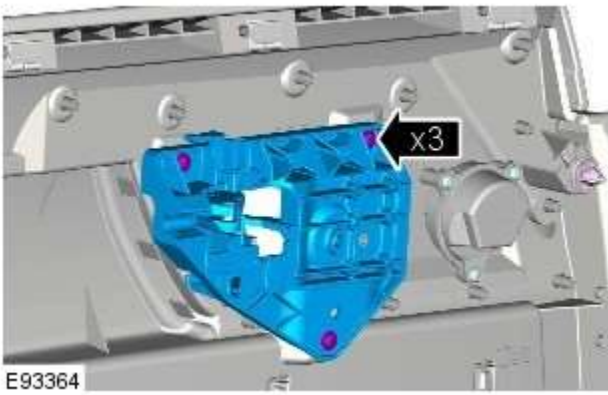
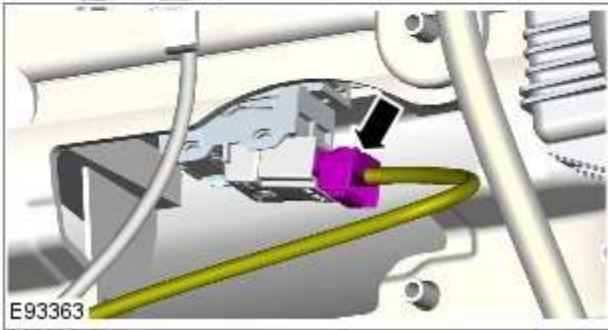
4.



5.

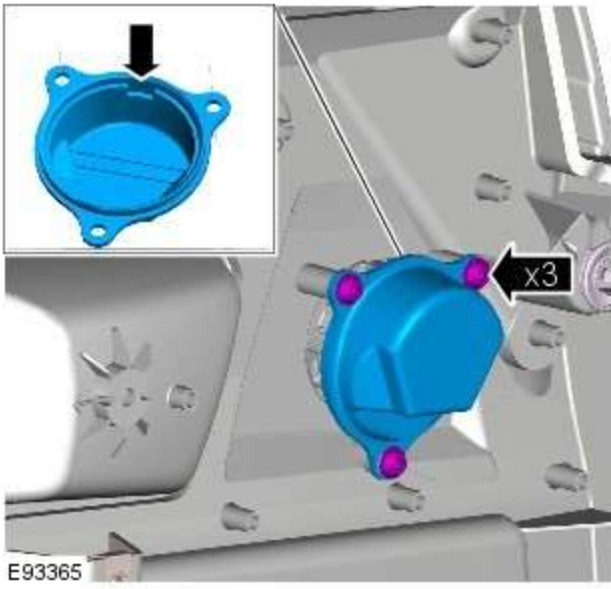


6.

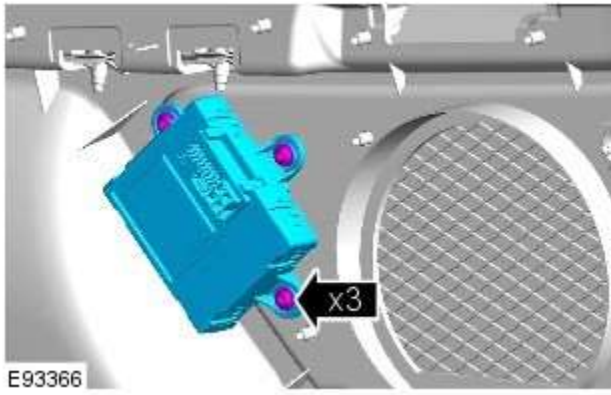


7.  NOTE: Do not disassemble further if the component is removed for access only.

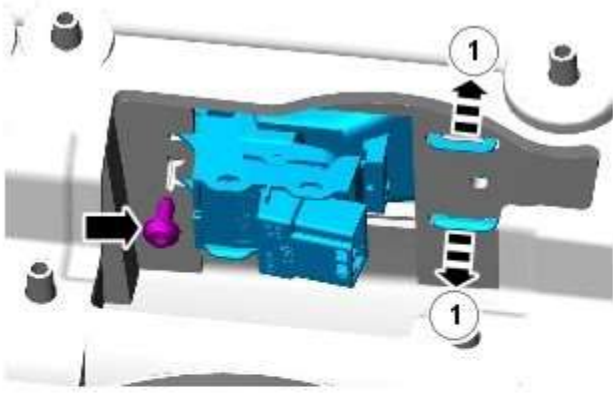
8.



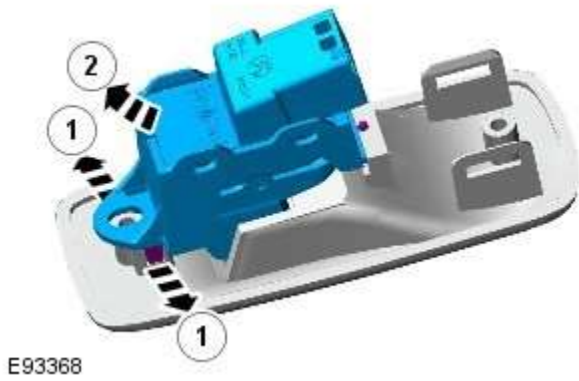
9.



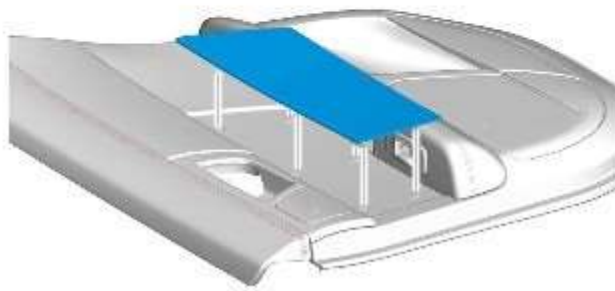
10.



11.

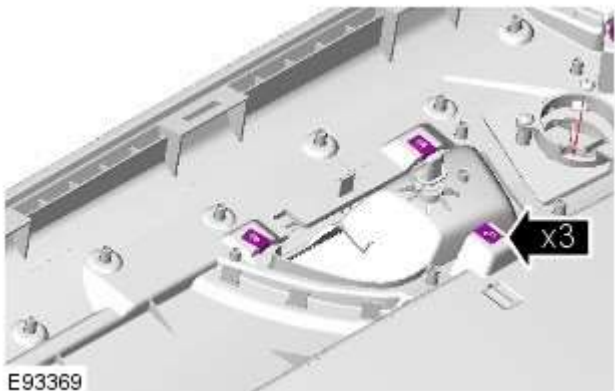


12.



E93422

13.



E93369

Installation

1. To install, reverse the removal procedure.

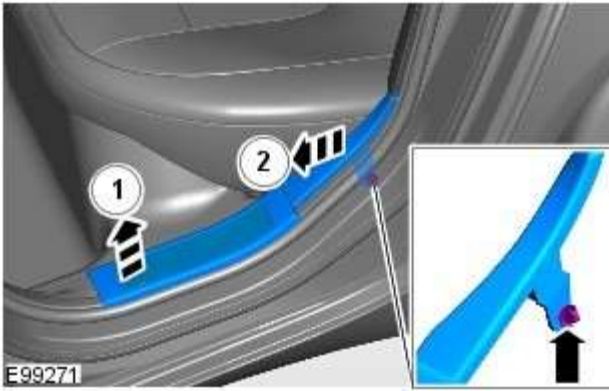
Interior Trim and Ornamentation - Rear Scuff Plate Trim Panel

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.



1. CAUTIONS:



Care must be taken when releasing the trim panel from the retaining clips.



Make sure that the clips are correctly located.

Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - Sun Visor

Removal and Installation

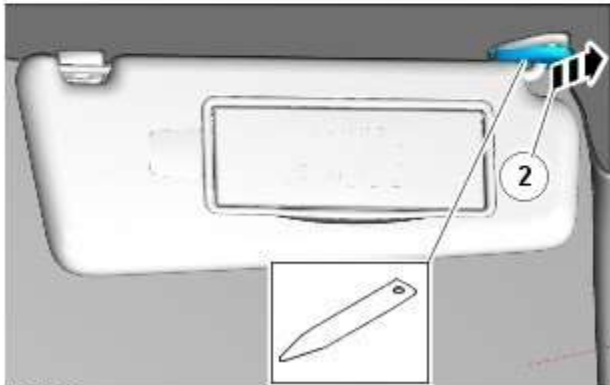
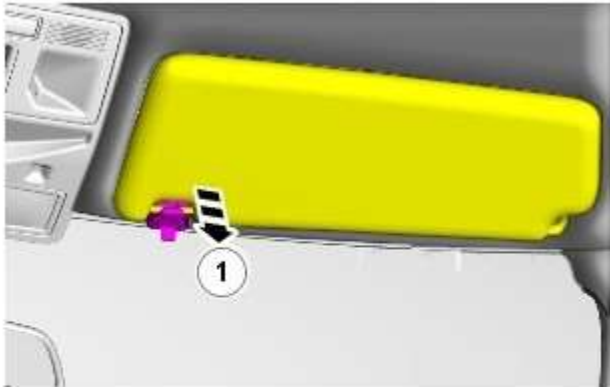
Removal



NOTE: Removal steps in this procedure may contain installation details.



1. CAUTION: Take extra care not to damage the edges of the component.

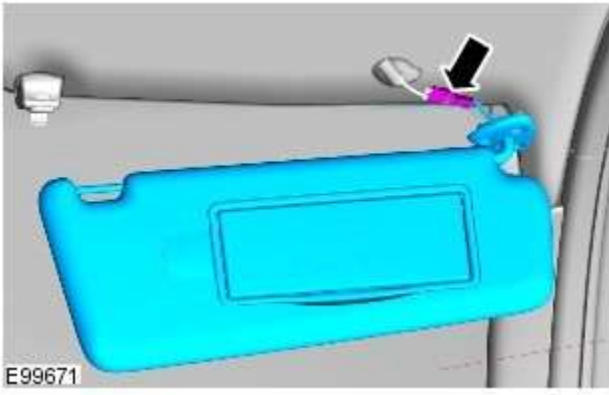


E99669

2. TORQUE: 2 Nm



E99670



3.

Installation

1. To install, reverse the removal procedure.

Interior Trim and Ornamentation - Sun Visor Vanity Mirror

Removal and Installation

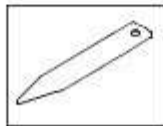
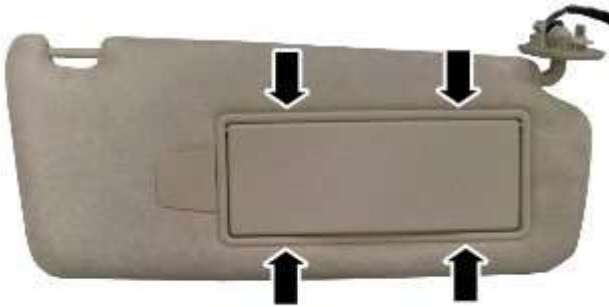
General Equipment

Interior trim remover

Removal

1. Using a suitable tool, release the retaining clips and remove the sun visor vanity mirror from the sun visor.

General Equipment: [Interior trim remover](#)




E150926

Installation



E150927

1.  **CAUTION:** Do not use excessive force to install the component.

Press firmly against the areas indicated until an audible click is heard.

Exterior Trim and Ornamentation -

Description	Nm	lb-ft	lb-in
Luggage compartment lid moulding retaining nuts	3	-	26

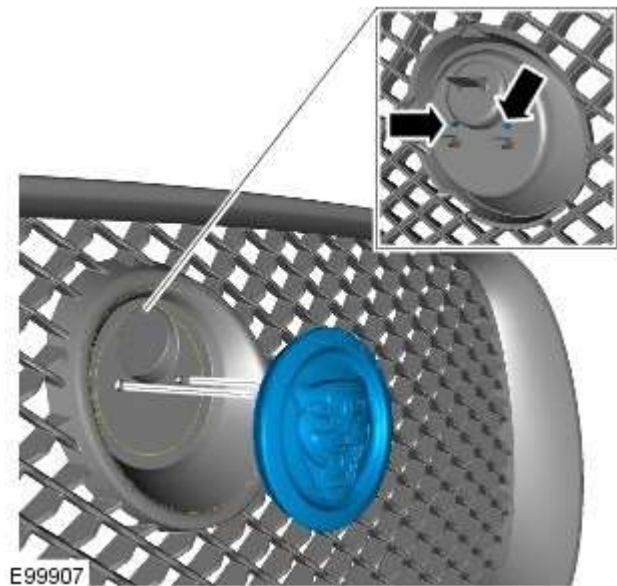
Exterior Trim and Ornamentation - Radiator Grille

Removal and Installation

Removal

1. Refer to: [Front Bumper Cover](#) (501-19 Bumpers, Removal and Installation).

2.



3.  NOTE: Note the fitted position of the locating pegs.

Installation

1. To install, reverse the removal procedure.

Exterior Trim and Ornamentation - Luggage Compartment Lid Moulding

Removal and Installation

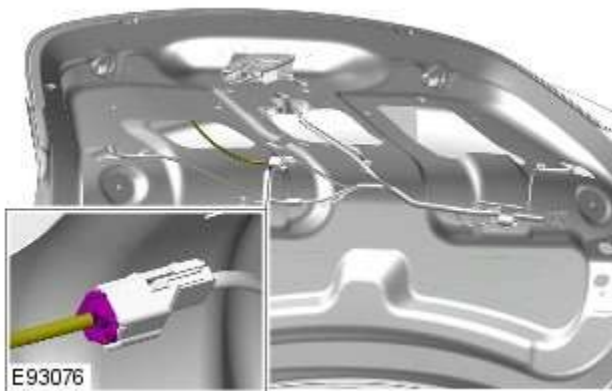
Removal



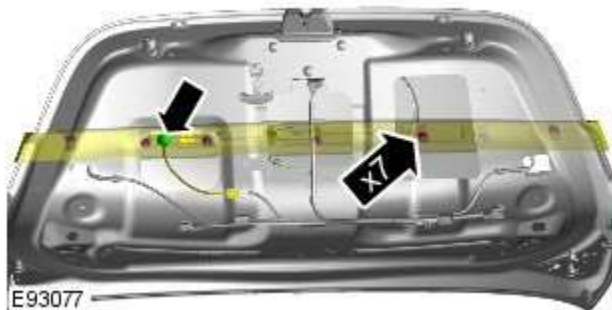
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Luggage Compartment Lid Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.

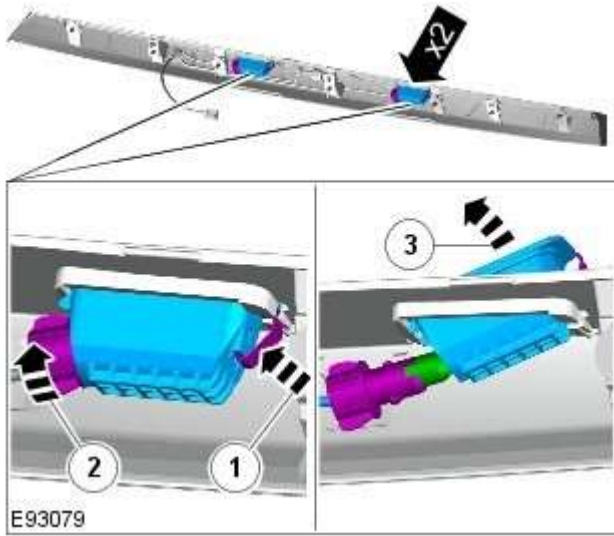


3. Torque: 3 Nm

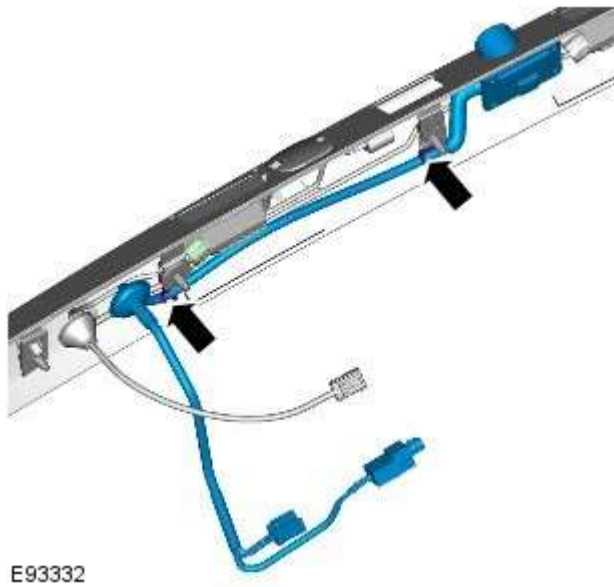


4.

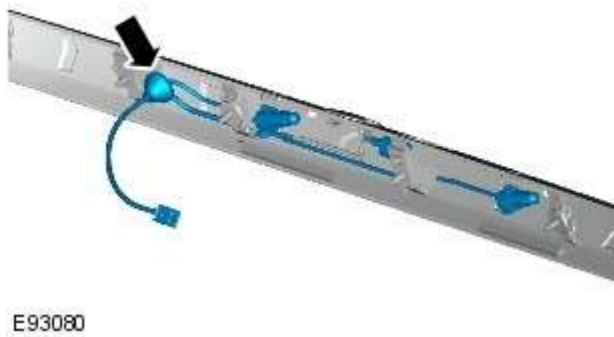




5.  NOTE: Do not disassemble further if the component is removed for access only.



6.



7.

Installation

1. To install, reverse the removal procedure.

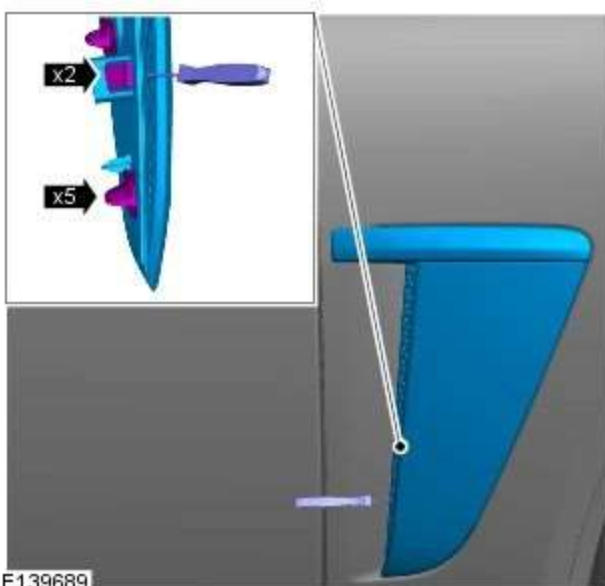
Exterior Trim and Ornamentation - Front Fender Moulding

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

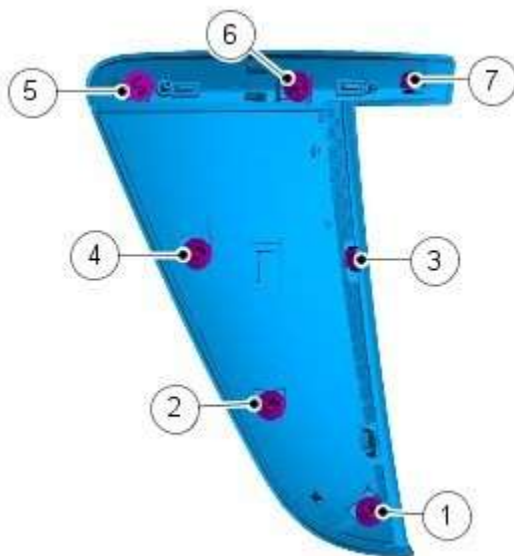


E139689

1. CAUTION: Failure to follow this instruction may cause damage to the vehicle.



NOTE: Using a screwdriver, carefully release the moulding at the position illustrated.



E139690

2. CAUTION: Make sure that the clips are correctly located.

NOTES:



Using a thin plastic trim tool, carefully detach the clips in order shown.



Install clip number 5 when installing the front fender moulding

Installation

1. To install, reverse the removal procedure.

Exterior Trim and Ornamentation - Rocker Panel Moulding

Removal and Installation

Removal

CAUTIONS:




Protect the surrounding paintwork to avoid damage.



LH illustration shown, RH is similar.



NOTE: Removal steps in this procedure may contain installation details.

1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

2.



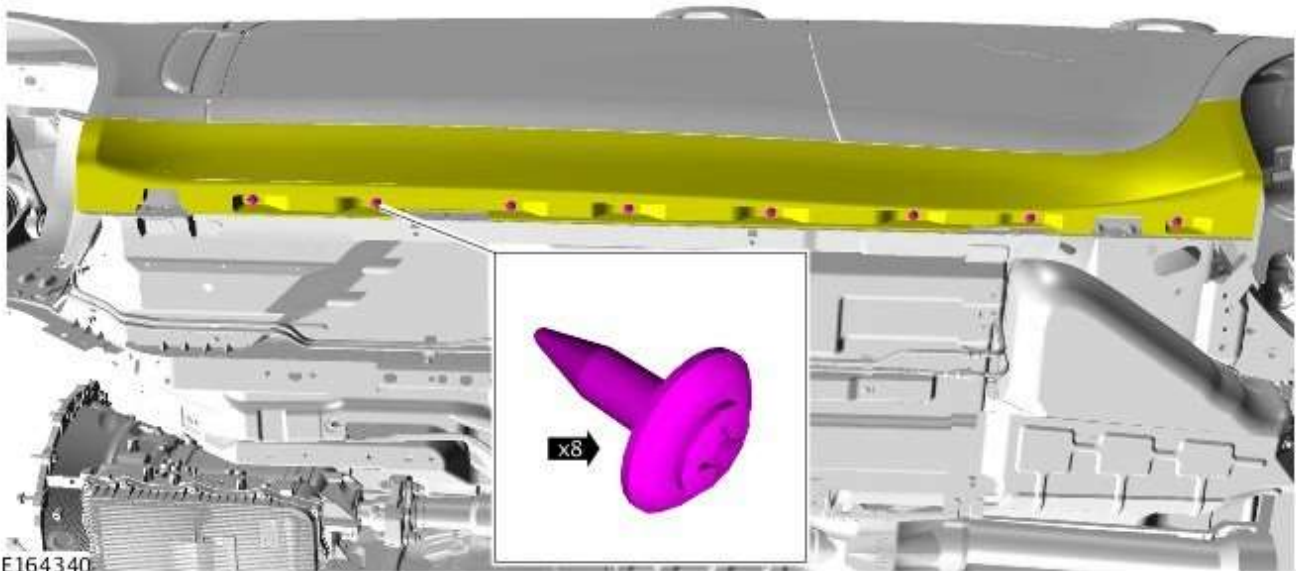
E164338

3.

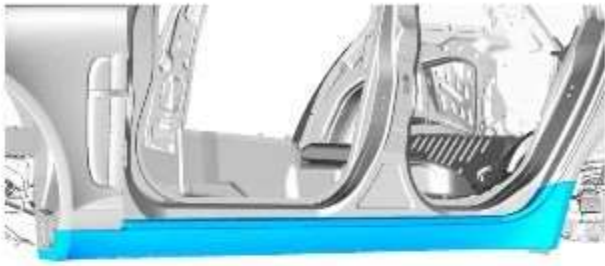


E164342

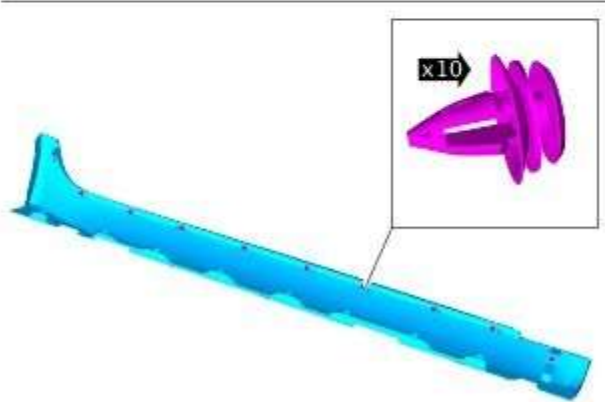
4.




E164340

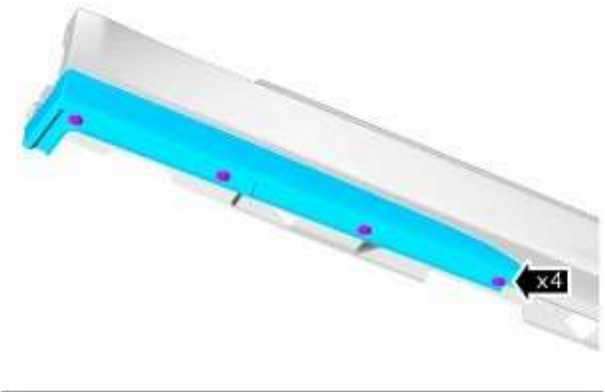


5.



E164341

6.  NOTE: If equipped



E164339

Installation

1. To install, reverse the removal procedure.
www.JagDocs.com

Rear View Mirrors -

Torque Specifications

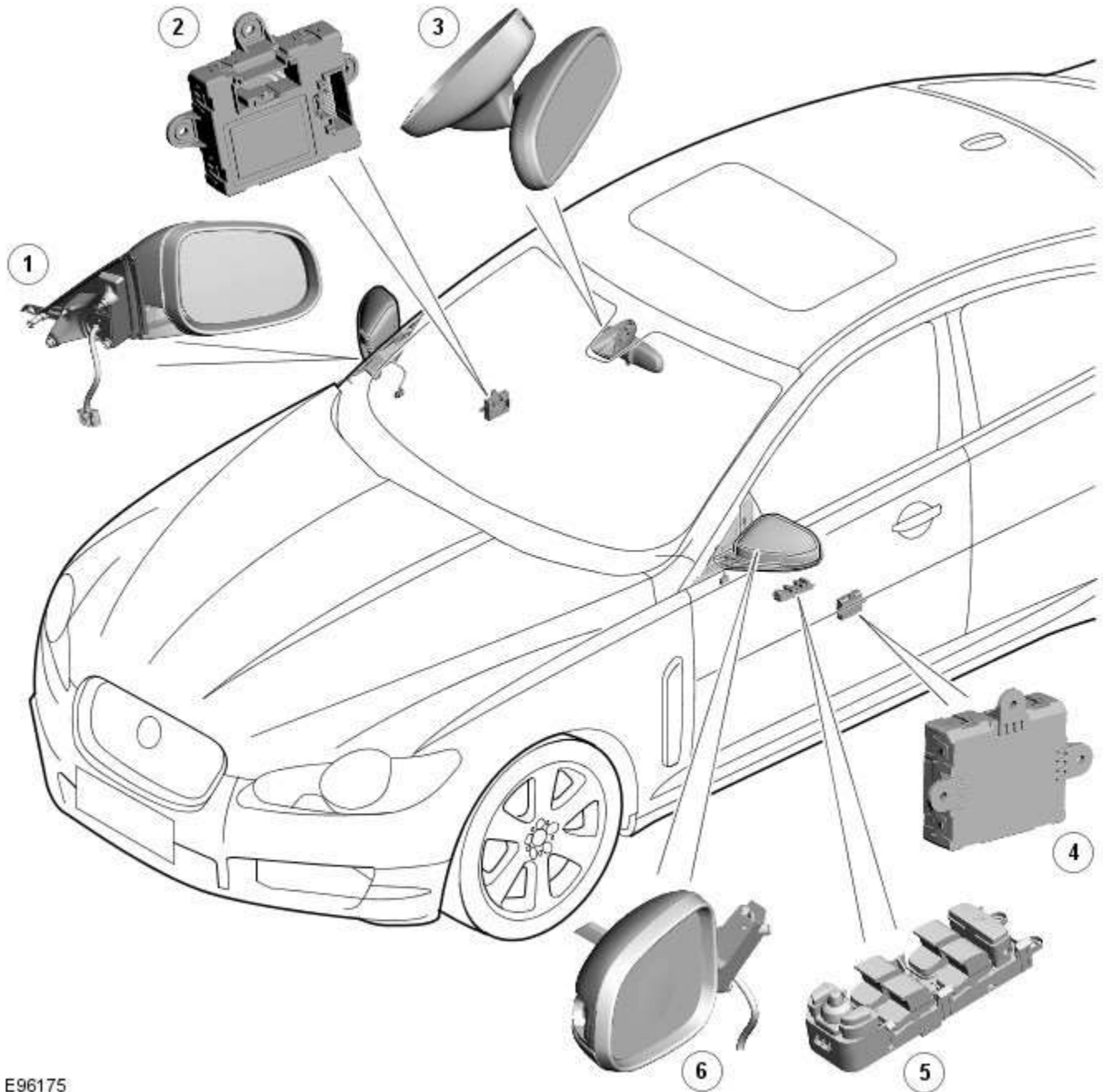
Description	Nm	lb-ft	lb-in
Exterior mirror retaining nuts	8	—	71
Exterior mirror motor retaining screws	1	—	9

Rear View Mirrors - Rear View Mirrors - Component Location

Description and Operation



NOTE: LHD (left-hand drive) shown RHD (right-hand drive) similar



E96175

Item	Description
1	Passenger door mirror
2	Passenger door control module
3	Interior mirror
4	Drivers door control module
5	Mirror control switch
6	Drivers door mirror

Rear View Mirrors - Rear View Mirrors - Overview

Description and Operation

Overview

The exterior mirrors incorporate the following:

- Blind spot monitoring indicator
- Auto dimming function
- Turn signal indicators
- Approach lamps
- Exterior temperature sensor
- Heated mirror function
- Reverse dipping function

Movement of the door mirrors is controlled from a switch pack located on the drivers door. The switch pack contains 2 non-latching mirror select buttons labeled 'L' and 'R' and a 4-way mirror movement switch. Door mirror movement commands are transmitted to the driver's door module over the [LIN \(local interconnect network\)](#) bus. The drivers door module transmits any mirror movement commands to the passenger door module over the medium speed [CAN \(controller area network\)](#) bus.

Movement of the door mirrors is carried out by the respective door module. The door modules provide supply and ground paths to the mirror motors and monitor mirror position via potentiometers located in the mirror housings.

Both exterior door mirrors and the interior mirror feature an auto dimming function. The interior rear view mirror contains one forward and one reward facing light sensor. The light sensors control the auto dimming feature of the interior mirror to reduce glare from the headlights of following vehicles.

When auto-dimming of the interior mirror is required, a supply is provided by the interior mirror to both door mirrors to initiate the door mirror auto-dimming sequence.

Blind spot monitoring function alerts the driver to a vehicle located in the vehicle blind spot. A warning indicator is located in each exterior mirror towards the outer edge.

Refer to: [Blindspot Monitoring System](#) (413-09 Warning Devices, Description and Operation).

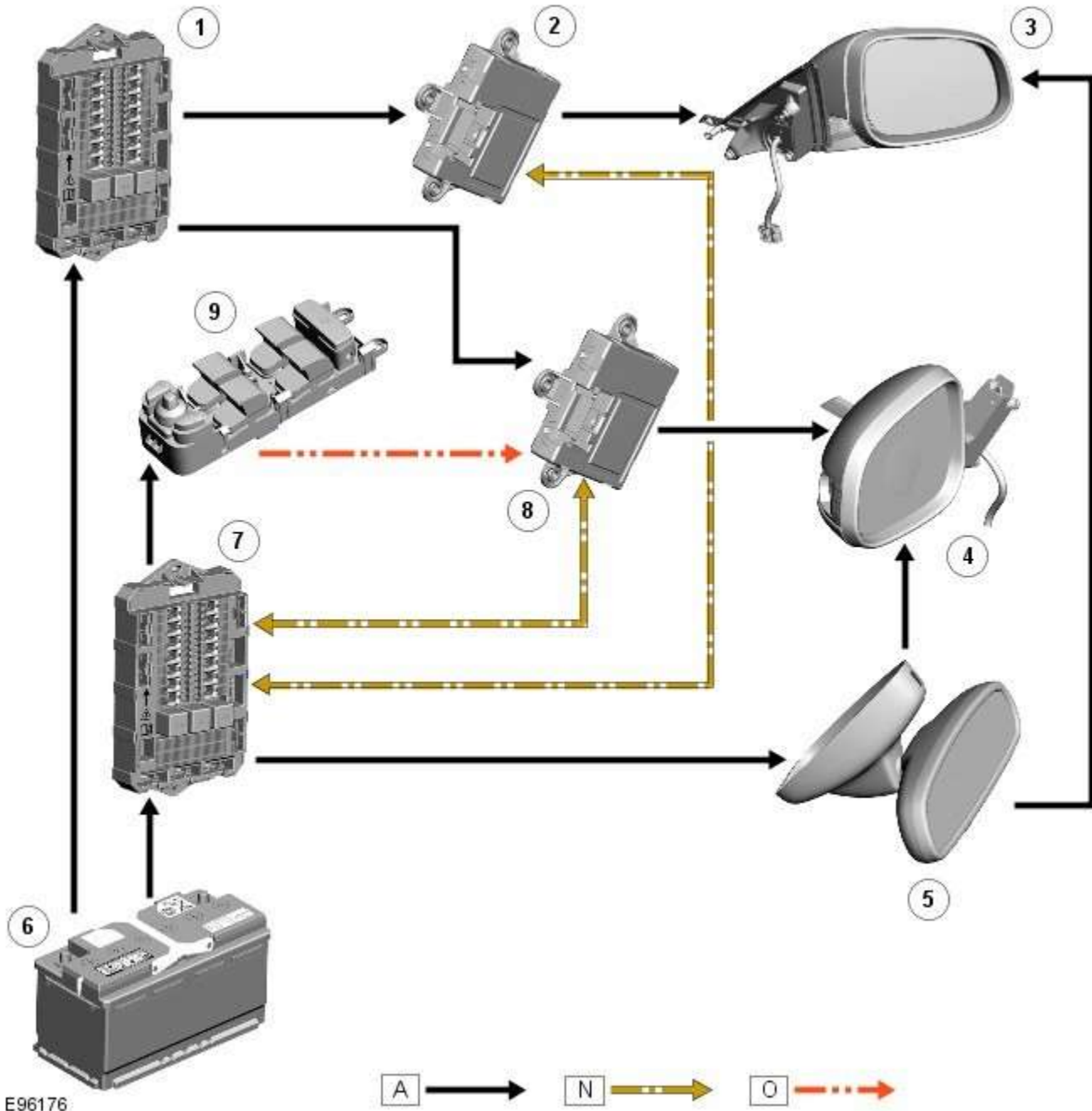
Rear View Mirrors - Rear View Mirrors - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired, N = Medium speed CAN (controller area network) bus, O = LIN (local interconnect network) bus



E96176

Item	Description
1	RJB (rear junction box)
2	RH (right-hand) door module
3	RH door mirror
4	LH (left-hand) side door mirror
5	Interior mirror
6	Battery

7	CJB (central junction box)
8	LH door module
9	Exterior mirror control switches

System Operation

The rear view mirrors comprise an interior mirror mounted to the windshield, and an exterior mirror mounted on each front door cheater. The types of mirrors and associated operating functions installed depend on the specification and trim level of the vehicle.

Interior Mirrors

The interior rear view mirror is provided as a manual dimming or an electrically operated automatic dimming type.

The manual dimming mirror comprises a prismatic glass housed within a surrounding case that is attached with a ball joint connector to the mirror stem. Manual dimming of the mirror is achieved using the lever mounted on the underside of the mirror body. Operating the lever will tilt the mirror head from the 'day' position to the 'night' position.

The automatic dimming mirror comprises an electro-chromatic glass housed within a surrounding case that is attached with a ball joint connector to the mirror stem. The mirror stem incorporates an 8-pin electrical connector that is connected to the roof panel wiring harness. The wiring harness provides hardwired and a [LIN](#) connection to the [CJB](#).

Light sensors are mounted on the front and rear of the mirror surround case. The sensors control the automatic dimming feature to reduce glare from the headlights of following vehicles.

The automatic dimming function is permanently active when the ignition is in power mode 4 (Accessory) and power mode 6 (Ignition). The forward facing light sensor monitors the ambient light level at the front of the vehicle; the rearward facing light sensor monitors the light level coming from the rear of the vehicle. When light from the rear of the vehicle exceeds the ambient light level from the front of the vehicle, the automatic dimming circuit darkens the interior mirror surface.

Automatic dimming is inhibited when reverse gear is selected to provide the driver with maximum vision. On vehicles with automatic transmission, the reverse gear signal is provided by the [TCM \(transmission control module\)](#) via the high speed [CAN](#) bus to the [CJB](#). The [CJB](#) then provides a power feed to the mirror. On vehicles with manual transmission, the reverse gear signal is provided by a transmission switch that is hardwired to the [CJB](#).

Exterior Mirrors

Electrically operated and heated exterior mirrors are installed as standard. Depending on the specification and trim level of the vehicle, the following options are available:

- Power fold (switch pack operated feature) and auto fold (remote handset operated feature)
- Memory recall
- Reverse gear mirror dip
- Mirror heating
- Exterior mirror lamps.

The power fold/auto fold feature is available only when power fold mirrors are installed to the vehicle.

The mirrors can be configured to automatically fold when the vehicle is locked and unfold when unlocked. This feature can be enabled or disabled via the Vehicle settings area of the touch screen:

- Select 'Settings' from the touch screen Home menu.
- Select 'Security/Vehicle'
- Select 'Windows/Mirrors'
- Select Power Fold 'On' or 'Off' as appropriate.

The passenger side mirror can be configured to automatically dip when reverse gear is selected. This feature can be enabled or disabled via the Vehicle settings area of the touch screen:

- Select 'Settings' from the touch screen Home menu.
- Select 'Security/Vehicle'
- Select 'Windows/Mirrors'
- Select Reverse dip 'On' or 'Off' as appropriate.

The [LH](#) door mirror incorporates an ambient air temperature sensor that is hardwired to the [ECM \(engine control module\)](#). The [ECM](#) is connected to the [CJB](#) and other control modules via the high speed [CAN](#) bus. The sensor provides information to the [ECM](#) that is then transmitted on the medium speed [CAN](#) bus for use by other control modules. On vehicles installed with a high-line instrument cluster, the [CJB](#) transmits the temperature signal to the instrument cluster that provides a display of the ambient temperature to the driver.

The exterior mirror lamps are controlled by the interior lighting function.

The door mirrors are controlled using a switch pack located on the driver's door. The switch pack contains 2 non-latching mirror select switches labeled 'L' and 'R' and a 4-way directional joystick. The switch pack is connected to the driver door control module via the [LIN](#) bus. The driver and front passenger door control modules are connected via the medium speed [CAN](#) bus. A hardwired connection between each door control module and the corresponding door mirror, provides the supply and ground paths for the mirror motors.

Each exterior door mirror incorporates 2 motors to control horizontal (left/right) and vertical (up/down) adjustments.

On vehicles installed with a driver's power operated memory seat and memory exterior mirrors, a potentiometer is incorporated within each mirror motor and is used to provide information regarding the actual motor positions. The current position and memory positions of each door mirror motor are maintained and stored within the corresponding door control module.

The memory exterior mirror positions are also monitored and stored within door control module memory when the reverse gear mirror dip function is used.

When reverse gear is selected, the door control module stores the current mirror positions and will then dip the passenger mirror glass to a default dip position. While reverse gear is selected it is possible to store a preferred dipped mirror position by adjusting the driver/passenger mirror glass to the desired position via the mirror switch pack. When the desired position is achieved using the switch, the new dip positions will be automatically stored by the door control module when reverse gear is de-selected. Therefore when reverse gear is re-selected, the dip position recalled by the door control module will be the new reverse gear mirror dip stored position. When reverse gear is deselected the mirror glass will automatically move to the previous stored position prior to reverse gear selection.

If the driver selects a memory recall function using the memory seat switch pack, the driver's memory seat and exterior memory mirrors are moved to a stored memory position.

Exterior mirrors with the power fold/auto fold feature incorporate a motor located in the hinge of each exterior mirror arm. Operation of the power fold feature is achieved using the exterior mirror switch pack. Operation of the auto fold feature is achieved using the remote handset.

The power fold function is active when the ignition is in power mode 6 (Ignition).

Both exterior mirrors will power fold when the mirror switch pack 'L' and 'R' switches are pressed together. Pressing the switches again will unfold the mirrors.

When the instrument cluster is configured for the auto fold feature, the mirrors will fold in when the remote handset lock button is pressed. The mirrors will unfold when the vehicle is unlocked using the remote handset unlock button.



NOTE: If the mirrors are folded in using the mirror switch pack (power fold) and the vehicle is then locked, subsequent unlocking of the vehicle will not unfold the mirrors.

When the remote handset unlock button is operated, the [CJB](#) recognizes the remote handset for that vehicle and acknowledges the request. The door control modules are connected directly to the [AJB \(auxiliary junction box\)](#) for power supply to the exterior mirror folding motors.

When the vehicle is locked the door control modules reverse the polarity of the mirror fold motor, power and ground connections to operate the mirrors in the opposite direction.

Exterior mirror heating is provided with heater elements bonded to the back of the mirror glass. Power supply for the mirror heating elements is provided by the corresponding driver or passenger door control module via the [RJB](#). The door control modules receive a power supply from the [RJB](#), and are both connected on the medium speed [CAN](#) bus to the [ATC \(automatic temperature control\)](#) module. A ground terminal from each door control module completes the circuit. The [ATC](#) module automatically controls the mirror heating function whenever the ignition is in power mode 4 (Accessory) and power mode 6 (Ignition).

Operation of the exterior mirror heaters is fully automatic and not controllable by the driver. Exterior mirror heater operation is determined by ambient air temperature and windshield wiper status. When ambient air temperature reaches a pre-determined level, the [ATC](#) module broadcasts an exterior mirror heating request to the door modules over the medium speed [CAN](#) bus. On receipt of this message, the door modules provide feed and ground connections to both exterior mirror heater elements.

The mirror heating is controlled in two phases, the initial heating phase and a second [PWM \(pulse width modulation\)](#) controlled phase. In the first phase the heater elements in the mirrors are permanently powered for a pre-determined length of time. This length of time varies with the ambient temperature. During the second [PWM](#) phase, the heater elements are turned on and off every 30 seconds. The amount of time the exterior mirror heaters are operational increases if the windshield wipers are switched on. This ensures the mirrors remain mist free in damp and wet conditions, where there is an increased risk of misting.

Rear View Mirrors - Rear View Mirrors

Diagnosis and Testing

Principles of Operation

For a detailed description of the rear view mirrors and systems, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (501-09 Rear View Mirrors)

[Rear View Mirrors](#) (Description and Operation),
[Rear View Mirrors](#) (Description and Operation),
[Rear View Mirrors](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Exterior rear view mirror glass 	<ul style="list-style-type: none"> • Fuse(s) • Relay(s) • Wiring Harness • Electrical connector(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



When carrying out repair/diagnosis of the system, on removal of the front or rear bumper inspect the sensor connectors to ensure they were correctly latched and check fly leads for signs of chaffing or trapped wires.

DTC	Description	Possible Cause	Action
B116311	Left Mirror Heater Output	<ul style="list-style-type: none"> Left mirror heater control circuit - short to ground 	Refer to the electrical circuit diagrams and test left mirror heater control circuit for short to ground
B116315	Left Mirror Heater Output	<ul style="list-style-type: none"> Left mirror heater control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test left mirror heater control circuit for short to power, open circuit
B116411	Right Mirror Heater Output	<ul style="list-style-type: none"> Right mirror heater control circuit - short to ground 	Refer to the electrical circuit diagrams and test right mirror heater control circuit for short to ground
B116415	Right Mirror Heater Output	<ul style="list-style-type: none"> Right mirror heater control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test right mirror heater control circuit for short to power, open circuit
B11F711	Passenger Folding Mirror Motor	<ul style="list-style-type: none"> Passenger folding mirror motor control circuit - short to ground 	Refer to the electrical circuit diagrams and check passenger folding mirror motor control circuit for short to ground
B11F715	Passenger Folding Mirror Motor	<ul style="list-style-type: none"> Passenger folding mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check passenger folding mirror motor control circuit for short to power, open circuit
B1C0911	Driver Left/Right Mirror Motor Circuit	<ul style="list-style-type: none"> Driver left/right mirror motor control circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver left/right mirror motor control circuit for short to ground
B1C0915	Driver Left/Right Mirror Motor Circuit	<ul style="list-style-type: none"> Driver left/right mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver left/right mirror motor control circuit for short to power, open circuit
B1C1011	Driver Up/Down Mirror Motor Circuit	<ul style="list-style-type: none"> Driver up/down mirror motor control circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver up/down mirror motor control circuit for short to ground
B1C1015	Driver Up/Down Mirror Motor Circuit	<ul style="list-style-type: none"> Driver up/down mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver up/down mirror motor control circuit for short to power, open circuit
B1C1111	Passenger Left/Right Mirror Motor Circuit	<ul style="list-style-type: none"> Passenger left/right mirror motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger left/right mirror motor control circuit for short to ground
B1C1115	Passenger Left/Right Mirror Motor Circuit	<ul style="list-style-type: none"> Passenger left/right mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test passenger left/right mirror motor control circuit for short to power, open circuit
B1C1211	Passenger Up/Down Mirror Motor Circuit	<ul style="list-style-type: none"> Passenger up/down mirror motor control circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger up/down mirror motor control circuit for short to ground
B1C1215	Passenger Up/Down Mirror Motor Circuit	<ul style="list-style-type: none"> Passenger up/down mirror motor control circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test passenger up/down mirror motor control circuit for short to power, open circuit
B1C1311	Driver Up/Down Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> Driver up/down mirror motor feedback circuit - short to ground 	Refer to the electrical circuit diagrams and test driver up/down mirror motor feedback circuit for short to ground

DTC	Description	Possible Cause	Action
B1C1315	Driver Up/Down Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> • Driver up/down mirror motor feedback circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver up/down mirror motor feedback circuit for short to power, open circuit
B1C1411	Driver Left/Right Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> • Driver left/right mirror motor feedback circuit - short to ground 	Refer to the electrical circuit diagrams and test driver left/right mirror motor feedback circuit for short to ground
B1C1415	Driver Left/Right Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> • Driver left/right mirror motor feedback circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and test driver left/right mirror motor feedback circuit for short to power, open circuit
B1C1511	Passenger Up/Down Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> • Passenger up/down mirror motor feedback circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger up/down mirror motor feedback circuit for short to ground
B1C1515	Passenger Up/Down Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> • Passenger up/down mirror motor feedback circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and test passenger up/down mirror motor feedback circuit for short to power, open circuit
B1C1611	Passenger Left/Right Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> • Passenger left/right mirror motor feedback circuit - short to ground 	Refer to the electrical circuit diagrams and test passenger left/right mirror motor feedback circuit for short to ground
B1C1615	Passenger Left/Right Mirror Motor Feedback Circuit	<ul style="list-style-type: none"> • Passenger left/right mirror motor feedback circuit - short to power, open circuit 	Refer to the electrical circuit diagrams and test passenger left/right mirror motor feedback circuit for short to power, open circuit

Rear View Mirrors - Exterior Mirror

Removal and Installation

Removal



1.  NOTE: Left-hand shown, right-hand similar.



E94765

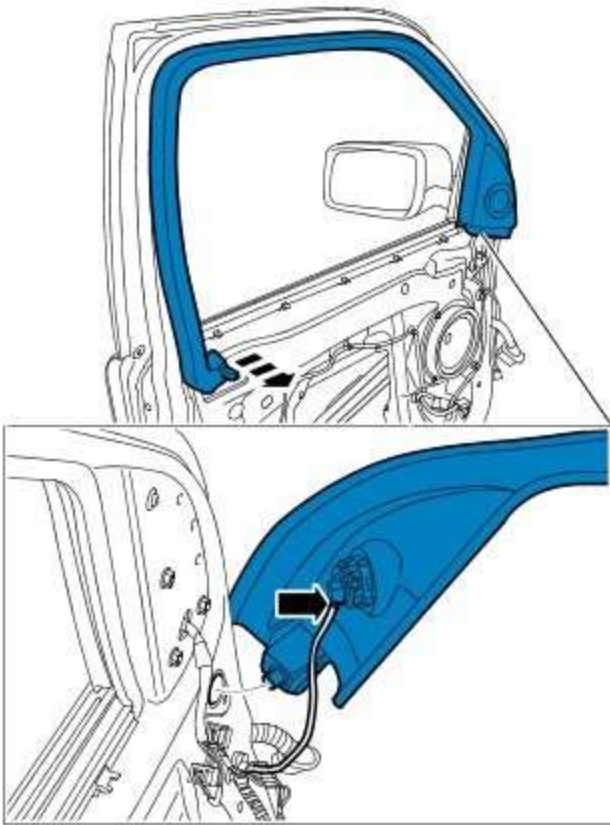
2. Refer to: Front Door Trim Panel (501-05, Removal and Installation).



3.  NOTE: Left-hand shown, right-hand similar.

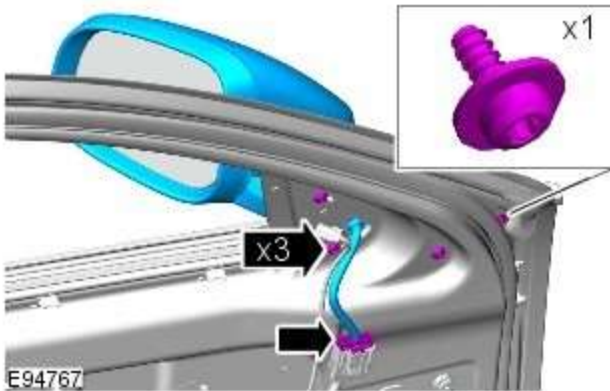
E94766

4.  NOTE: Left-hand shown, right-hand similar.



E76992

 NOTE: Left-hand shown, right-hand similar.



E94767

5.

Installation

1. To install, reverse the removal procedure.

Rear View Mirrors - Exterior Mirror Cover

Removal and Installation

Removal

NOTES:

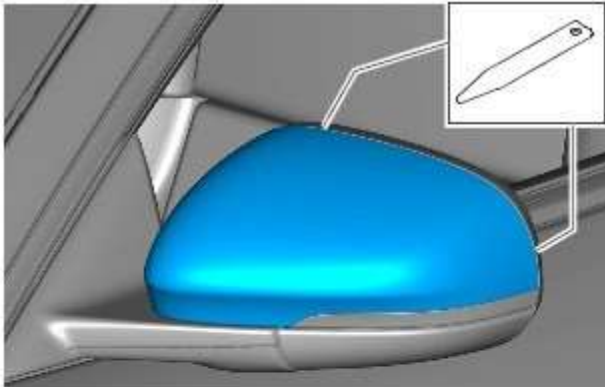


Removal steps in this procedure may contain installation details.

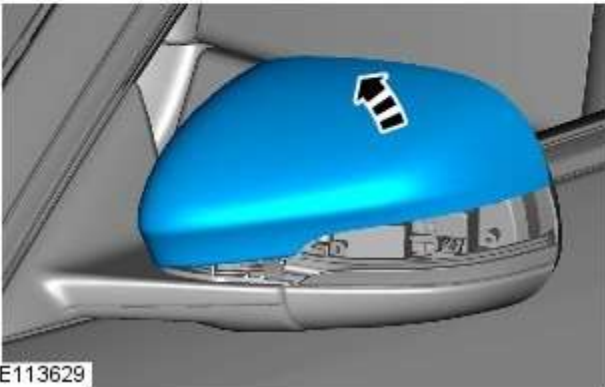


Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Exterior Mirror Glass](#) (501-09 Rear View Mirrors, Removal and Installation).



2. NOTE: Note the fitted position of the locating pegs.



Installation

1. To install, reverse the removal procedure.

Rear View Mirrors - Exterior Mirror Glass

Removal and Installation

Removal

NOTES:

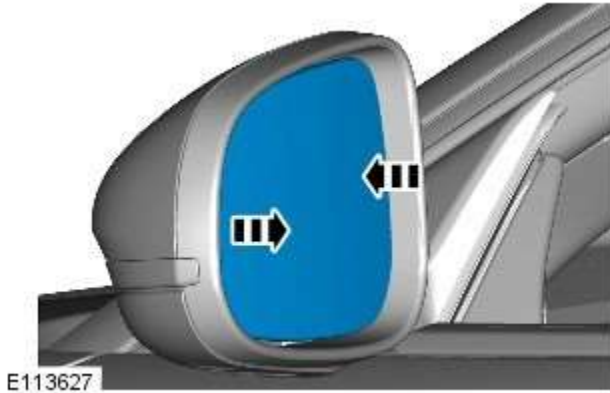


Removal steps in this procedure may contain installation details.

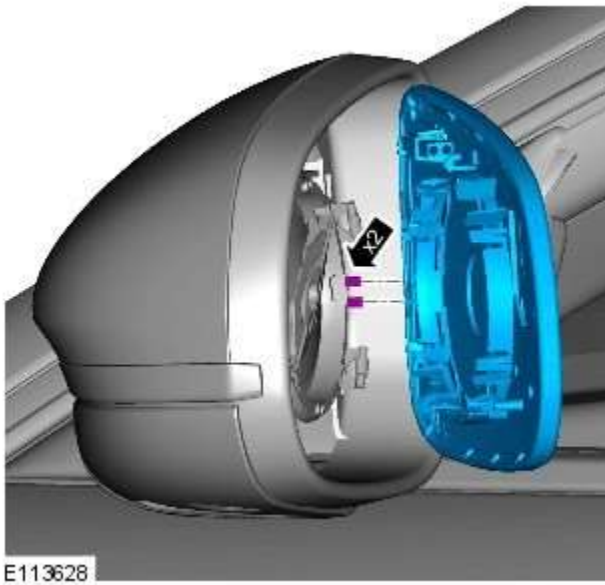


Some variation in the illustrations may occur, but the essential information is always correct.

1.



2.



Installation

-  **NOTE:** Note the fitted position of the locating pegs.
To install, reverse the removal procedure.

Rear View Mirrors - Exterior Mirror Motor

Removal and Installation

Removal

NOTES:



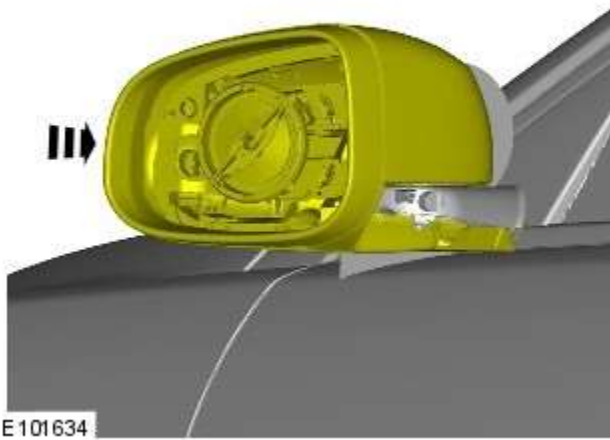
Removal steps in this procedure may contain installation details.



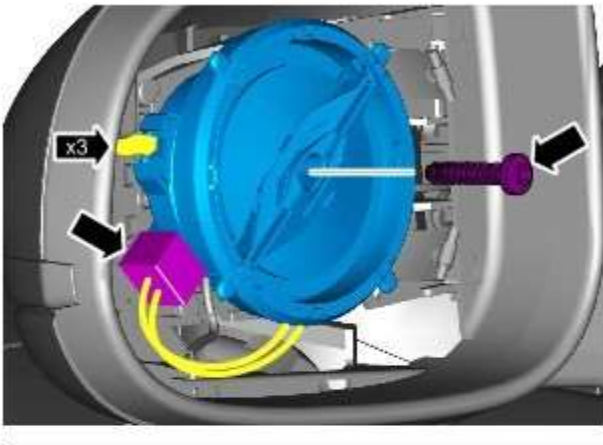
Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Exterior Mirror Glass](#) (501-09 Rear View Mirrors, Removal and Installation).

2.



3.



Installation

1. To install, reverse the removal procedure.

Rear View Mirrors - Interior Rear View Mirror

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

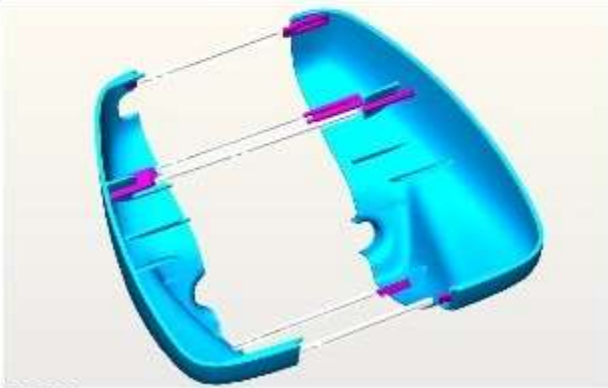
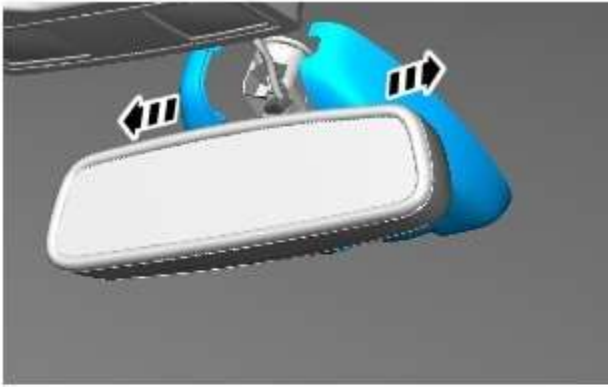
1. CAUTIONS:



Take extra care not to damage the clips.

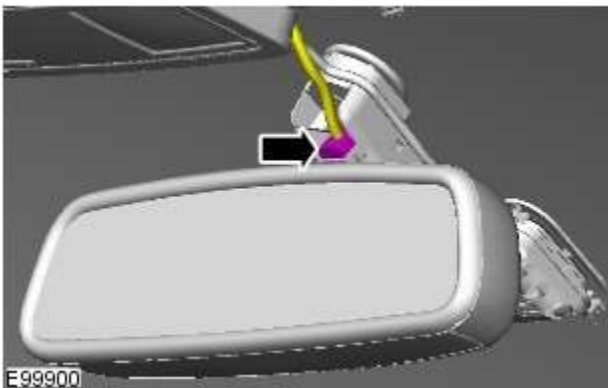


Protect the surrounding trim to avoid damage.

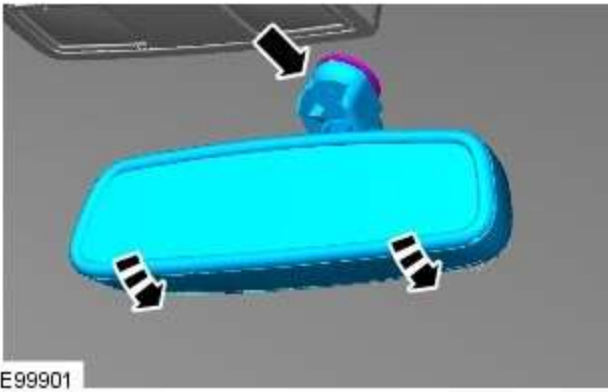


E99899

2.

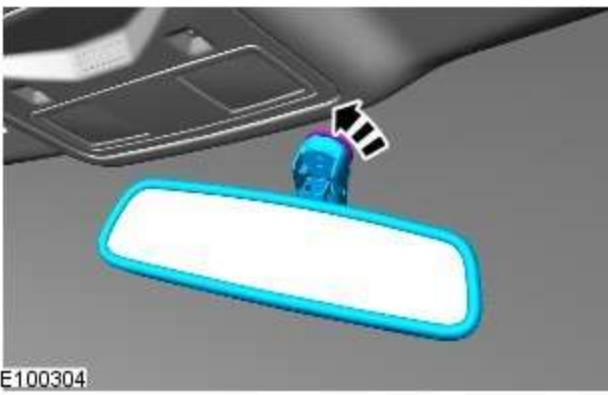


E99900



3.

Installation



1. To install, reverse the removal procedure.

Seating -

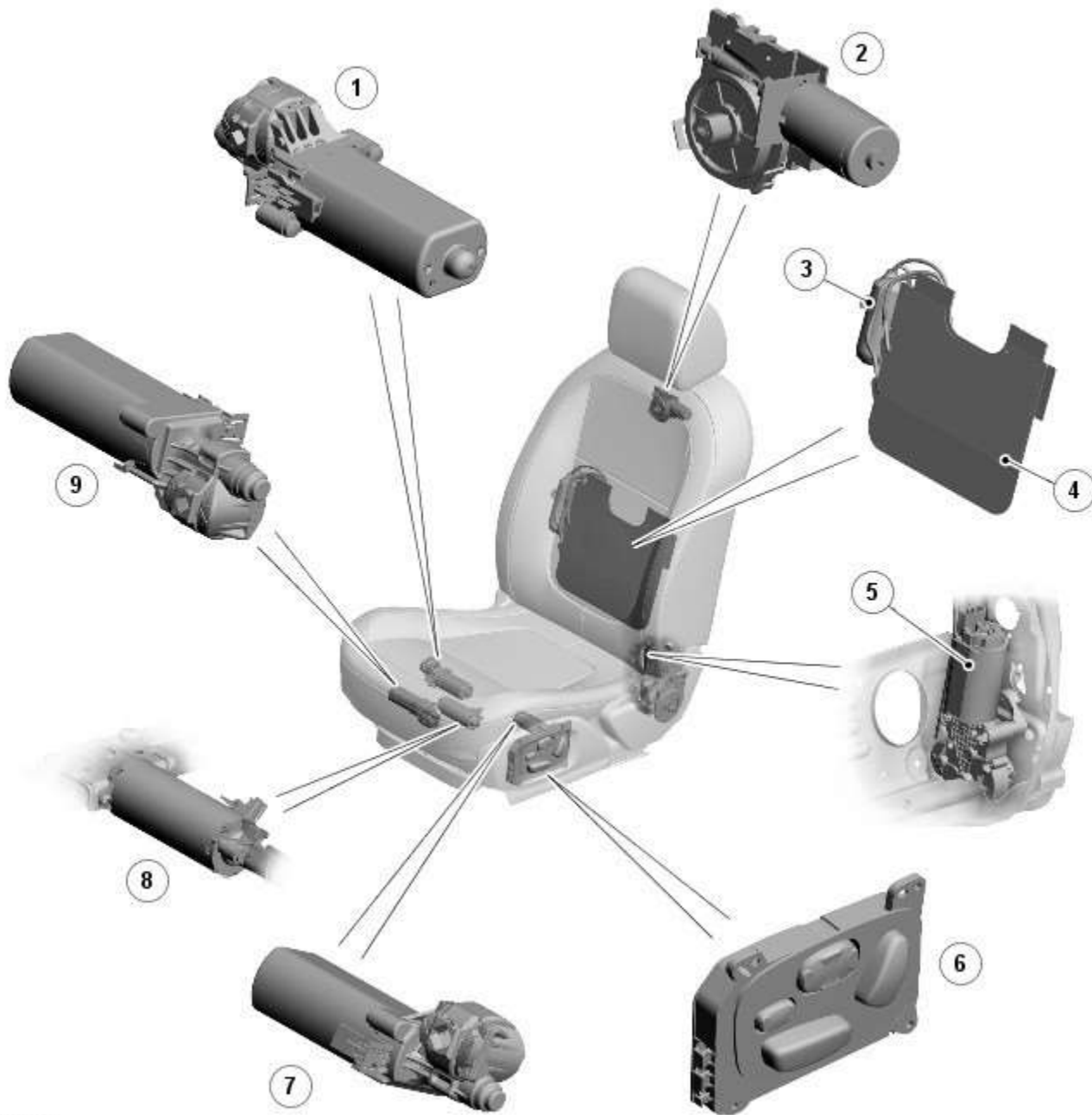
Torque Specifications

Description	Nm	lb-ft	lb-in
Front seat backrest retaining bolts	35	26	-
Front seat safety belt anchor retaining bolts	40	30	-
Front seat retaining bolts	47	35	-
Front safety belt buckle retaining bolt	40	30	-
Rear seat backrest retaining bolts	17	13	-
Side air bag module retaining nuts	7	-	62

Seating - Seats - Component Location

Description and Operation

COMPONENT LOCATION - MOVEMENT



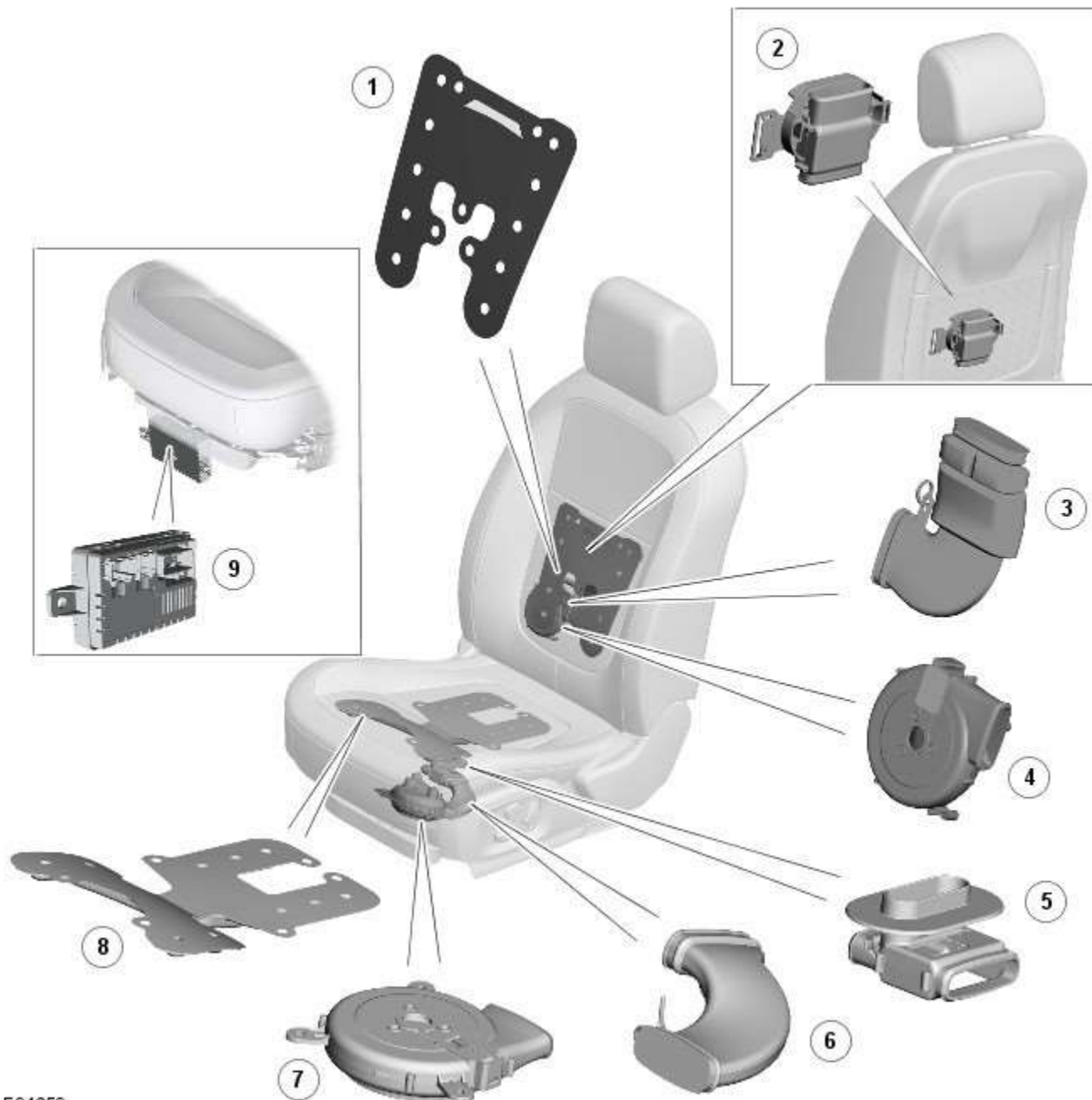
E94653

Item	Description
Note: 16-way LH (left-hand) driver's seat shown.	
1	Seat height motor
2	Head restraint motor
3	Lumbar support motor
4	Lumbar support air cells
5	Seat squab recline motor
6	Seat switch pack
7	Seat slide motor
8	Seat cushion tilt motor
9	Seat cushion extension motor



E95062

Item	Description
Note:	Heated front seat shown
1	Squab heater element
2	Cushion heater element



E94659

Item	Description
Note: Heated and cooled front seat shown	
1	Squab liner
2	Squab climate module
3	Squab inlet duct
4	Squab blower
5	Cushion climate module
6	Cushion inlet duct
7	Cushion blower
8	Cushion liner
9	Front seat climate control module

Seating - Seats - Overview

Description and Operation

OVERVIEW

Leather Seat Covers

Leather is a natural product, therefore it bears natural characteristics, such as grain variations, growth & bush marks. These non-weakening marks show the true nature of the hide and are the hallmarks of Leather. In order to maintain the beauty of the vehicles natural Leather upholstery it requires regular cleaning, which if neglected, may cause deterioration. Where dust and dirt are allowed to accumulate and become ingrained in the surface of the Leather, the upholstery may become permanently damaged.

Light coloured upholstery can be particularly susceptible to soiling and staining and care should be taken to ensure that where there is evidence of any soiling or staining on the upholstery then this should be cleaned immediately using the Jaguar/Land Rover approved products, failure to do this could lead to the stain becoming permanent, this applies to all leather upholstery and is not colour specific.

Leather trimmed seats will naturally exhibit areas of creasing and wrinkling over a period of time and is a normal characteristic as the Leather ages.

Particular care should be taken where there is evidence of soiling or staining on the leather, this should be cleaned immediately. Failure to do this could lead to the stain becoming permanent.

Particular care should be taken to prevent damage from studs, zips and buckles.

NOTES:



Please refer to Leather care label attached to seats for more information.



Creasing and wrinkling does not represent a manufacturing defect.



Damage from studs, zips and buckles do not represent manufacturing defects.



Use only Jaguar/Land Rover approved products in accordance with the instructions for use.

General

A number of front seating options are available. An 8-way electrically adjustable driver's seat is complemented by an 8-way electrically adjustable passenger seat. A 10-way electrically adjustable driver's seat is complemented by an 10-way electrically adjustable front passenger seat. A 16-way electrically adjustable driver's seat is complemented by a 12-way electrically adjustable front passenger seat.

On non-memory seats, the operation of the seats is controlled directly from the driver's seat switchpack. On memory seats, the operation of the seat motors is controlled by a seat control module which is located on the underside of the driver's seat frame.

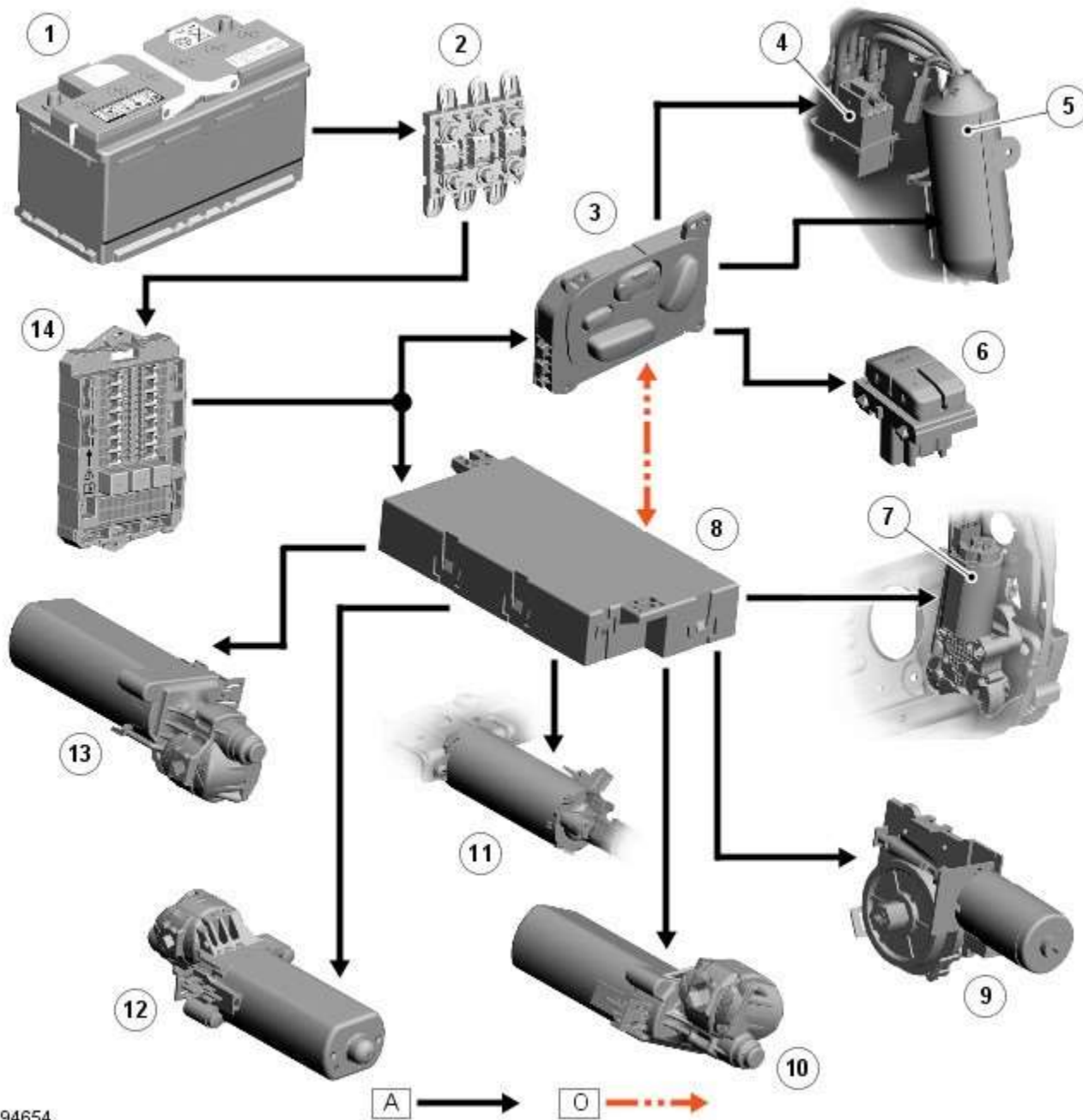
The driver's seat is fitted with a seat position sensor which is located on the seat rail. The sensor is used by the [RCM \(restraints control module\)](#) to determine the seat position and adjust the inflation time of the airbag deployment accordingly. Refer to: [Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) (501-20B Supplemental Restraint System, Description and Operation).

Seating - Seats - System Operation and Component Description

Description and Operation

Control Diagram

CONTROL DIAGRAM - MOVEMENT - MEMORY SEATS

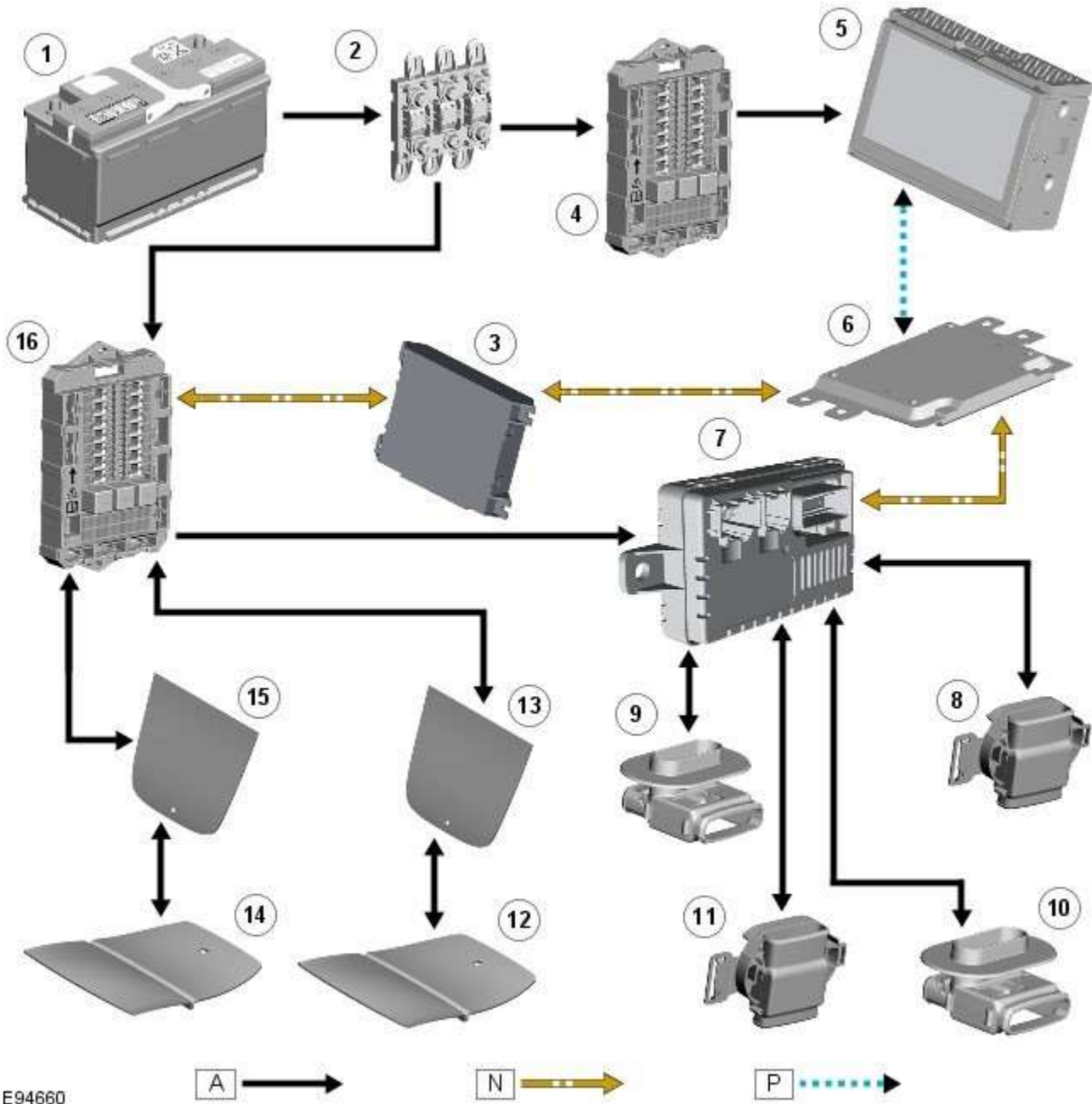


E94654

Item	Description
Note: A = Hardwired; O = LIN (local interconnect network)	
1	Battery
2	BJB (battery junction box)
3	Seat switch pack
4	Lumbar support solenoids
5	Lumbar support motor
6	Seat memory switches
7	Squab recline motor

8	Driver's seat module
9	Head restraint motor
10	Cushion tilt motor
11	Cushion extension motor
12	Seat slide motor
13	Seat height motor
14	CJB (central junction box)

CONTROL DIAGRAM - TEMPERATURE



E94660

Item	Description
Note: A = Hardwired; N = Medium speed CAN (controller area network) bus; P = MOST ring	
1	Battery
2	BJB
3	ATC (automatic temperature control) module
4	RJB (rear junction box)
5	Touch Screen Display (TSD)
6	Information and Entertainment module

7	Front seat climate control module
8	Passenger seat squab climate module
9	Drivers seat cushion climate module
10	Passenger seat cushion climate module
11	Drivers seat squab climate module
12	Passenger seat cushion heater element
13	Passenger seat squab heater element
14	Drivers seat cushion heater element
15	Drivers seat squab heater element
16	CJB

System Operation

HEATED SEATS - OPERATION

Heated Front Seats

The TSD receives a fused power supply from the [RJB](#). One of the 3 seat heat temperature selections made by the driver or passenger using the TSD soft keys are passed from the TSD on the MOST ring to the Information and Entertainment module. The information and entertainment module processes the information and transmits the request on the medium speed [CAN](#) bus to the [ATC](#) module.

The cushion heaters have a thermal sensor which supplies a feed back signal back to the [CJB](#). The squab heater elements do not have a thermal sensor and are maintained at the same temperature as the seat cushion elements.

The [ATC](#) module reacts to the driver request information received from the information and entertainment module and requests the [CJB](#) to activate the seat heaters. The [CJB](#) measures the returned temperature signals from the thermal sensors and relays the temperature signals back to the [ATC](#) module. The [ATC](#) module then uses the measured seat element temperatures to provide closed-loop control of the heater elements to maintain the temperature at one the 3 heat ranges selected.



NOTE: To prevent excessive battery discharge, the heated front seats will only operate when the engine is running.

Heated and Cooled Front Seats

The TSD receives a fused power supply from the [RJB](#). Selections made by the driver using the TSD soft keys are passed from the TSD on the MOST ring to the Information and Entertainment module. The information and entertainment module processes the information and transmits the request on the medium speed [CAN](#) bus to the front seat climate control module. The front seat climate control module is located beneath the [RH \(right-hand\)](#) front seat, on the floor cross member.

The front seat climate control module receives its power supplies from the [CJB](#). Heating and cooling requests are generated using the soft buttons on the TSD. These requests are transmitted to the information and entertainment module over the MOST ring. The Information and Entertainment module forwards these requests to the front seat climate control module over the medium speed [CAN](#) bus.

The front seat climate control module supplies power to the two climate modules in each seat. The temperature sensor in each climate module is monitored by the front seat climate control module which uses the temperature information to control the Peltier cells accordingly and also the blower fans to distribute the heated or cooled air.



NOTE: To prevent excessive battery discharge, the heated and cooled front seats will only operate when the engine is running.

Electric Driver's Seat Adjustment - Non-Memory Seats

The [CJB](#) supplies 3 power supplies to the driver's seat switchpack. The fused supplies provide power for the seat height and squab recline, the seat slide and seat tilt and the lumbar adjustment respectively. The [CJB](#) only provides the power to the driver's seat switch pack when the ignition is on (power mode 6).

For the seat movement motors, when the applicable switch is operated, the power is supplied to the applicable side of the motor and the ground path is completed to operate the motor in the required direction. To move the motor in the opposite direction the polarity is reversed.

For the lumbar adjustment, when the switch is operated in the inflate position, power is supplied to the pump motor to inflate the lumbar support. When the switch is operated in the opposite direction, the power energizes a solenoid which in turn opens a valve to deflate the lumbar support.

Electric Passenger Seat Adjustment (8, 10 and 12 way)

The [CJB](#) supplies 3 power supplies to the passenger seat switchpack. The fused supplies provide power for the seat height and squab recline, the seat slide and seat tilt and the head restraint and lumbar adjustment respectively. The [CJB](#) only provides the power to the passenger seat switch pack when the ignition is on (power mode 6).

For the seat movement and head restraint motors, when the applicable switch is operated, the power is supplied to the applicable side of the motor and the ground path is completed to operate the motor in the required direction. To move the

motor in the opposite direction the polarity is reversed.

For the lumbar adjustment, when the switch is operated in the inflate position, power is supplied to the pump motor to inflate the lumbar support. When the switch is operated in the opposite direction, the power energizes a solenoid which in turn opens a valve to deflate the lumbar support.

Electric Driver's Seat Adjustment - Memory Seats (10 and 16 way)

The [CJB](#) supplies 3 power supplies to the driver's seat module and one supply to the driver's seat switch pack. The fused supplies provide power for the movement motors in addition to the driver's seat switch pack. Power is only supplied to the driver's seat module and the driver's seat switch pack when the ignition is on (power mode 6).

The driver's seat switch pack is connected to the driver's seat module by a [LIN](#) bus for the seat movement switches. Any selection for seat movement generates a message which is passed via the [LIN](#) to the driver's seat module. The seat module processes the request and operates the applicable seat function as required using the power supplies from the [CJB](#).

Each seat motor contains a Hall position sensor. The sensor sends a feedback signal to the driver's seat module. The signal is used for memory store and memory recall functions.

The lumbar adjustment switch on the driver's seat switch pack is wired direct to the lumbar pump and solenoids. The switch, when moved to the inflate position for either the upper or lower inflatable cushion cell, provides a power supply to the lumbar pump and simultaneously activates the applicable inflate solenoid valve. When the switch is released the pump stops and the solenoid valve closes trapping the air in the inflatable cushion. When the switch is moved to the deflate position for either the upper or lower inflatable cushion cell, power is supplied to the applicable deflate solenoid valve which opens to allow the air in the cushion to escape. When the switch is released, the valve is closed and the remaining air in the cushion is retained.

Component Description

FRONT SEATS - DESCRIPTION

The table below highlights the features available for each seating option.

Seat Type	Non-Heated	Heated	Heated and Cooled	Lumbar Support	Memory
8-way	Yes	Optional	No	2-way	No
10-way	Yes	Optional	Optional	2-way	Optional (Driver's seat only)
12-way	No	No	Yes	4-way	No
16-way	No	No	Yes	4-way	Yes (Driver's seat only)

Seat Heating

The 3-stage heated front seats feature 2 heater elements located in the seat cushion and a single heater element located in the seat squab. Operation of the heated front seats is controlled by the [ATC](#) module via the TSD, information and entertainment control module and the [CJB](#) module on vehicles with heated seats. On vehicles with heated and cooled seats the operation is controlled by the TSD, information and entertainment control module and the front seat climate control module.

The heated and cooled front seats each contain 2 climate modules; one in the cushion, one in the squab. The climate modules contain 'Peltier' cells which are able to deliver heating and cooling based on a voltage provided by the front seat climate control module. Each climate module also contains a fan, which blows air over the Peltier cells to distribute heated or cooled air via liners in the seat cushion and squab. The fan is also controlled by the front seat climate control module. The TSD allows the driver and passenger to select 3 ranges of heated or cooled ventilation; off, minimum and intermediate. Also, using the selections on the TSD, the driver and passenger can select between full seat ventilation or squab backrest ventilation only.

Vehicles fitted with the 3-stage heated front seat option also feature a heated steering wheel.
Refer to: [Steering Column Switches](#) (211-05 Steering Column Switches, Description and Operation).

Electric Seat Adjustment

Lumbar Support

On 8, 10 and 12 way seats, a 2 way lumbar support is provided which allows the lumbar inflatable cushion to be inflated or deflated as required. On 16 way seats, a 4 way lumbar support is fitted which comprises two separate cushion cells. The upper and lower cells can be inflated or deflated individually allowing greater comfort adjustment for the driver and passenger.

The lumbar support comprises an inflatable cushion located in the seat squab, a pump and solenoids. The pump is activated when the applicable seat switch is moved to the inflate position, inflating the cell(s) in the inflatable cushion. On 8 and 10 way seats, a single solenoid operated valve allows the inflatable cushion to be deflated. On 12 and 16 way seats, 4 solenoid valves control the inflation and deflation of the upper and lower inflatable cushion cells, allowing each cell to be adjusted individually.

Seat Motors

The head restraint motor is located in the upper section of each seat squab and is accessible by removal of the seat back. The motor moves a cradle which is driven in a vertical motion by a rack and pinion arrangement. The cradle has the two head restraint stems attached to it and therefore raises and lowers the head restraint as the motor moves the cradle. The motor contains a Hall sensor which supplies positional information to the driver's seat module.

The seat slide motor is an integral component of the seat frame. The motor drives on a gear on a worm drive lead screw which is integral with the floor rail. The lead screw has a stop at each end to limit the fore and aft seat movement.

The tilt motor is located below the seat. The tilt motor drives a gear on a lead screw to raise the front of the seat cushion. The motor contains a Hall sensor which supplies positional information to the driver's seat module.

The cushion extend motor is located below the seat. The motor drives a gear on a lead screw which extends or retracts the front of the seat cushion. The motor contains a Hall sensor which supplies positional information to the driver's seat module.

The height motor is located below the seat. The height motor drives a gear on a lead screw. The lead screw moves a lever mechanism which raises or lowers the seat cushion. The motor contains a Hall sensor which supplies positional information to the driver's seat module.

The squab recline motor is located in the seat back rest. The recline motor rotates a shaft which is connected the seat squab frame and raises or lowers the back rest position. The motor contains a Hall sensor which supplies positional information to the driver's seat module.

DRIVER'S SEAT MODULE

A memory store switch is located in the lower part of the driver's door. The switch communicates with the driver's seat module via the LIN bus in the driver's seat switch pack. The memory store switch has two buttons; 1 and 2 to allow two separate memory positions to be stored and 'set' button with integral LED (light emitting diode). The seat, door mirror and steering column motors have position sensors which provide feedback to driver's seat module.

Once the driver's seat, steering column and exterior mirrors have been adjusted, the vehicle is able to memorize these settings for future use by using the following procedure:

- Push the memory 'SET' button, the LED in the switch will illuminate
- Press the memory button 1 or 2 to memorize the current settings. The LED will extinguish, and a chime will sound to confirm that the settings have been memorized. If the ignition is on, power mode 6, the message center will display a confirmation message.

The positions can be recalled by pressing the applicable button 1 or 2.

Stall Detection

Seat, steering column and mirror motors are deemed to have stalled if there is no change in the inputs that are received from the corresponding feedback sensors for 200 ms (seat).

If a stall condition is detected then the drive to that motor is cancelled for the remainder of that memory operation (memory recall) or until the switch is re-selected (manual movement).

If the motor movement has stopped due to loss of sensor feedback, either stall or sensor failure, then that motor may be activated again, to move past the stall position, by re-selecting the appropriate switch and pressing for longer than 2 seconds. This allows control of the motor to be maintained if sensor feedback is lost.

Upon re-selection of movement, if sensor pulses are detected then the motor will continue to be driven until the switch is released or another stall condition is detected. If sensor feedback is not detected then the motor is only driven for 0.5 second and then stops until the switch is released and then pressed again, when a further 0.5 second of activation is permitted, and so on, this is known as inch mode.

For all seat motor manual movements, whenever a motor is driven and a stall occurs, the memory control module records the position at which the stall occurred. If movement occurs beyond a stall position, then that position is erased from the control modules memory. This will always allow movement past a previously recorded stall position once movement has been registered beyond that position. This is the case for both manual and memory movement.

Initialization

When a replacement driver's seat module is fitted, it should be calibrated a Jaguar approved diagnostic system so that the module can learn the seats absolute position.

Battery Monitor

If the battery voltage drops below 10.5 Volts, then the driver's seat module ignores all requests for a memory recall until the battery voltage has reached 11.5 Volts. This will conserve as much power in the vehicle battery as possible to enable engine cranking.

REAR SEATS - DESCRIPTION

The rear seat features a single piece cushion and a 60/40 split squab. Two latches are secured to the rear bulkhead by a pair of M8 bolts to retain the seat squabs in the upright position. The latches can be released to fold down the individual cushions by pulling a cable release located below the rear window parcel shelf in the luggage compartment.

ISOFIX fastening points are attached to the vehicle floor to provide secure fastening for compatible child seats.

A centrally mounted center arm rest can be folded down from the 60% squab. The arm rest contains two drinks holders.

Seating - Seat Cover Inspection

Description and Operation

Leather Seat Covers

Leather is a natural product, therefore it bears natural characteristics, such as grain variations, growth & bush marks. These non-weakening marks show the true nature of the hide and are the hallmarks of Leather. In order to maintain the beauty of the vehicles natural leather upholstery it requires regular cleaning, which if neglected, may cause deterioration. Where dust and dirt are allowed to accumulate and become ingrained in the surface of the leather, the upholstery may become permanently damaged.

Light coloured upholstery can be particularly susceptible to soiling and staining and care should be taken to ensure that where there is evidence of any soiling or staining on the upholstery then this should be cleaned immediately using the Jaguar/Land Rover approved products, failure to do this could lead to the stain becoming permanent, this applies to all leather upholstery and is not colour specific.

Leather trimmed seats will naturally exhibit areas of creasing and wrinkling over a period of time and is a normal characteristic as the leather ages.

Particular care should be taken where there is evidence of soiling or staining on the leather, this should be cleaned immediately. Failure to do this could lead to the stain becoming permanent.

Particular care should be taken to prevent damage from studs, zips and buckles.

Seat Cover Replacement

Rest of World Vehicles

Reference should be made to the list of documents below before any seat cover is replaced in Jaguar Land Rover warranty.

- Global Warranty Policy and Procedure Manual on TOPIx.
- Leather Seat Cover Finessing Process on the Excellence Academy.
- Seat Smoothing Procedure in the workshop manual.

All seat covers that are replaced should be done using all available TOPIx guides. Any damage that has been done to other components during the seat cover replacement process will not be paid under warranty.

NAS vehicles

Reference should be made to the list of documents below before any seat cover is replaced in Jaguar Land Rover warranty.

- Warranty Policy and Procedure Manual.
- Leather Seat Cover Finessing Process on the Excellence Academy.
- Seat Smoothing Procedure in the workshop manual.

All seat covers that are replaced should be done using all available TOPIx guides. Any damage that has been done to other components during the seat cover replacement process will not be paid under warranty.

Leather Seat Covers Manufacturing Defect Guidelines

Examples of Damage to Seat Cover

Below are some examples of damage that would not be accepted under the terms of the Jaguar Land Rover warranty agreement. Please note: these are examples only and do not represent all warrantable/non warrantable customer concerns.

The examples below show damage such as cuts, tears and puncture holes. These types of damage would not be accepted under the terms of the Jaguar Land Rover warranty agreement (unless the seat cover damage was noted on the Pre Delivery Inspection).



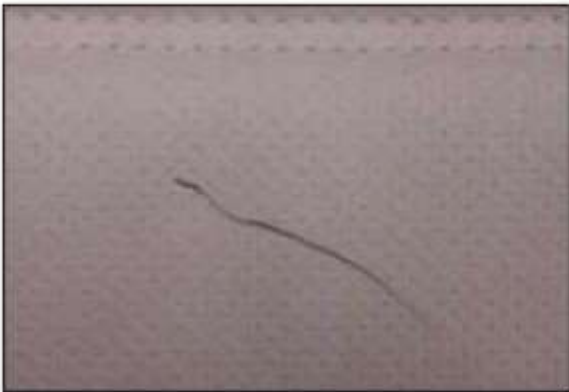
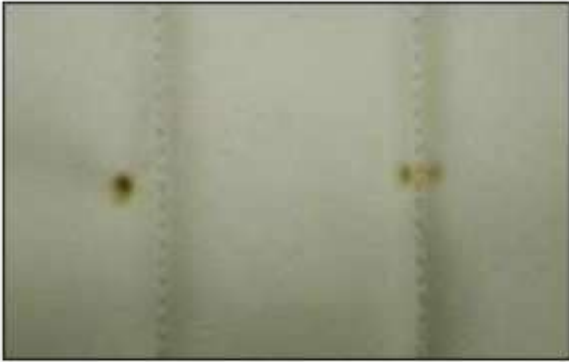
E167177

The examples below show damage such as scratches, scrapes, snags and indentation marks. These types of damage would not be accepted under the terms of the Jaguar Land Rover warranty agreement (unless the seat cover damage was noted on the Pre Delivery Inspection).



E167178

The examples below show damage such as pen marks and visual surface burns. These types of damage would not be accepted under the terms of the Jaguar Land Rover warranty agreement (unless the seat cover damage was noted on the Pre Delivery Inspection).



E167179

Examples of Natural Characteristics of Leather

Below are some examples of the natural characteristics of leather which will mature with use and ageing. These examples of the natural characteristics of leather are not manufacturing defects. Improvements in the seat cover can be achieved by following the smoothing process.

The examples below show the natural characteristics of leather on the front seat cushion. These types of natural characteristics of leather would not be accepted under the terms of the Jaguar Land Rover warranty agreement.



E167180

The examples below show the natural characteristics of leather on the front seat back and squab bolsters, These types of natural characteristics of leather would not be accepted under the terms of the Jaguar Land Rover warranty agreement.



E167181

The examples below show the natural characteristics of leather on the rear seat. These types of natural characteristics of leather would not be accepted under the terms of the Jaguar Land Rover warranty agreement.



E167182

Examples of Soiling, Stains and Incorrect Cleaning

Below are some examples of soiling, stains and incorrect cleaning that would not be accepted under the terms of the Jaguar Land Rover warranty agreement. Please note: these are examples only and do not represent all warrantable/non warrantable customer concerns.

The example below shows soiling on the seat cover. This type of soiling would not be accepted under the terms of the Jaguar Land Rover warranty agreement.



E167183

The examples below show staining on the seat cover. These type of staining would not be accepted under the terms of the Jaguar Land Rover warranty agreement.



E167184

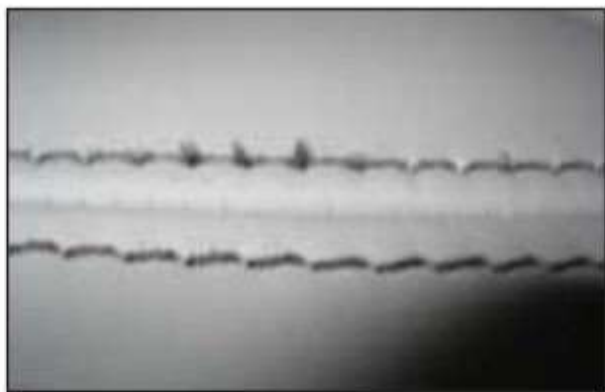
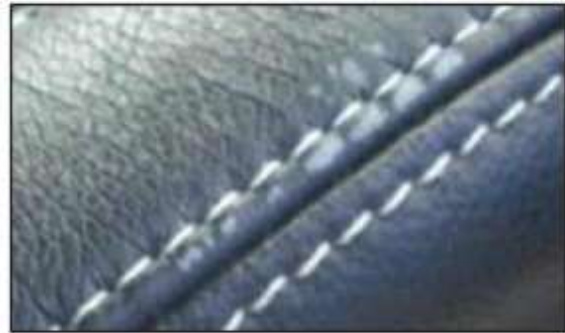
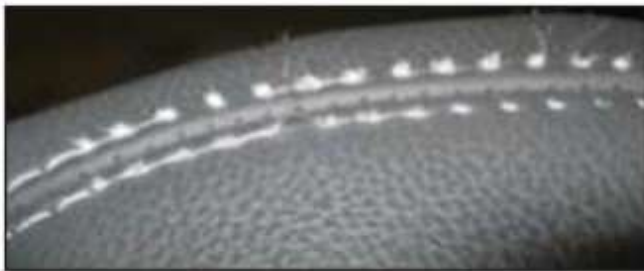
The example below shows incorrect cleaning on the seat cover. This type of incorrect cleaning would not be accepted under the terms of the Jaguar Land Rover warranty agreement.



Examples of Excessive Wear

Below are some examples of excessive wear on the seat covers that is often caused by studs, zips and buckles. This would not be accepted under the terms of the Jaguar Land Rover warranty agreement. Please note: these are examples only and do not represent all warrantable/non warrantable customer concerns.

The examples below show excessive wear on the seat covers, when studs, zips and buckles are in contact with the seat cover while entering and exiting the vehicle. These types of wear would not be accepted under the terms of the Jaguar Land Rover warranty agreement.



E167186

Seat Cover Replacement

Below are some examples of issues on the seat covers after they have been replaced. This would not be accepted under the terms of the Jaguar Land Rover warranty agreement. Please note: these are examples only and do not represent all warrantable/non warrantable customer concerns.

The example below shows excessive wrinkling or looseness due to incorrect fitment of the front seat covers. These types of incorrect fitment would not be accepted under the terms of the Jaguar Land Rover warranty agreement.



E167187

The example below shows excessive wrinkling or looseness due to incorrect fitment of the rear seat covers. This type of incorrect fitment would not be accepted under the terms of the Jaguar Land Rover warranty agreement.



E167188

Seating - Seats

Diagnosis and Testing

Principle of Operation

For a detailed description of the seats and seat operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (501-10 Seating)

[Seats](#) (Description and Operation),

[Seats](#) (Description and Operation),

[Seats](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.



NOTE: Prior to carrying out any diagnosis, ensure the vehicle battery is in a good serviceable condition, refer to the battery care manual.



1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.


Visual Inspection



Mechanical	Electrical
<ul style="list-style-type: none"> • Security, condition and correct installation of seat components and fixings 	<ul style="list-style-type: none"> • Fuses • Harnesses for damage/corrosion • Electrical connectors • Damaged/corroded pins

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, verify the concern and refer to the Symptom Chart, alternatively, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSM's which may be valid for the specific customer complaint and carry out the recommendations as needed.

Symptom Chart

Symptom	Possible Cause	Action
No seat movement from switch pack (including no memory recall)	<ul style="list-style-type: none"> • Seat module has gone into sleep mode • Seat switch pack LIN, power or ground circuit - open circuit • Seat switch pack LIN circuit - short to power, ground 	Set ignition ON. Re-check seat function from switch pack. Check for DTC B1A9887 and refer to DTC Index. Check for DTC B1A9888 and refer to DTC Index
No seat movement or lumbar movement from switch pack (including no memory recall)	 <p>NOTE: Seat module does not control the seat lumbar function</p> <ul style="list-style-type: none"> • Seat switch pack power or ground supply circuits - open circuit 	Refer to the electrical circuit diagrams and check seat switch pack power and ground supply circuits for open circuit
Seat movement and lumbar movement from switch pack is ok, however, no recall from memory switch pack	<ul style="list-style-type: none"> • Seat switch pack to memory switch pack circuits - short, open circuit 	 <p>NOTE: Memory switch pack is separate switch hardwired to seat adjust switch</p> <p>Refer to the electrical circuit diagrams and check seat switch pack to memory switch pack circuits for short,</p>

Symptom	Possible Cause	Action
		open circuit
Seat movement and memory recall works correctly however seat lumbar is not working correctly	 <p>NOTE: Seat module does not control the seat lumbar function</p> <ul style="list-style-type: none"> • Seat movement switch to lumbar circuits - short, open circuit 	Refer to the electrical circuit diagrams and check seat movement switch to lumbar circuits for short, open circuit
Seat movement from switch pack occurs in delayed inch mode (seat axis moves short distance when switch pressed for longer than 2 seconds and then stops). This behaviour could occur on any seat axis (slide, height, squab, tilt, headrest or cushion) when requested	<ul style="list-style-type: none"> • Motor Hall sensor on affected axis is not connected or not receiving expected signals 	Check for DTCs, B1B8731, B1B9131, B1B8931, B1B9331, B106331, B106431. If present then check Hall sensor feedback circuits between seat motor and seat module and also check Hall sensor ground circuits for affected axis. These DTCs are only logged if the axis is attempted to be moved in both directions. When hall sensor connection issue fixed press switch on affected axis for longer than 2 seconds. By keeping the switch pressed the axis movement should now operate for the duration of switch-press. Re-calibrate affected seat
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	<ul style="list-style-type: none"> • MS CAN fault 	Carry out CAN network integrity test using manufacturer approved diagnostic system
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	<ul style="list-style-type: none"> • Seat module is disconnected from the CAN Bus 	Check for Instrument Cluster DTC U020800 'Lost Communication With Seat Module'. If this DTC is present, refer to the electrical circuit diagrams and check seat module power and ground supplies for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	<ul style="list-style-type: none"> • Instrument cluster is disconnected from the CAN Bus 	Check for seat module DTC U015500 'Lost Communication With Instrument Cluster'. If this DTC is present, refer to the electrical circuit diagrams and check instrument cluster power and ground supplies for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	<ul style="list-style-type: none"> • Driver Door Module is disconnected from the CAN Bus 	Check for seat module DTC U019900 'Lost Communication With Driver Door Module'. If this DTC is present, refer to the electrical circuit diagrams and check driver door module power and ground supplies for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	<ul style="list-style-type: none"> • Rear Junction Box (RJB) is disconnected from the CAN Bus 	Check for seat module DTC U014200 'Lost Communication With RJB'. If this DTC is present, refer to the electrical circuit diagrams and check RJB power and ground supplies for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system
Seat movement from switch pack occurs in inch mode. When seat axis movement is requested from the seat switch pack the requested seat axis moves a short distance then stops (does not include lumbar). This behaviour will occur on ALL seat axis (slide, height, squab, tilt headrest and cushion) when requested. MS CAN communication not possible	<ul style="list-style-type: none"> • Central Junction Box (CJB) is disconnected from the CAN Bus 	Refer to the electrical circuit diagrams and check CJB power and ground supplies for short, open circuit. Carry out CAN network integrity tests using the manufacturer approved diagnostic system

Symptom	Possible Cause	Action
 NOTE: Electric passenger seat can always be activated – there is no passenger seat module installed to this vehicle Seat module does not go to sleep. Seat movement is always active from driver seat switch pack	<ul style="list-style-type: none"> Seat module is in manufacturing mode 	 NOTE: A new module is NOT required to be installed, only the module replacement routine needs to be performed. This will set the PID required to disable manufacturing mode Seat module needs to be configured for customer mode. Check for DTC U1A4C68 'Build/End of Line mode Active'. If this DTC is present then configure for customer mode by running 'New Seat Module Replacement' application for the affected seat using the manufacturer approved diagnostic system
Front seat fore/aft movement not functioning	<ul style="list-style-type: none"> Carry out the pinpoint test associated to this Symptom 	GO to Pinpoint Test A.
Front seat excessive fore/aft free play	<ul style="list-style-type: none"> Carry out the pinpoint test associated to this Symptom 	GO to Pinpoint Test B.
Front seat fore/aft movement noisy	<ul style="list-style-type: none"> Carry out the pinpoint test associated to this Symptom 	GO to Pinpoint Test C.
Front seat height, tilt and/or seat extension motor movement not functioning	<ul style="list-style-type: none"> Carry out the pinpoint test associated to this Symptom 	GO to Pinpoint Test D.
Front seat height, tilt and/or extension movement noisy	<ul style="list-style-type: none"> Carry out the pinpoint test associated to this Symptom 	GO to Pinpoint Test E.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Driver Seat Module

DTC	Description	Possible Cause	Action
B105F11	Seat Cushion Extension Motor Output	<ul style="list-style-type: none"> Driver seat cushion extension motor circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat cushion extension motor circuit for short to ground
B105F15	Seat Cushion Extension Motor Output	<ul style="list-style-type: none"> Driver seat cushion extension motor circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat cushion extension motor circuit for short to power, open circuit
B106011	Seat Headrest Motor Output	<ul style="list-style-type: none"> Driver seat headrest motor circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat headrest motor circuit for short to ground
B106015	Seat Headrest Motor Output	<ul style="list-style-type: none"> Driver seat headrest motor circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat headrest motor circuit for short to power, open circuit
B106331	Seat Cushion Extension Motor Speed/Position Sensor	<ul style="list-style-type: none"> Harness/connector problem No signal from sensor Sensor/motor malfunction 	<ul style="list-style-type: none"> Check the seat wiring harness/connectors for security/integrity Refer to the electrical circuit diagrams and check the seat cushion motor sensor circuit. Repair circuit as required. Clear DTC and retest
B106431	Seat Headrest Motor Speed/Position Sensor	<ul style="list-style-type: none"> Harness/connector problem No signal from sensor Sensor/motor malfunction 	<ul style="list-style-type: none"> Check the seat wiring harness/connectors for security/integrity Refer to the electrical circuit diagrams and check the seat headrest motor sensor circuit. Repair circuit as required. Clear DTC and retest
B106524	Cushion extend switch	<ul style="list-style-type: none"> Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and cushion extend circuit for short to ground
B106624	Cushion retract switch	<ul style="list-style-type: none"> Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and cushion retract circuit for short to ground
B106D24	Headrest up switch	<ul style="list-style-type: none"> Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and headrest up circuit for short to ground
B106E24	Headrest down switch	<ul style="list-style-type: none"> Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and headrest down circuit for short to ground
B1A9883	LIN Bus Circuit #1	<ul style="list-style-type: none"> Value of signal protection calculation incorrect 	Check LIN network for interference/EMC related issues
B1A9886	LIN Bus Circuit #1	<ul style="list-style-type: none"> LIN bus Header error 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check LIN network for interference/EMC related issues
B1A9887	LIN Bus Circuit #1	<ul style="list-style-type: none"> Slave node communication missing. LIN bus circuit - short to ground, power, open circuit (ECU Types 7 & 8) 	Refer to electrical circuit diagrams and test LIN Bus between seat switch pack and control module for short to ground, power, open circuit, check power and ground supplies to switch pack
B1A9888	LIN Bus Circuit #1	<ul style="list-style-type: none"> Bus off 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to electrical circuit diagrams and test LIN Bus between seat switch pack and control module for short to ground or power
B1B8611	Seat Height Motor Relay	<ul style="list-style-type: none"> Driver seat parallel height motor circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat parallel height motor circuit for short to ground
B1B8615	Seat Height Motor Relay	<ul style="list-style-type: none"> Driver seat parallel height motor circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat parallel height motor circuit for short to power, open circuit




DTC	Description	Possible Cause	Action
B1B8731	Seat Height Motor Speed/Position Sensor	<ul style="list-style-type: none"> • Harness/connector problem • No signal from sensor • Sensor/motor malfunction 	<ul style="list-style-type: none"> • Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat height motor sensor circuit. Repair circuit as required. Clear DTC and retest
B1B8811	Seat Slide Motor Relay	<ul style="list-style-type: none"> • Driver seat slide motor circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat slide motor circuit for short to ground
B1B8815	Seat Slide Motor Relay	<ul style="list-style-type: none"> • Driver seat slide motor circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat slide motor circuit for short to power, open circuit
B1B8931	Seat Slide Motor Speed/Position Sensor	<ul style="list-style-type: none"> • Harness/connector problem • No signal from sensor • Sensor/motor malfunction 	<ul style="list-style-type: none"> • Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat slide motor speed sensor circuit. Repair circuit as required. Clear DTC and retest
B1B9011	Seat Tilt Motor Relay	<ul style="list-style-type: none"> • Driver seat tilt motor circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat tilt motor circuit for short to ground
B1B9015	Seat Tilt Motor Relay	<ul style="list-style-type: none"> • Driver seat tilt motor circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat tilt motor circuit for short to power, open circuit
B1B9131	Seat Tilt Motor Speed/Position Sensor	<ul style="list-style-type: none"> • Harness/connector problem • No signal from sensor • Sensor/motor malfunction 	<ul style="list-style-type: none"> • Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat tilt motor speed sensor circuit. Repair circuit as required. Clear DTC and retest
B1B9211	Seat Recline Motor Relay	<ul style="list-style-type: none"> • Driver seat recline motor circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat recline motor circuit for short to ground
B1B9215	Seat Recline Motor Relay	<ul style="list-style-type: none"> • Driver seat recline motor circuit - short to power, open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check driver seat recline motor circuit for short to power, open circuit
B1B9331	Seat Recline Motor Speed/Position Sensor	<ul style="list-style-type: none"> • Harness/connector problem • No signal from sensor • Sensor/motor malfunction 	<ul style="list-style-type: none"> • Check the seat wiring harness/connectors for security/integrity • Refer to the electrical circuit diagrams and check the seat recline motor speed sensor circuit. Repair circuit as required. Clear DTC and retest
B1B9424	Seat Height Up Switch	<ul style="list-style-type: none"> • Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat height up circuit for short to ground
B1B9524	Seat Height Down Switch	<ul style="list-style-type: none"> • Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat height down circuit for short to ground
B1B9624	Seat Slide Forward Switch	<ul style="list-style-type: none"> • Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat slide forward circuit for short to ground
B1B9724	Seat Slide Backward Switch	<ul style="list-style-type: none"> • Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat slide backward circuit for short to ground
B1B9824	Seat Tilt Up Switch	<ul style="list-style-type: none"> • Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat tilt up circuit for short to ground
B1B9924	Seat Tilt Down Switch	<ul style="list-style-type: none"> • Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat tilt down circuit for short to ground

DTC	Description	Possible Cause	Action
B1C0024	Seat Recline Up Switch	<ul style="list-style-type: none"> Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and seat recline up circuit for short to ground
B1C0124	Seat Recline Down Switch	<ul style="list-style-type: none"> Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit and check seat recline down circuit for short to ground
B1C0224	Memory Store Switch	<ul style="list-style-type: none"> Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit
B1C0324	Memory #1 Switch	<ul style="list-style-type: none"> Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit
B1C0424	Memory #2 Switch	<ul style="list-style-type: none"> Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit
B1C0524	Memory #3 Switch	<ul style="list-style-type: none"> Signal stuck high 	Check for a stuck switch. Refer to the electrical circuit diagrams and check driver seat switch pack to seat module LIN circuit for short, open circuit
U001088	Medium speed Can communication Bus	<ul style="list-style-type: none"> Bus off 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CAN network to climate controlled seat module for short, open circuit
U014000	Lost communication with CJB	<ul style="list-style-type: none"> Lost communication with CJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check CJB for related DTCs and refer to the relevant DTC Index
U014200	Lost communication with RJB	<ul style="list-style-type: none"> Lost communication with RJB 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Check RJB for related DTCs and refer to the relevant DTC Index
U015500	Lost communications with instrument cluster	<ul style="list-style-type: none"> Lost communications with instrument cluster 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check CAN network to climate controlled seat module and instrument cluster for short, open circuit
U019900	Lost communication with Driver Door Module (DDM)	<ul style="list-style-type: none"> Lost communication with DDM 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
U030000	Internal control module software incompatibility	<ul style="list-style-type: none"> Invalid configuration message is received 	Re-configure the RJB using the manufacturer approved diagnostic system. Clear the DTC and retest. If the DTC is still logged suspect the DSM/PSM, refer to the new module installation note at the top of the DTC Index
U1A1449	CAN Initialisation failure	<ul style="list-style-type: none"> Internal electronic failure 	Install a new DSM, refer to the new module installation note at the top of the DTC Index
U1A4C68	Build/end of line mode active	<ul style="list-style-type: none"> Manufacturing mode has not been removed 	Place DSM in to customer mode using manufacturer approved diagnostic system
U300049	Control module	<ul style="list-style-type: none"> Internal electronic failure 	Install a new DSM, refer to the new module installation note at the top of the DTC Index
U300055	Stored vehicle configuration data does not match	<ul style="list-style-type: none"> Incorrect car configuration data received 	Re-configure the RJB using the manufacturer approved diagnostic system. Clear DTC and re-test. If the DTC remains suspect the DSM, refer to the new module installation note at the top of the DTC Index
U300087	Control Module	<ul style="list-style-type: none"> Missing message 	Re-configure the RJB using the manufacturer approved diagnostic system. Check DSM for DTCs and refer to the DTC Index. Check CAN network integrity using the manufacturer approved diagnostic system
U300146	Control module improper shutdown	<ul style="list-style-type: none"> Calibration/parameter memory failure 	Check for DTCs that could indicate power failure to the module and refer to the DTC Index
U300281	Vehicle Identification Number (VIN)	<ul style="list-style-type: none"> Vehicle/component mis-match. Corrupt VIN data being transmitted, module previously installed to other vehicle 	Install original module, check for DTCs and refer to relevant DTC Index
U300316	Battery Voltage	<ul style="list-style-type: none"> Circuit voltage below threshold 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system


DTC	Description	Possible Cause	Action
U300317	Battery Voltage	<ul style="list-style-type: none"> Circuit voltage above threshold 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

Pinpoint Tests


PINPOINT TEST A : FRONT SEAT FORE/AFT MOVEMENT NOT FUNCTIONING

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS				
A1: CHECK FOR FRONT SEAT FORWARD-REARWARD SEAT MOTOR OPERATION					
	 WARNING: Before work is carried out, make the air bag supplemental restraint system safe. For additional information, refer to Standard Workshop Practices section of workshop manual.				
	<ol style="list-style-type: none"> Set ignition status to 'ON'. From the switch pack, operate the front seat forward-rearward seat motor switch and listen for evidence of the motor operating. 				
	Does the motor operate? Yes GO to A2. No GO to A3.				
A2: CHECK FRONT SEAT FORWARD-REARWARD SEAT MOTOR DRIVE BAR					
	<ol style="list-style-type: none"> Check front seat drive bar for correct installation and condition 				
	Is the front seat drive bar correctly installed and in a serviceable condition? Yes Re-check for correct front seat forward-rearward movement. Remove seat to allow for further investigation if required. No Correctly install front seat forward-rearward seat motor drive bar, or replace if required.				
A3: CHECK FRONT SEAT FORWARD-REARWARD SEAT MOTOR					
	 WARNING: When carrying out the following steps, stand clear of all moving parts and ensure link harness is routed accordingly.				
	<ol style="list-style-type: none"> Set ignition status to 'OFF'. Disconnect front seat forward-rearward seat motor connector. 				
	 NOTE: It may be that the seat has been driven to the limit of travel along the relevant axis, and when the link harness is connected, the seat will remain in the same position. If this is the case, a jolt may be felt from the motor. To confirm the motor operation, swap the link harness to alternate motor pin connections and the seat should travel in the opposite direction.				
	<ol style="list-style-type: none"> Using a locally made fused link harness and power supply, connect power and ground to forward-rearward seat motor. 				
	<table border="1" style="width: 100%;"> <thead> <tr> <th>Battery positive terminal</th> <th>Battery negative terminal</th> </tr> </thead> <tbody> <tr> <td>forward-rearward seat motor pin 1</td> <td>forward-rearward seat motor pin 2</td> </tr> </tbody> </table>	Battery positive terminal	Battery negative terminal	forward-rearward seat motor pin 1	forward-rearward seat motor pin 2
Battery positive terminal	Battery negative terminal				
forward-rearward seat motor pin 1	forward-rearward seat motor pin 2				
	Does the motor operate? Yes Using manufacturer approved diagnostic system, check for related Diagnostic Trouble Codes (DTCs) and carry out the repair operations specified. Alternatively, refer to the electrical circuit diagrams and check front seat forward-rearward seat motor circuits. No Replace front seat forward-rearward seat motor. Refer to relevant section of workshop manual.				

PINPOINT TEST B : FRONT SEAT EXCESSIVE FORWARD-REARWARD FREE PLAY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK FRONT SEAT FOR EXCESSIVE FORWARD-REARWARD FREE PLAY	
	 WARNING: Before work is carried out, make the air bag supplemental restraint system safe. For additional information, refer to Standard Workshop Practices section of workshop manual.
	<ol style="list-style-type: none"> Check all accessible front seat frame fixings are installed and to the correct torque.
	Are all accessible front seat frame fixings installed and to the correct torque? Yes GO to B2. No Install and tighten all accessible front seat frame fixings to correct torque and re-check for excessive free play.

B2: COMPARE THE FRONT SEAT FORWARD-REARWARD FREE PLAY AGAINST A SIMILAR SEAT	
	1 Compare the front seat forward-rearward free play against a similar seat.
	Is the front seat forward-rearward free play excessive when compared to a similar seat? Yes GO to B3. No The front seat frame is operating correctly. Submit Electronic Product Quality Report (EPQR) with any further query.
B3: CHECK REMAINING FRONT SEAT FRAME FIXINGS	
	1 Remove front seat and/or any seat covers/trim to allow access to check remaining front seat frame fixings are all installed and to the correct torque.
	Are all remaining front seat frame fixings installed and to the correct torque? Yes Replace front seat frame. Refer to the relevant section of the workshop manual. No Install and tighten all remaining front seat frame fixings to correct torque and re-check for excessive free play.

PINPOINT TEST C : FRONT SEAT FORWARD-REARWARD MOVEMENT NOISY	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: COMPARE FRONT SEAT FORWARD-REARWARD MOVEMENT NOISE TO OTHER FRONT SEAT	
	 WARNING: Before work is carried out, make the air bag supplemental restraint system safe. For additional information, refer to Standard Workshop Practices section of workshop manual.
	1 Compare the front seat forward-rearward movement noise to other front seat.
	Is the front seat forward-rearward movement noise excessive when compared to other front seat? Yes GO to C2. No GO to C3.
C2: COMPARE FRONT SEAT FORWARD-REARWARD MOVEMENT NOISE TO FRONT SEAT IN OTHER VEHICLE	
	1 Compare the front seat forward-rearward movement noise to front seat in other vehicle.
	Is the front seat forward-rearward movement noise excessive when compared to front seat in other vehicle? Yes GO to C3. No The front seat frame is operating correctly. Submit Electronic Product Quality Report (EPQR) with any further query.
C3: CHECK FOR DEBRIS OBSTRUCTING SEAT MOVEMENT	
	1 Check for debris obstructing seat movement.
	Is the front seat forward-rearward movement obstructed by debris? Yes Remove obstruction and re-check for noisy forward-rearward seat movement. No GO to C4.
C4: RE-ALIGN FRONT SEAT FRAME	
	1 Loosen front seat frame fixings.
	2 Set ignition status to 'ON'.
	3 Using the front seat switch pack drive the front seat fully forward then fully rearward.
	4 Tighten front seat frame fixings to the correct torque.
	5 Re-check for noisy seat movement.
	Is the front seat forward-rearward movement still noisy? Yes GO to C5. No The front seat frame is now operating correctly.
C5: CHECK FRONT SEAT FORWARD-REARWARD SEAT MOTOR DRIVE BAR	
	1 Check front seat drive bar for correct installation and condition.
	Is the front seat drive bar correctly installed and in a serviceable condition? Yes Replace front seat forward-rearward seat motor. Refer to relevant section of workshop manual. No Correctly install front seat forward-rearward seat motor drive bar, or replace if required.

PINPOINT TEST D : FRONT SEAT HEIGHT, TILT AND/OR SEAT EXTENSION MOTOR MOVEMENT NOT FUNCTIONING	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CHECK FRONT SEAT HEIGHT, TILT OR EXTENSION MOTOR	

WARNINGS:



Before work is carried out, make the air bag supplemental restraint system safe. For additional information, refer to Standard Workshop Practices section of workshop manual.



When carrying out the following steps, stand clear of all moving parts and ensure link harness is routed accordingly.

- 1 Set ignition status to ' OFF'.
- 2 Disconnect front seat height, tilt or extension motor connector.



NOTE: It may be that the seat has been driven to the limit of travel along the relevant axis, and when the link harness is connected, the seat will remain in the same position. If this is the case, a jolt may be felt from the motor. To confirm the motor operation, swap the link harness to alternate motor pin connections and the seat should travel in the opposite direction.

- 3 Using a locally made fused link harness and power supply, connect power and ground to relevant motor.

Battery positive terminal

Battery negative terminal

motor pin 1

motor pin 2

Does the motor operate?

Yes

Using manufacturer approved diagnostic system, check for related Diagnostic Trouble Codes (DTCs) and carry out the repair operations specified. Alternatively, refer to the electrical circuit diagrams and check relevant motor circuits.

No

Replace the relevant motor. Refer to relevant section of workshop manual.

PINPOINT TEST E : FRONT SEAT HEIGHT, TILT AND/OR EXTENSION MOVEMENT NOISY

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: COMPARE THE HEIGHT, TILT OR EXTENSION MOVEMENT NOISE WITH THE OTHER FRONT SEAT	
	<p>WARNING: Before work is carried out, make the air bag supplemental restraint system safe. For additional information, refer to Standard Workshop Practices section of workshop manual.</p>
	<ol style="list-style-type: none"> 1 Compare the front seat movement noise to other front seat.
	<p>Is the front seat height, tilt or extension movement noise excessive when compared to other front seat?</p> <p>Yes GO to E2.</p> <p>No GO to E3.</p>
E2: COMPARE FRONT SEAT HEIGHT, TILT OR EXTENSION MOVEMENT NOISE TO FRONT SEAT IN OTHER VEHICLE	
	<ol style="list-style-type: none"> 1 Compare the front seat height, tilt or extension movement noise to front seat in other vehicle.
	<p>Is the front seat height, tilt or extension movement noise excessive when compared to front seat in other vehicle?</p> <p>Yes GO to E3.</p> <p>No The front seat frame is operating correctly. Submit Electronic Product Quality Report (EPQR) with any further query.</p>
E3: CHECK FOR DEBRIS OBSTRUCTING SEAT MOVEMENT	
	<ol style="list-style-type: none"> 1 Check for debris obstructing seat movement.
	<p>Is the front seat height, tilt or extension movement obstructed by debris?</p> <p>Yes Remove obstruction and re-check for noisy height, tilt or extension seat movement.</p> <p>No GO to E4.</p>
E4: CHECK FOR HEIGHT, TILT OR EXTENSION MOVEMENT MECHANISM LUBRICATION	
	<ol style="list-style-type: none"> 1 Check and apply manufacturer approved lubrication to seat height, tilt or extension movement mechanism and re-test for noise.
	<p>Is the front seat height, tilt or extension noise still apparent?</p> <p>Yes Replace the relevant motor. Refer to relevant section of workshop manual.</p> <p>No The front seat height, tilt or extension motor is operating correctly.</p>

Seating - Heater Mats

Diagnosis and Testing

Principles of Operation

Heated seats incorporate heater elements in the cushion and the backrest of the seat. Each cushion heater element has a thermal sensor, which supplies a feedback temperature signal to the related seat heater module. The backrest heater elements do not have a thermal sensor, and are regulated at the same temperature as the cushion heater elements.

For a detailed description of the seat heater mat, refer to the relevant Description and Operation section in the workshop manual. REFER to: (501-10)

Seats (Description and Operation),
Seats (Description and Operation),
Seats (Description and Operation).

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Seat heater switches condition and installation 	<ul style="list-style-type: none"> • Fuses • Harnesses and connectors • Seat heater module • Seat heater switches • Seat heater mat

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTC's) and refer to the DTC Index.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

DTC Index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to section 100-00. REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Seat Module (Driver/Passenger/Rear Left/Rear Right) (100-00, Description and Operation) / Diagnostic Trouble Code (DTC) Index - DTC: Seat Climate Control Module (SCCM) (100-00, Description and Operation).

Seat Heater Mat Application Chart







NOTE: To ensure an accurate resistance reading, calibrated test equipment **must be** used

Vehicle / Year	Cushion / Backrest	Heater Mat / NTC Resistor	Left Hand Drive		Right Hand Drive		Minimum Resistance	Maximum Resistance
			Passenger Side Connector / Pin	Driver Side Connector / Pin	Passenger Side Connector / Pin	Driver Side Connector / Pin	Ohms At 20°C ±10°C	Ohms At 20°C ±10°C
XK 2010	Cushion	Heater mat	PS002/1 and PS002/4	DS002/1 and DS002/4	PS002/1 and PS002/4	DS002/1 and DS002/4	1,2	1,6
		NTC resistor	PS002/2 and PS002/3	DS002/2 and DS002/3	PS002/2 and PS002/3	DS002/2 and DS002/3	4 000	10 000
	Backrest	Heater mat	PS003/1 and PS003/2	DS003/1 and DS003/2	PS003/1 and PS003/2	DS003/1 and DS003/2	0,35	0,47
XF	Cushion	Heater mat	C3HS07A/1 and C3HS07A/4	C3HS02A/1 and C3HS02A/4	C3HS07A/1 and C3HS07A/4	C3HS02A/1 and C3HS02A/4	1,23	1,64
		NTC resistor	C3HS07A/2 and C3HS07A/3	C3HS02A/2 and C3HS02A/3	C3HS07A/2 and C3HS07A/3	C3HS02A/2 and C3HS02A/3	4 000	10 000
	Backrest	Heater mat	C3HS06A/1 and C3HS06A/2	C3HS01A/1 and C3HS01A/2	C3HS06A/1 and C3HS06A/2	C3HS01A/1 and C3HS01A/2	0,82	1,09
XJ 2008	Cushion	Heater mat	SP14-1 and SP14-4	SD14-1 and SD14-4	SP14-1 and SP14-4	SD14-1 and SD14-4	1,28	1,71
		NTC resistor	SP14-2 and SP14-3	SD14-2 and SD14-3	SP14-2 and SP14-3	SD14-2 and SD14-3	4 000	10 000
	Backrest	Heater mat	SP15-1 and SP15-2	SD15-1 and SD15-2	SP15-1 and SP15-2	SD15-1 and SD15-2	0,88	1,17
XJ 2010 onwards - Front	Cushion	Heater mat	C3HS07/1 and C3HS07/4	C3HS02/1 and C3HS02/4	C3HS07/1 and C3HS07/4	C3HS02/1 and C3HS02/4	0,99	1,32
		NTC resistor	C3HS07/2 and C3HS07/3	C3HS02/2 and C3HS02/3	C3HS07/2 and C3HS07/3	C3HS02/2 and C3HS02/3	4 000	10 000
	Backrest	Heater mat	C3HS06/1 and C3HS06/2	C3HS01/1 and C3HS01/2	C3HS06/1 and C3HS06/2	C3HS01/1 and C3HS01/2	0,67	0,90
XJ 2010 onwards - Rear	Cushion	Heater mat	C3HS78/1 and C3HS78/4	C3HS76/1 and C3HS76/4	C3HS76/1 and C3HS76/4	C3HS78/1 and C3HS78/4	0,99	1,32
		NTC resistor	C3HS78/2 and C3HS78/3	C3HS76/2 and C3HS76/3	C3HS76/2 and C3HS76/3	C3HS78/2 and C3HS78/3	4 000	10 000
	Backrest	Heater mat	C3HS79/1 and C3HS79/4	C3HS77/1 and C3HS77/4	C3HS77/1 and C3HS77/4	C3HS79/1 and C3HS79/4	1,0	1,3

PINPOINT TEST A : SEAT HEATER MAT

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK FOR DTC'S	
	1 Where possible use the manufacturer approved diagnostic system to review any logged seat heater mat DTC's
	Were any seat heater mat DTC's logged? Yes Carry out the help text action for any logged DTC's. Clear the DTC and retest. If DTC's return follow the tests listed below GO to A2. No GO to A2.
A2: MANUAL CHECK	
NOTES:	
	The manual check should be carried out by someone familiar with correct seat heat operation
	On full power the seat should be hot to touch
	1 If required operate the vehicle air conditioning on full for 10 minutes to reduce the in vehicle ambient temperature
	2 Operate the seat heater on full power
	Does the seat heater operate correctly? Yes Clear any stored DTC's and retest. If seat heater operation is correct no further action required No GO to A3.
A3: SHORT CIRCUIT TO GROUND	

	1	Refer to the electrical circuit diagrams and the seat heater mat application chart (see above) to identify the connector
	2	Disconnect the connector
	3	Refer to the electrical circuit diagrams and check the seat heater mat heater circuit and the NTC resistor circuit for short circuit to ground
		Are either of the circuits short circuit to ground? Yes Repair the circuit or replace the seat heater mat as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Clear any stored DTC's and retest No GO to A4.
A4: CIRCUIT CONTINUITY TEST		
	1	Refer to the electrical circuit diagrams and check the seat heater mat (heater circuit) for circuit continuity
		Does the seat heater mat heater circuit pass the continuity test? Yes GO to A5. No Repair the circuit or replace the seat heater mat as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Clear any stored DTC's and retest
A5: POWER CONSUMPTION		
 NOTE: The seat heater power supply cycles on and off dependant on the seat and cabin temperature and may only switch on for 5 seconds in 30 seconds		
	1	Reconnect the connector
	2	Operate the vehicle air conditioning on full for 10 minutes to reduce the in vehicle ambient temperature
	3	Refer to the electrical circuit diagrams and check the seat heater mat (heater circuit) using a current clamp
	4	Operate the seat heater on full power
	5	Use the chart above to calculate typical value ($V/R=I$) (Volts divided by Resistance equals Current in Amps)
	6	Examples (12 volts / 0.5 ohms =24 amps) (12 volts / 1 ohms = 12 amps) (12 volts / 2 ohms = 6 amps)
		Does the seat heater mat consume the correct level of current? Yes Clear any stored DTC's and retest. If operation correct, no further action required No GO to A6.
A6: RESISTANCE CHECK		
NOTES:		
 Ensure the multimeter used is calibrated and a resistance reading of 0 ohms is shown when the test leads are connected together, alternately subtract any resistance shown from the result		
 The seat heater mat circuits should be checked at the seat heater module connector		
 Refer to the electrical circuit diagrams and to confirm the total resistance of the circuit the cushion and backrest are connected in series		
	1	Refer to the electrical circuit diagrams and the seat heater mat application chart (see above) to identify the terminals
	2	Disconnect the connector
	3	Using a multimeter, carry out a resistance check of the seat heater mat heater circuit and the NTC resistor circuit . Record the results
	4	Compare the results to the chart (see above)
		Are the results within specification at the given ambient temperature? (tolerance +/- 0.5 Ohms) Yes Reconnect the connector. Clear any stored DTC's and retest. If customer concern or DTC's return refer to electrical circuit diagrams and investigate the power and ground supply circuits No Replace the seat heater mat as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component. Clear any stored DTC's and retest

Seating - Seats Vehicles With: Climate Controlled Seats

Diagnosis and Testing

Principle of Operation

For a detailed description of the seating systems and operation, refer to the relevant description and operation section of the workshop manual. REFER to: (501-10 Seating)

[Seats](#) (Description and Operation),
[Seats](#) (Description and Operation),
[Seats](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals



The DTC index containing an actions list is for guidance only any reference to "check and install new blower unit" should only be carried out following failure confirmation using the pin out diagnostics and/or the over temperature and fluid/air leak diagnostics contained below. The recording of a DTC does NOT signify a permanently failed unit



The climate system functions in a manner that means any detected error state either intermittent or permanent will shut down the complete seat climate system until the next ignition cycle, this does not mean that both climate units within the one seat have failed. This shut down is design intent to protect the system to ensure that the fault detected does not damage the units, it is possible that both units are functioning correctly and that the fault lies elsewhere within the system. The following process can be carried out without removing either the seats or the climate units from the vehicle and should correctly identify any failed units, this should ensure that only failed units are changed under warranty. Any units exhibiting the correct reading as per process below, should NOT be changed under warranty. If all units have a correct reading then re-confirm customer symptom, if customer symptom is still present then carry out further system checks

1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Seat heater switch condition and installation 	<ul style="list-style-type: none"> • Battery condition and state of charge • Fuses • Harnesses and connectors • Seat heater switch(es) • Seat heater elements • Seat module(s) • Ignition switch • Battery junction box • Central junction box • LIN circuit

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, carry out normal dealer warranty process, perform on-demand self test, check for DTCs and refer to the relevant DTC index
5. Allow 30 mins since the last seat/cooled operation prior to carrying out pin testing detailed below in the section "Connector and Pin Information"

6. Locate climate seat module, (refer to Electrical Information - Electrical Reference Library, contained in TOPIx) for guidance on how to gain access to the connector(s)
7. Locate and disconnect relevant connector prior to pin test
8. Using ohm-meter to probe each heat/cooled unit pins (at rear of connector), reading should achieve no greater than 10 ohms after 1 minute (initial fluctuations in readings may occur using ohm-meter, post 1 minute readings will have stabilized)

Connector and Pin Information

X250 (All Model Years)								
Terminal ID	1	2	3	4	7	8	9	10
Climate Seat Unit Location	Right Cushion	Right Cushion	Right Backrest	Right Backrest	Left Cushion	Left Cushion	Left Backrest	Left Backrest
Wiring Colour - Left Hand Drive Vehicles	GY-BU - Grey/Blue	BU - Blue	BU-BN - Blue/Brown	WH - White	YE-BU - Yellow/Blue	BU-OG - Blue/Orange	GY-VT - Grey/Violet	WH-VT - White/Violet
Wiring Colour - Right Hand Drive Vehicles	YE-BU - Yellow/Blue	BU-OG - Blue/Orange	GY-VT - Grey/Violet	WH-VT - White/Violet	GY-BU - Grey/Blue	BU - Blue	BU-BN - Blue/Brown	WH - White

1. If any unit reads greater than 10 ohms, replace only that defective unit
2. If all units read less than 10 ohms but faults are still suspected, do not replace any units. Refer to step 4 below
3. As a final check, when a faulty unit has been identified strip the seat to access unit connector; REFER to: Seats (501-10, Removal & Installation) and re-check ohm reading to confirm greater than 10 ohms prior to removing unit
4. In cases where the above diagnostic routine does NOT identify a failed unit, please refer to "Over Temperature and Fluid/Air Leak Diagnostics" below. Also check for any live technical service bulletins referring to the seat climate system



Seat Climate Control Module/Seat Climate Assembly - Further Diagnostics


In the event of suspected climate seat faults use the pinpoint tests detailed below

Connector Checks

First, check the integrity of the three seat climate control module harness connectors:

1. Disconnect each connector
2. Inspect each connector for cracks and breaks, replace as required
3. Check the integrity of connector terminals for bent terminals, backed-out or badly crimped wires. Rectify as required
4. Reconnect all connectors and retest. If seat climate functions are still faulty, note any DTCs that have been logged by the seat climate control module(s) and refer to the table and pinpoint tests below:

DTC Logged	Pinpoint Test Required
 <p>NOTE: Where DTCs are marked in bold, this means that there are two possible diagnostic processes that may be applied to resolve these faults. Check the listings below to reference an alternative set of pinpoint tests for these DTCs</p> <ul style="list-style-type: none"> • B10B9-13 Blower Control - Circuit open B10B9- • 4B Blower Control - Over temperature B1157- • 13 Blower Control B - Circuit open B1157-4B • Blower Control B - Over temperature • B120E-4B Right Thermal Electric Device Control - Over temperature • B1224-4B Left Thermal Electric Device Control - Over temperature • B122A-11 Right Seat Cushion Blower Speed Sensor - Circuit short to ground • B122A-12 Right Seat Cushion Blower Speed Sensor - Circuit short to battery • B122B-11 Right Seat Back Blower Speed Sensor - Circuit short to ground • B122B-12 Right Seat Back Blower Speed Sensor - Circuit short to battery • B122C-11 Left Seat Cushion Blower Speed Sensor - Circuit short to ground • B122C-12 Left Seat Cushion Blower Speed Sensor - Circuit short to battery • B122D-11 Left Seat Back Blower Speed Sensor - Circuit short to ground • B122D-12 Left Seat Back Blower Speed Sensor - Circuit short to battery 	GO to Pinpoint Test A.
 <p>NOTE: Where DTCs are marked in bold, this means that there are two possible diagnostic processes that may be applied to resolve these faults. Check the listings below to reference an alternative set of pinpoint tests for these DTCs</p> <ul style="list-style-type: none"> • B120E-13 Right Thermal Electric Device Control - Circuit open 	GO to Pinpoint Test B.

DTC Logged	Pinpoint Test Required
<ul style="list-style-type: none"> • B120E-19 Right Thermal Electric Device Control - Circuit current above threshold • B1223-13 Right Seat Cushion Temperature Sensor - Circuit open • B1224-13 Left Thermal Electric Device Control - Circuit open • B1224-19 Left Thermal Electric Device Control - Circuit current above threshold • B1225-13 Right Seat Back Temperature Sensor - Circuit open • B1229-13 Left Seat Back Temperature Sensor - Circuit open • B1235-13 Left Seat Cushion Temperature Sensor - Circuit open 	
<ul style="list-style-type: none"> • B120F-98 Left Seat Cushion - Component or system over temperature • B122E-98 Right Seat Cushion - Component or system over temperature • B122F-98 Right Seat Back - Component or system over temperature • B1230-98 Left Seat Back - Component or system over temperature • B1231-7A Right Seat - Fluid leak or seal failure • B1232-7A Left Seat - Fluid leak or seal failure 	GO to Pinpoint Test C .
<p> NOTE: Where DTCs are marked in bold, this means that there are two possible diagnostic processes that may be applied to resolve these faults. Check the listings above to reference an alternative set of pinpoint tests for these DTCs</p> <ul style="list-style-type: none"> • B120E-4B Right Thermal Electric Device Control - Over temperature • B120E-13 Right Thermal Electric Device Control - Circuit open • B120E-19 Right Thermal Electric Device Control - Circuit current above threshold • B1223-13 Right Seat Cushion Temperature Sensor - Circuit open • B1224-4B Left Thermal Electric Device Control - Over temperature • B1224-13 Left Thermal Electric Device Control - Circuit open • B1224-19 Left Thermal Electric Device Control - Circuit current above threshold • B1225-13 Right Seat Back Temperature Sensor - Circuit open • B1229-13 Left Seat Back Temperature Sensor - Circuit open • B1235-13 Left Seat Cushion Temperature Sensor - Circuit open 	GO to Pinpoint Test D .

PINPOINT TEST A : CLIMATE SEATS ASSEMBLY - BLOWER DIAGNOSTICS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CLIMATE SEATS ASSEMBLY - BLOWER SPEED CONTROL CIRCUIT RESISTANCE CHECKS AT SEAT TO VEHICLE CONNECTOR	
	1 Uncouple connector C3HS03C from the seat climate control module
	2 Check the resistance of the climate seats blower speed control circuits at connector C3HS03C <ul style="list-style-type: none"> • For right-side seat cushion blower, check resistance at pins 3 and 7 • For right-side seat backrest blower, check resistance at pins 4 and 7 • For left-side seat cushion blower, check resistance at pins 11 and 15 • For left-side seat backrest blower, check resistance at pins 12 and 15
	Is the resistance between 290 and 420 kilo-ohms? Yes No circuit faults present. No further action No GO to A2.
A2: CLIMATE SEATS ASSEMBLY - BLOWER POWER CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Locate the appropriate seat backrest/seat cushion climate assembly connector
	2 Disconnect connector
	3 Check the integrity of connector terminals for bent terminals, backed-out or badly crimped wires. Rectify as required
	4 Check the resistance of the climate seats blower power circuits at the climate assembly connector, pins 2 and 4
	Is the resistance between 290 and 420 kilo-ohms? Yes GO to A3. No Replace the seat climate assembly
A3: CLIMATE SEATS ASSEMBLY - BLOWER SPEED CONTROL CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Check the resistance of the climate seats blower control circuits at the climate assembly connector, pins 4 and 7

	<p>Is the resistance between 290 and 420 kilo-ohms?</p> <p>Yes No internal circuit faults present. Check for circuit faults in wiring harness between seat climate control module and climate seat assembly and replace as required</p> <p>No Replace the seat climate assembly</p>
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PINPOINT TEST B : CLIMATE SEATS ASSEMBLY - THERMAL ELECTRIC DEVICE (TED) DIAGNOSTICS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CLIMATE SEATS ASSEMBLY - TED SENSOR CIRCUIT RESISTANCE CHECKS AT SEAT TO VEHICLE CONNECTOR	
	<p>1 Uncouple connector C3HS03B from the seat climate control module</p> <p>2 Check the resistance of the climate seats TED sensor circuits at connector C3HS03B</p> <ul style="list-style-type: none"> • For right-side seat cushion TED sensor circuits, check resistance at pins 2 and 3 • For right-side seat backrest TED sensor circuits, check resistance at pins 4 and 5 • For left-side seat cushion TED sensor circuits, check resistance at pins 7 and 8 • For left-side seat backrest TED sensor circuits, check resistance at pins 9 and 10
	<p>Is the resistance between 0.9 and 1.1 kilo-ohms? (Note: these values are based on an ambient temperature of 22°C/72°F)</p> <p>Yes No circuit faults present. No further action</p> <p>No GO to B2.</p>
B2: CLIMATE SEATS ASSEMBLY - TED SENSOR CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	<p>1 Locate the appropriate seat backrest/seat cushion climate assembly connector</p> <p>2 Disconnect connector</p> <p>3 Check the integrity of connector terminals for bent terminals, backed-out or badly crimped wires. Rectify as required</p> <p>4 Check the resistance of the climate seats TED sensor circuits at the climate assembly connector, pins 5 and 8 (Green and Green wires)</p>
	<p>Is the resistance between 0.9 and 1.1 kilo-ohms? (Note: these values are based on an ambient temperature of 22°C/72°F)</p> <p>Yes GO to B3.</p> <p>No Replace the seat climate assembly</p>
B3: CLIMATE SEATS ASSEMBLY - TED SUPPLY CIRCUIT OPEN CIRCUIT CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	<p>1 Check the TED supply circuits at the climate assembly connector, pins 1 and 3 (Blue and Yellow wires) for open circuit faults</p>
	<p>Is an open-circuit fault present?</p> <p>Yes Replace the seat climate assembly</p> <p>No No internal circuit faults present. Check for circuit faults in wiring harness between seat climate control module and climate seat assembly and replace as required</p>

PINPOINT TEST C : CLIMATE SEATS ASSEMBLY - BLOWER AND DUCTING DIAGNOSTICS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CLIMATE SEATS ASSEMBLY - BLOWER SPEED CONTROL CIRCUIT RESISTANCE CHECKS AT SEAT TO VEHICLE CONNECTOR	
	<p>1 Uncouple connector C3HS03C from the seat climate control module</p> <p>2 Check the resistance of the climate seats blower speed control circuits at connector C3HS03C</p> <ul style="list-style-type: none"> • For right-side seat cushion blower, check resistance at pins 3 and 7 • For right-side seat backrest blower, check resistance at pins 4 and 7 • For left-side seat cushion blower, check resistance at pins 11 and 15 • For left-side seat backrest blower, check resistance at pins 12 and 15
	<p>Is the resistance between 290 and 420 kilo-ohms?</p> <p>Yes No circuit faults present. No further action</p> <p>No GO to C2.</p>
C2: CLIMATE SEATS ASSEMBLY - BLOWER CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	

	1	Locate the appropriate seat backrest/seat cushion climate assembly connector
	2	Disconnect connector
	3	Check the integrity of connector terminals for bent terminals, backed-out or badly crimped wires. Rectify as required
	4	Check the resistance of the climate seats blower circuits at the climate assembly connector, pins 2 and 4 (Violet and Black wires)
		Is the resistance between 290 and 420 kilo-ohms? Yes GO to C3. No Replace the seat climate assembly

C3: CLIMATE SEATS ASSEMBLY - BLOWER CONTROL CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR

	1	Check the resistance of the climate seats blower control circuits at the climate assembly connector, pins 4 and 7 (Black and Purple wires)
		Is the resistance between 290 and 420 kilo-ohms? Yes No internal circuit faults present. Check for circuit faults in wiring harness between seat climate control module and climate seat assembly and replace as required. If no harness faults are found, GO to C4. No Replace the seat climate assembly

C4: CLIMATE SEATS ASSEMBLY - BLOWER DUCTING INSPECTION

	1	Check that the ducting is securely attached to the blower and thermal electric device
	2	Check the ducting for holes, cuts or tears
		Is the ducting undamaged and securely attached to the blower and thermal electric device? Yes GO to C5. No Replace the seat climate assembly

C5: CLIMATE SEATS ASSEMBLY - EXHAUST AIRFLOW CHECKS

	1	Check for blockages or restrictions at the thermal electric device exhaust vent
		Are blockages or restrictions present? Yes Rectify as required No GO to C6.

C6: CLIMATE SEATS ASSEMBLY - BLOWER AIRFLOW CHECKS

	1	Check for blockages or restrictions at the blower air intake
	2	Check that the blower fan movement is not restricted
		Are there any air intake blockages or restrictions to the blower fan movement? Yes Rectify as required No No further action

PINPOINT TEST D : CLIMATE SEATS ASSEMBLY - THERMAL ELECTRIC DEVICE (TED) AND DUCTING DIAGNOSTICS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CLIMATE SEATS ASSEMBLY - TED SENSOR CIRCUIT RESISTANCE CHECKS AT SEAT TO VEHICLE CONNECTOR	
	1 Uncouple connector C3HS03B from the seat climate control module
	2 Check the resistance of the climate seats TED sensor circuits at connector C3HS03B <ul style="list-style-type: none"> For right-side seat cushion TED sensor circuits, check resistance at pins 2 and 3 For right-side seat backrest TED sensor circuits, check resistance at pins 4 and 5 For left-side seat cushion TED sensor circuits, check resistance at pins 7 and 8 For left-side seat backrest TED sensor circuits, check resistance at pins 9 and 10
	Is the resistance between 0.9 and 1.1 kilo-ohms? (Note: these values are based on an ambient temperature of 22°C/72°F) Yes No circuit faults present. No further action No GO to D2.
D2: CLIMATE SEATS ASSEMBLY - TED SENSOR CIRCUIT RESISTANCE CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Locate the appropriate seat backrest/seat cushion climate assembly connector
	2 Disconnect connector
	3 Check the integrity of connector terminals for bent terminals, backed-out or badly crimped wires. Rectify as required

	4 Check the resistance of the climate seats TED sensor circuits at the climate assembly connector, pins 5 and 8 (Green and Green wires)
	Is the resistance between 0.9 and 1.1 kilo-ohms? (Note: these values are based on an ambient temperature of 22°C/72°F) Yes GO to D3. No Replace the seat climate assembly
D3: CLIMATE SEATS ASSEMBLY - TED SUPPLY CIRCUIT OPEN CIRCUIT CHECKS AT SEAT CLIMATE ASSEMBLY CONNECTOR	
	1 Check the TED supply circuits at the climate assembly connector, pins 1 and 3 (Blue and Yellow wires) for open circuit faults
	Is an open-circuit fault present? Yes Replace the seat climate assembly No No internal circuit faults present. Check for circuit faults in wiring harness between seat climate control module and climate seat assembly and replace as required. If no harness faults are found, GO to D4.
D4: CLIMATE SEATS ASSEMBLY - TED DUCTING INSPECTION	
	1 Check that the ducting is securely attached to the blower and thermal electric device
	2 Check the ducting for holes, cuts or tears
	Is the ducting undamaged and securely attached to the blower and thermal electric device? Yes GO to D5. No Replace the seat climate assembly
D5: CLIMATE SEATS ASSEMBLY - EXHAUST AIRFLOW CHECKS	
	1 Check for blockages or restrictions at the thermal electric device exhaust vent
	Are blockages or restrictions present? Yes Rectify as required No GO to D6.
D6: CLIMATE SEATS ASSEMBLY - BLOWER AIRFLOW CHECKS	
	1 Check for blockages or restrictions at the blower air intake
	2 Check that the blower fan movement is not restricted
	Are there any air intake blockages or restrictions to the blower fan movement? Yes Rectify as required No No further action

Over Temperature and Fluid/Air Leak Diagnostics

Check For Air Flow Specific DTCs	Diagnostic Guidance Notes
<ul style="list-style-type: none"> • B120F-98 • B122E-98 • B122F-98 • B1230-98 • B1231-7A • B1232-7A 	<ul style="list-style-type: none"> • Once the diagnostic process detailed above has been carried out and it has been identified that there has not been a failure of any of the climate units, then refer back to the relevant climate system DTC codes that have been recorded • DTC codes listed that end in 7A or 98 indicate a possible air leak or air flow restriction within the system • In these circumstances, starting with the seat base check all ducting connections for correct engagement and inspect ducting for signs of damage which could result in an air leak (for connection issues re-connect and test system). Only in the event of finding damage to the ducting of one of the units should the unit be replaced. Note that only the specific unit should be replaced • Due to the design function of the system, both climate units in any one seat operate integrally. Therefore, if an issue is detected in one of the units then both units are shut down to protect the system until next Ignition cycle. Under these circumstances, only replace the damaged unit and DO NOT replace both units

DTC Index

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

Climate Controlled Seat Module

DTC	Description	Possible Causes	Action
B10B9-13	Blower Control - Circuit open	<ul style="list-style-type: none"> Connectors disconnected or connector pin damage Seat blower left circuit - Open circuit Blower motor assembly - Short circuit to ground Front seat climate control module failure 	<ul style="list-style-type: none"> Check for any disconnected connectors or damaged connector pins Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_FANS_RTN, Circuit reference LH_FANS_PWR - For open circuit. Repair circuit as required, clear DTC and retest Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B10B9-4B	Blower Control - Over temperature	<ul style="list-style-type: none"> Mechanical restriction in blower motor assembly Seat blower left circuit - Short circuit to ground Blower motor assembly - Short circuit to ground Front seat climate control module failure 	<ul style="list-style-type: none"> Check for mechanical restriction or debris in seat blower Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_FANS_RTN, Circuit reference LH_FANS_PWR - For short circuit to ground. Repair circuit as required, clear DTC and retest Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1157-13	Blower Control "B" - Circuit open	<ul style="list-style-type: none"> Connectors disconnected or connector pin damage Seat blower right circuit - Open circuit Blower motor assembly - Open circuit Front seat climate control module failure 	<ul style="list-style-type: none"> Check for any disconnected connectors or damaged connector pins Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_FANS_RTN, Circuit reference RH_FANS_PWR - For open circuit. Repair circuit as required, clear DTC and retest Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1157-4B	Blower Control "B" - Over temperature	<ul style="list-style-type: none"> Mechanical restriction in blower motor assembly Seat blower right circuit - Short circuit to ground Blower motor assembly - Short circuit to ground Front seat climate control module failure 	<ul style="list-style-type: none"> Check for mechanical restriction or debris in seat blower Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_FANS_RTN, Circuit reference RH_FANS_PWR - For short circuit to ground. Repair


DTC	Description	Possible Causes	Action
			<p>circuit as required, clear DTC and retest</p> <ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B120E-13	Right Thermal Electric Device Control - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat backrest thermal electric device right circuit - Open circuit • Seat cushion thermal electric device right circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_TED+, Circuit reference RH_SEAT_BACK_TED- - For open circuit. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_TED+, Circuit reference RH_CUSHION_TED- - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B120E-19	Right Thermal Electric Device Control - Circuit current above threshold	<ul style="list-style-type: none"> • Seat backrest thermal electric device right circuit - Short circuit to ground • Seat cushion thermal electric device right circuit - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_TED+, Circuit reference RH_SEAT_BACK_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_TED+, Circuit reference RH_CUSHION_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B120E-4B	Right Thermal Electric Device Control - Over temperature	<ul style="list-style-type: none"> • Restriction in thermal electric device air path • Seat backrest thermal electric device right circuit - Short circuit to ground • Seat cushion thermal electric device right circuit - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device air path • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_TED+, Circuit reference RH_SEAT_BACK_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_TED+, Circuit reference RH_CUSHION_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B120F-98	Left Seat Cushion - Component or system over temperature	<ul style="list-style-type: none"> • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric device fan movement 	<ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device fan exhaust vent • Check for restricted thermal electric device fan movement • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint

DTC	Description	Possible Causes	Action
			tests associated with this DTC using the manufacturer approved diagnostic system
B1223-13	Right Seat Cushion Temperature Sensor - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat cushion temperature sensor right circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_SENSOR, Circuit reference RH_CUSHION_SENSOR_RTN - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1224-13	Left Thermal Electric Device Control - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat backrest thermal electric device left circuit - Open circuit • Seat cushion thermal electric device left circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_TED+, Circuit reference LH_SEAT_BACK_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_TED+, Circuit reference LH_CUSHION_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1224-19	Left Thermal Electric Device Control - Circuit current above threshold	<ul style="list-style-type: none"> • Seat backrest thermal electric device left circuit - Short circuit to ground • Seat cushion thermal electric device left circuit - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_TED+, Circuit reference LH_SEAT_BACK_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_TED+, Circuit reference LH_CUSHION_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1224-4B	Left Thermal Electric Device Control - Over temperature	<ul style="list-style-type: none"> • Restriction in thermal electric device air path • Seat backrest thermal electric device left circuit - Short circuit to ground • Seat cushion thermal electric device left circuit - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device air path • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_TED+, Circuit reference LH_SEAT_BACK_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_TED+, Circuit reference LH_CUSHION_TED- - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
			approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1225-13	Right Seat Back Temperature Sensor - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat backrest temperature sensor right circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_SENSOR, Circuit reference RH_SEAT_BACK_SENSOR_RTN - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1229-13	Left Seat Back Temperature Sensor - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat backrest temperature sensor left circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_SENSOR, Circuit reference LH_SEAT_BACK_SENSOR_RTN - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122A-11	Right Seat Cushion Blower Speed Sensor - Circuit short to ground	<ul style="list-style-type: none"> • Seat cushion blower speed right circuit - Short circuit to ground • Blower motor assembly - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_FAN_SPEED - For short circuit to ground. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122A-12	Right Seat Cushion Blower Speed Sensor - Circuit short to battery	<ul style="list-style-type: none"> • Seat cushion blower speed right circuit - Short circuit to power • Blower motor assembly - Short circuit to power • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_CUSHION_FAN_SPEED - For short circuit to power. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122B-11	Right Seat Back Blower Speed Sensor - Circuit short to ground	<ul style="list-style-type: none"> • Seat backrest blower speed right circuit - Short circuit to ground • Blower motor assembly - Short circuit to ground • Front seat climate control module failure 	<ul style="list-style-type: none"> • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_FAN_SPEED - For short circuit to ground. Repair circuit as required, clear

DTC	Description	Possible Causes	Action
			<p>DTC and retest</p> <ul style="list-style-type: none"> Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122B-12	Right Seat Back Blower Speed Sensor - Circuit short to battery	<ul style="list-style-type: none"> Seat backrest blower speed right circuit - Short circuit to power Blower motor assembly - Short circuit to power Front seat climate control module failure 	<ul style="list-style-type: none"> Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference RH_SEAT_BACK_FAN_SPEED - For short circuit to power. Repair circuit as required, clear DTC and retest Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122C-11	Left Seat Cushion Blower Speed Sensor - Circuit short to ground	<ul style="list-style-type: none"> Seat cushion blower speed left circuit - Short circuit to ground Blower motor assembly - Short circuit to ground Front seat climate control module failure 	<ul style="list-style-type: none"> Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_FAN_SPEED - For short circuit to ground. Repair circuit as required, clear DTC and retest Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122C-12	Left Seat Cushion Blower Speed Sensor - Circuit short to battery	<ul style="list-style-type: none"> Seat cushion blower speed left circuit - Short circuit to power Blower motor assembly - Short circuit to power Front seat climate control module failure 	<ul style="list-style-type: none"> Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_FAN_SPEED - For short circuit to power. Repair circuit as required, clear DTC and retest Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122D-11	Left Seat Back Blower Speed Sensor - Circuit short to ground	<ul style="list-style-type: none"> Seat backrest blower speed left circuit - Short circuit to ground Blower motor assembly - Short circuit to ground Front seat climate control module failure 	<ul style="list-style-type: none"> Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_FAN_SPEED - For short circuit to ground. Repair circuit as required, clear DTC and retest Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122D-12	Left Seat Back Blower Speed Sensor - Circuit short to battery	<ul style="list-style-type: none"> Seat backrest blower speed left circuit - Short circuit to power Blower motor assembly - Short circuit to power Front seat climate control module failure 	<ul style="list-style-type: none"> Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_SEAT_BACK_FAN_SPEED - For short circuit to power. Repair circuit as required, clear DTC and retest Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
B122E-98	Right Seat Cushion - Component or system over temperature	<ul style="list-style-type: none"> • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric device fan movement 	<p>tests associated with this DTC using the manufacturer approved diagnostic system</p> <ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device fan exhaust vent • Check for restricted thermal electric device fan movement • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B122F-98	Right Seat Back - Component or system over temperature	<ul style="list-style-type: none"> • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric device fan movement 	<ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device fan exhaust vent • Check for restricted thermal electric device fan movement • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1230-98	Left Seat Back - Component or system over temperature	<ul style="list-style-type: none"> • Blocked or restricted thermal electric device fan exhaust vent • Restricted thermal electric device fan movement 	<ul style="list-style-type: none"> • Check for blockage or restriction in thermal electric device fan exhaust vent • Check for restricted thermal electric device fan movement • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1231-7A	Right Seat - Fluid leak or seal failure	<ul style="list-style-type: none"> • Seat backrest assembly - Air path leaking • Seat cushion assembly - Air path leaking • Seat assembly damaged 	<ul style="list-style-type: none"> • Check for blockage or restriction in seat backrest/seat cushion thermal electric device fan ducts • Check seat backrest/seat cushion thermal electric device fan exhaust vent is clear • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1232-7A	Left Seat - Fluid leak or seal failure	<ul style="list-style-type: none"> • Seat backrest assembly - Air path leaking • Seat cushion assembly - Air path leaking • Seat assembly damaged 	<ul style="list-style-type: none"> • Check for blockage or restriction in seat backrest/seat cushion thermal electric device fan ducts • Check seat backrest/seat cushion thermal electric device fan exhaust vent is clear • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system
B1235-13	Left Seat Cushion Temperature Sensor - Circuit open	<ul style="list-style-type: none"> • Connectors disconnected or connector pin damage • Seat cushion temperature sensor left circuit - Open circuit • Front seat climate control module failure 	<ul style="list-style-type: none"> • Check for any disconnected connectors or damaged connector pins • Carry out on demand self test using manufacturer approved diagnostic system to confirm the fault is present • Refer to the electrical circuit diagrams and check the front seat climate control module - Circuit reference LH_CUSHION_SENSOR, Circuit reference LH_CUSHION_SENSOR_RTN - For open circuit. Repair circuit as required, clear DTC and retest • Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Alternatively, carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system

DTC	Description	Possible Causes	Action
U0010-88	Medium Speed CAN Communication Bus - Bus off	<ul style="list-style-type: none"> Medium speed CAN communication - Bus off 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module Using the manufacturer approved diagnostic system, complete a CAN network integrity test Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0140-00	Lost Communication With Body Control Module - No sub type information	<ul style="list-style-type: none"> Lost communication with central junction box 	 <p>NOTE: This DTC may be stored even though no fault condition is present and should be ignored unless the customer has reported a climate seat concern. Clear the DTC and retest. Verify the customer concern prior to diagnosis</p> <ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module Using the manufacturer approved diagnostic system, complete a CAN network integrity test Refer to the electrical circuit diagrams and check the CAN network between the front seat climate control module and central junction box Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0142-00	Lost Communication With Body Control Module "B" - No sub type information	<ul style="list-style-type: none"> Lost communication with rear junction box 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module Using the manufacturer approved diagnostic system, complete a CAN network integrity test Refer to the electrical circuit diagrams and check the CAN network between the front seat climate control module and rear junction box Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0155-00	Lost Communication With Instrument Panel Cluster (IPC) Control Module - No sub type information	<ul style="list-style-type: none"> Lost communication with instrument cluster 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module Using the manufacturer approved diagnostic system, complete a CAN network integrity test Refer to the electrical circuit diagrams and check the CAN network between the front seat climate control module and instrument cluster Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0156-00	Lost Communication With Information Center "A" - No sub type information	<ul style="list-style-type: none"> Lost communication with rear seat entertainment control module 	<ul style="list-style-type: none"> Refer to the electrical circuit diagrams and check the power and ground connections to the module Using the manufacturer approved diagnostic system, complete a CAN network integrity test Refer to the electrical circuit diagrams and check the CAN network between the front seat climate control module and rear seat entertainment control module Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0300-00	Internal Control Module Software Incompatibility - No sub type information	<ul style="list-style-type: none"> Software stored in front seat climate control module is not compatible with master configuration 	<ul style="list-style-type: none"> Check the front seat climate control module is configured correctly Reconfigure the front seat climate control module using the manufacturer approved diagnostic system. Clear the DTC and retest the system Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U0401-00	Invalid Data Received From ECM/PCM - No sub type information	<ul style="list-style-type: none"> The engine control module has transmitted engine speed quality factor CAN signal at a specific value for a greater than expected time period 	<ul style="list-style-type: none"> Check the engine control module for related DTCs and refer to the relevant DTC index On software levels previous to 8X23-14B663-AE clear the DTC and take no further action if the system is operating correctly

DTC	Description	Possible Causes	Action
U2101-00	Control module Configuration Incompatible - No sub type information	<ul style="list-style-type: none"> • Compatible central car configuration file not received by front seat climate control module 	<ul style="list-style-type: none"> • Using the manufacturer approved diagnostic system check and update the car configuration file as required. Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification. Clear the DTC and retest
U3000-04	Control Module - System internal failures	<ul style="list-style-type: none"> • Front seat climate control module - Internal failure 	<ul style="list-style-type: none"> • Check and install new front seat climate control module as required. Carry out on demand self test using manufacturer approved diagnostic system to confirm rectification
U3003-62	Battery Voltage - Signal compare failure	<ul style="list-style-type: none"> • Wiring harness fault • Battery internal failure • Charging system fault 	<ul style="list-style-type: none"> • Refer to the electrical circuit diagrams and check the power and ground connections to the front seat climate control module and the central junction box • Refer to the battery care manual and verify that the vehicle battery is fully charged and serviceable before continuing with further diagnostic tests • Check the vehicle charging system

Seating - Seat Smoothing

General Procedures

Check

WARNINGS:



Make sure that the steamer is in the OFF position before connecting or disconnecting from the electrical outlet.



Do not use another high wattage device on the same electrical circuit.



If the use of an extension cord is absolutely necessary, the cord must be rated at a minimum of 10 amps.



To avoid the risk of electrical shock, check the condition of the power cord and the steamer before use.



Make sure that the steamer is disconnected from the electrical outlet before filling or emptying the water reservoir.



The steamer must only be used and placed on its stand on a stable surface.



To prevent injury such as burns, take care whilst using the steamer. Avoid coming into contact with the hot surface of the steamer and do not direct steam toward any persons.



The steamer must ALWAYS be switched off when not in use or left unattended.



Do not allow the power cord to come into contact with the hot surface of the steamer.

CAUTIONS:



Protect the surrounding paintwork to avoid damage.



Protect the paintwork during this operation.



Do not use any additives in the steamer. Damage to the steamer or the seat cover can result if used.



NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. CAUTIONS:



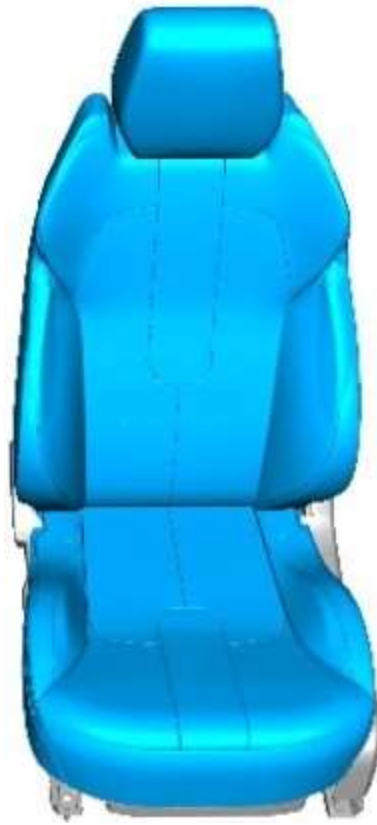
Steam the leather cushions evenly and progressively. Do not use excessive force.



Take care not to damage the leather whilst steaming into the corners.



Do not hold the steamer in one place for longer than 10 seconds, as this will burn the leather and damage the covers.



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li lj

Seating - Front Seat

Removal and Installation

Removal

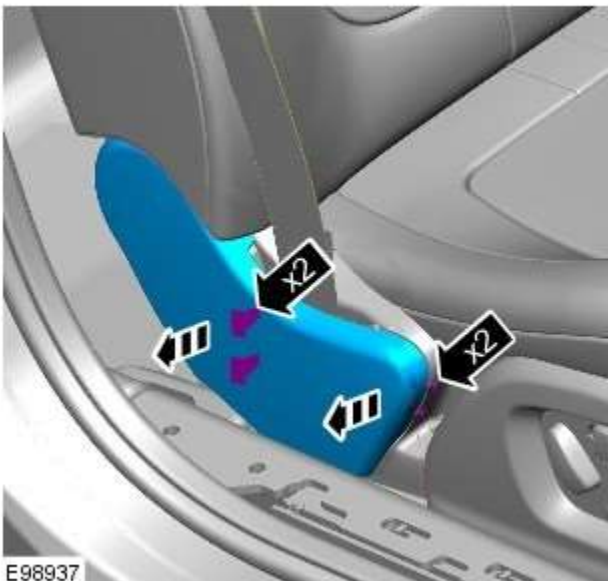
1. Make the air bag supplemental restraint system (SRS) safe.
For additional information, refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).




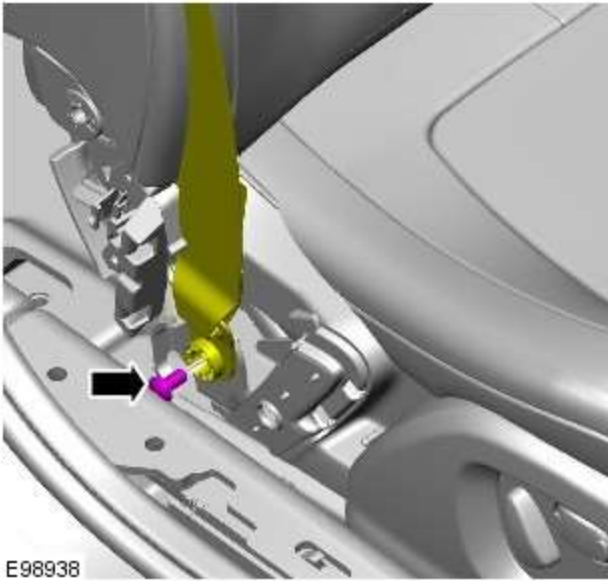
2.  **NOTE:** Right-hand shown, left-hand similar.

Position the front seat fully forwards.

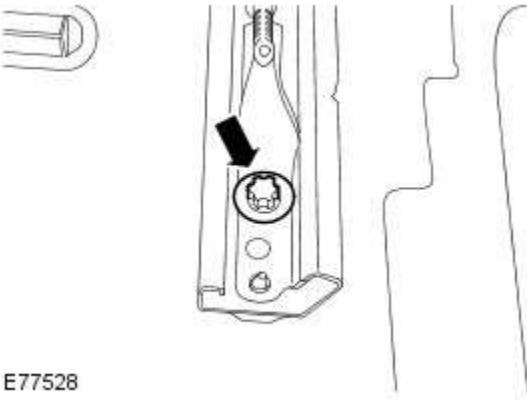
- Lower the front seat head restraint to the fully lowered position.




3.  **NOTE:** Right-hand shown, left-hand similar.
Remove the safety belt lower anchor trim panel.



4. **NOTE:** Right-hand shown, left-hand similar. Release the safety belt lower anchor from the front seat.



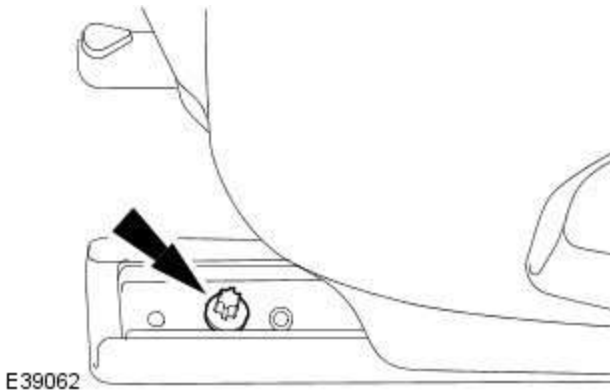
5. **NOTES:**

 Left-hand shown, right-hand similar.

 Some variation in the illustrations may occur, but the essential information is always correct.

Remove the 2 rear bolts from the front seat.

6. Position the front seat fully rearwards.

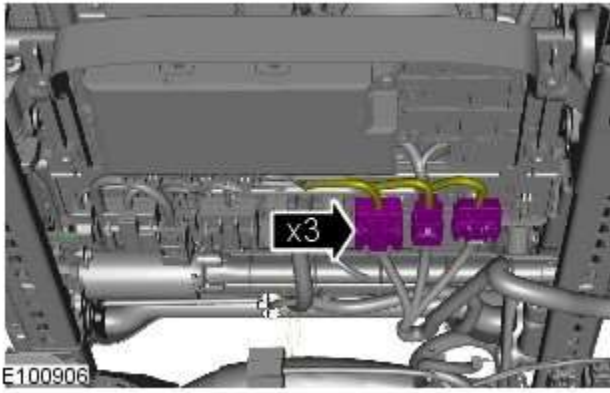


7. **NOTE:** Left-hand shown, right-hand similar.

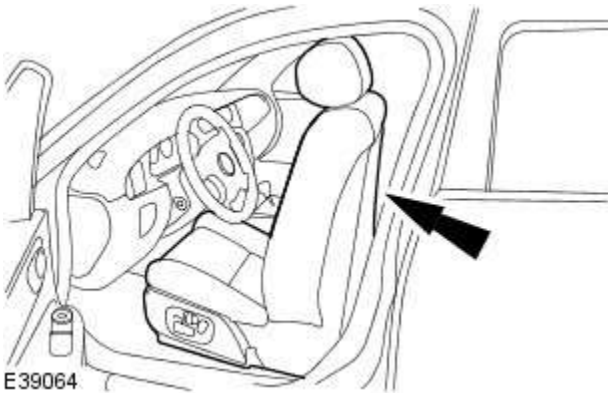
Remove the 2 front bolts from the front seat.

8. Reposition the front seat to the central position.

9. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



10. Disconnect the front seat harness electrical connectors.
 - Tilt the front seat rearwards to aid disconnecting the front seat electrical connectors.



11. NOTES:



Make sure no damage is caused to the vehicle trim when removing the front seat.

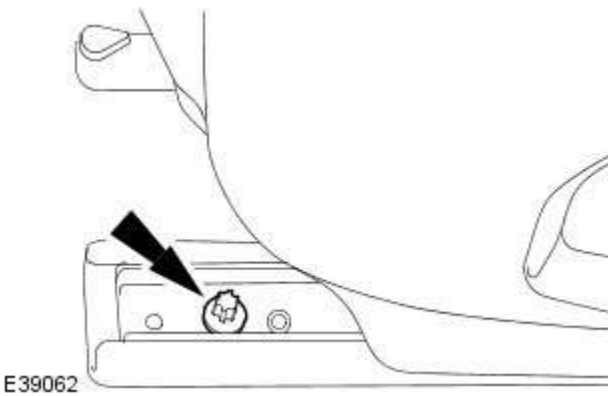


Left-hand shown, right-hand similar.

Remove the front seat.

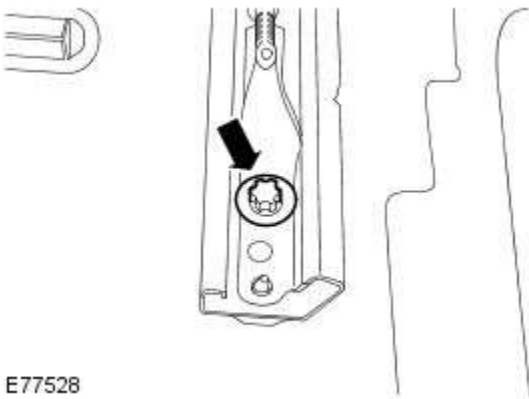
Installation

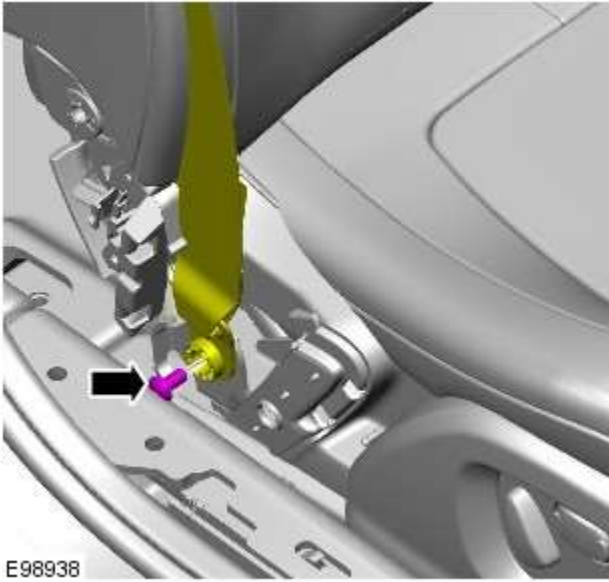
1. To install, reverse the removal procedure.
 - TORQUE: 47 Nm



2. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

TORQUE: 47 Nm





3. NOTE: Right-hand shown, left-hand similar.

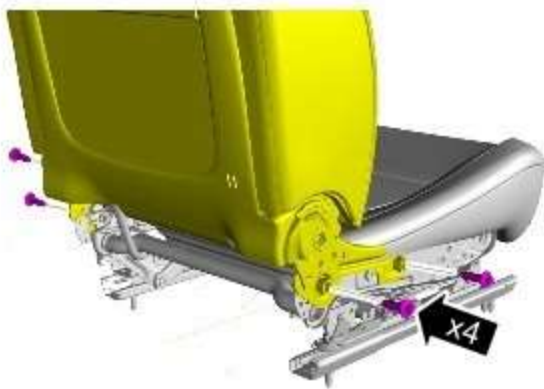
TORQUE: 40 Nm

Seating - Front Seat Backrest


Removal and Installation

Removal

1. Make the air bag supplemental restraint system (SRS) safe.
For additional information, refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).
2. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Remove the front seat.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).



4.  **WARNING:** This step requires the aid of another technician.

 **CAUTION:** Take extra care when handling the component.

Remove the front seat backrest assembly.



E101228

5. Remove the front seat backrest cover.
For additional information, refer to: [Front Seat Backrest Cover](#) (501-10 Seating, Removal and Installation).
6. Remove the backrest halo panel.
 - Release the 5 wiring harness clips.



7. **NOTE:** Do not disassemble further if the component is removed for access only.

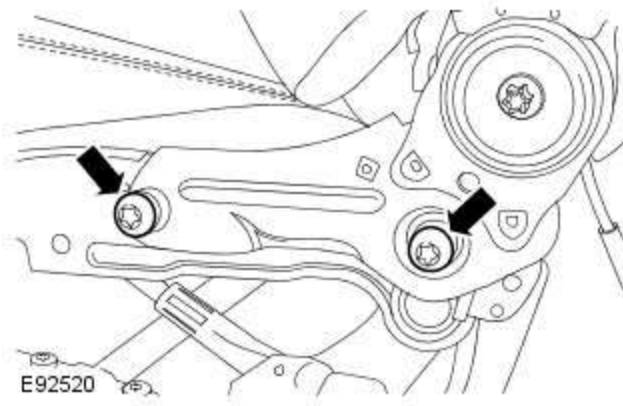
Remove the front seat recliner motor.

For additional information, refer to: [Front Seat Recliner Motor](#) (501-10,

Removal and Installation).

8. Remove the lumbar assembly.
For additional information, refer to: [Lumbar Assembly](#) (501-10 Seating, Removal and Installation).
9. Remove the front seat head restraint motor.
For additional information, refer to: [Front Seat Head Restraint Motor](#) (501-10 Seating, Removal and Installation).

Installation



1. To install, reverse the removal procedure.
 - TORQUE: 35 Nm

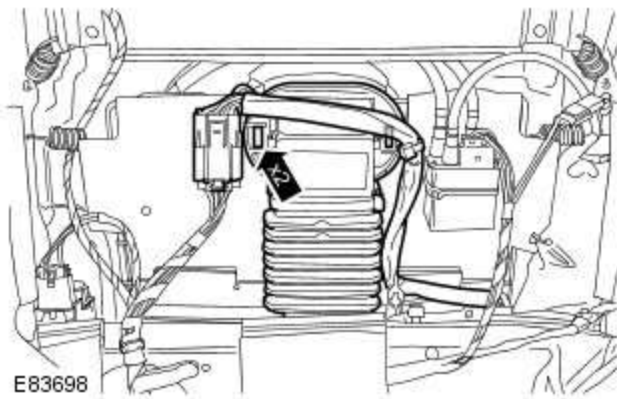
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Seating - Front Seat Backrest Cover

Removal and Installation

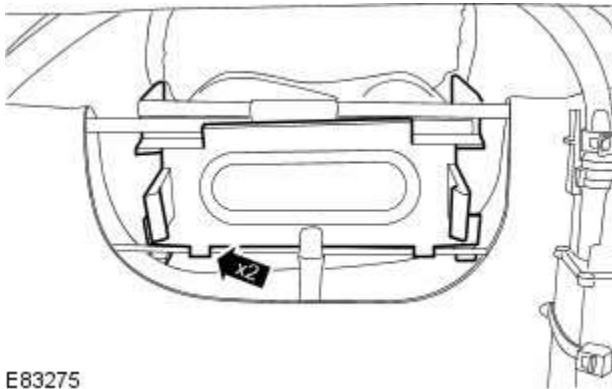
Removal

1. Make the air bag supplemental restraint system (SRS) safe.
For additional information, refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).
2. Remove the front seat.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
3. Remove the side air bag module.
For additional information, refer to: [Side Air Bag Module](#) (501-20B Supplemental Restraint System, Removal and Installation).



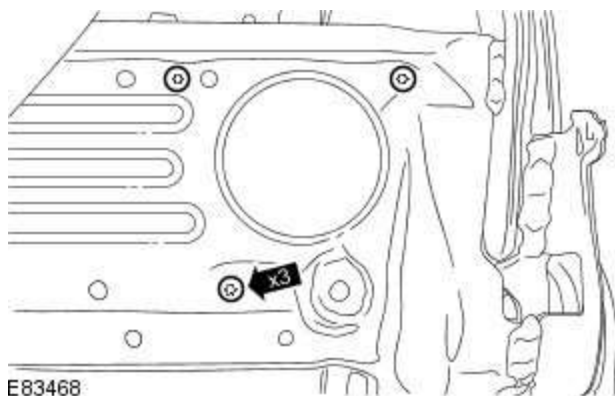
4.  NOTE: If equipped.

Reposition the front seat backrest thermo-electric device.



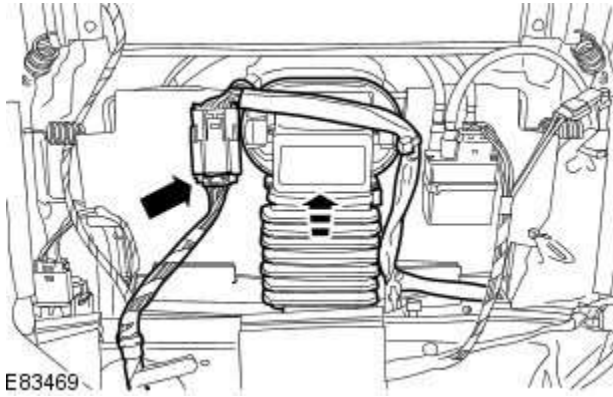
5.  NOTE: If equipped.


Release the front seat backrest thermo-electric device duct



6.  NOTE: If equipped.

Remove the front seat backrest thermo-electric device retaining screws.




7.  NOTE: If equipped.

Remove the front seat backrest thermo-electric device.

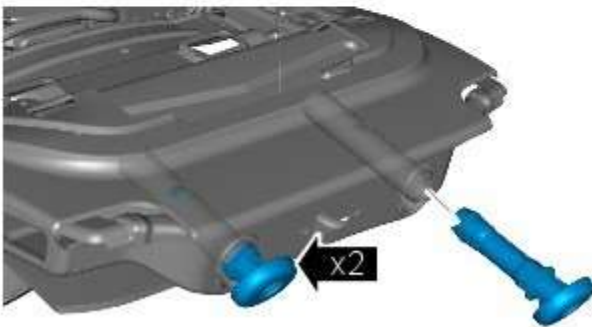
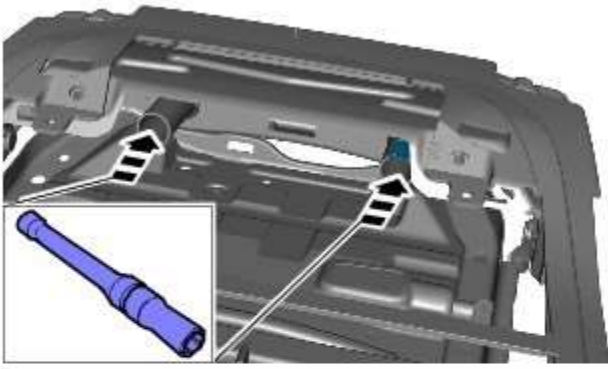
- Disconnect the electrical connector.

8. Remove the front seat head restraint.

9. Remove the front seat head restraint motor.
For additional information, refer to: [Front Seat Head Restraint Motor](#) (501-10 Seating, Removal and Installation).

10.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Using a suitable tool, remove the front seat head restraint guide sleeves.



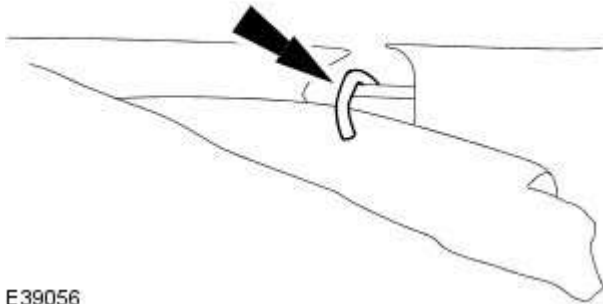
E101146



11. Remove the front seat backrest cushion and cover from the front seat frame.

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12. Remove and discard the hog rings.
 - Remove the 22 hog rings.



E39056

13. Remove the front seat backrest cover.




E39246

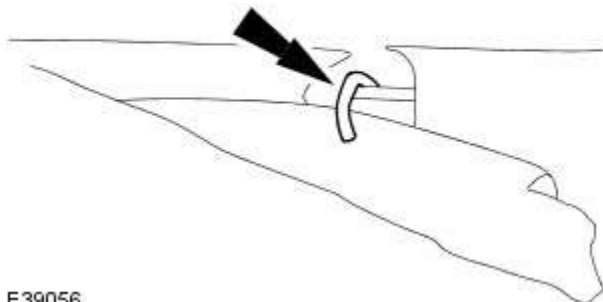
Installation

1. NOTES:

 Make sure that new hog rings are installed.

 Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

To install, reverse the removal procedure.



E39056

Seating - Front Seat Bolster

Removal and Installation

Removal

NOTES:



Removal steps in this procedure may contain installation details.

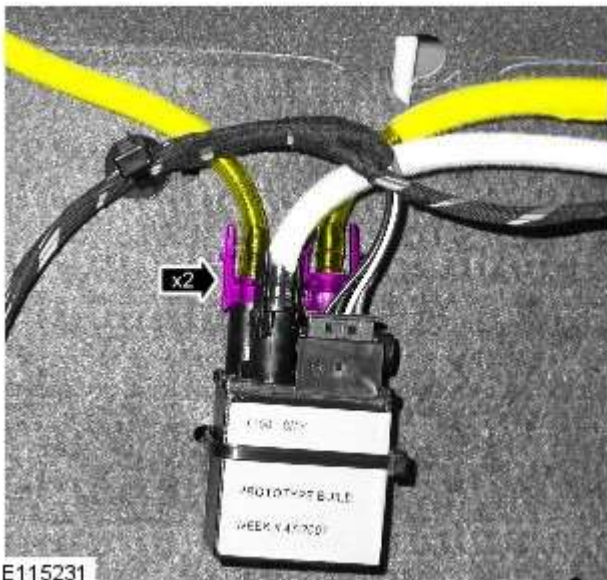


Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2. Refer to: [Front Seat Backrest Cover](#) (501-10 Seating, Removal and Installation).

3.



E115231

4.  **WARNING:** The procedure must be carried out on both sides of the seat.



CAUTION: Make sure that the clips are correctly located.



E115232

Installation

1. To install, reverse the removal procedure.

Seating - Front Seat Bolster Pump

Removal and Installation

Removal

NOTES:



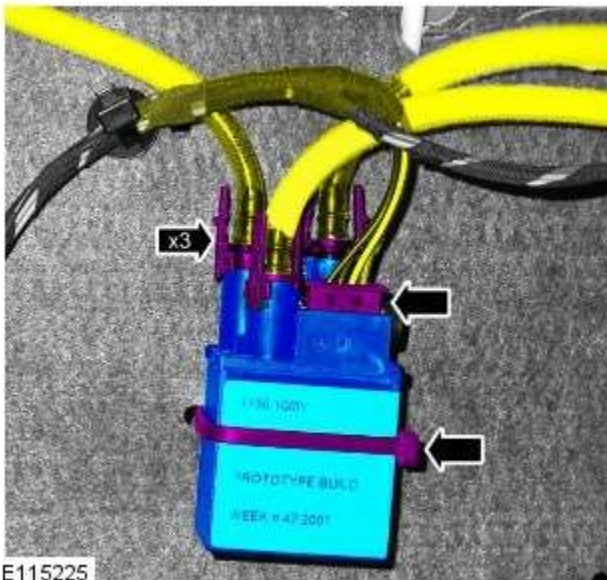
Removal steps in this procedure may contain installation details.



Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Front Seat Backrest Cover](#) (501-10 Seating, Removal and Installation).

3.



Installation

1. To install, reverse the removal procedure.

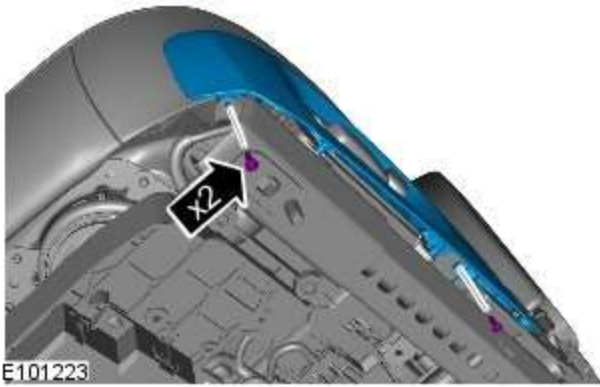
Seating - Front Seat Cushion Cover

Removal and Installation

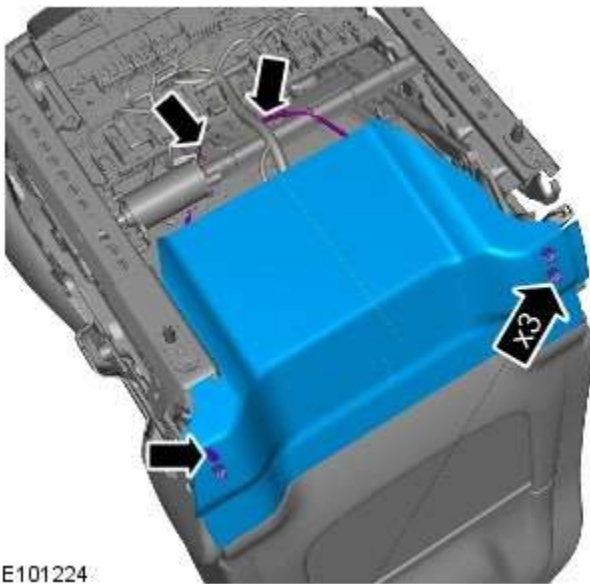
Removal

1. Refer to: [Front Safety Belt Buckle](#) (501-20A Safety Belt System, Removal and Installation).

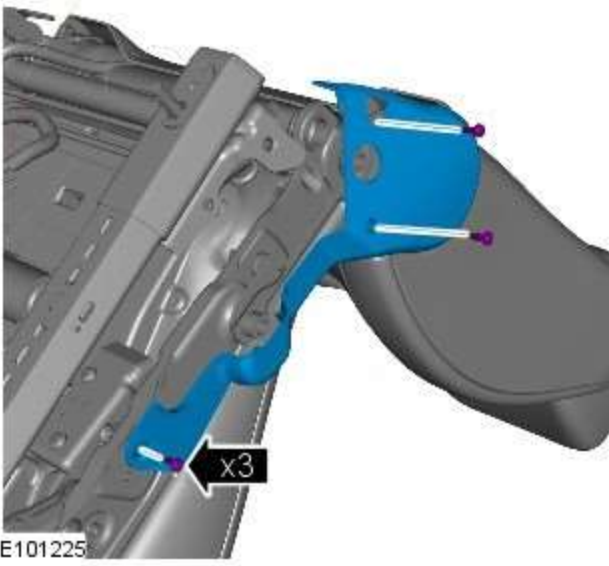
2.



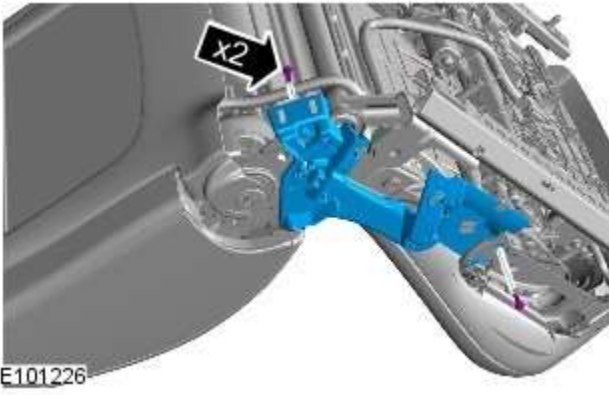
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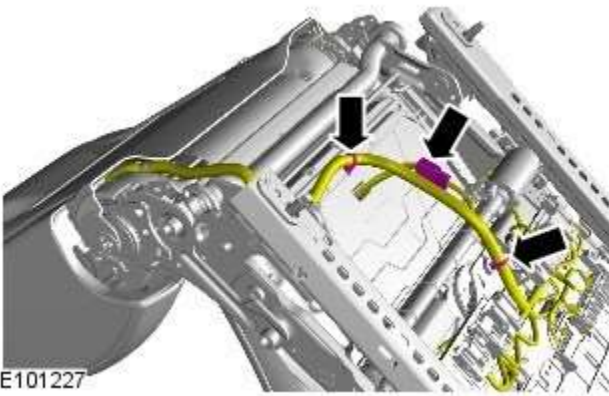
4.

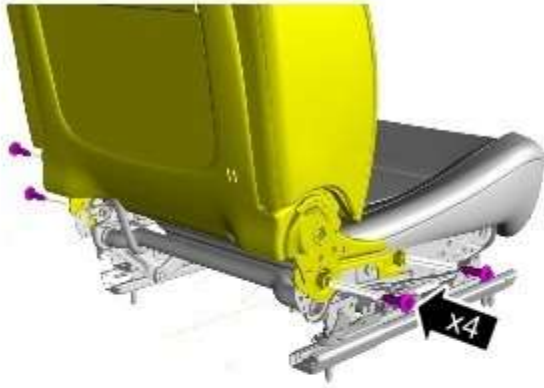


5.




6.





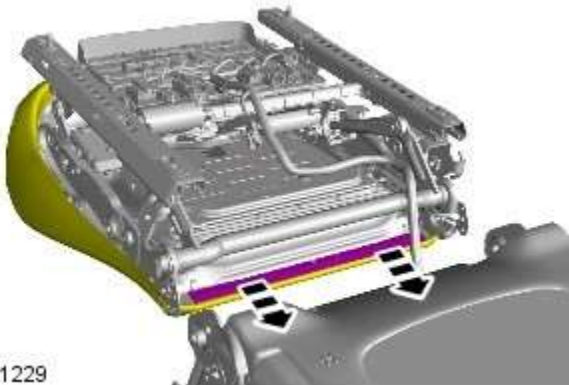
7.  **WARNING:** This step requires the aid of another technician.

 **CAUTION:** Take extra care when handling the component.

Torque: 35 Nm

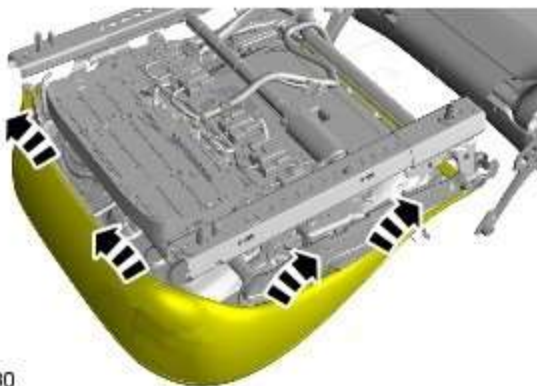


E101228



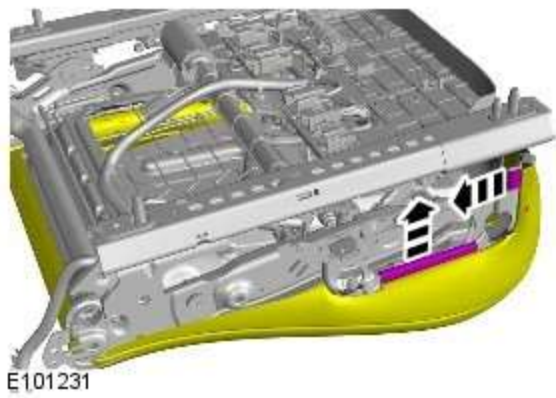
E101229

8.



E101230

9.



E101231

10.




E101232

11.



E101233

12.

13.  NOTE: Make sure that new hog rings are installed.



E101234

Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Seating - Front Seat Track Motor

Removal and Installation

Removal

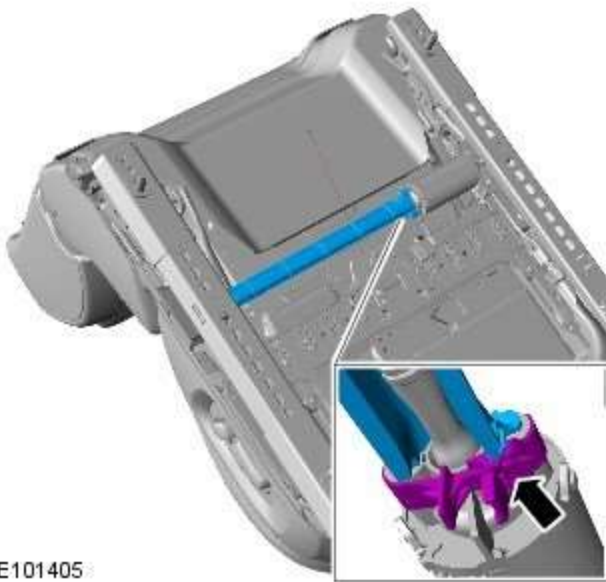
1. Make the air bag supplemental restraint system (SRS) safe.

Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

2. Remove the front seat.

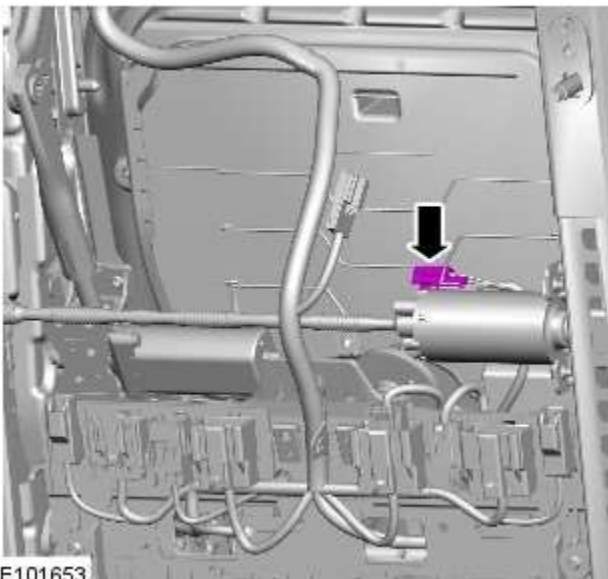
Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).

- 3.

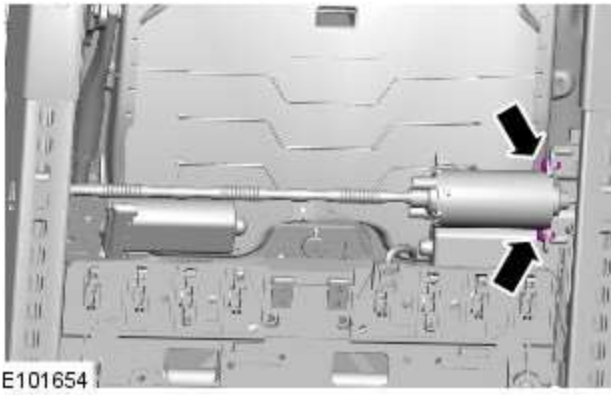


E101405

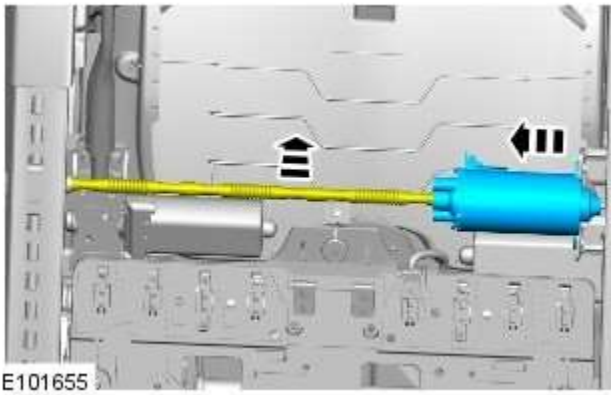
- 4.



E101653



5.



6.

Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Seating - Lumbar Assembly

Removal and Installation

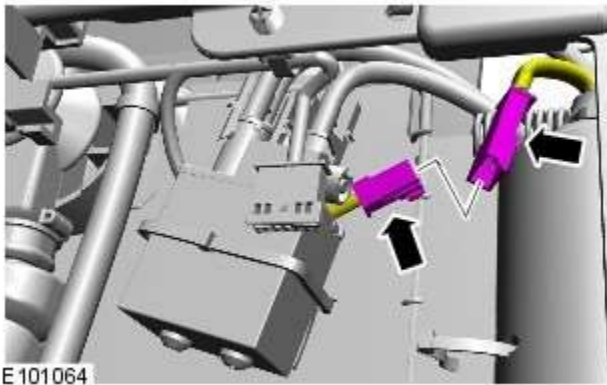
Removal

1. Make the air bag supplemental restraint system (SRS) safe.

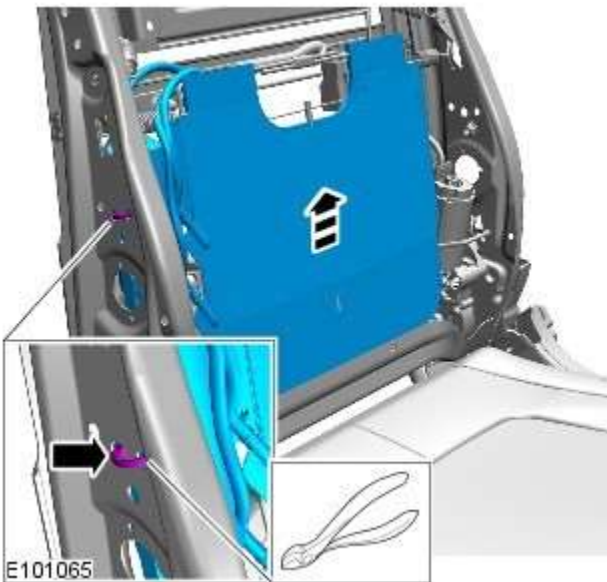
Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

2. Refer to: [Front Seat Backrest Cover](#) (501-10 Seating, Removal and Installation).

3.



4.



Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

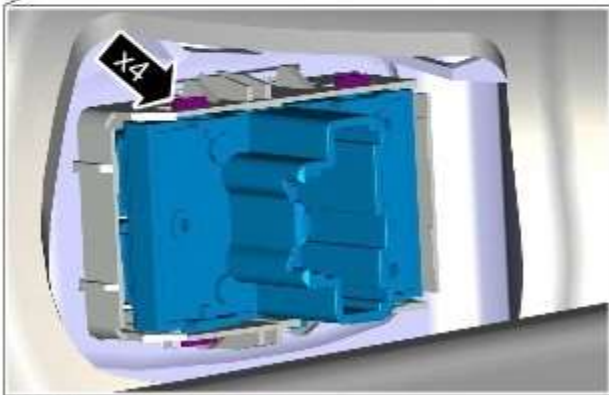
Seating - Memory Seat Position Switch

Removal and Installation

Removal

1. Refer to: Front Door Trim Panel (501-05, Removal and Installation).

2.



E93341

Installation

1. To install, reverse the removal procedure.

Seating - Seat Base

Removal and Installation

Removal

WARNINGS:



To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.



Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.



To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.



To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.



To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.



Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.



Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discolored or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

NOTES:



Some variation in the illustrations may occur, but the essential information is always correct.



Removal steps in this procedure may contain installation details.

1. Make the air bag supplemental restraint system (SRS) safe.

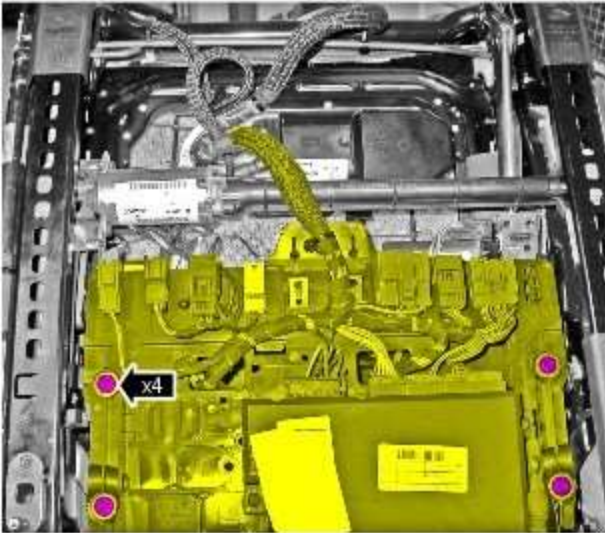
Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

2. Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).

3. Refer to: [Front Safety Belt Buckle](#) (501-20A Safety Belt System, Removal and Installation).

4. Refer to: [Front Seat Cushion Cover](#) (501-10 Seating, Removal and Installation).

5.

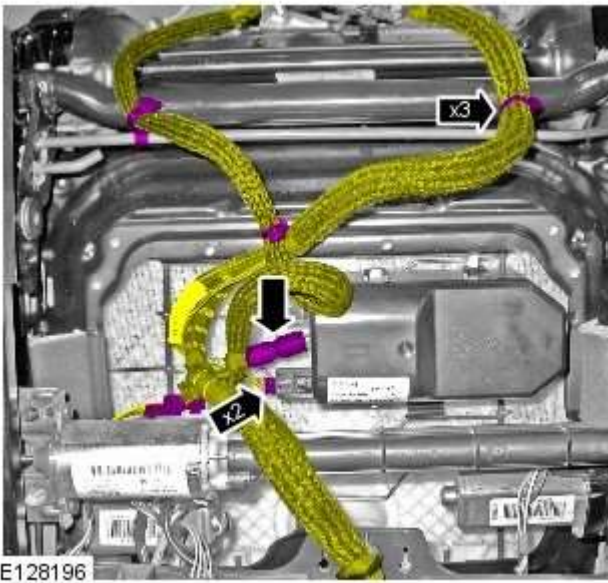


E128198

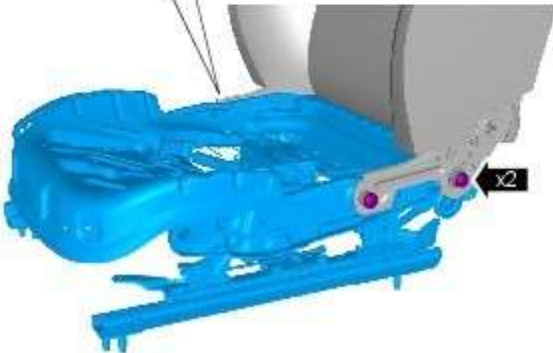
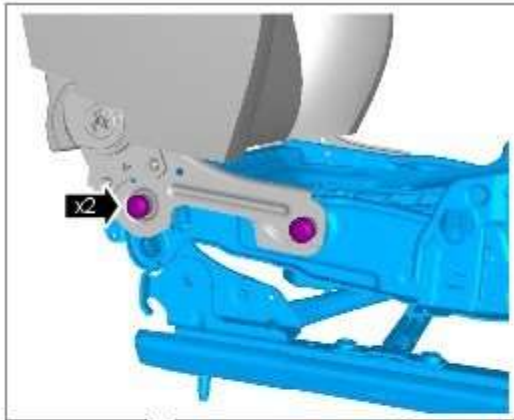
6.




E128197



7.



E128209

8.  CAUTION: Make sure that new bolts are installed.

Torque: 35 Nm

Installation

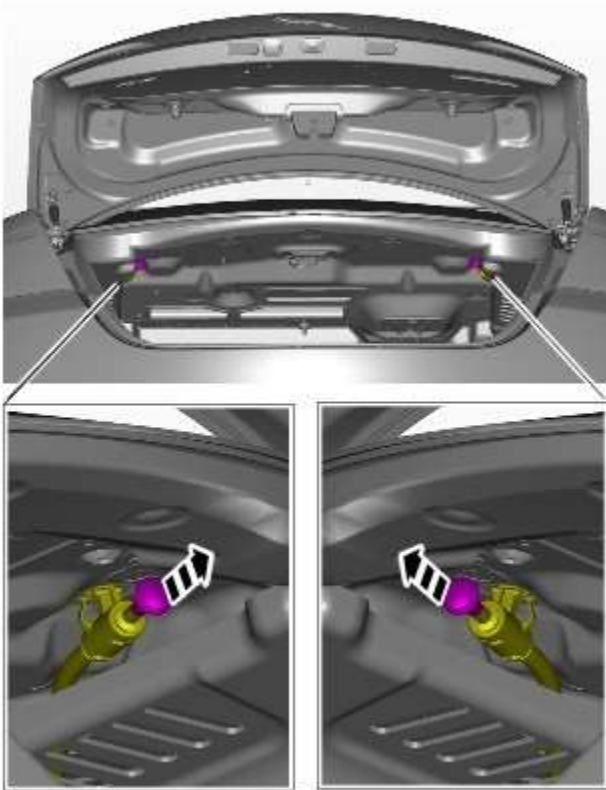
1. To install, reverse the removal procedure.

Seating - Rear Seat Backrest Cover

Removal and Installation

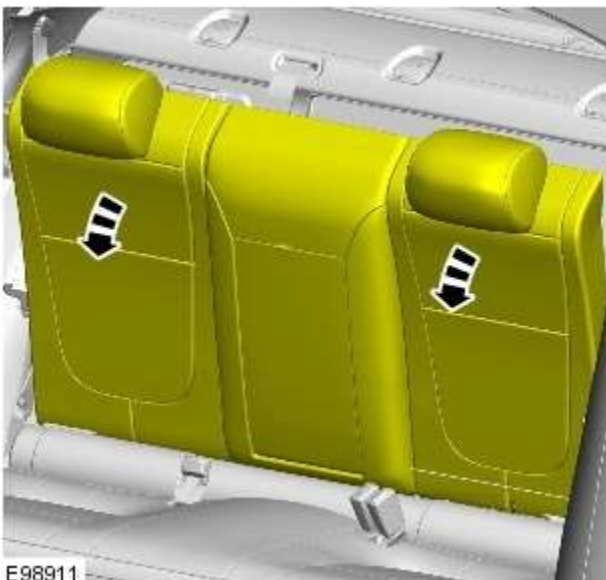
Removal

1. Remove the rear seat cushion.
For additional information, refer to: [Rear Seat Cushion](#) (501-10 Seating, Removal and Installation).
2. Release both the rear seat back rest catches.

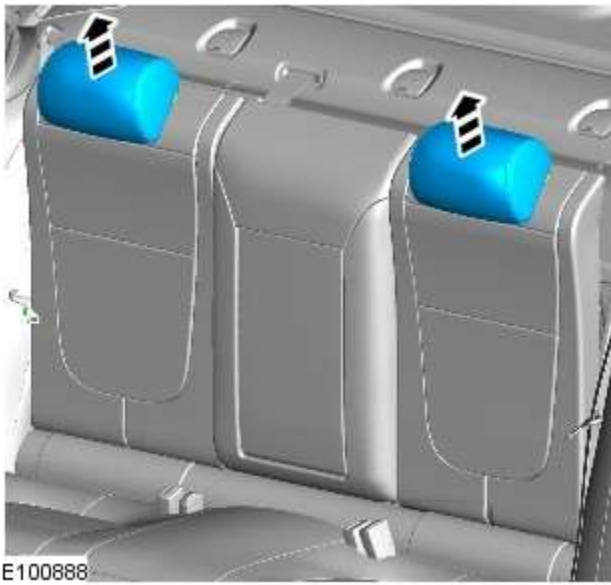


E98909

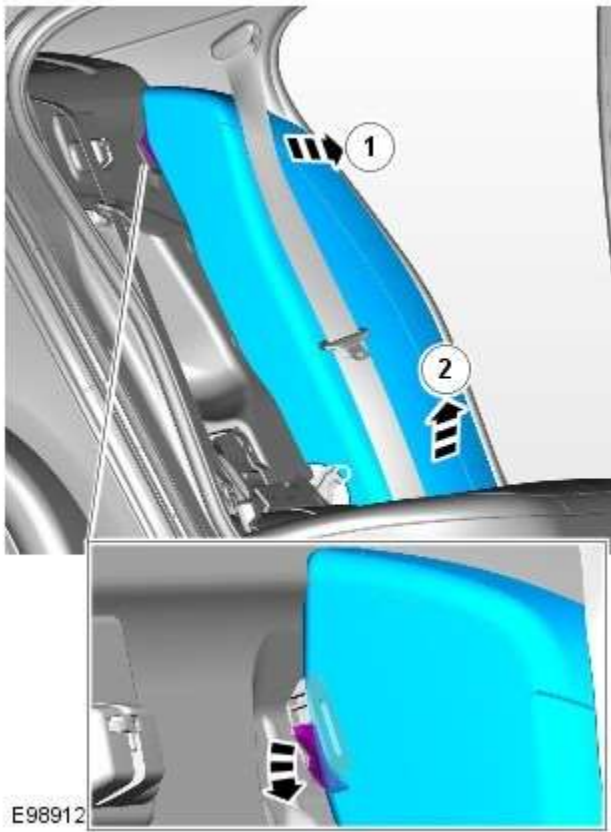
3. Fold down the rear seat backrest.



E98911



4. Remove the rear seat head restraint(s).
 - Lower both rear seats.



5. NOTES:

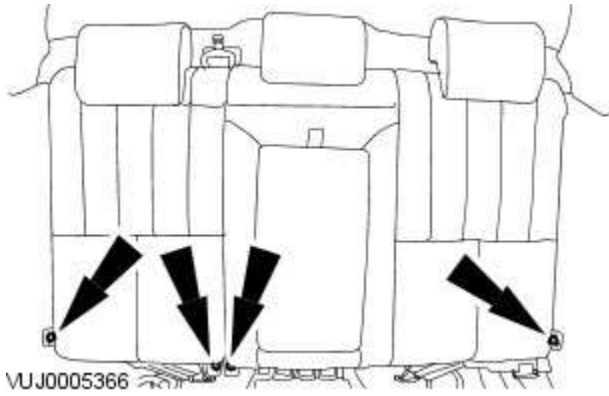


The procedure must be carried out on both sides of the seat.



Left-hand shown, right-hand similar.

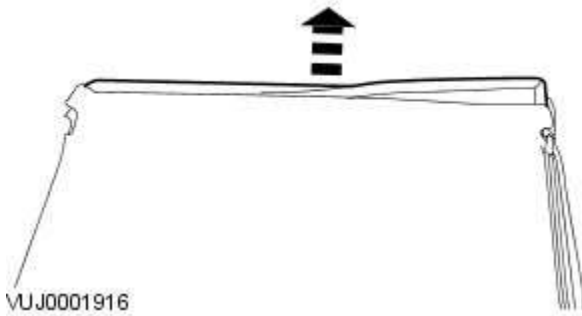
Remove both rear seat bolsters.



6. **CAUTION:** Make sure no damage is caused to the vehicle trim when removing the rear seat.

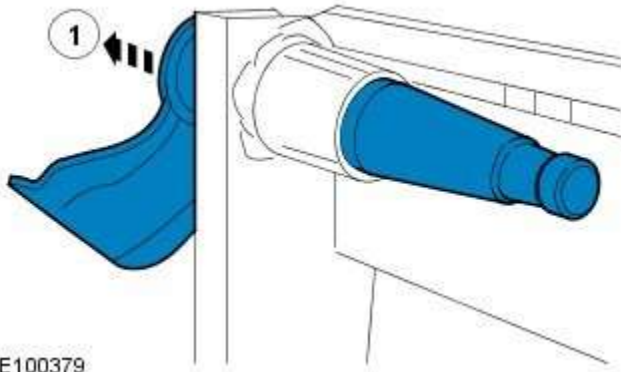
With assistance, remove the rear seat backrest.

- Both rear seat backrests need to be in an upright position but not latched for access to retaining bolts.

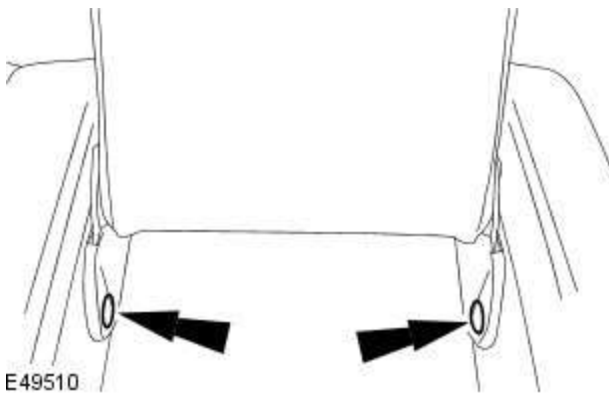


7. Release the backrest cover.

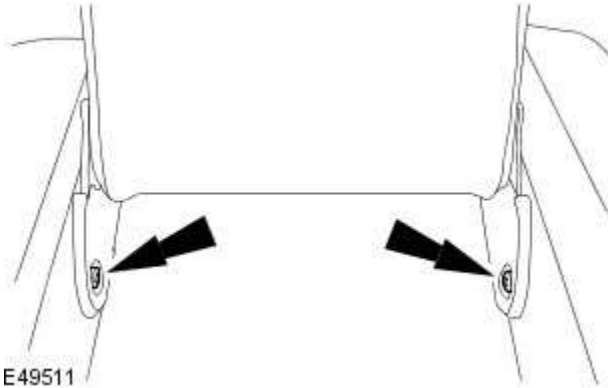
- Release all 4 sides.



8. Remove the rear seat backrest hinge(s).

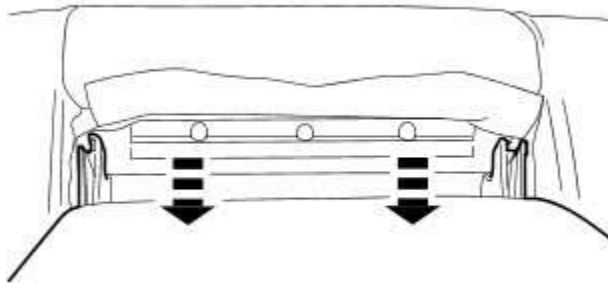


9. Remove the rear armrest retaining screw covers.




E49511

10. Remove the rear armrest retaining screws.
 - Remove the 2 Torx screws.



E49515

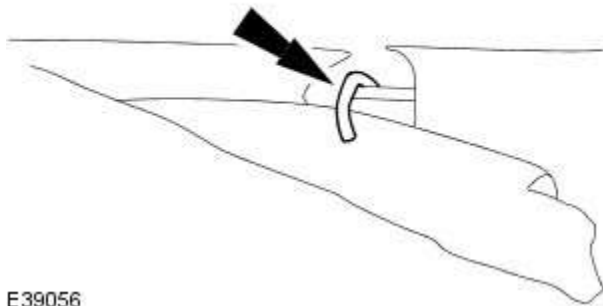
11.  **CAUTION:** Make sure no damage is caused to the seat trim when removing the seat armrest.
Remove the rear seat armrest.

12. Release the rear seat backrest cover from the armrest aperture.
 - Release the 3 plastic retaining strips from the securing clips.

13. Remove the cappings from the rear head restraint retaining posts.
 - Release the rear backrest cover over the head restraint posts.

14. Remove the rear seat backrest cushion and cover from the rear seat backrest.

15. Remove and discard the hog rings.
 - Remove the 36 hog rings securing the rear 60% seat backrest cover to the backrest seat cushion.
 - Remove the 26 hog rings securing the rear 40% seat backrest cover to the backrest seat cushion.



E39056

16. Remove the rear seat backrest cover.

Installation

1. **NOTES:**



Make sure that new hog rings are installed.



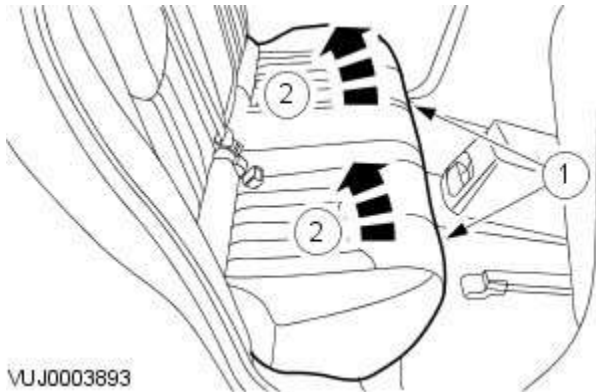
Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.

To install, reverse the removal procedure.

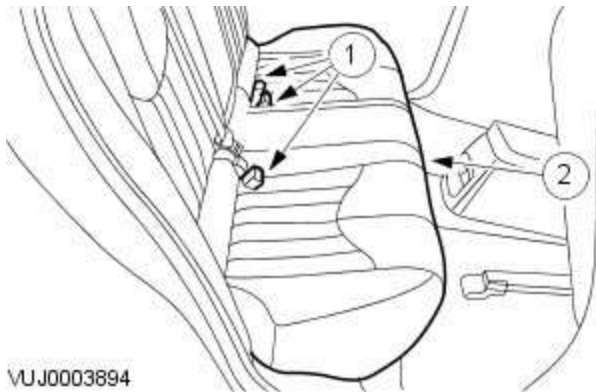
Seating - Rear Seat Cushion

Removal and Installation

Removal



1. Detach the rear seat cushion.
 - Release the rear seat cushion retaining clips.
 - Detach the rear seat cushion.



2. Remove the rear seat cushion.
 - Guide the safety belt buckles through the rear seat cushion aperture.
 - Remove the rear seat cushion.

Installation

1. To install, reverse the removal procedure.

Seating - Front Seat Height Adjustment Motor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Make the air bag supplemental restraint system (SRS) safe.

Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

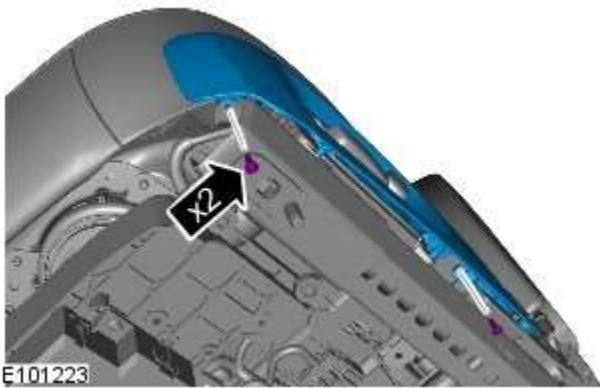
2. Disconnect the battery ground cable.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

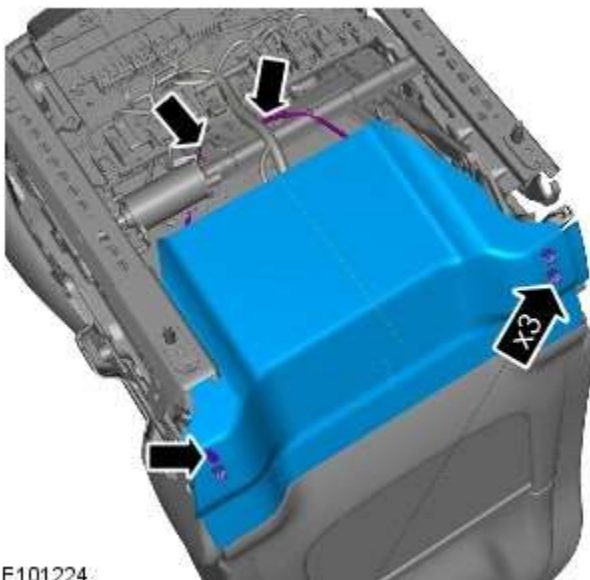
3. Remove the front seat.

Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).

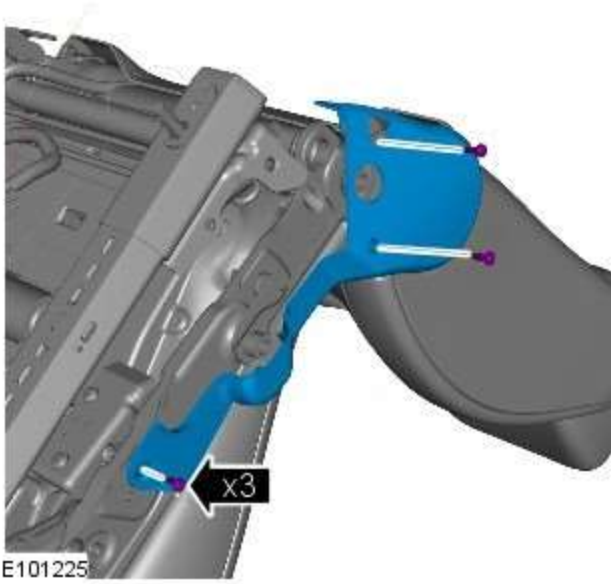
4.



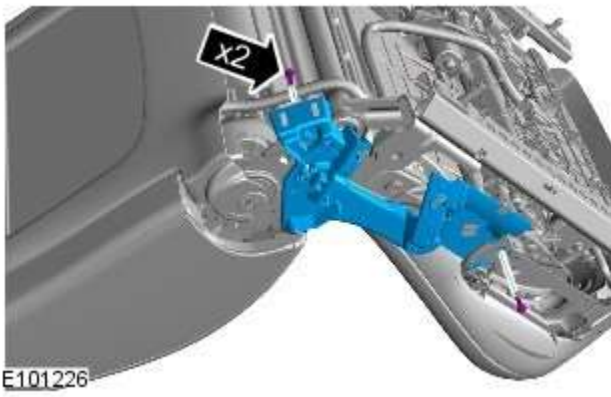
5.



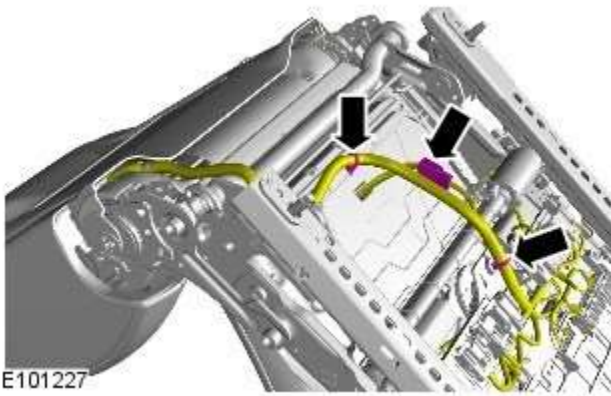
6.

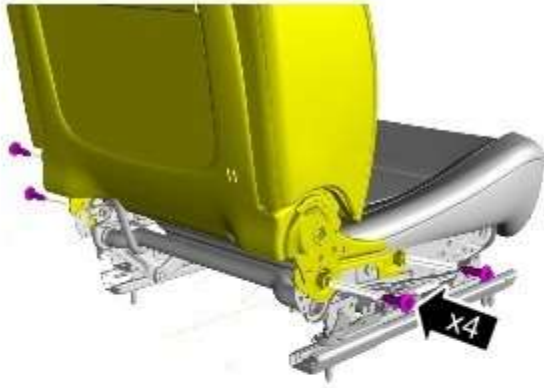


7.




8.





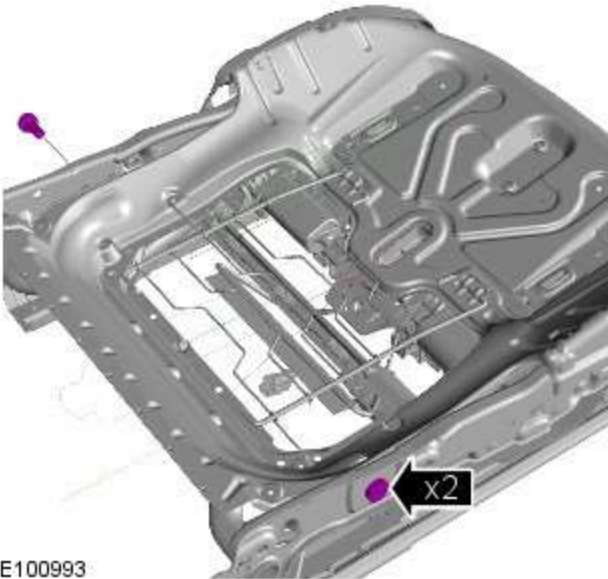
9.  **WARNING:** This step requires the aid of another technician.


 **CAUTION:** Take extra care when handling the component.

Torque: 35 Nm



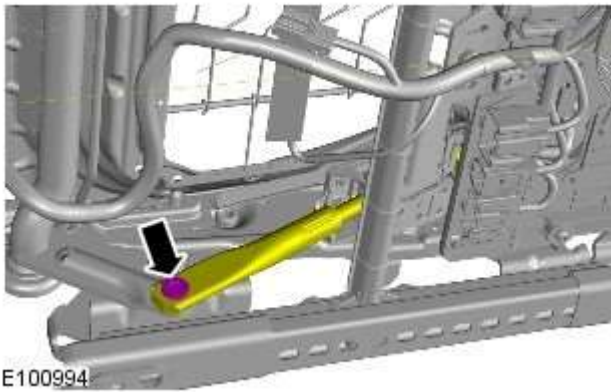
E101228




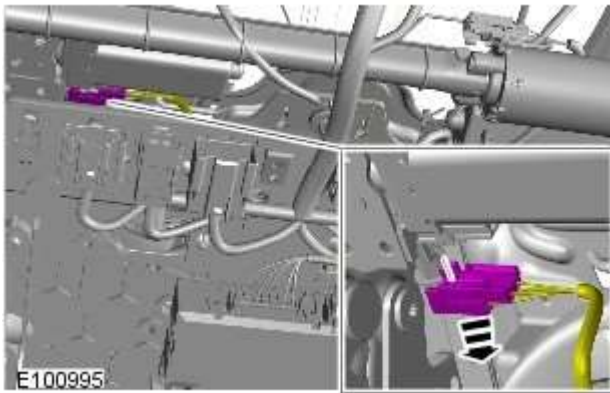
10.  **NOTE:** Some variation in the illustrations may occur, but the essential information is always correct.


Torque: 35 Nm

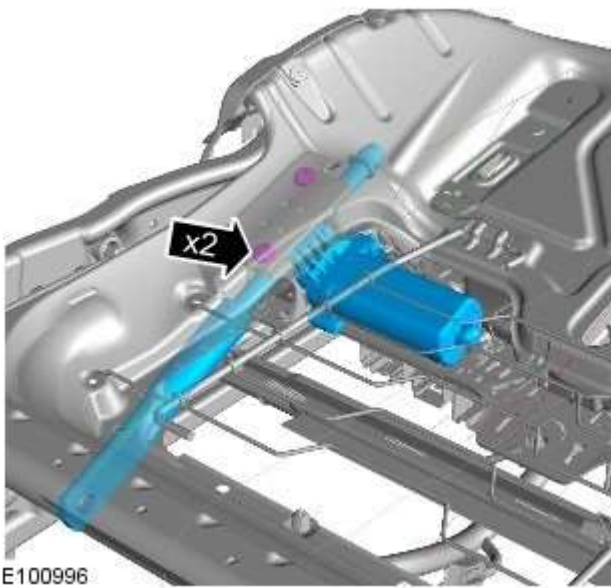
E100993




11.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



12.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



13.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

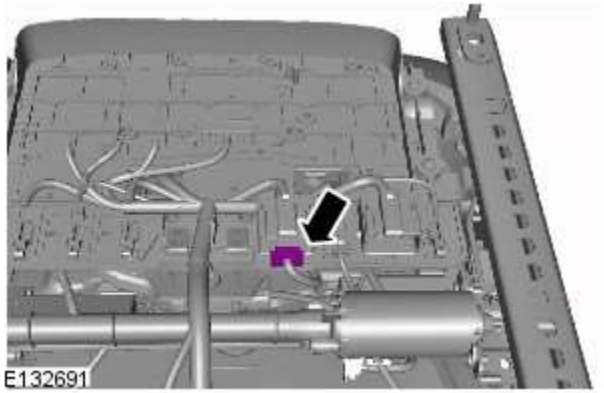
Seating - Front Seat Control Switch

Removal and Installation

Removal

1. Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).

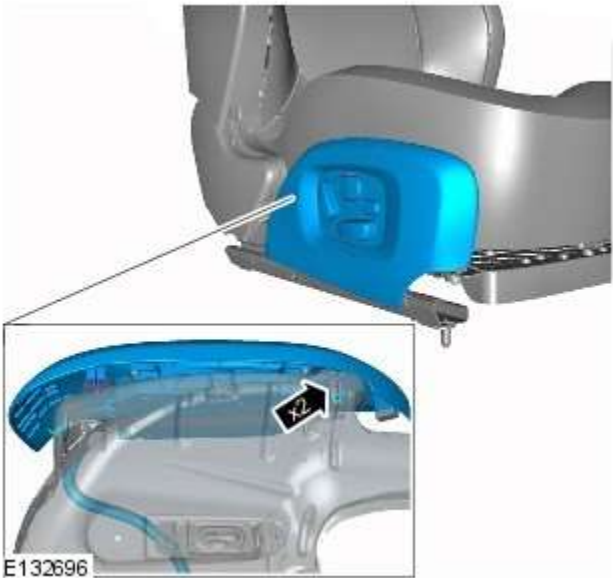
2.



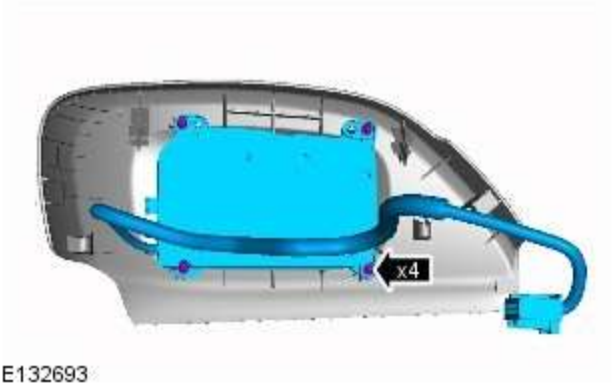
3.



- Remove and discard the retaining clips.

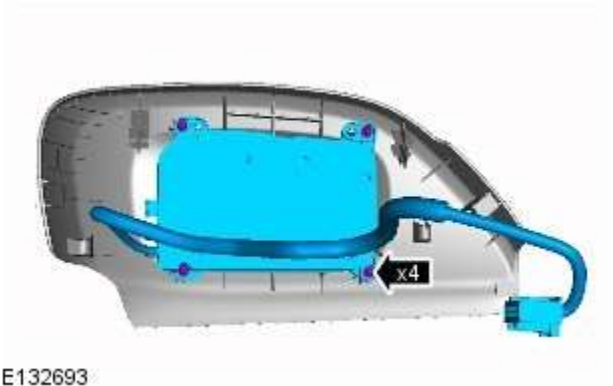


4.



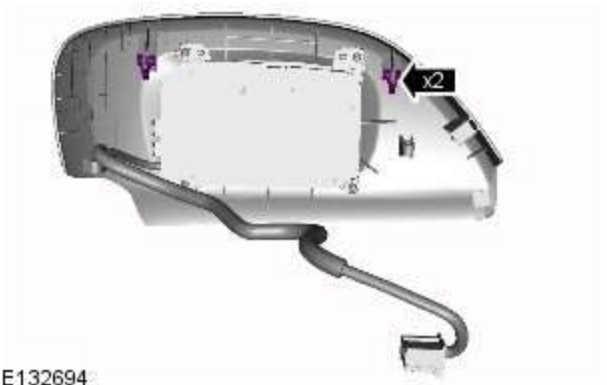
5.

Installation



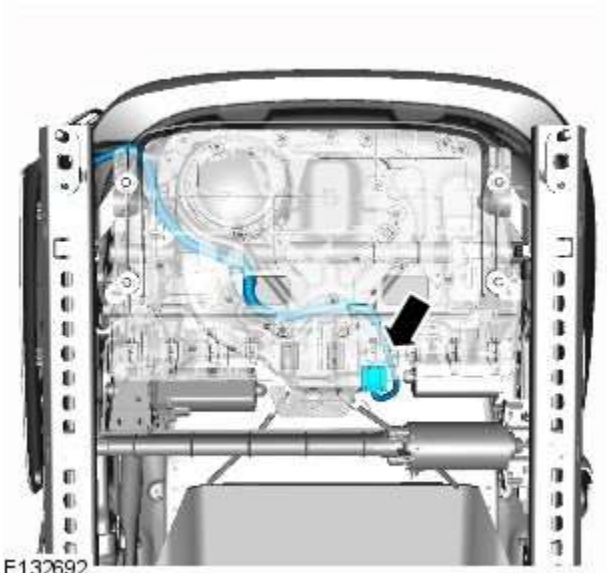
1.

2. Install new clips.



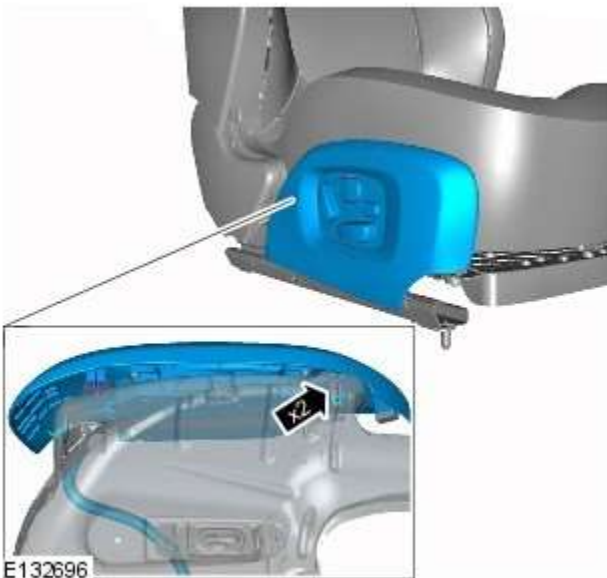
E132694

3.



E132692

4.

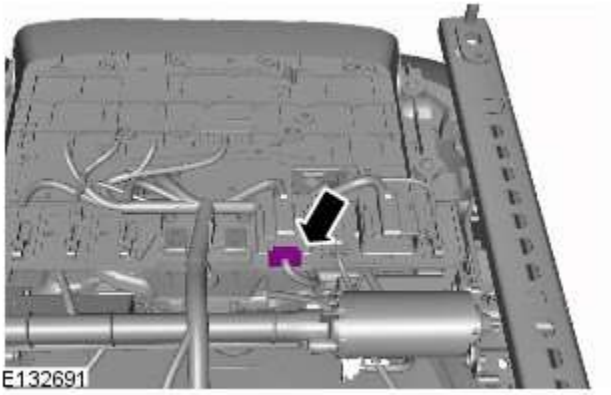


E132696

5.



6.



7. Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).

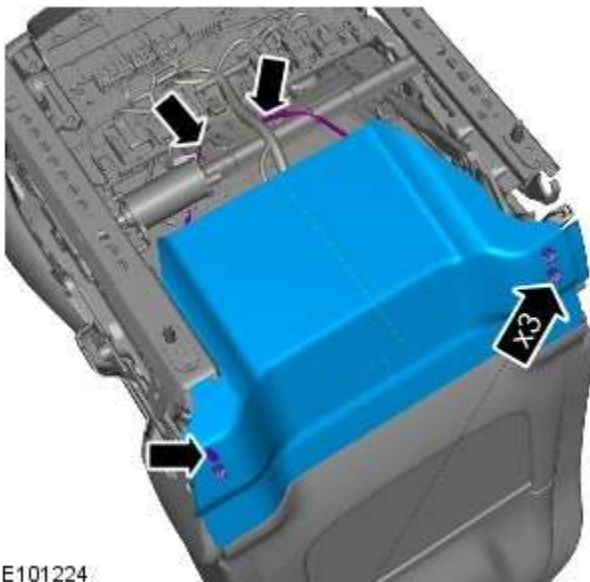
Seating - Front Seat Head Restraint Motor

Removal and Installation

Removal

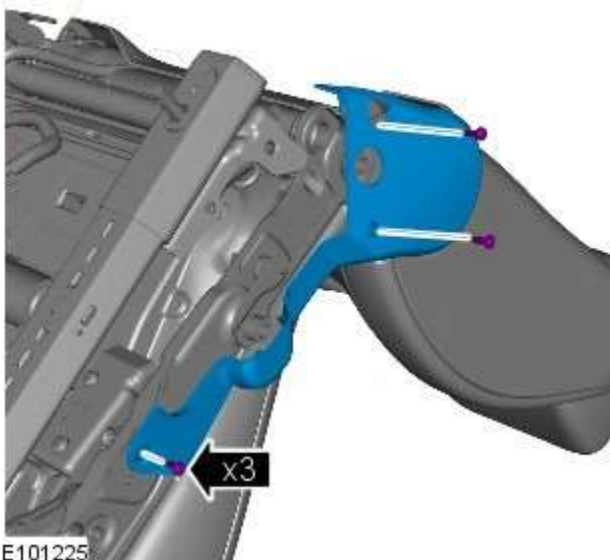
1. For additional information, refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).
2. For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
4. For additional information, refer to: [Front Safety Belt Buckle](#) (501-20A Safety Belt System, Removal and Installation).

5.



E101224

6.



E101225

7.



8.

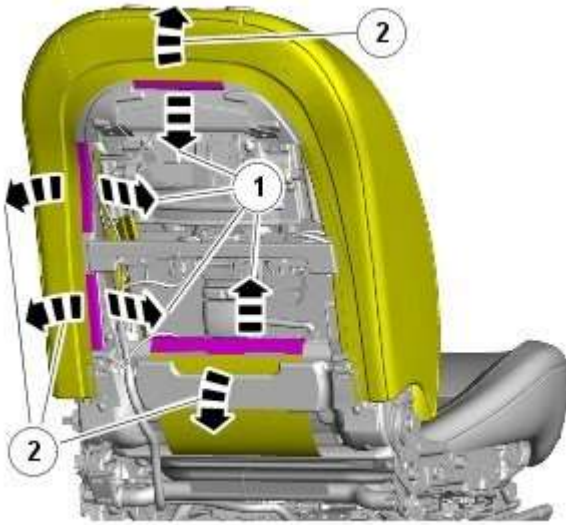


9.
 - Remove and discard the retaining clips.



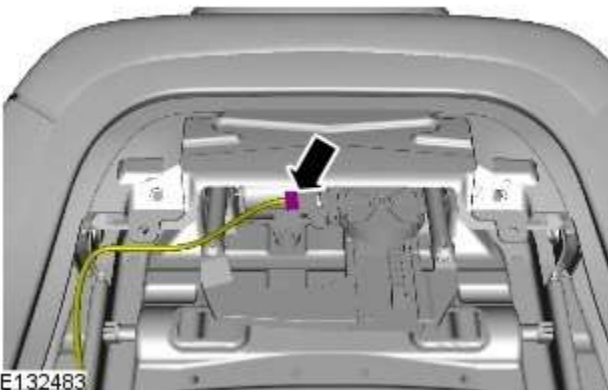
E132317

- 10.



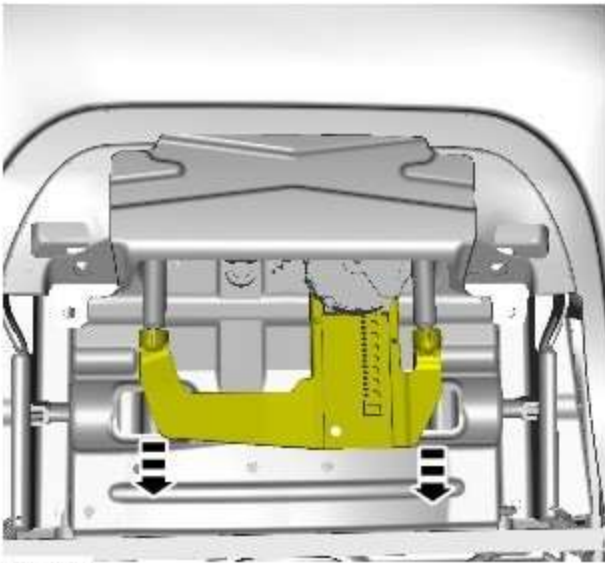
E99892

- 11.



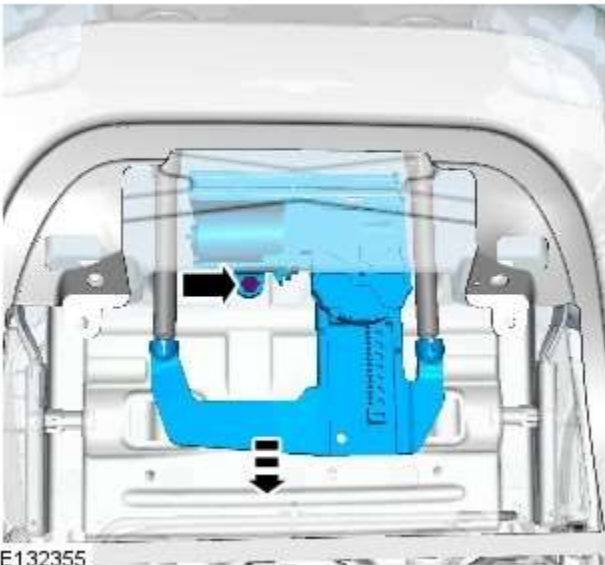
E132483

12.



E132357

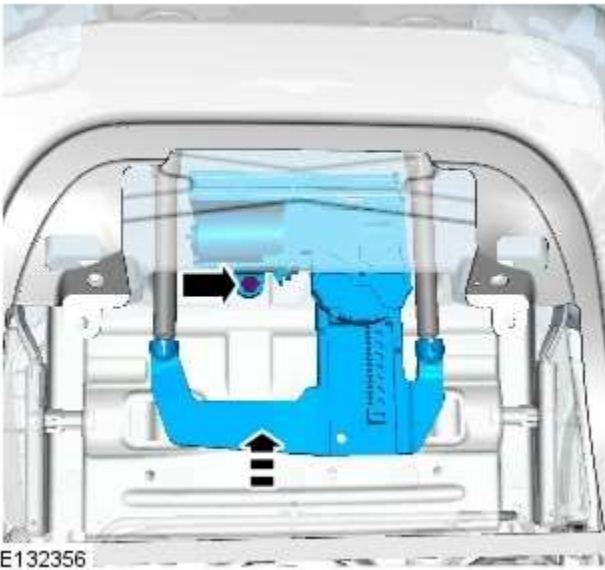
13.




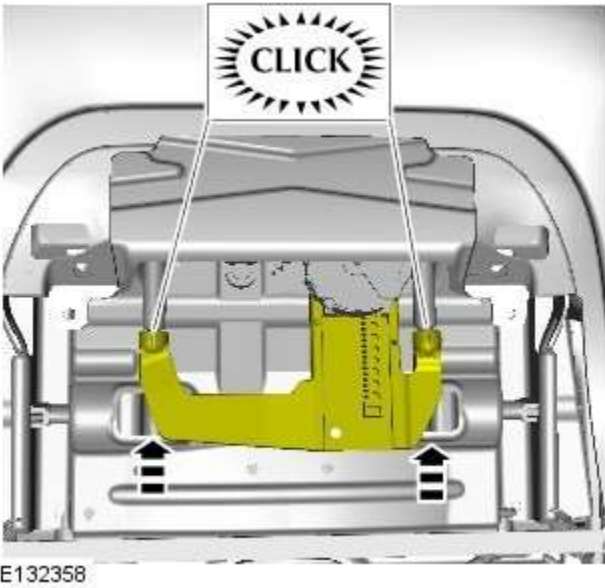
E132355

Installation

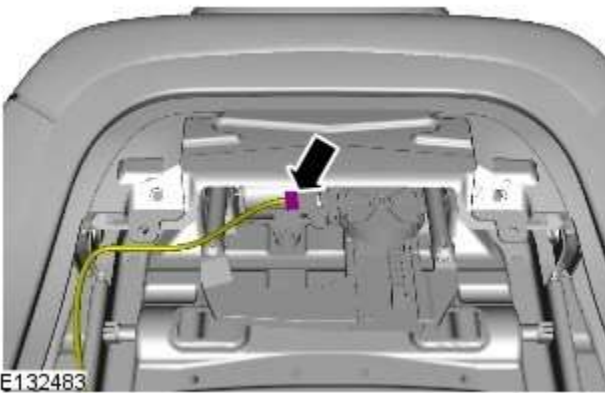
1.



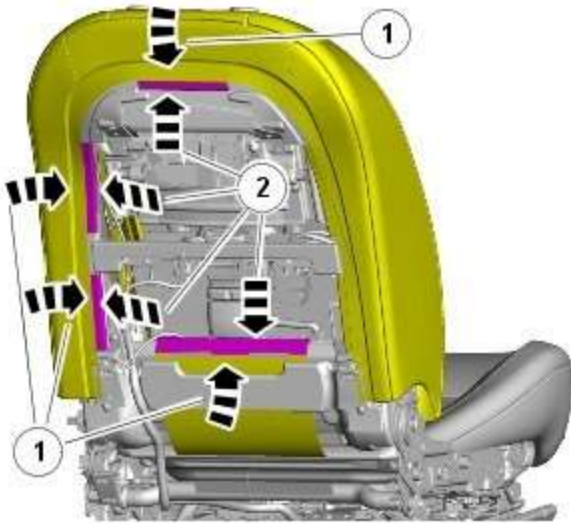
2.  **CAUTION:** Support the head restraint motor assembly while pushing down on the head restraint, you should hear two audible clicks to secure the head restraint to the motor assembly. Failure to do follow this instruction may result in failure of the component.



3.



4.

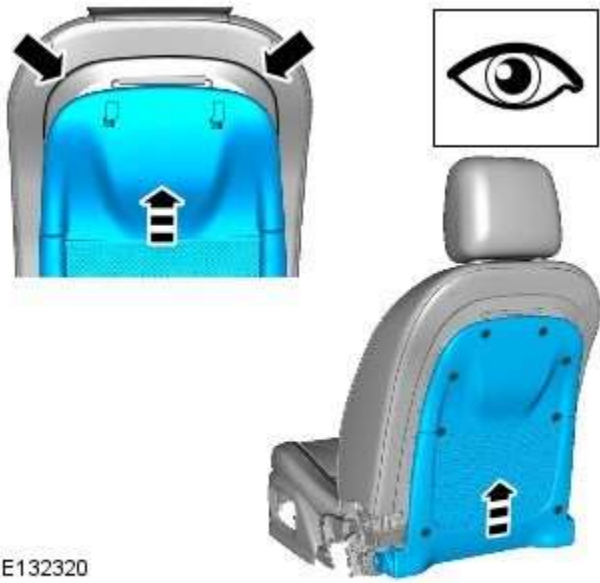


E132394

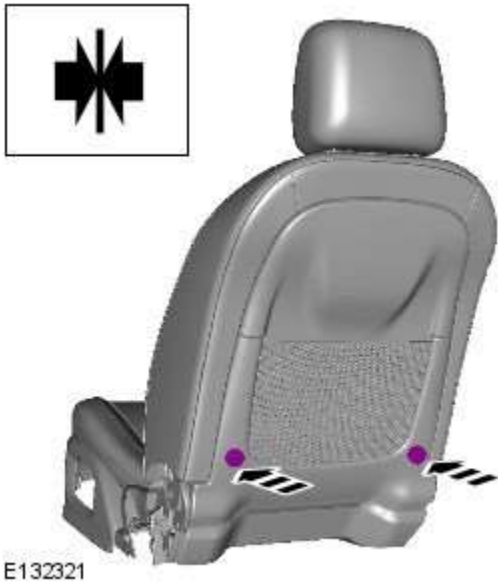
5. Install new clips.



E132319



6. Install the front seat backrest cover.

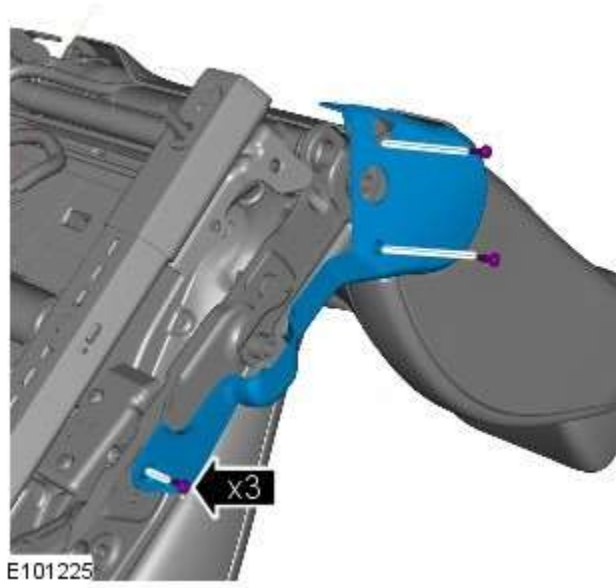


7.

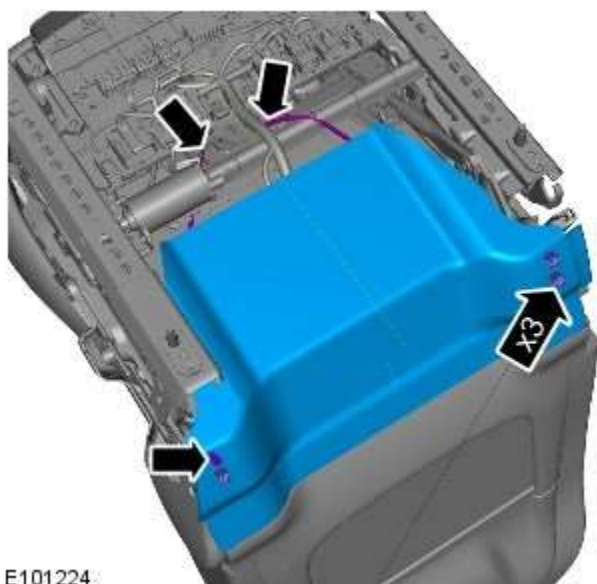
8.



9.



10.



E101224

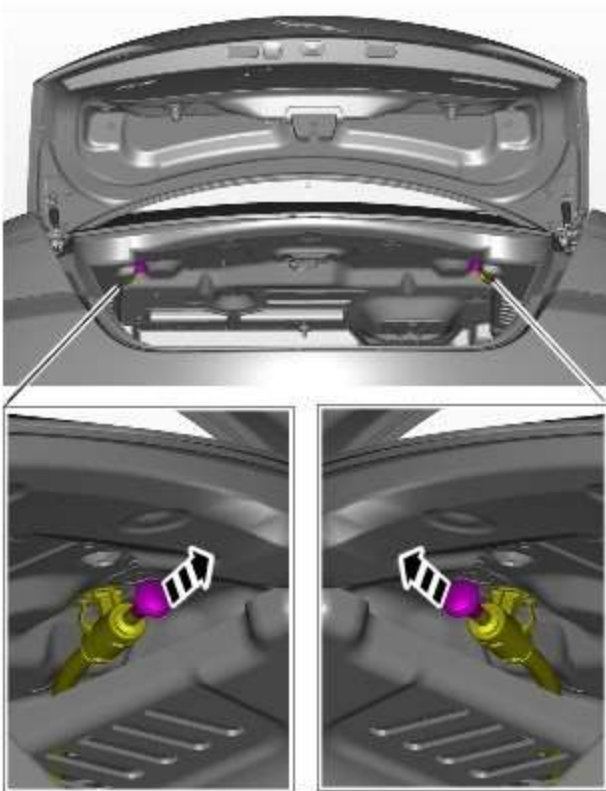
11. For additional information, refer to: [Front Safety Belt Buckle](#) (501-20A Safety Belt System, Removal and Installation).
12. For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
13. For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Seating - Rear Seat Bolster

Removal and Installation

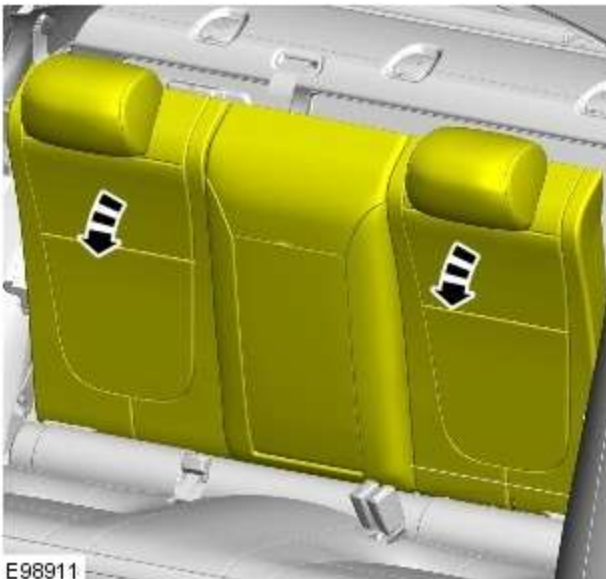
Removal

1.

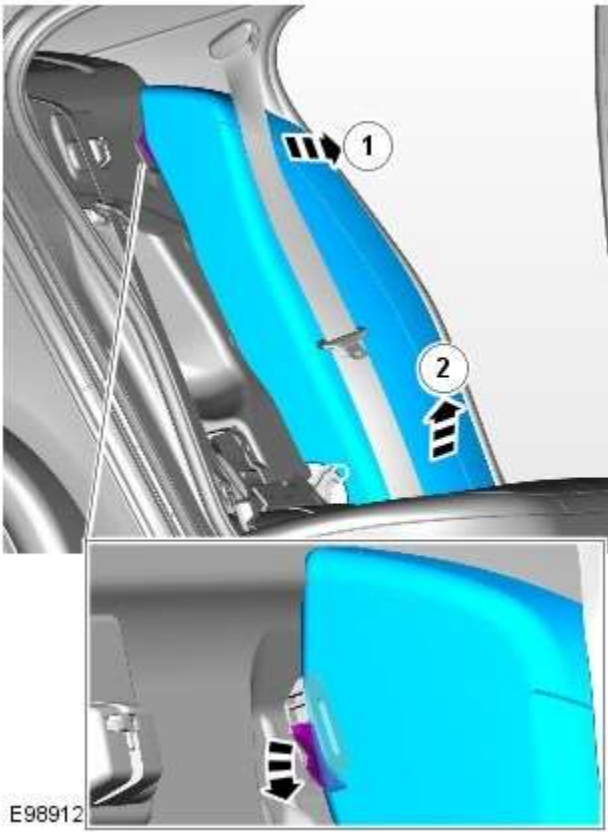


E98909

2.



E98911



E98912

3.

Installation

1. To install, reverse the removal procedure.

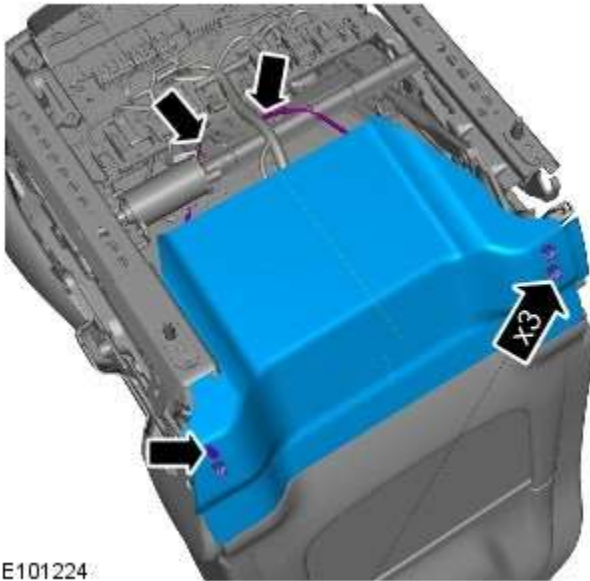
Seating - Front Seat Backrest Cover Trim Panel

Removal and Installation

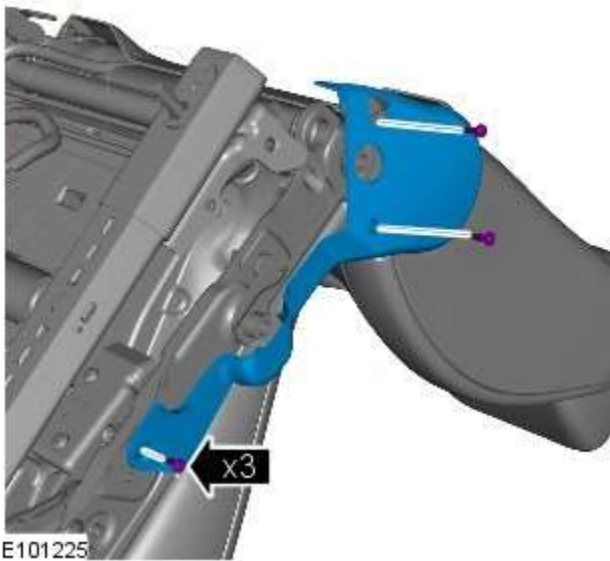
Removal

1. Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).

2.



3.



4.



5.



6.



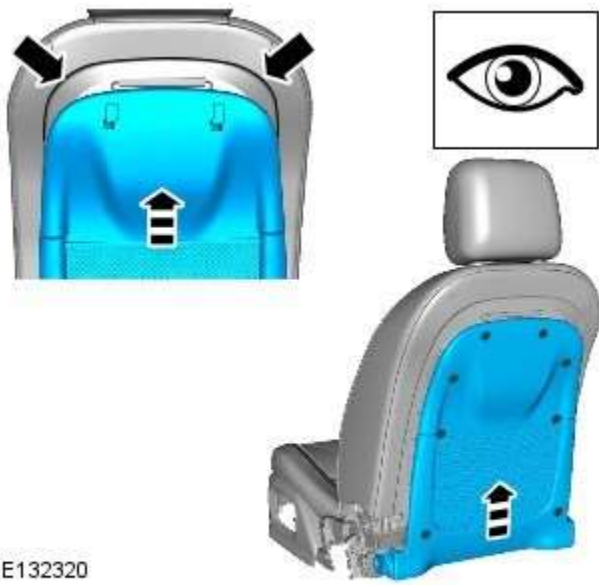
E132317

Installation

1. Install new clips.

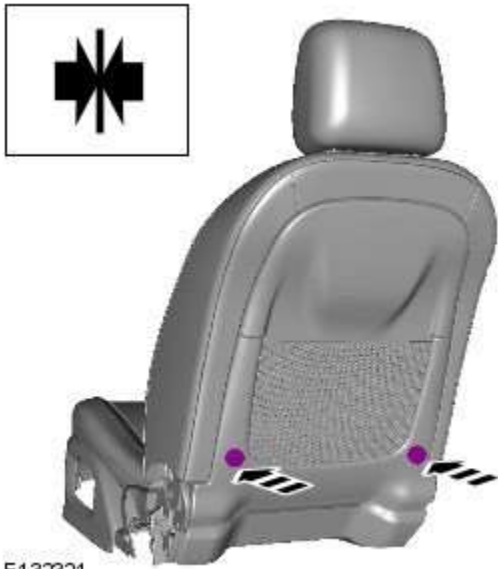


E132319



E132320

2. Install the front seat back rest cover trim panel.



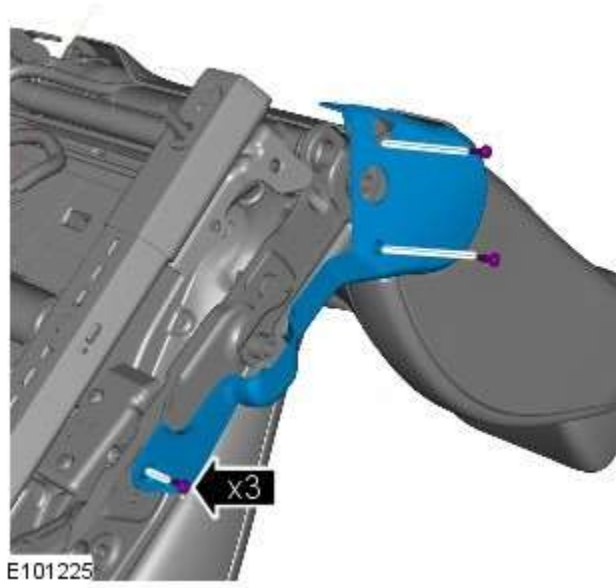
E132321

3.

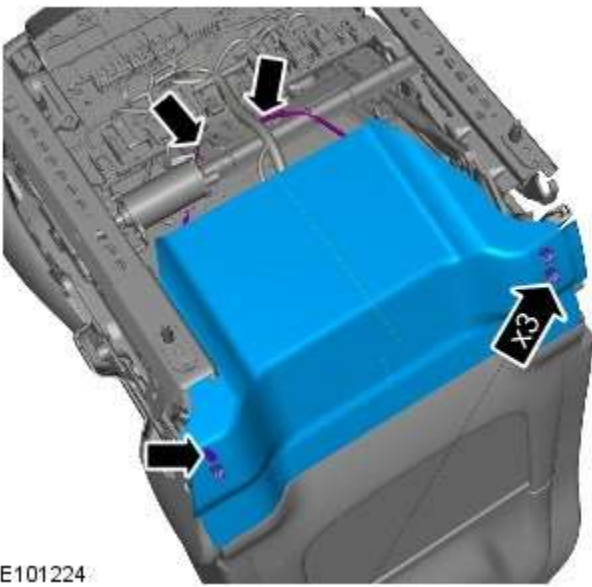
4.



5.



6.



E101224

7. Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).

Glass, Frames and Mechanisms -

Torque Specifications

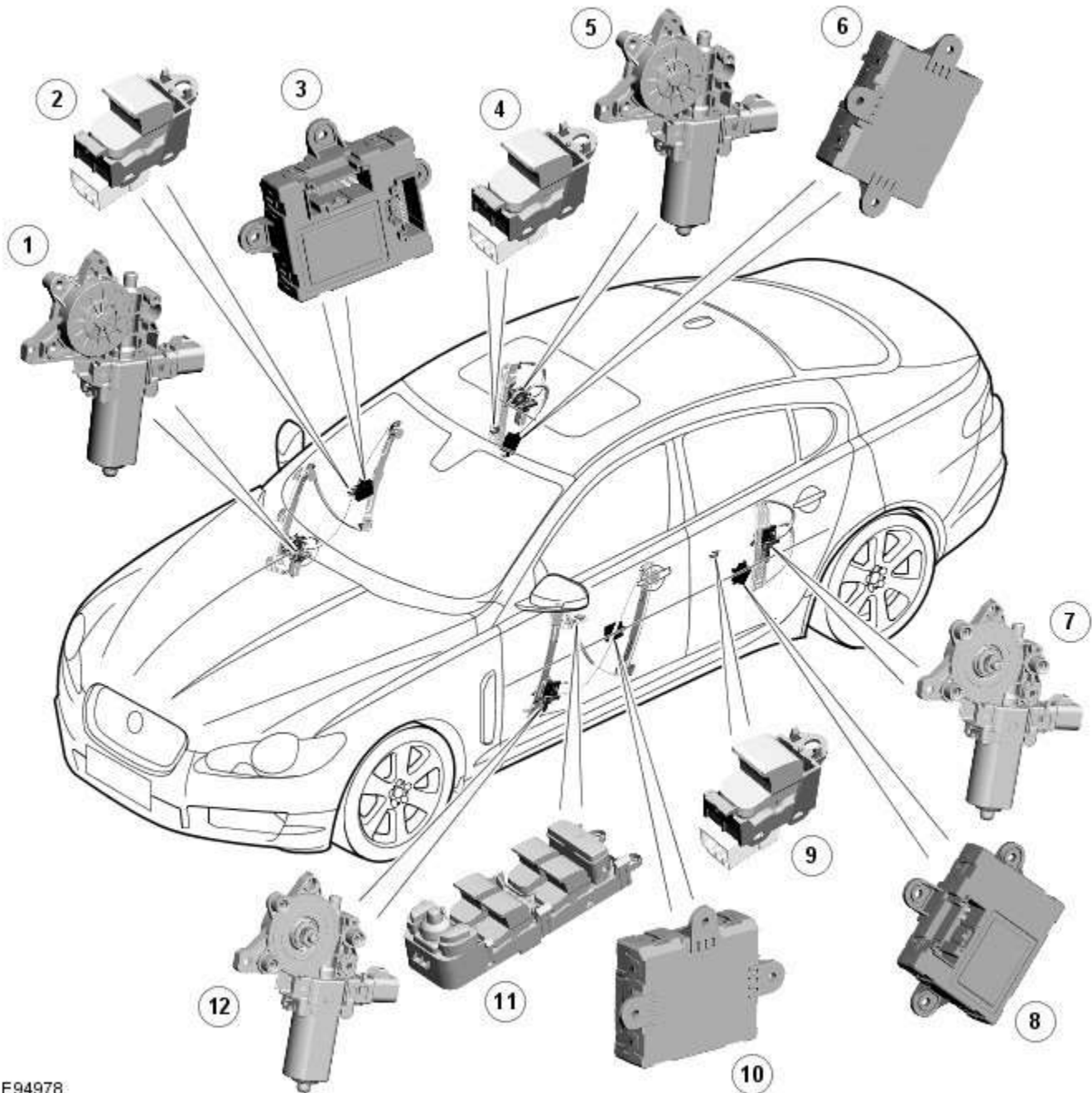
Description	Nm	lb-ft	lb-in
Front door window glass regulator retaining screws to BIW	7	-	62
Front door window glass regulator motor retaining screw to panel	2	-	18
Rear door window glass regulator retaining screws to BIW	7	-	62
Rear door window glass regulator motor retaining screw to panel	2	-	18
Rear door glass run retaining nuts	4	-	35

Glass, Frames and Mechanisms - Glass, Frames and Mechanisms -

Component Location

Description and Operation

Component Location



E94978

Item	Description
1	Window regulator motor - front passenger
2	Window control switch - front passenger
3	Door module - front passenger
4	Window control switch - RH (right-hand) rear passenger
5	Window regulator motor - RH rear passenger
6	Door module - RH rear passenger
7	Window regulator motor - LH (left-hand) rear passenger
8	Door module - LH rear passenger

9	Window control switch - LH rear passenger
10	Door module - driver's door
11	Window control switches - driver's door
12	Window regulator motor - driver's door

Glass, Frames and Mechanisms - Glass, Frames and Mechanisms - Overview

Description and Operation

Overview

The windshield is manufactured from laminated green-tinted glass with two variants of windshield being available: standard and heated.

The rear window is manufactured from toughened green-tinted glass. The heated rear window grid-wire and antennas are incorporated in the rear window. There are two variants of rear window dependant on the TV antenna specification.

The door windows are manufactured from green-tinted toughened glass. The driver and passenger windows are electrically operated; the rear glass sections in the rear doors are fixed units. Door windows can be operated individually, or by the driver's window control switch. An anti-trap function is included that stops the window's travel when an obstacle is detected in the in the window's path.

Glass, Frames and Mechanisms - Glass, Frames and Mechanisms - System

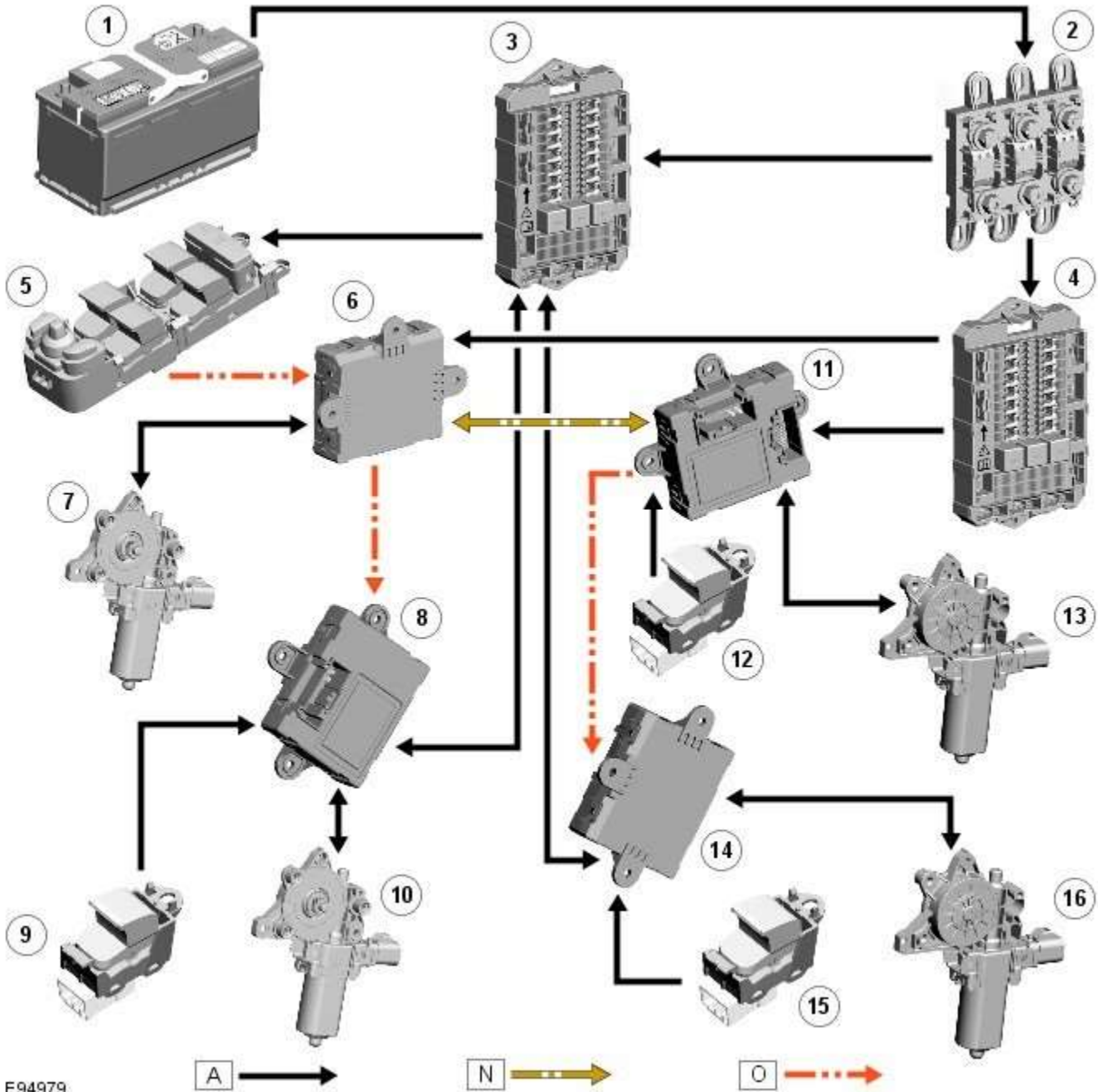
Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **N** = Medium speed CAN; **O** = LIN bus



E94979

Item	Description
1	Battery
2	Megafuse (250 amp)
3	CJB (central junction box)
4	RJB (rear junction box)
5	Window control switches - driver's door
6	Door module - driver's door

7	Window regulator motor – driver's door
8	Door module – LH (left-hand) rear passenger
9	Window control switch - LH rear passenger
10	Window regulator motor – LH rear passenger
11	Door module – front passenger
12	Window control switches - front passenger
13	Window regulator motor – front passenger
14	Door module – RH (right-hand) rear passenger
15	Window control switch - RH rear passenger
16	Window regulator motor – RH rear passenger

System Operation

Door Windows

All windows can be operated individually, or by the driver's window control switch. The operation of the windows is proportional to the switch activation. All windows can be controlled by 'one touch' in an upward or downward direction. When the 'one touch' operation is activated in the upwards direction 'pinch protection' is enabled. If a pinch condition is detected the window will automatically stop and travel downwards to a pre-determined position.

When the rear window 'one touch' operation is activated in the downward direction, the window will drop a limited way down. This is the comfort setting to achieve optimum noise levels when vehicle is in motion with rear windows open. Further 'one touch' operation will drop the window all the way down. (Only applies to vehicles post VIN R99740) The 'one touch' operation to activate the upward direction will fully close the window.

Electric window operation is enabled while the ignition is in power mode 4 and 6. When the switches in the driver's door are used to operate the passenger windows, the driver's door module outputs a related message on the [LIN \(local interconnect network\)](#) bus and medium speed [CAN \(controller area network\)](#) bus. The passenger door module responds to the message by operating the appropriate window. When the child lock is engaged, the rear door modules ignore inputs from the rear window switches.

End of travel shut off

End of travel shut-off for the window motors is determined by monitoring the current draw of the motors. Each time it switches on a window motor, the door module measures the window motor current for a preset time. The maximum value measured within that time is stored as the switch-on current. When the window motor current next exceeds the switch-on current, the door module assumes the window has reached the end of its travel and switches off the power supply to the window motor even if a window switch is still being activated.

Anti-trap

The anti-trap function is enabled for window closing in both the inching and one-shot modes. If the anti-trap feature is activated while a window is closing, the window motor is reversed for a preset period.

A Hall sensor, located in the window regulator motor, monitors the speed of the motor and if the speed decreases below a set threshold, indicating an obstruction, the power feed to the motor is reversed so the window goes back down for preset time.

In an emergency the anti-trap function can be overridden by holding the window switch in the one-shot closed position.

After the battery has been disconnected it is necessary to initialize the door window motors to be able to operate the one-shot up function.

Component Description

Windshield

The windshield, manufactured from 5mm laminated green-tinted glass is positioned to the vehicle's body by two locator pins, one in each top corner of the windshield. This allows for centralizing movement of the windshield across the car upon fitment. The base of the windshield carries a leaf-screen retainer. The windshield is bonded and sealed to the vehicle body aperture using Polyurethane (PU) adhesive. The windshield finisher is a three-sided extruded flip, taped onto the inner surface of the glass; this helps to centralize the glass in the aperture.

Two variants of windshield are available:

- standard, and
- heated.

Refer to: [Control Components](#) (412-01 Climate Control, Description and Operation).

Interior Mirror and Rain Sensor

The interior mirror and rain sensor mounting positions are located at the top of the windshield.
Refer to: [Wipers and Washers](#) (501-16 Wipers and Washers, Description and Operation).

Rear Window

The rear window, manufactured from toughened 4mm green-tinted glass, is positioned to the vehicle's body by two locator pins, one in each top corner of the windshield. This allows for the centralizing movement of the windshield across the car upon fitment. The window is bonded and sealed to the vehicle body aperture using PU adhesive. The window finisher is a three-sided extruded flip, taped onto the inner surface of the glass; this helps to centralize the glass in the aperture.

The heated rear window grid wire and antennas are incorporated in the rear window. There are two derivatives of rear window dependant on the TV antenna specification.

Refer to: Video System (415-01, Description and Operation).

Door Windows

The door windows are manufactured from 4.85mm green-tinted toughened glass. The driver and passenger windows are electrically operated, and are raised and lowered by a cable mechanism; the rear glass sections in the rear doors are fixed units.

All windows can be operated individually, or by the driver's window control switch. The operation of the windows is proportional to the switch activation. The driver window can be controlled by 'one touch' in an upward or downward direction. When the 'one touch' operation is activated in the upwards direction an anti-trap sensor is automatically checked prior to the window closing. If the anti-trap sensor is inoperative the window will not close. When the anti-trap sensor detects an obstacle in the window's path, the upward travel of the window will automatically cease. Downward travel of the window will begin and then stop when a preset time has elapsed.

Glass, Frames and Mechanisms - Glass, Frames and Mechanisms

Diagnosis and Testing

Principle of Operation

For a detailed description of the glass, frames and mechanisms, refer to the relevant Description and Operation section in the workshop manual. REFER to: (501-11 Glass, Frames and Mechanisms)

[Glass, Frames and Mechanisms](#) (Description and Operation),

[Glass, Frames and Mechanisms](#) (Description and Operation),

[Glass, Frames and Mechanisms](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern by operating the system
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Window glass • Door window regulator • Window seals 	<ul style="list-style-type: none"> • Fuse(s) • Door window regulator motor • Loose or corroded electrical connector(s) • Switch • Circuit(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the concern is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC index

Window Regulator Diagnostic

This diagnostic procedure is to be carried out if the door window either: closes to the top, then reopens (**Bounce back**); does not **fully close** to the top of the door frame; the **one touch** function is disabled

PINPOINT TEST A : DIAGNOSTIC PROCEDURE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: DOOR WINDOW - SEAL CONDITION / FOREIGN MATERIAL	
NOTE: To check that the door window seal is free from foreign material and has no sign of damage and is not worn in the door channels	
1	Carry out visual inspection for: <ul style="list-style-type: none"> • Foreign material • Obstruction • Signs of damage or wear to door window seal
	Is the door window seal free from foreign material, damage and wear? Yes GO to A2. No Remove any foreign material or were necessary install new door window seal. Test the system for correct operation
A2: DOOR WINDOW - SEAL INSTALLATION	
NOTE: To check that the door window seal is installed correctly	
1	Check that the door window seal is installed correctly, ensure that it is fully installed into the corner areas
	Is the door window seal installed correctly? Yes GO to A3. No

Correctly install the door window seal. Test the system for correct operation

A3: DOOR WINDOW - SECURITY



NOTE: To check the door window is secure

- 1 Check if the door window is installed correctly and secured to the door window regulator

Is the door window correctly installed and secure?

Yes

[GO to A4.](#)

No

Adjust the door window referring to the door window installation process REFER to: (501-11 Glass, Frames and Mechanisms)

[Front Door Window Glass](#) (Removal and Installation),

[Rear Door Window Glass](#) (Removal and Installation).

Test the system for correct operation

A4: DOOR WINDOW - RESET PROCEDURE

- 1 Disconnect vehicle battery, wait for a minimum of 2 minutes, then reconnect the battery

- 2 **For vehicles pre-VIN S08680**, the latest version of the diagnostic software must be loaded. SDD must be loaded with SDD DVD126_V6.03 and Calibration File 77 (or later)

- 3 **For vehicles pre-VIN R54858**, replace the front door window regulator motor, REFER to: [Front Door Window Regulator and Motor](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).

- 4 With the vehicle engine running, initialize the door window regulator motors, REFER to: [Door Window Motor Initialization](#) (501-11 Glass, Frames and Mechanisms, General Procedures).

- 5 Cycle the window 20 times, using the 'one-touch' function to open and close the window

- 6 **NOTE:** The door window regulator motor may thermally cut out after too many operations, if this occurs wait 30 seconds before continuing

Is door window closing correctly and the **One-touch** function operational?

Yes

No further action requires

No

Replace the front door window regulator motor

REFER to: [Door Window Regulator Motor](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).

, or rear door window regulator motor

REFER to: [Rear Door Window Regulator and Motor](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).

Test the system for correct operation

Manual Sunblind Initialization Routine

Where a sunblind module has been replaced, there is an initialization routine available on the diagnostic tool. This requires a new module to be initially installed in the fully down position and running of the "Initialize Specified Function/Feature" diagnostic routine on the manufacturer approved diagnostic tool. Alternatively, the sunblind may be initialized manually by following the procedures described below:

1. Raise the sunblind to top (fully retracted) position
2. Press and hold the door window 'down' switch for 15 seconds (the sunblind will go down and will then be in initialization mode)
3. Release door window drop switch and press door window 'down' switch again to drive blind fully into lower block
4. Activate window switch 'up' until the sunblind reaches the top (fully retracted) position and release switch
5. The sunblind is now initialized and should have 'one-touch' functionality

DTC Index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Driver Door Module \(DDM\)](#) (419-10 Multifunction Electronic Modules, Diagnosis and Testing).

Glass, Frames and Mechanisms - Fixed Window Glass

Diagnosis and Testing

Principles of Operation

For a detailed description of the Glass, Frames and Mechanisms, refer to the relevant Description and Operation section in the workshop manual.

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Refer to Section 100-00 General Information for window glass health and safety precautions.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Electrical
<ul style="list-style-type: none"> • Physical damage to the windshield

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Warranty Repairs

NOTES:



The warranty period for the windshield is twelve months with the exception of delamination and electrical faults.



Warranty repairs should be completed using genuine parts, in accordance with the Warranty Policy and Procedures Manual.

1. Draw a line around the windshield damage using a marker pen.
2. Photograph the entire windshield. If the damage extends behind any trim, remove the trim and take further photographs.
3. Photograph the trademark logo and code to validate the windshield as factory fitment.


Symptom Chart

Symptom	Possible Causes	Action
Scratches	<ul style="list-style-type: none"> • Debris trapped under a wiper blade 	<ul style="list-style-type: none"> • GO to Pinpoint Test A.


Symptom	Possible Causes	Action
	<ul style="list-style-type: none"> Foreign object damage Fouling by trim 	
Chips	<ul style="list-style-type: none"> Foreign object damage 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
Cracks	<ul style="list-style-type: none"> Foreign object damage Impact damage during assembly 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
Delamination	<ul style="list-style-type: none"> Manufacturing defect 	<ul style="list-style-type: none"> GO to Pinpoint Test D.

Pinpoint Tests



PINPOINT TEST A : SCRATCH TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: SCRATCH TEST 1	
 NOTE: A scratch will usually be regular in shape, following the line of the object that caused it.	
	1 Probe using the tip of a pencil to identify a groove in the windshield surface. Is there a groove? Yes Windshield scratched. GO to A2. No Defect not valid.
A2: SCRATCH TEST 2	
	1 Check for trim, body panels, or foreign objects that may have caused the scratch. Was the scratch caused by a foreign object? Yes The damage is not due to a defect or an assembly error. No Rectify as appropriate.

PINPOINT TEST B : CHIP TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHIP TEST 1	
 NOTE: Impact damage may cause a crack to form.	
	1 Assess the damage by probing with the tip of a pencil. Is the damaged area rough (indicating a breach of the windshield surface)? Yes Damage caused by the impact of a foreign object. Not a manufacturing defect. No Install a new windshield.

PINPOINT TEST C : CRACK TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CRACK TEST 1	
 NOTE: A crack will be detectable as a step in the glass.	
	1 Confirm the presence of a crack by probing with the tip of a pencil. Is the windshield cracked? Yes Windshield cracked. GO to C2. No Windshield not cracked. GO to Pinpoint Test A.
C2: CRACK TEST 2	
 NOTE: Multiple cracks will radiate out from the source.	
	1 Assess the source of the crack by probing with the tip of a pencil. Is there evidence of impact damage being the source of the crack? Yes GO to Pinpoint Test B. No

Install a new windshield.

PINPOINT TEST D : DELAMINATION TESTS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: DELAMINATION TEST 1	
	1 Visually assess the windshield for delamination.
	Have the glass laminates separated? Yes Install a new windshield. No No further action.

DTC Index

For a complete list of all Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

Glass, Frames and Mechanisms - Door Window Motor Initialization

General Procedures

NOTES:



Make sure that the vehicle battery is fully charged before carrying out this procedure.



After the battery has been disconnected or a new window regulator and motor or door module has been installed, it is necessary to initialize each door window motor separately to operate the **one-touch** and anti-trap function.



In addition to this manual procedure, the approved diagnostic tool can also be used to initialize the door window motor.

1. Start the engine.
2. Operate the window control switch until the door window glass is in the fully closed position, continue to operate the window control switch for a further two seconds.
3. Release the window control switch.
4. Operate the window control switch in the closed position and continue to operate the window control switch for a further two seconds.
5. Operate the window control switch until the door window glass is in the fully open position (**one-touch** down).

6. NOTES:



If the door window motor initialization has been completed correctly, when the window control switch is operated, the door window glass should move to the fully closed position (**one-touch** up) automatically.



If the door window glass does not fully close automatically (**one-touch** up), repeat the complete procedure.

Operate the window control switch once to the close position.

- If multiple attempts have failed to initialize the door window motor, refer the diagnosis and testing procedure. For additional information, refer to: [Glass, Frames and Mechanisms](#) (501-11 Glass, Frames and Mechanisms, Diagnosis and Testing).

7. Repeat the door window motor initialization for each door window motor.

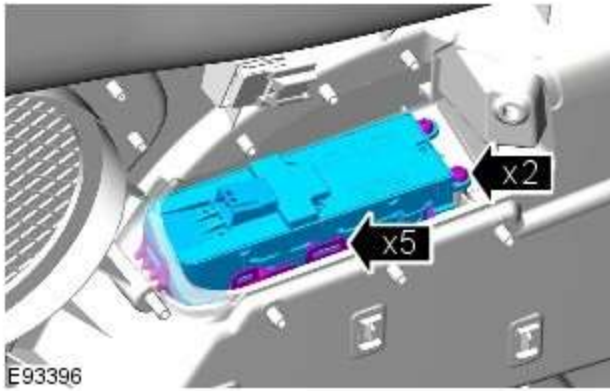
Glass, Frames and Mechanisms - Driver Door Window Control Switch

Removal and Installation

Removal

1. For additional information, refer to: [Front Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



3.



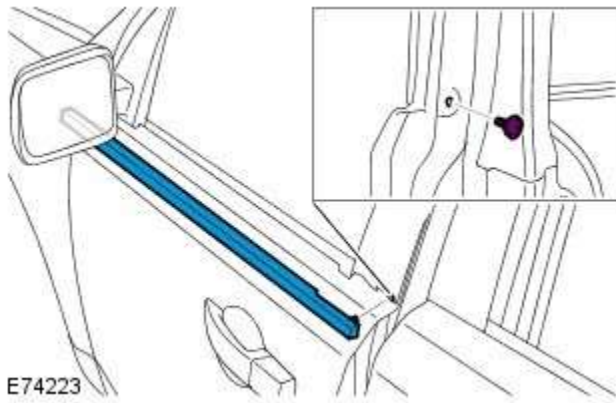
Installation

1. To install, reverse the removal procedure.

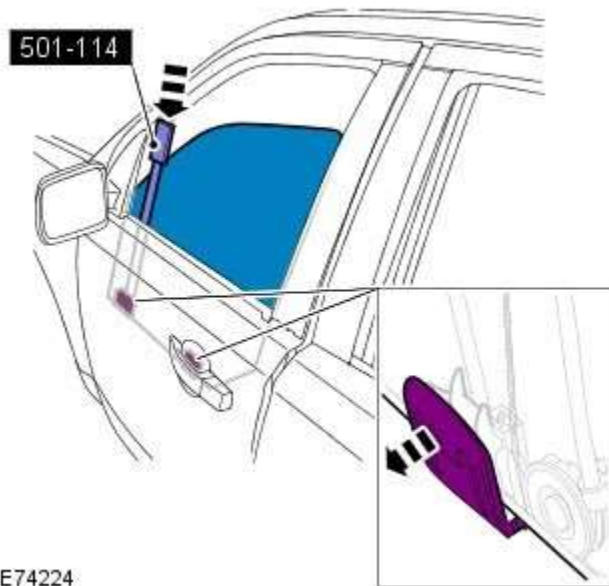
Glass, Frames and Mechanisms - Front Door Window Glass

Removal and Installation

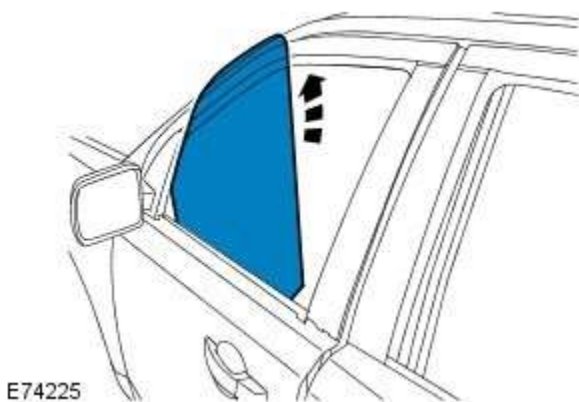
Removal



1.



2.

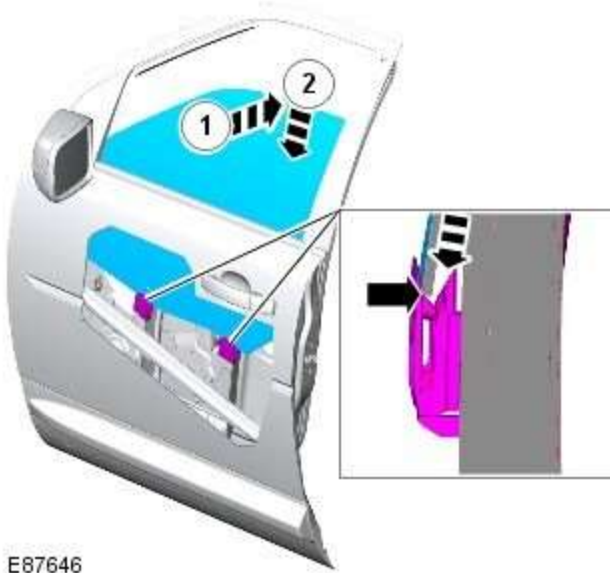


3.

Installation

1. To install, reverse the removal procedure.

2.




E87646

Glass, Frames and Mechanisms - Front Door Window Regulator and Motor

Removal and Installation

Special Tool(s)

 <p>501-114</p> <p>E54200</p>	<p>Door glass release lever 501-114</p>
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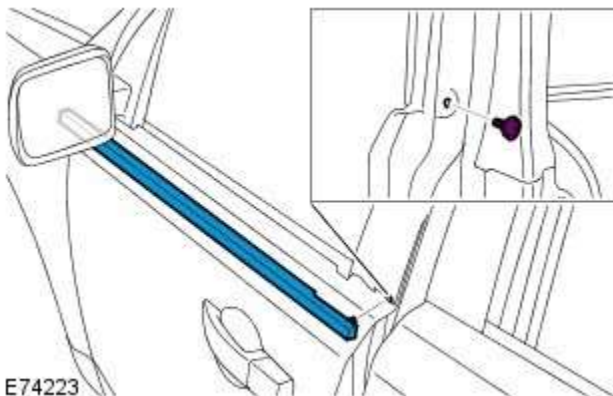
Removal



1.  NOTE: Left-hand shown, right-hand similar.

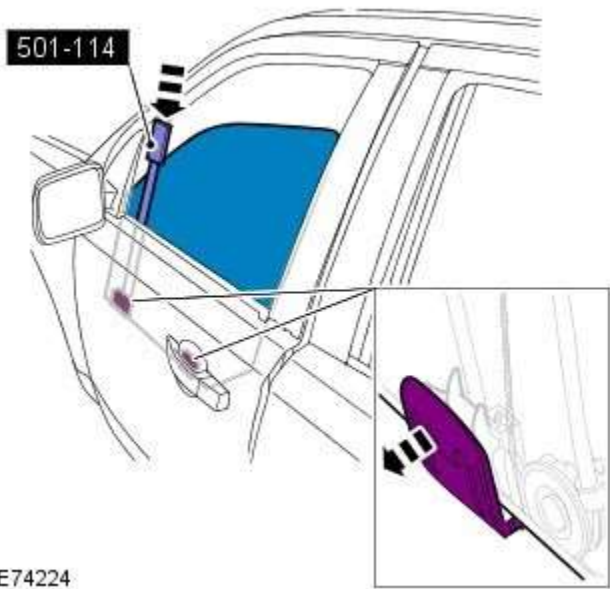




E94765



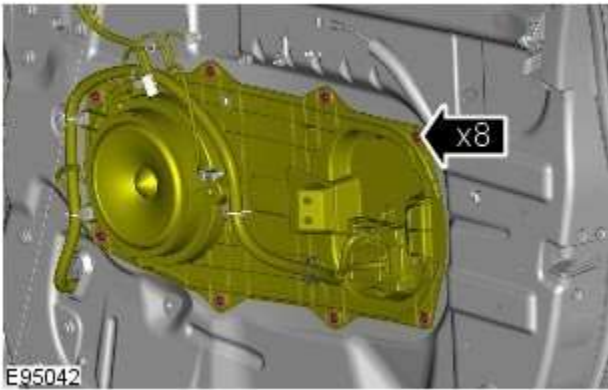
2.  NOTE: Left-hand shown, right-hand similar.

E74223



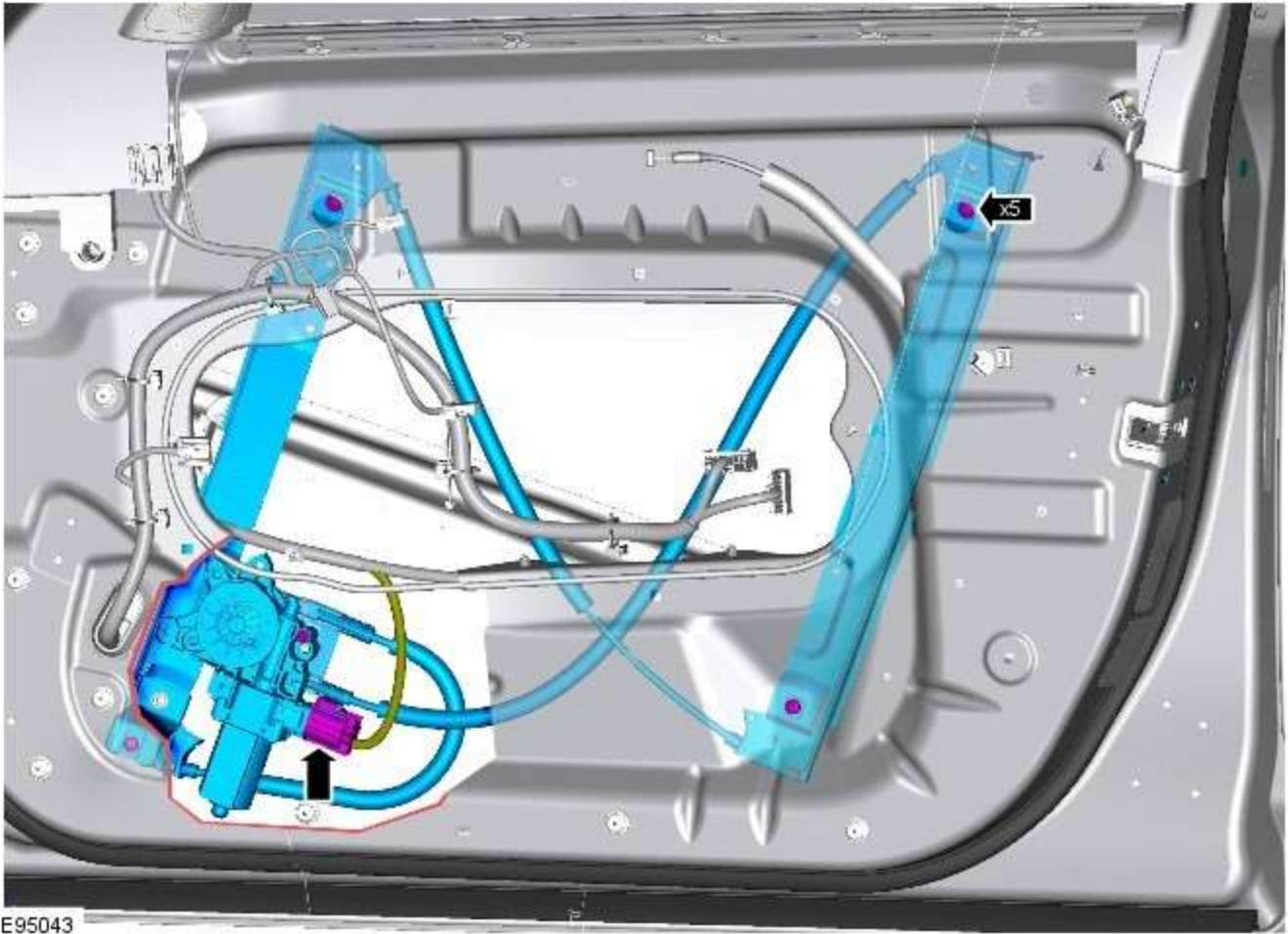
3.  WARNING: Do not allow the glass to drop.
-  NOTE: Left-hand shown, right-hand similar.

4. For additional information, refer to: [Front Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



5.  NOTE: Right-hand shown, left-hand similar.

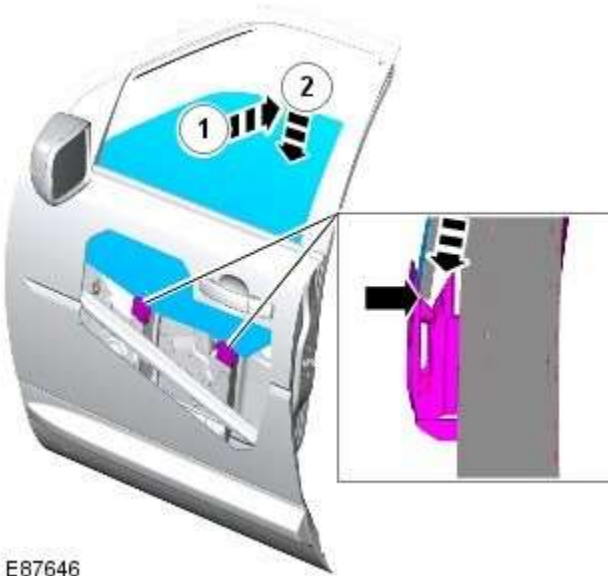
6. • TORQUE: 7 Nm



E95043

Installation

1. To install, reverse the removal procedure.



E87646

Glass, Frames and Mechanisms - Rear Door Fixed Window Glass

Removal and Installation

Removal

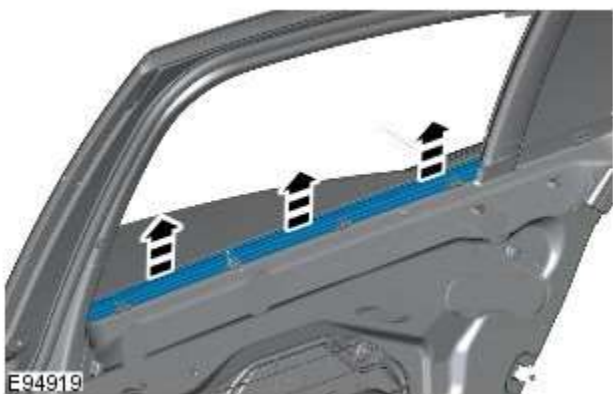
1. Lower the rear door window glass.



2. Remove the rear door trim panel.

Refer to: [Rear Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

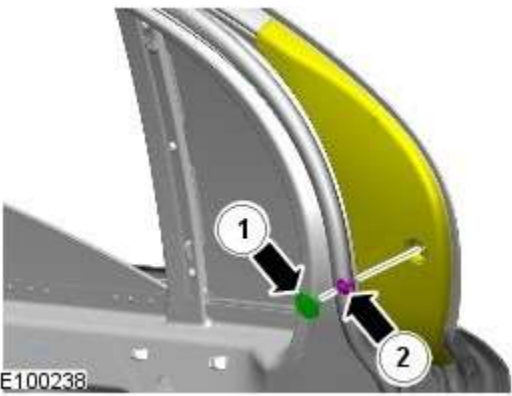
- 3.



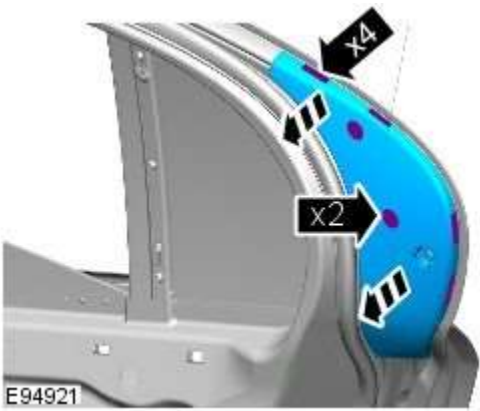
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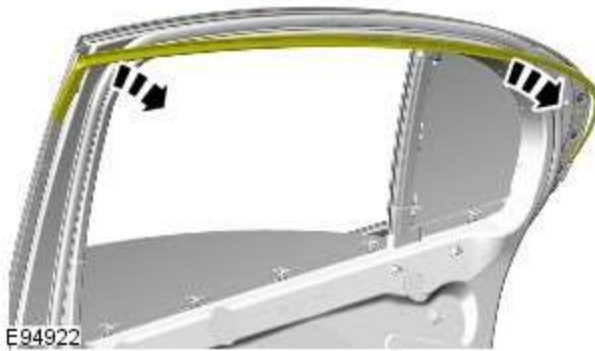
5.



6.



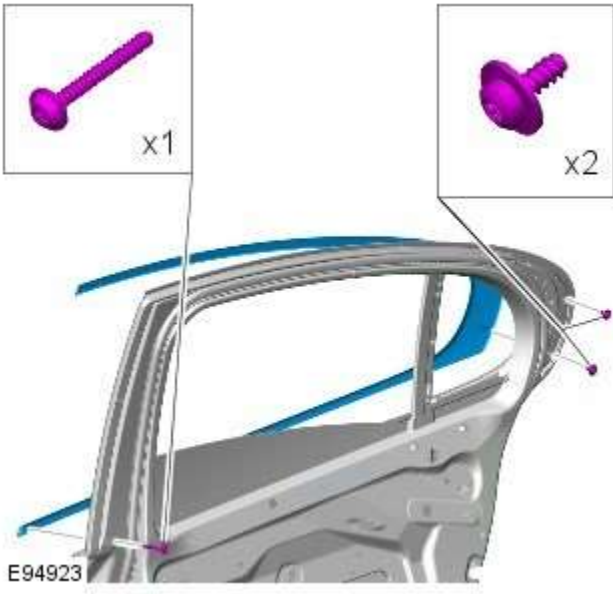
7.

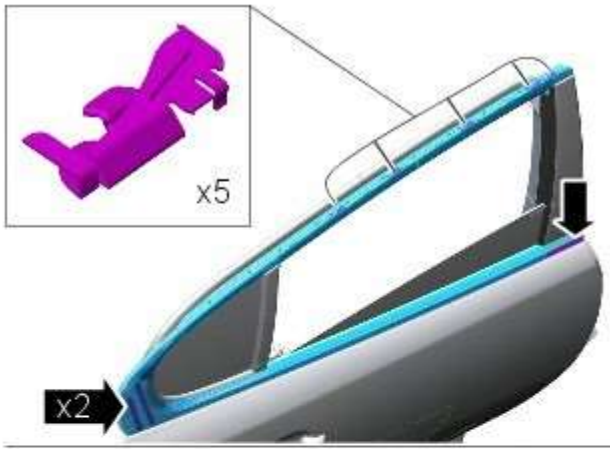


8.

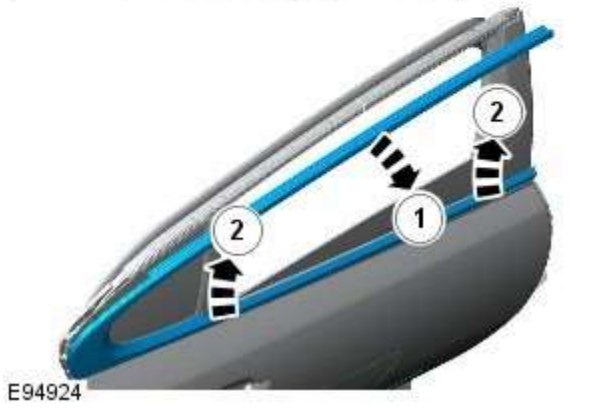


9.



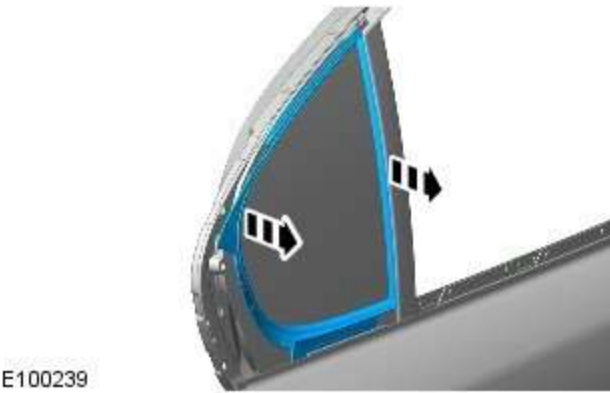


10.  CAUTION: Note the fitted position of the component prior to removal.



E94924

- 11.

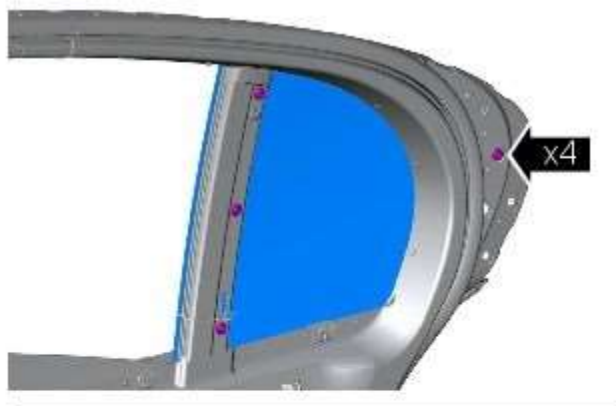


E100239

12.



13.



Installation

1. To install, reverse the removal procedure.
2. Tighten the Torx screws securing the fixed window glass after alignment of the bright external trim.

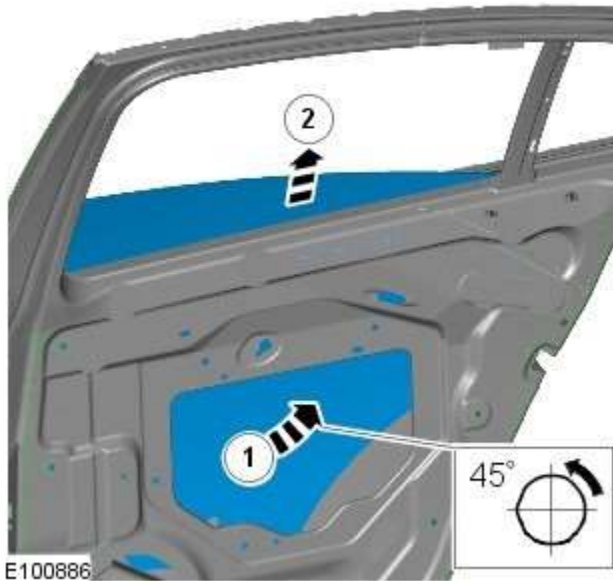
Glass, Frames and Mechanisms - Rear Door Window Glass

Removal and Installation

Removal

1. Refer to: [Rear Door Fixed Window Glass](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).
2. Refer to: [Rear Door Window Regulator and Motor](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).

3.



Installation

1. To install, reverse the removal procedure.

Glass, Frames and Mechanisms - Rear Door Window Regulator and Motor

Removal and Installation

Removal

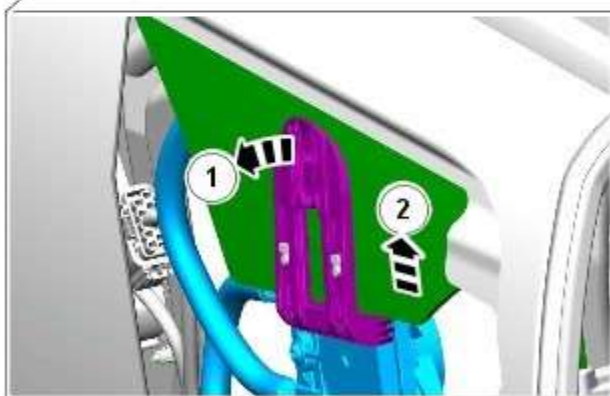
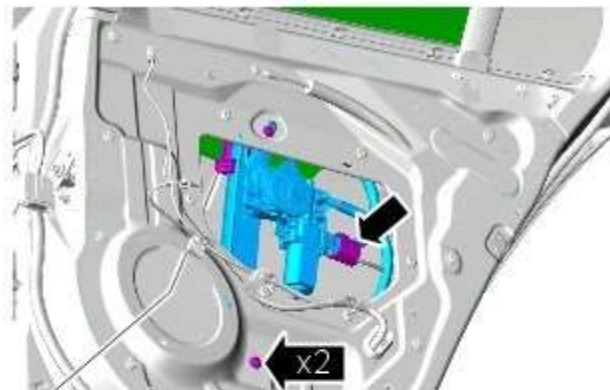
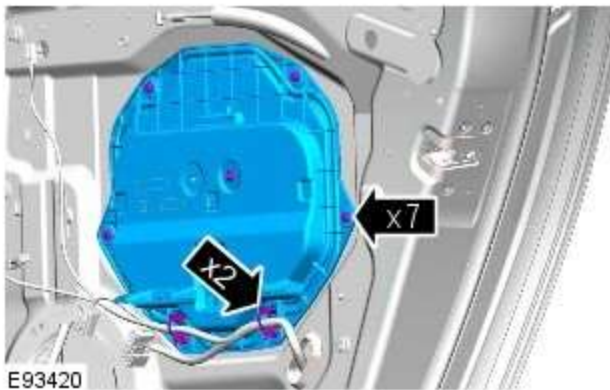


NOTE: Removal steps in this procedure may contain installation details.

1. Remove the rear door speaker.

Refer to: [Rear Door Speaker](#) (415-01A Information and Entertainment System, Removal and Installation).

- 2.



3. WARNING: Do not allow the glass to drop.



NOTE: The door glass should be lowered by approximately one third.

Torque: 7 Nm

Installation

1. To install, reverse the removal procedure.

Glass, Frames and Mechanisms - Rear Window Glass

Removal and Installation

Removal

CAUTIONS:



Always protect paintwork and glass when removing exterior components.



Always protect the interior components when removing body glass.



Lay the glass on felt covered supports. Do not stand on edge as this can cause chips which subsequently develop into cracks.

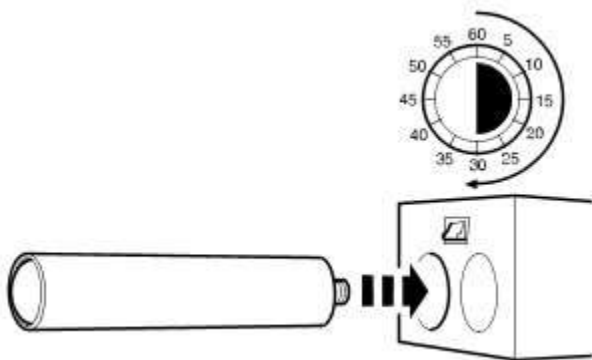


NOTE: The following equipment is required: I Cutting wire and handles I Kent knife I Glazing knife I Windshield replacement kit I Sealant applicator gun I Suction cups I A felt covered table or stand to support glass

1. Refer to: [C-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

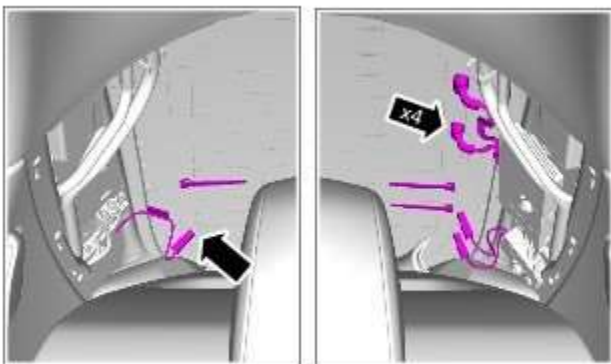
2.

- Remove the polyurethane (PU) adhesive cap and heat the PU adhesive for a minimum of 30 minutes.

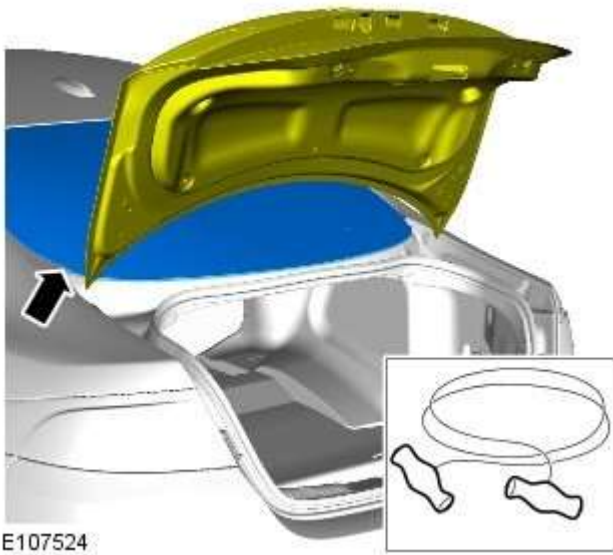


TIE0022871

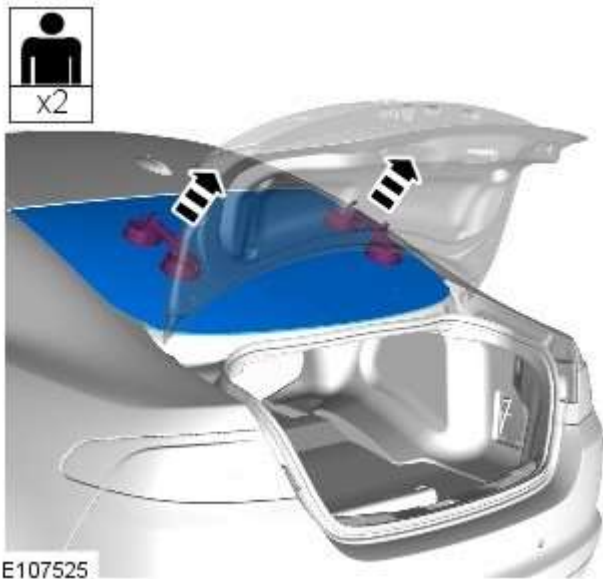
3.



E107523

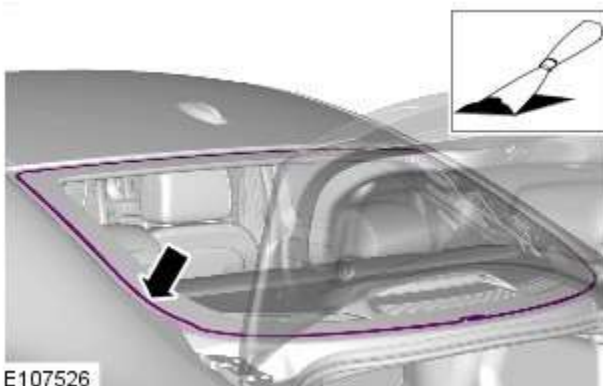


E107524



E107525

Installation



E107526

4. CAUTIONS:



Protect the surrounding components.



Protect the surrounding paintwork to avoid damage.

5.  **WARNING:** This step requires the aid of another technician.

1. CAUTIONS:

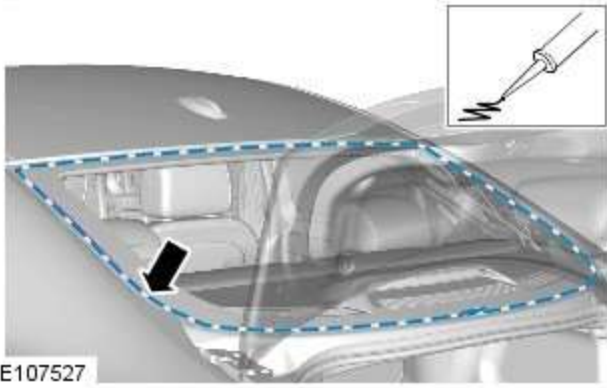


Make sure that the mating faces are clean and free of foreign material.



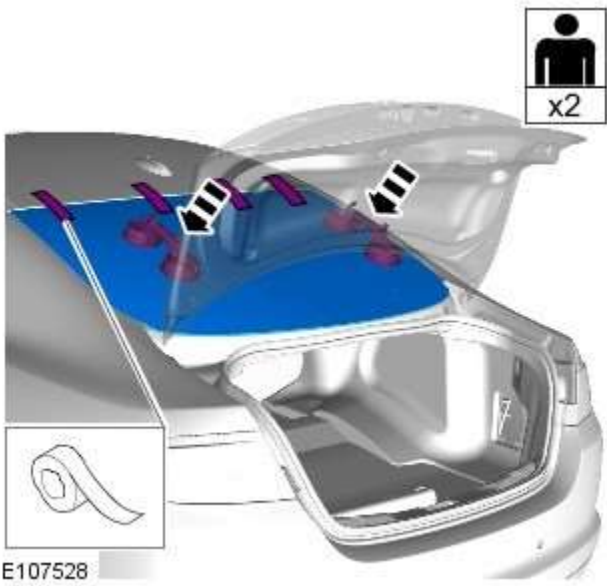
Correct preparation of body apertures "post painting" to ensure satisfactory glass adhesion, must be carried out in line with industry practise.

- Prepare the window glass, window glass flange and trimmed PU adhesive in accordance with the instructions included with the PU adhesive kit.

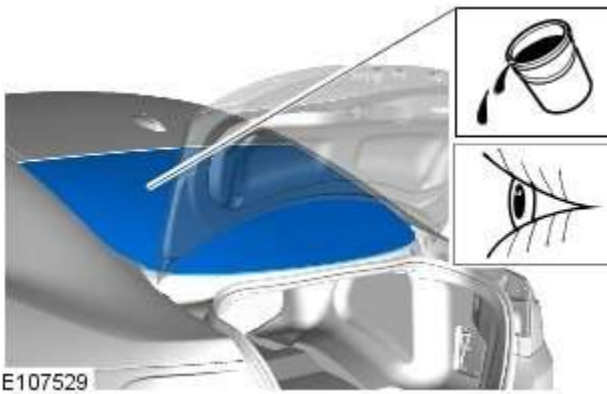



2.  CAUTION: Touching the adhesive surface will impair rebonding.

 NOTE: Install new spacers.



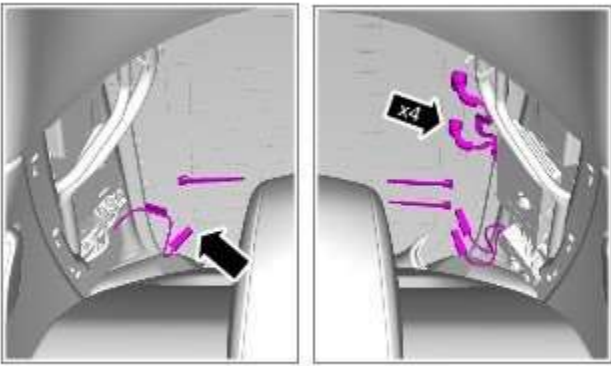
3.



4.  CAUTION: Make sure that no excess sealant residue is evident.

- If water is used as a means for the leak check, then allow sealant to dry before testing.
- Spray water around the windshield glass, mark any area that leaks. Dry the windshield glass and sealant before applying additional sealant.

5.



E107523

6. Refer to: [C-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

Glass, Frames and Mechanisms - Windshield Glass

Removal and Installation

Removal

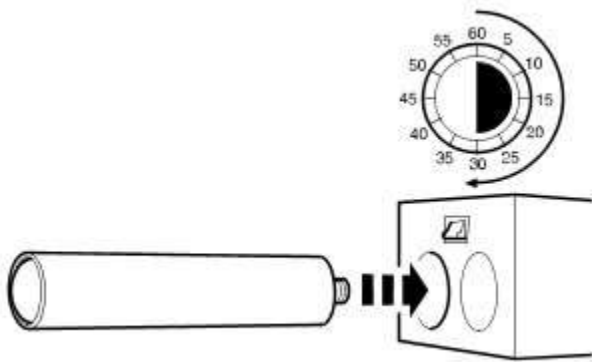


NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).
2. Refer to: [A-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Refer to: [Rain Sensor](#) (501-16 Wipers and Washers, Removal and Installation).

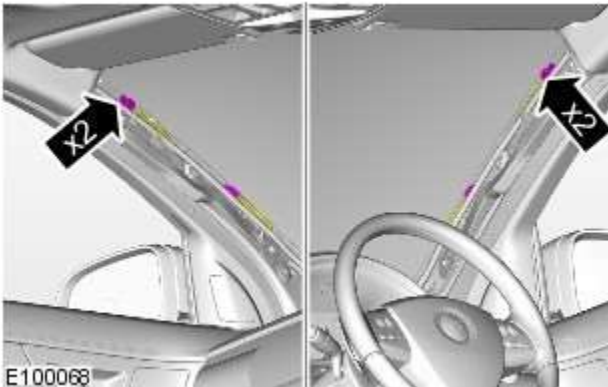
4.

- Remove the polyurethane (PU) adhesive cap and heat the PU adhesive for a minimum of 30 minutes.

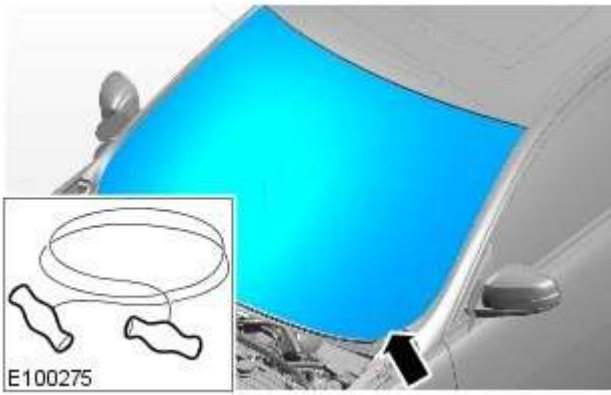


TIE0022871

5.



E100068



6. CAUTIONS:



Protect the surrounding components.

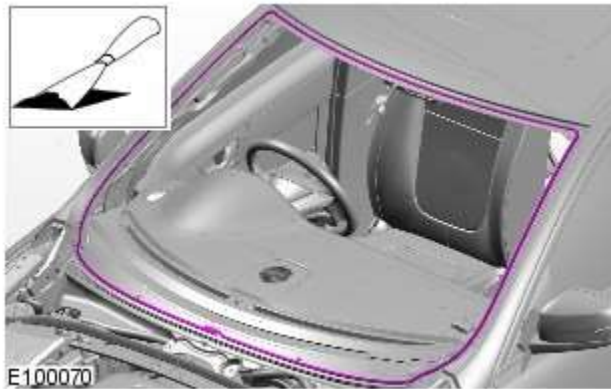


Protect the surrounding paintwork to avoid damage.



7.  **WARNING:** This step requires the aid of another technician.

Installation



1. CAUTIONS:

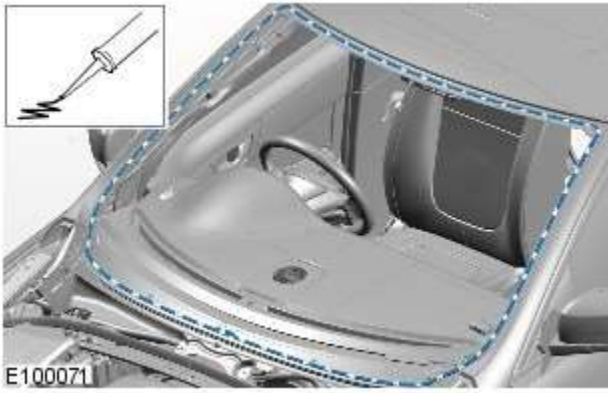



Make sure that the mating faces are clean and free of foreign material.

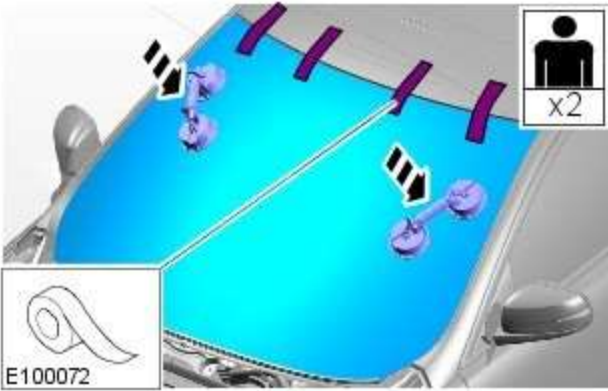


Correct preparation of body apertures "post painting" to ensure satisfactory glass adhesion, must be carried out in line with industry practise.

- Prepare the window glass, window glass flange and trimmed PU adhesive in accordance with the instructions included with the PU adhesive kit.




2.  **CAUTION:** Touching the adhesive surface will impair rebonding.



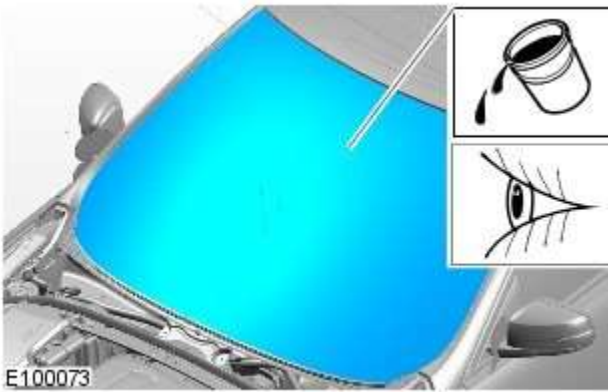
3.  **WARNING:** This step requires the aid of another technician.


CAUTIONS:

 Make sure that the component is correctly located on the locating dowels.

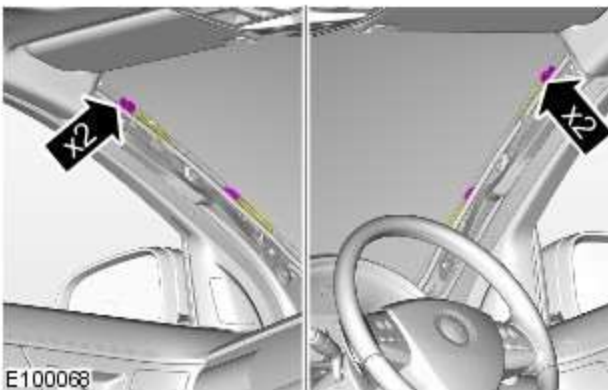
 Make sure that equal pressure is applied to the full length of the component.

- If the ambient temperature falls below 10 degrees C, apply warm air (25 degrees C) continuously for 15 minutes.



4.  **CAUTION:** Make sure that no excess sealant residue is evident.

- If water is used as a means for the leak check, then allow sealant to dry before testing.
- Spray water around the windshield glass, mark any area that leaks. Dry the windshield glass and sealant before applying additional sealant.



- 5.

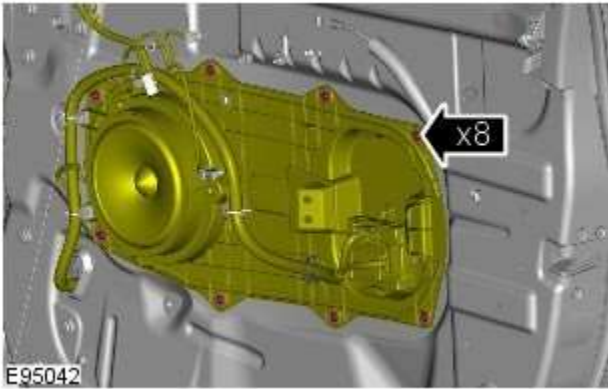
6. Refer to: [Rain Sensor](#) (501-16 Wipers and Washers, Removal and Installation).
7. Refer to: [A-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
8. Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).

Glass, Frames and Mechanisms - Door Window Regulator Motor

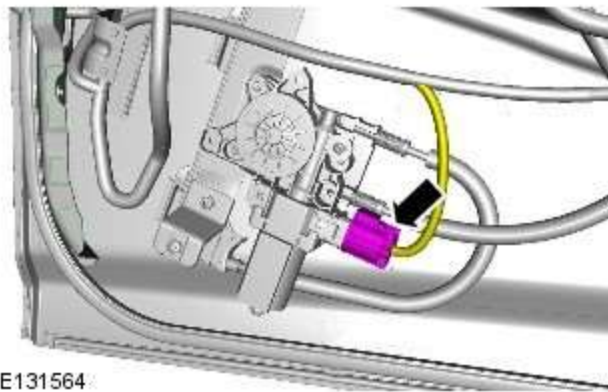
Removal and Installation

Removal

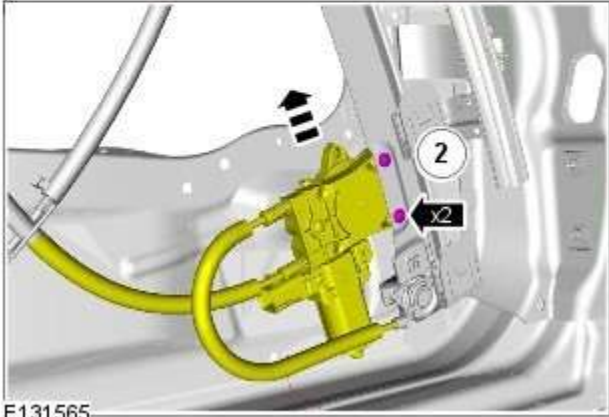
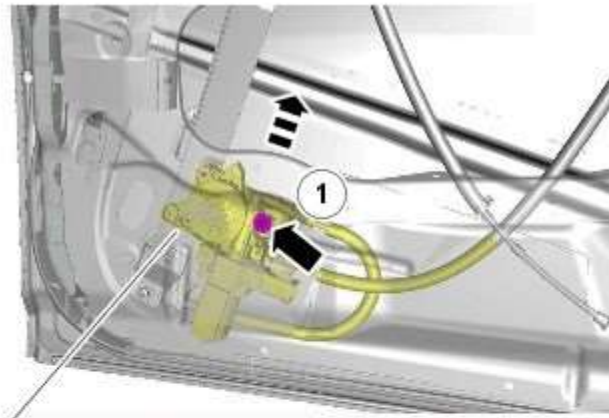
1. Refer to: [Front Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



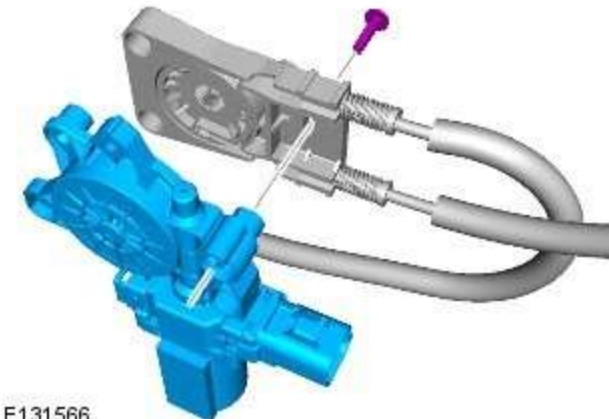
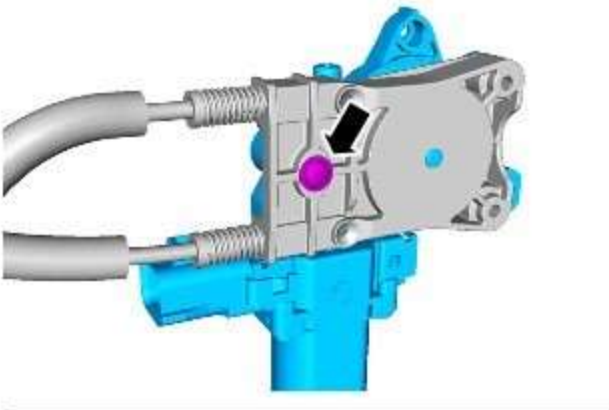
2.  NOTE: Right-hand shown, left-hand similar.



3.  NOTE: Components removed for clarity.



E131565



E131566

4. NOTES:




Make sure the door window glass is in the fully closed position.

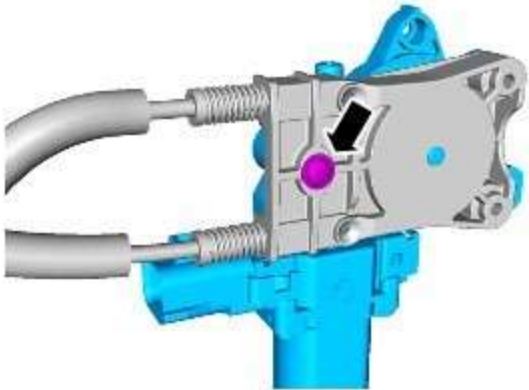


Components removed for clarity.

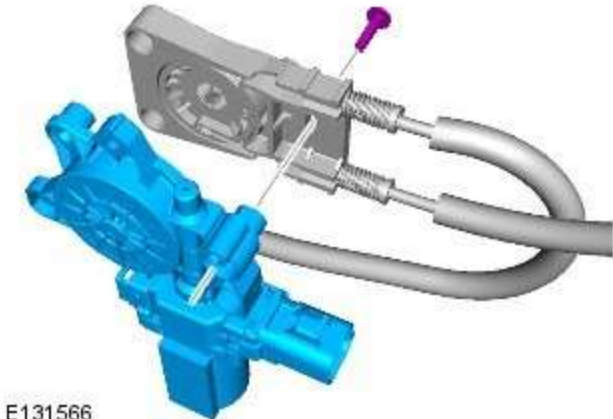
- Apply suitable adhesive tape to the door window glass and over the door frame, to prevent the door window glass from damage.

5.  CAUTION: Make sure the drum remains in position. Use a suitable flat blade screwdriver to secure the drum while separating the motor.

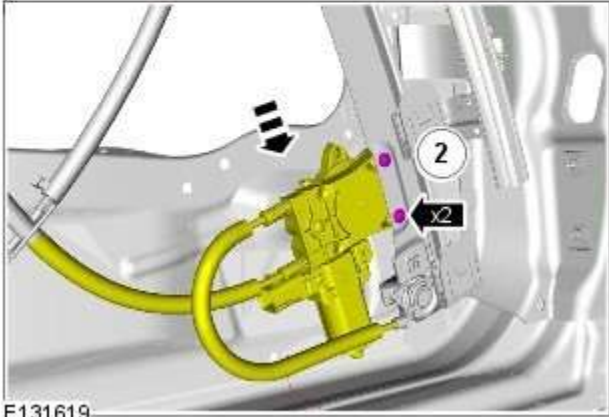
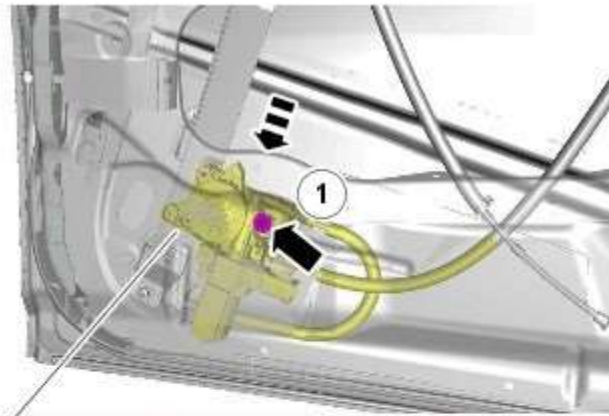
Installation



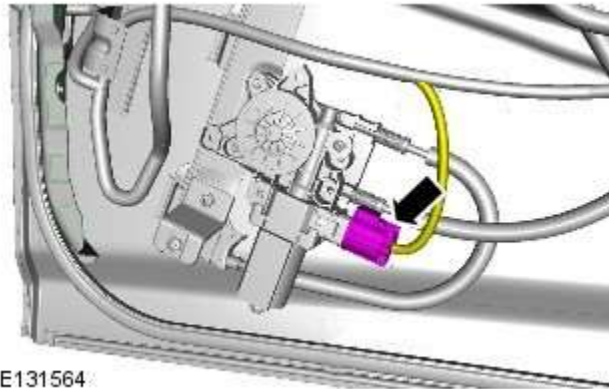
- 1. • Torque: 5 Nm



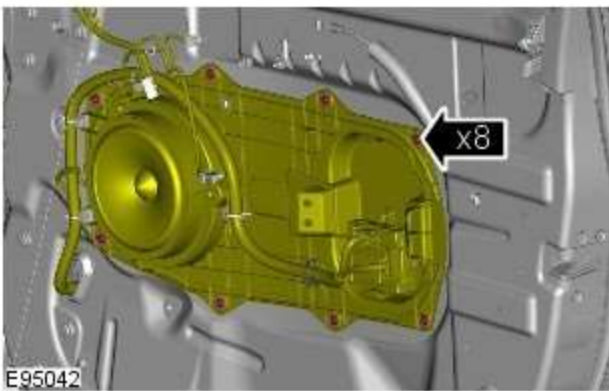
E131566



E131619



E131564



E95042

2. CAUTIONS:

 Install all the bolts finger tight before final tightening.

 Care must be taken not to damage the outer door panel.

- Install the retaining bolt 1 to the witness mark on the body.

- *Torque:*
 - 1 1.9 Nm
 - 2 5 Nm

3.  NOTE: Components removed for clarity.

4.  NOTE: Right-hand shown, left-hand similar.

- *Torque:* 1.5 Nm

5. Refer to: [Front Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

Instrument Panel and Console -

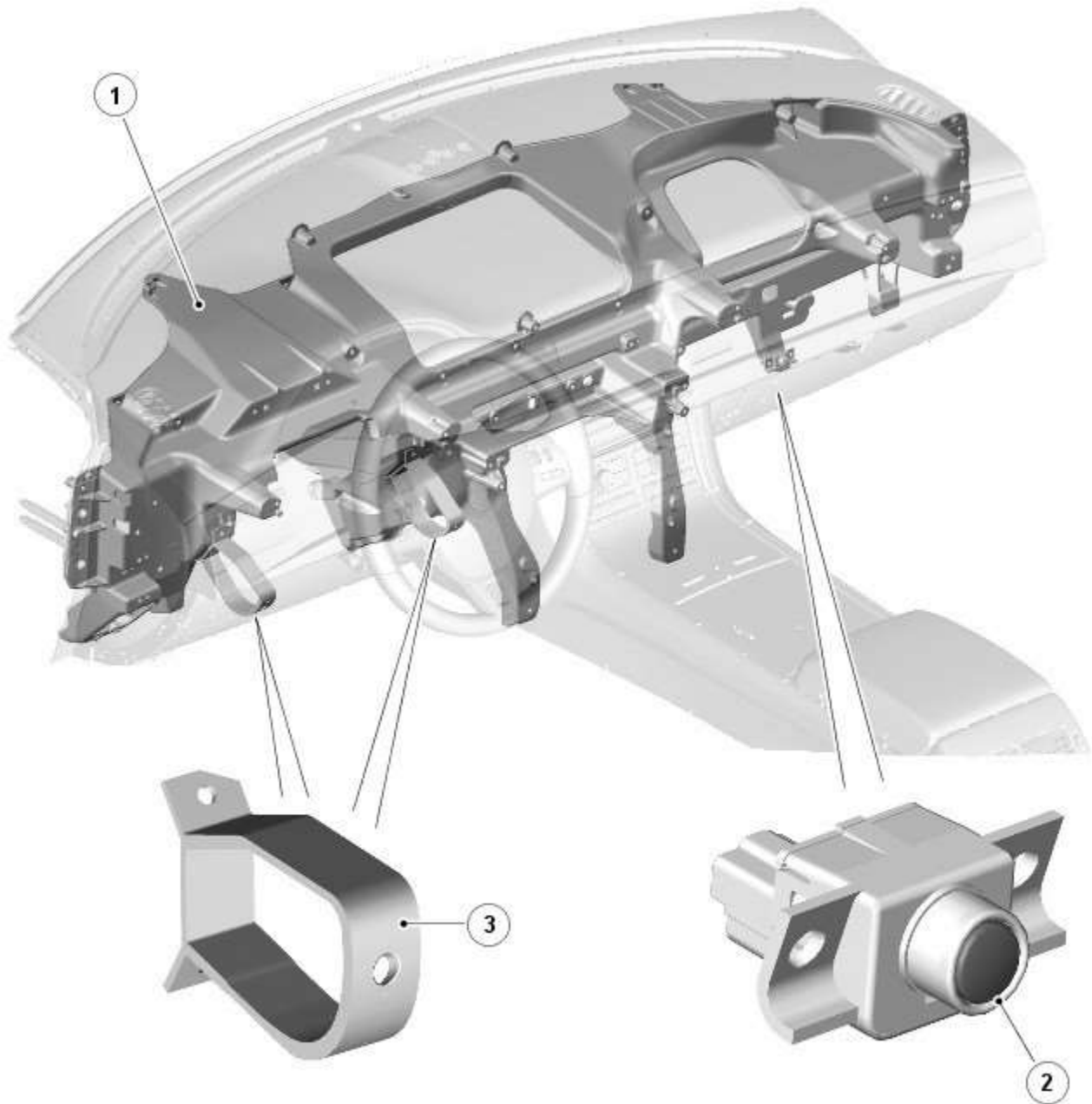
Torque Specifications

Description	Nm	lb-ft	lb-in
Instrument panel retaining bolts	20	15	-
Floor console retaining nuts	5	-	44
Instrument panel support brackets retaining bolts	9	-	80
Instrument panel support brackets retaining nuts	9	-	80

Instrument Panel and Console - Instrument Panel - Component Location

Description and Operation

COMPONENT LOCATION



E129713

Item	Description
1	Cross car beam
2	Glovebox switch
3	Energy absorbing brackets (2 off)

Instrument Panel and Console - Instrument Panel - Overview

Description and Operation

OVERVIEW

The instrument panel incorporates a magnesium cross car beam. North American Specification (NAS) vehicles also feature a pair of energy absorbing brackets. The energy absorbing brackets are mounted behind the driver's side of the instrument panel. Each is secured to the cross car beam by 2 screws.

The cross car beam acts as a support and provides mounting points for the instrument panel top pad. The instrument panel top pad supports various other system components. These include ducting, vents and registers for the climate control system and the passenger airbag. For additional information, refer to:

[Air Distribution and Filtering](#) (412-01 Climate Control, Description and Operation),

[Safety Belt System](#) (501-20A Safety Belt System, Description and Operation),

[Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) (501-20B Supplemental Restraint System, Description and Operation),

[Pedestrian Protection System](#) (501-20C Pedestrian Protection System, Description and Operation).

Instrument Panel and Console - Instrument Panel - System Operation and Component Description

Description and Operation

System Operation

GLOVEBOX SWITCH OPERATION

The [CJB \(central junction box\)](#) provides a battery voltage supply to the switch via the delayed power off relay. When the glovebox switch is pressed, the voltage signal is passed to the [CJB](#). If the correct conditions exist then the [CJB](#) then provides a power supply to operate the glovebox latch to unlock the glovebox.

The glove box opening is inhibited by the [CJB](#) if the anti-theft alarm system is armed and if valet mode is selected using the Touch Screen Display (TSD). The [CJB](#) detects the voltage signal from the switch but will not operate the glovebox latch if other condition exists.

Component Description

GLOVEBOX SWITCH DESCRIPTION

The conventional glove box switch is located behind the instrument panel veneer. The round button of the switch is visible through an aperture in the veneer.

Two screws hold the switch in position behind the veneer. The veneer panel has two bosses which the screws are threaded into.

Instrument Panel and Console - Floor Console

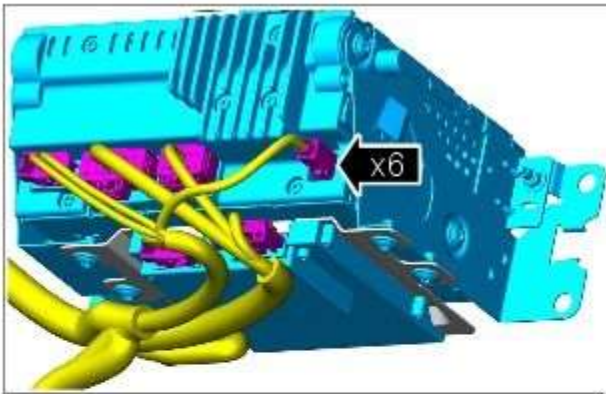
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Floor Console Cup Holder](#) (501-12 Instrument Panel and Console, Removal and Installation).



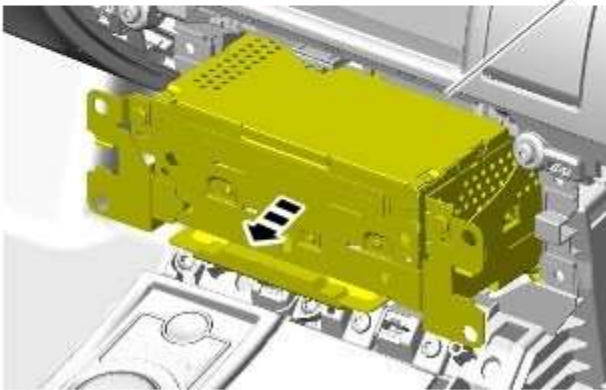
3. CAUTIONS:



Protect the surrounding trim to avoid damage.



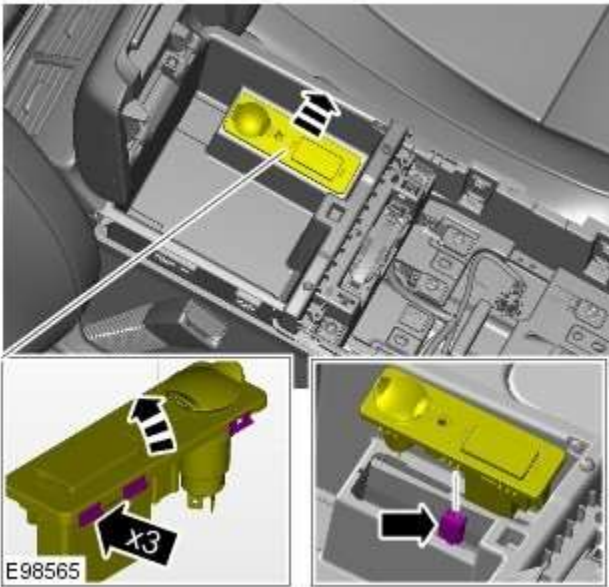
Cover fiber optic cable connectors to minimize dust ingress and avoid bending the cables in a radius of less than 30 mm.



E95329

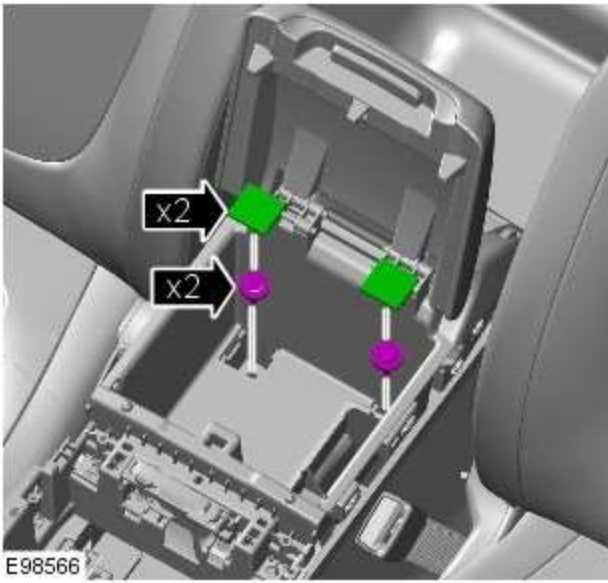


4. Torque: 9 Nm

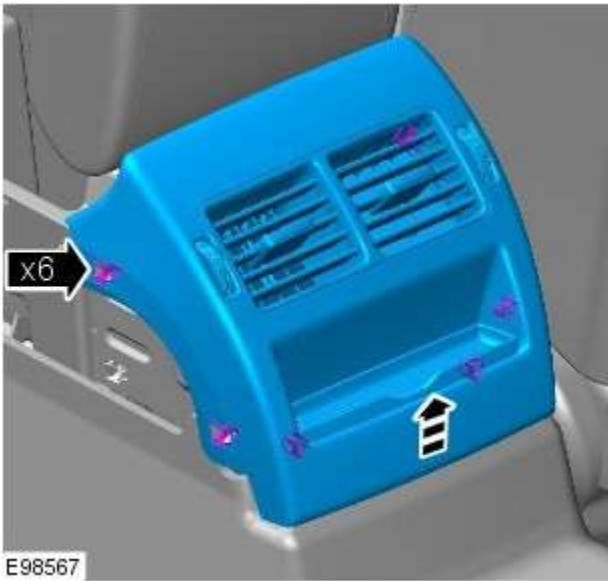


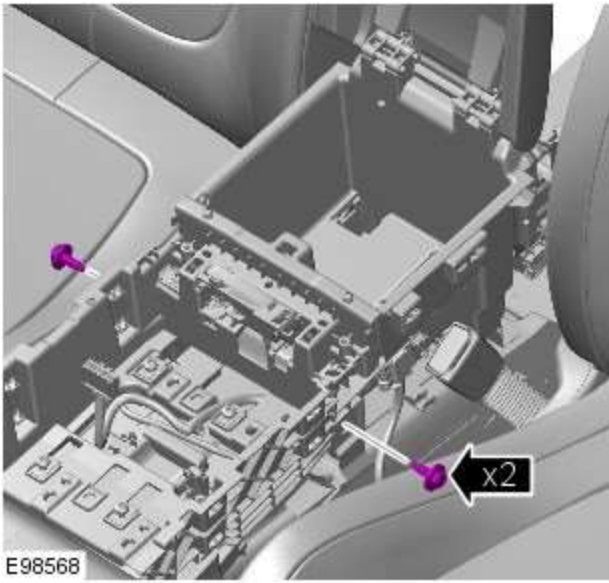
5.

6. Torque: 6 Nm

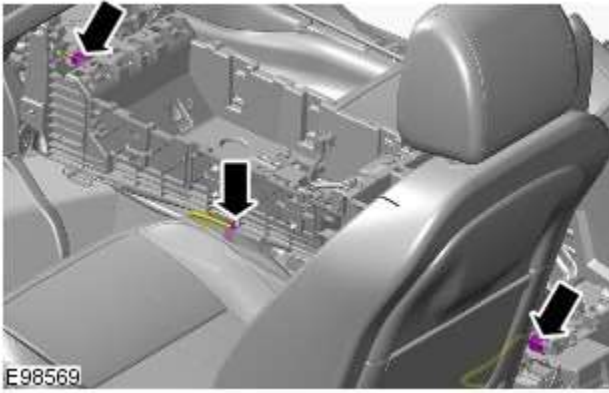


7.



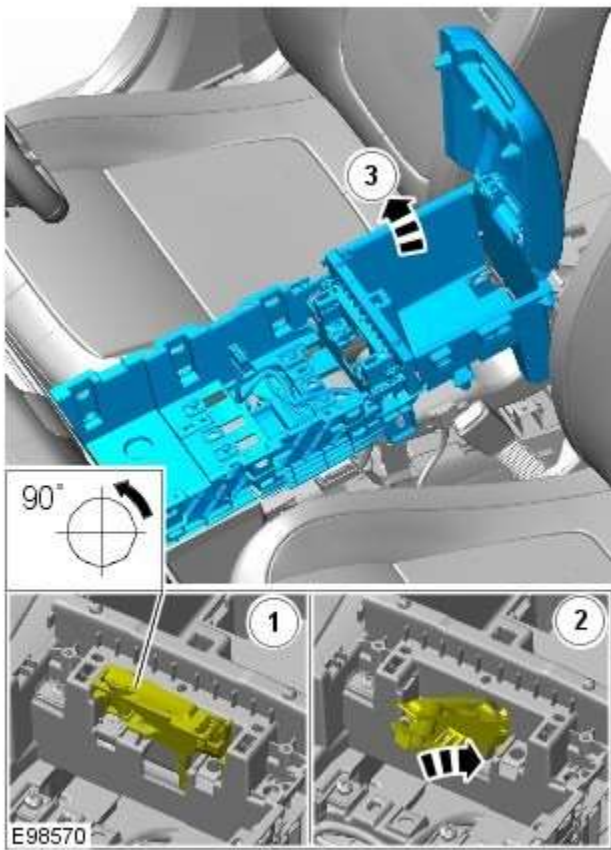


8. Torque: 6 Nm



9.

10.



Installation

1. To install, reverse the removal procedure.

Instrument Panel and Console - Floor Console Cup Holder

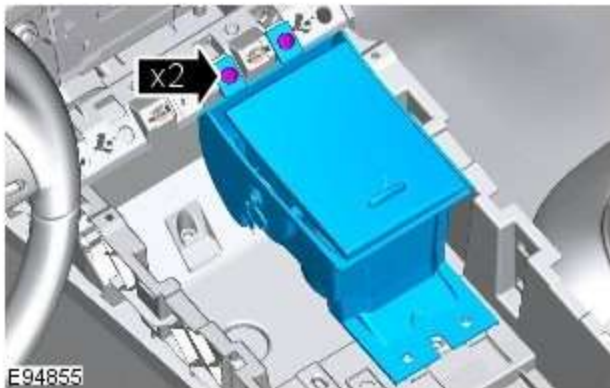
Removal and Installation

Removal


 NOTE: Removal steps in this procedure may contain installation details.

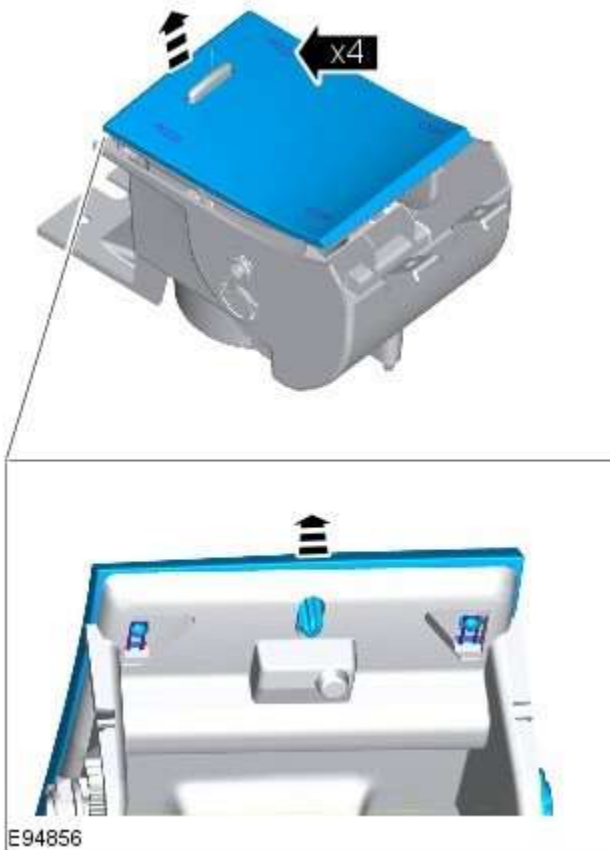
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Floor Console Double Cup Holder](#) (501-12 Instrument Panel and Console, Removal and Installation).

3.



4.  CAUTION: Take extra care not to damage the component.

 NOTE: Do not disassemble further if the component is removed for access only.



Installation

1.  NOTE: Make sure that the veneer trim panel is correctly installed and secured.

To install, reverse the removal procedure.

Instrument Panel and Console - Floor Console Double Cup Holder

Removal and Installation

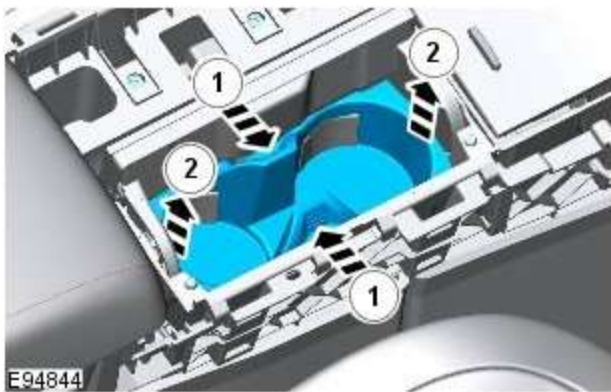
Removal



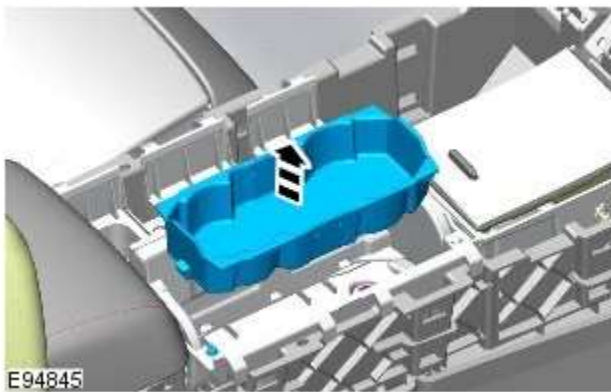
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Transmission Control Switch \(TCS\)](#) (307-05A Automatic Transmission/Transaxle External Controls - V6 3.0L Petrol, Removal and Installation).

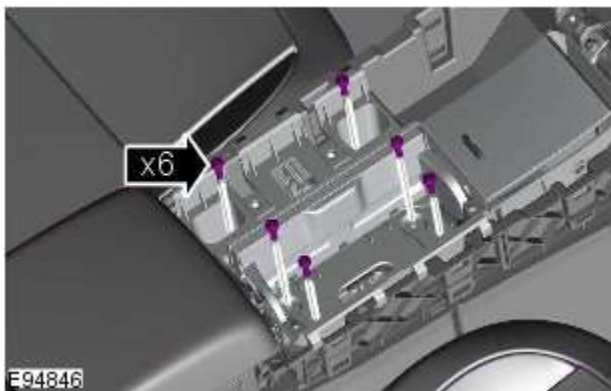
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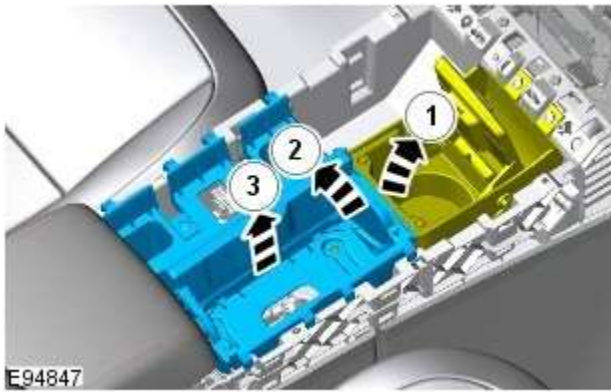
4.



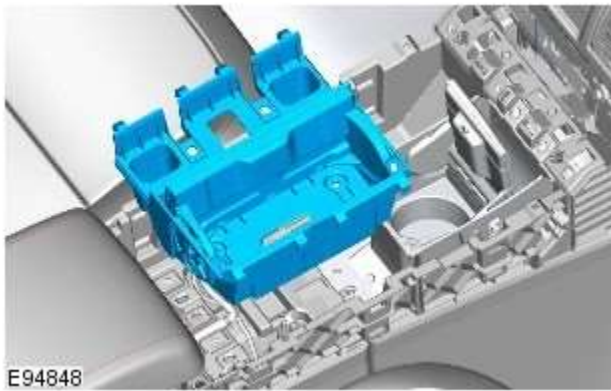
5.



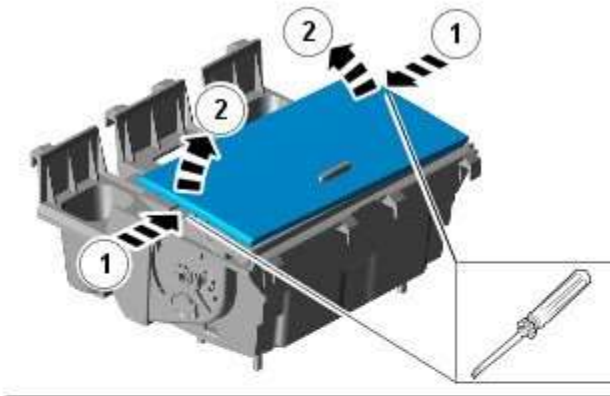
6. Open the floor console single cup holder.



7. Carefully release the front edge of the floor console double cup holder from under the rear edge of the floor console single cup holder.



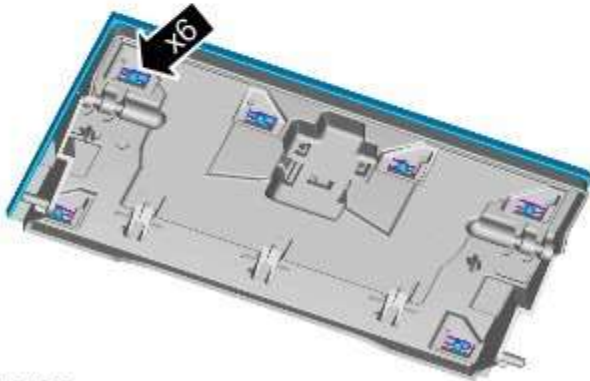
8.



9.  CAUTION: Take extra care not to damage the component.

2

-  NOTE: Do not disassemble further if the component is removed for access only.



E94849

Installation

1.  NOTE: Make sure that the veneer trim panel is correctly installed and secured.

To install, reverse the removal procedure.

Instrument Panel and Console - Floor Console Side Trim Panel

Removal and Installation

Removal

NOTES:

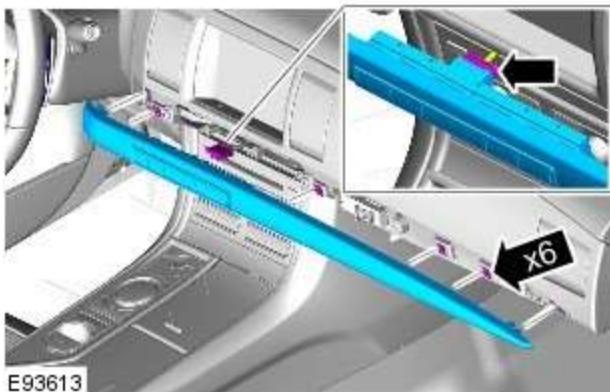


LHD right-hand floor console side trim panel shown, LHD left-hand and both RHD floor console side trim panels are similar.

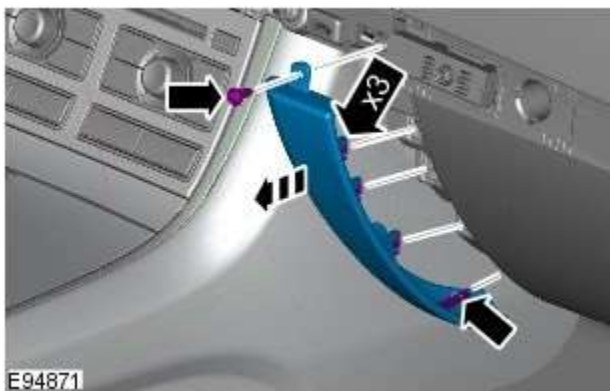


Removal steps in this procedure may contain installation details.

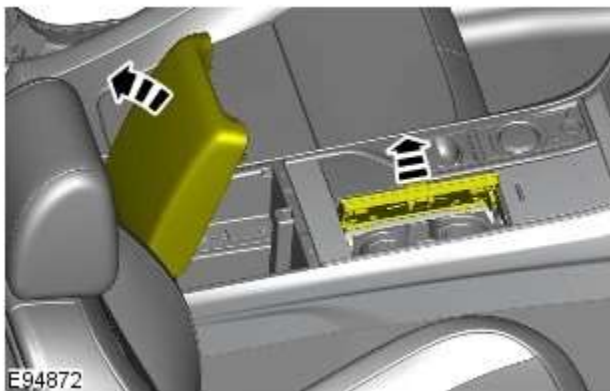
1. Recline the front seats and move to the rear most position.



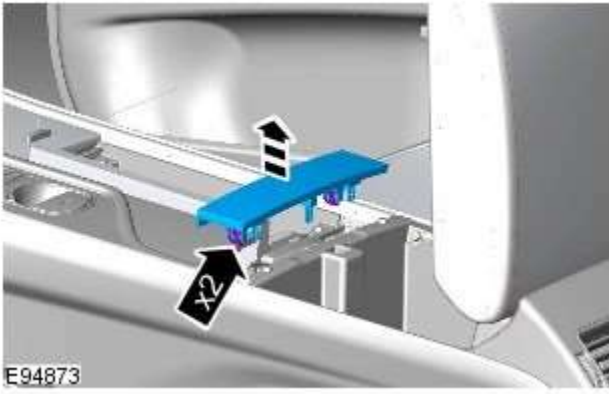
2. NOTE: When removing the component, some of the clips may remain attached. These clips should be removed and returned to their original positions in the instrument panel.



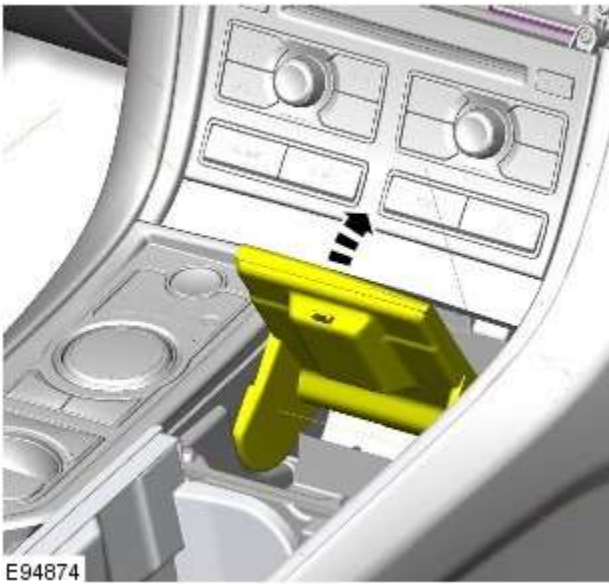
- 3.



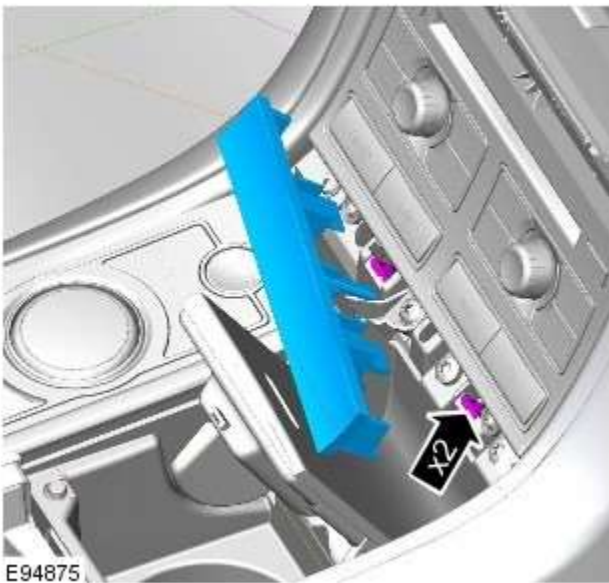
- 4.




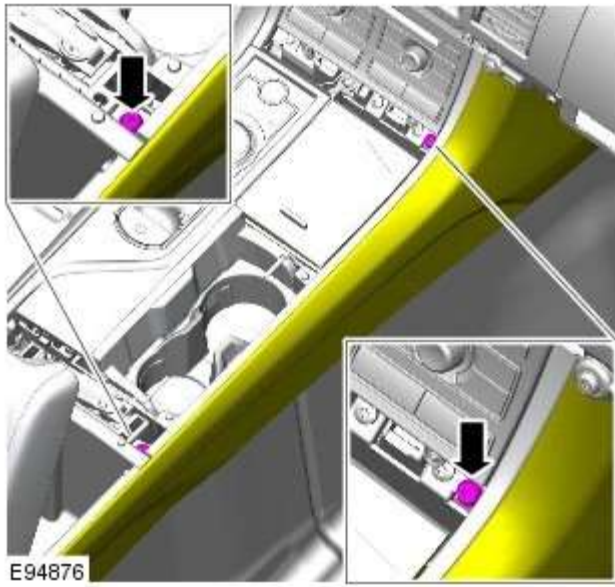
5.



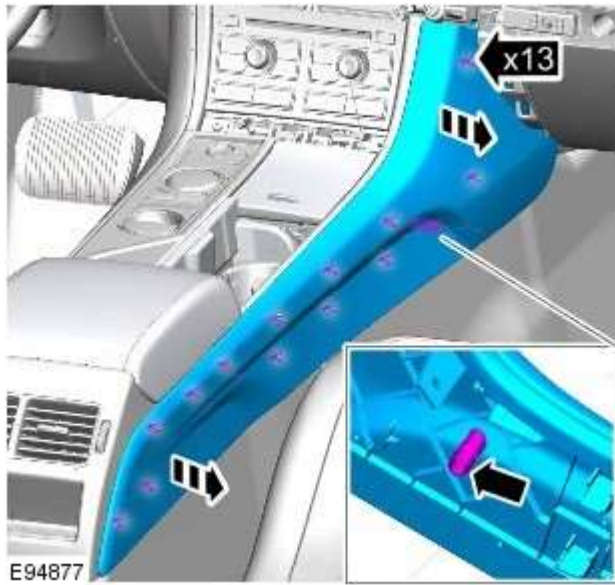
6.



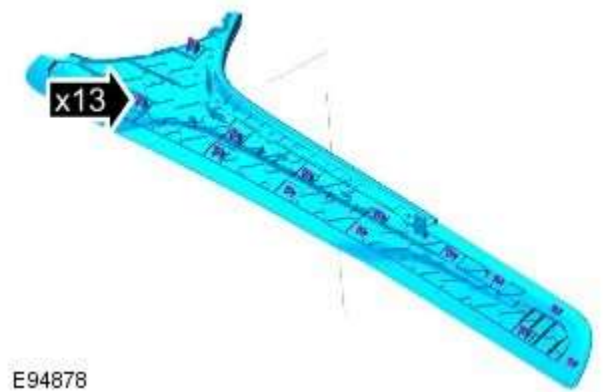
7.  NOTE: When removing the component, some of the clips may remain attached. These clips should be removed and returned to their original positions in the center console.




8.

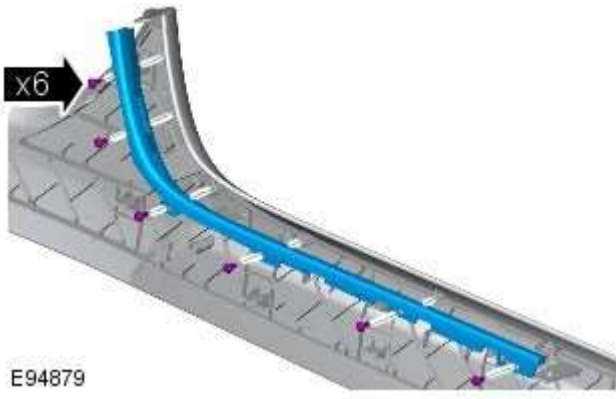


9.



10.  NOTE: Do not disassemble further if the component is removed for access only.

11.



Installation

1.  NOTE: Make sure that the veneer trim panel is correctly installed and secured.

To install, reverse the removal procedure.

Instrument Panel and Console - Glove Compartment

Removal and Installation

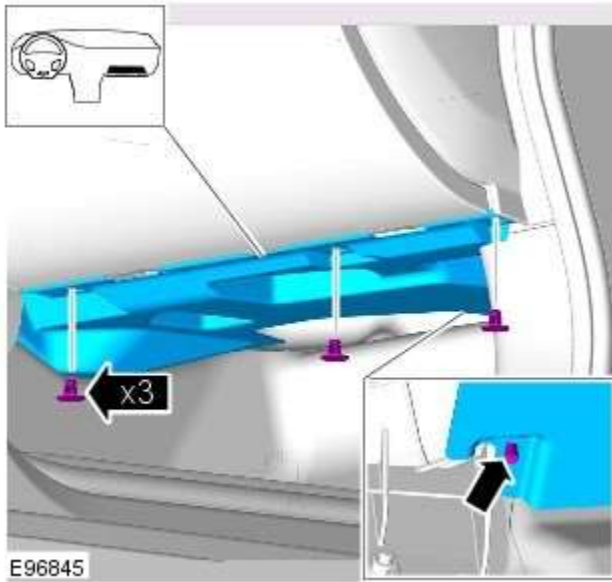
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Passenger Side Register](#) (412-01 Climate Control, Removal and Installation).

2.



3.



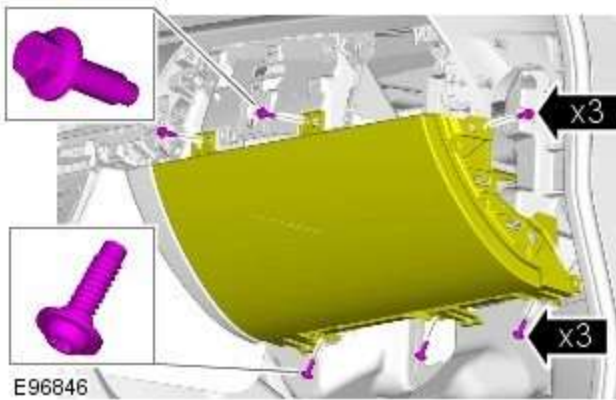
CAUTION: Fixings must be started by hand to avoid damaging threads.

- Upper 3 bolts.

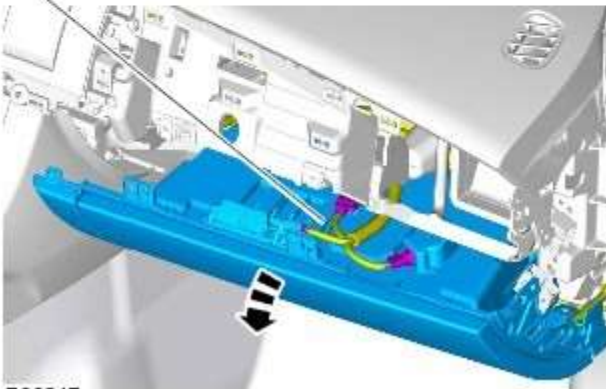
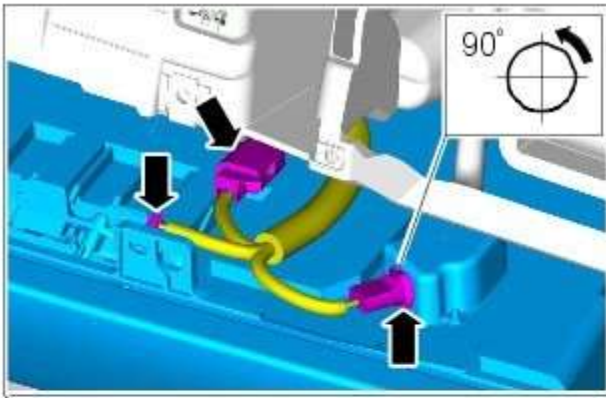
Torque: 2.5 Nm

- Lower 3 bolts.

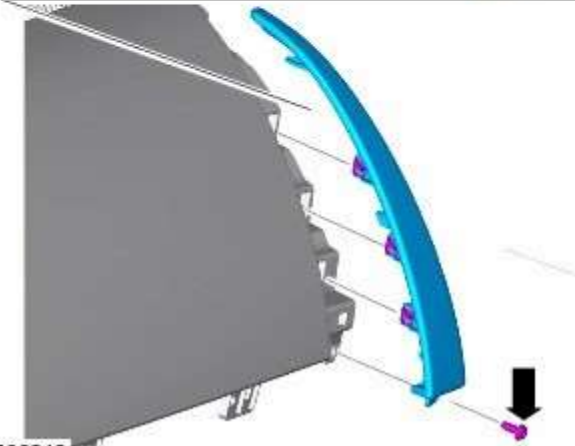
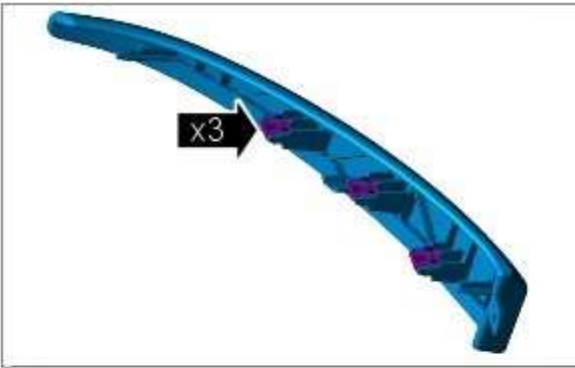
Torque: 9 Nm




4.



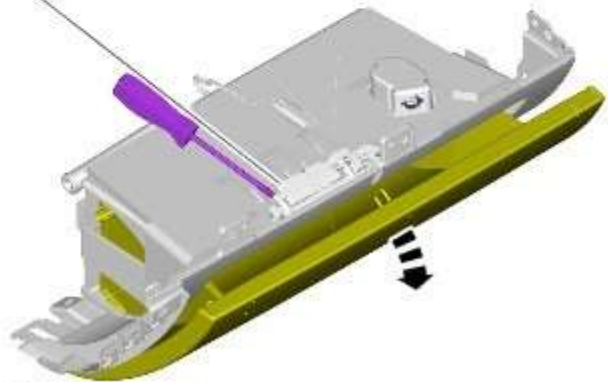
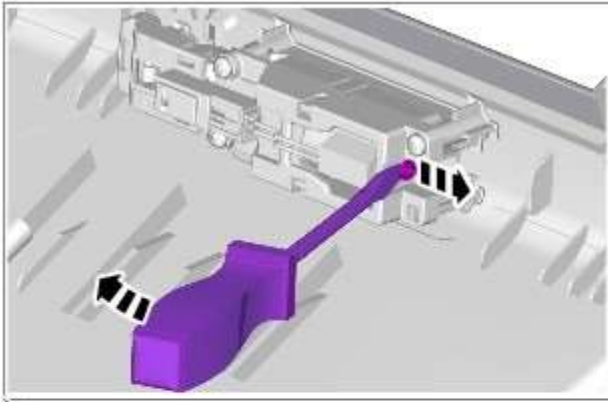
E96847



E96848

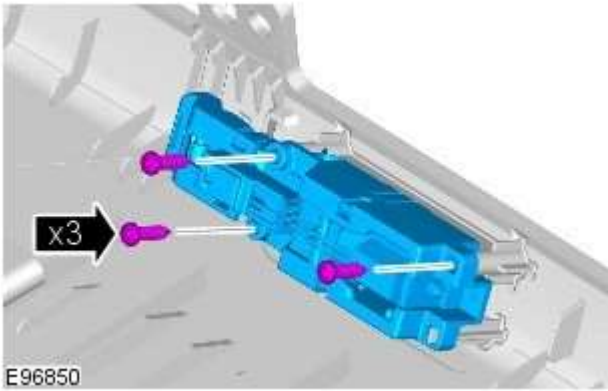
5.  NOTE: Do not disassemble further if the component is removed for access only.

6. Using a screwdriver, carefully release the latch and open the glove compartment.



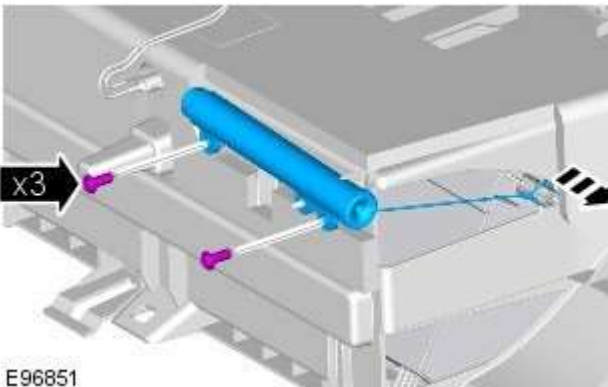
E96849

- 7.



E96850

- 8.



E96851


Installation

1. To install, reverse the removal procedure.

Instrument Panel and Console - Instrument Panel Console

Removal and Installation

Special Tool(s)

 <p>E116457</p>	<p>303-1496 Heater Hose Removal Tool</p>
--	--

Removal

CAUTIONS:



Inspect the seals, replace if damaged.



Inspect the O-rings, replace if damaged.



NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).



2. **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

Vehicles with supercharger

3. Refer to: [Cooling System Draining, Filling and Bleeding - V8 S/C 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

Vehicles without supercharger

4. Refer to: [Cooling System Draining, Filling and Bleeding - V8 5.0L Petrol](#) (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

Vehicles with diesel engine

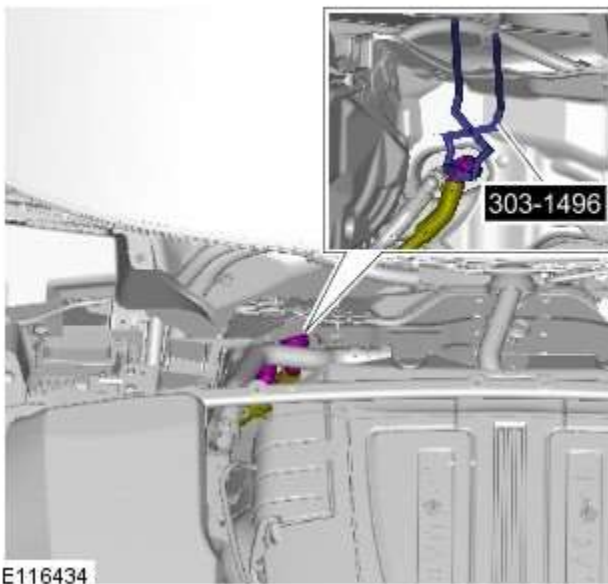
5. Refer to: [Cooling System Draining, Filling and Bleeding](#) (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

All vehicles

6. Refer to: [Air Conditioning \(A/C\) System Recovery, Evacuation and Charging](#) (412-00 Climate Control System - General Information, General Procedures).

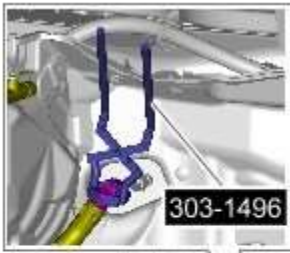
7. Refer to: [Secondary Bulkhead Center Panel](#) (501-02 Front End Body Panels, Removal and Installation).


8. Refer to: [Floor Console](#) (501-12 Instrument Panel and Console, Removal and Installation).
9. Refer to: [Glove Compartment](#) (501-12 Instrument Panel and Console, Removal and Installation).
10. Refer to: [Instrument Panel Lower Trim Panel](#) (501-12 Instrument Panel and Console, Removal and Installation).
11. Refer to: [A-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
12. Refer to: [Cowl Side Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
13. Refer to: [Steering Wheel](#) (211-04 Steering Column, Removal and Installation).

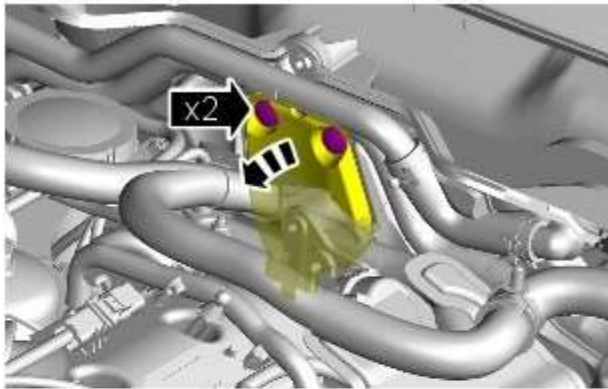


14.  CAUTION: Be prepared to collect escaping coolant.

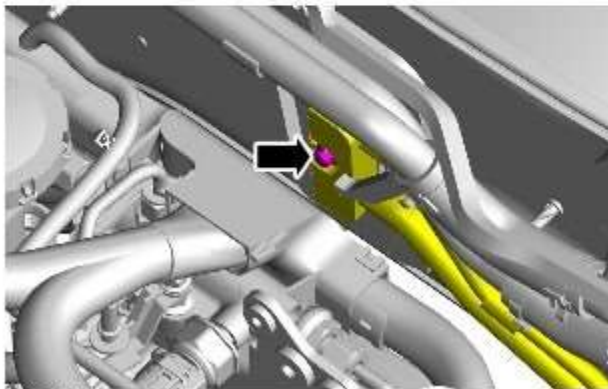
Special Tool(s): [303-1496](#)

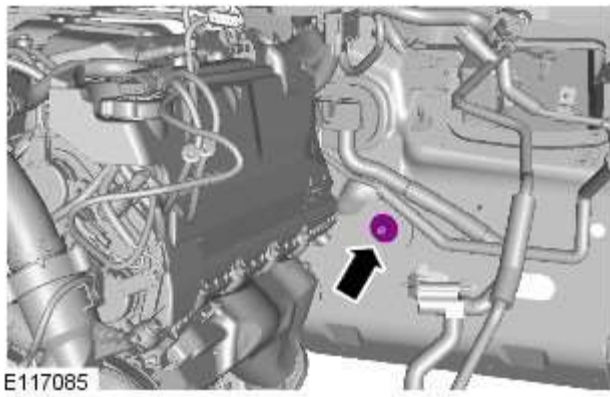


15.  CAUTION: Be prepared to collect escaping coolant.
Special Tool(s): [303-1496](#)

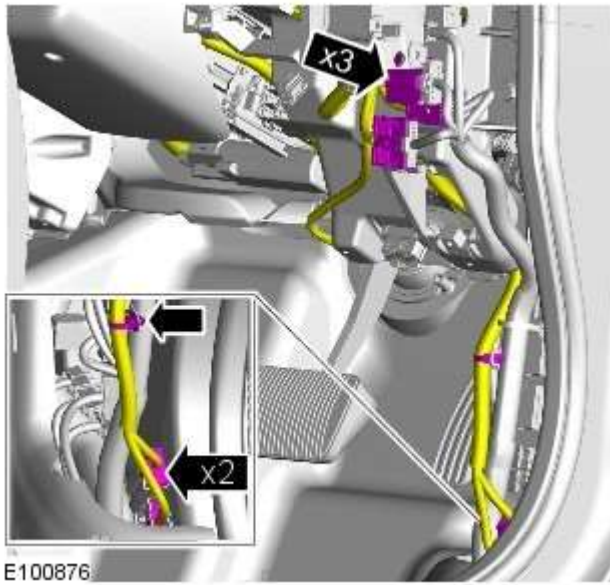


16.  CAUTION: Take care not to damage the O-ring seals during installation.
Torque: 9 Nm

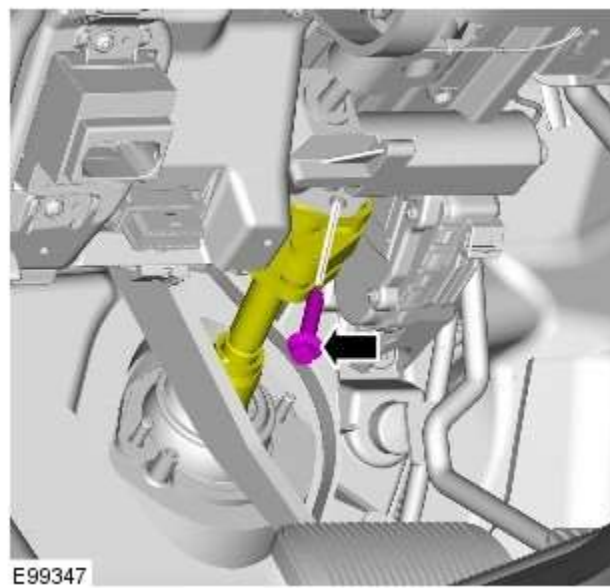




17. Torque: 4 Nm

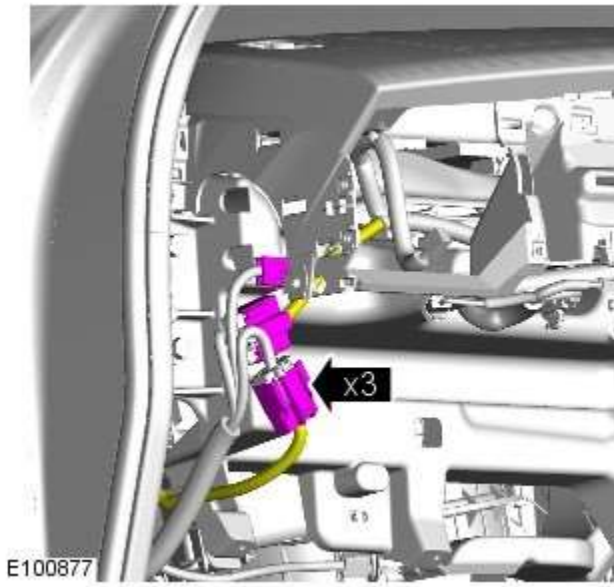


18.



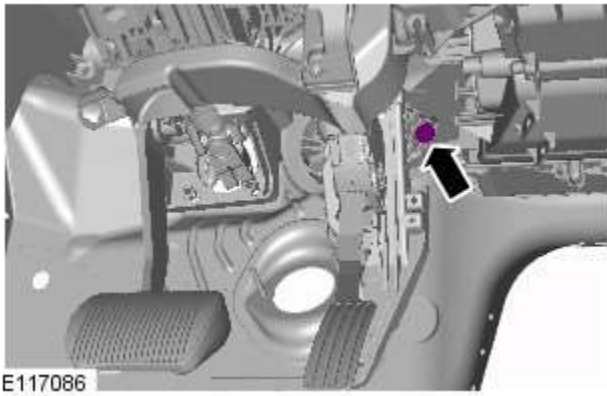
19. Torque: 30 Nm

20.



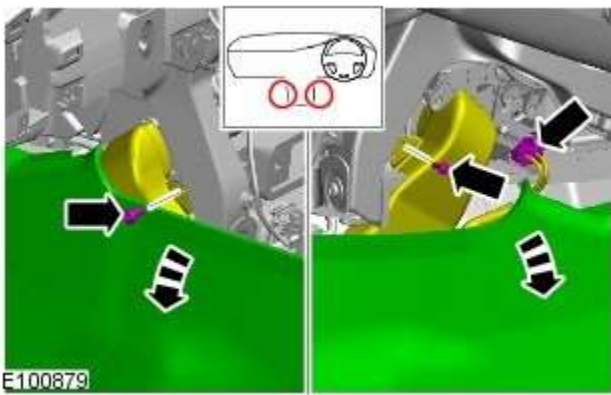
Left-hand drive vehicles

21. Torque: 4 Nm

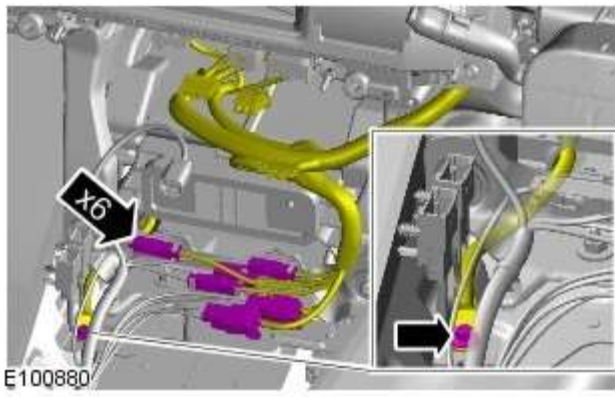


All vehicles

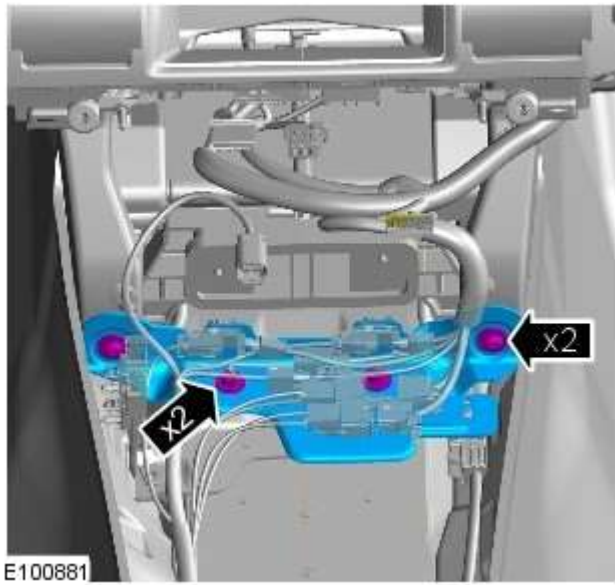
22.



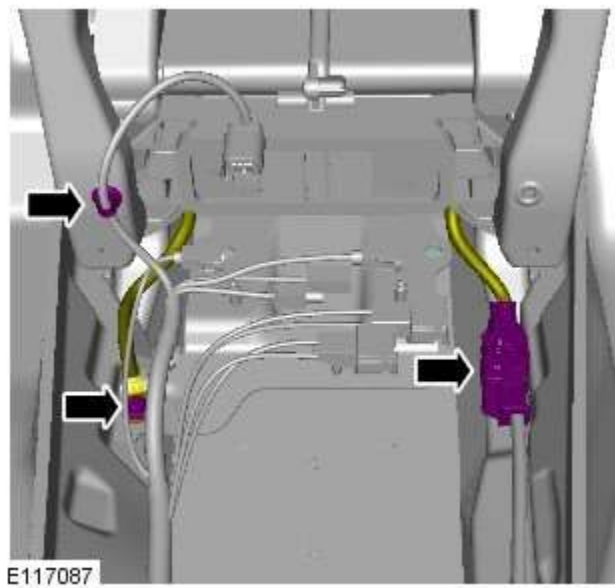
23. Torque: 12 Nm



24. Torque: 9 Nm



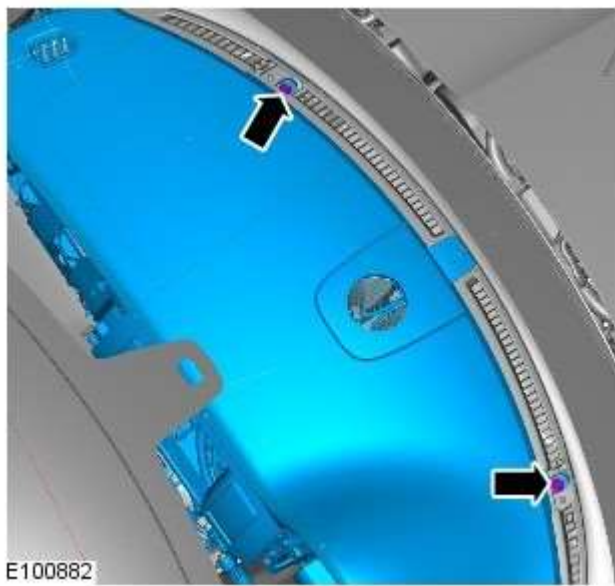
25.



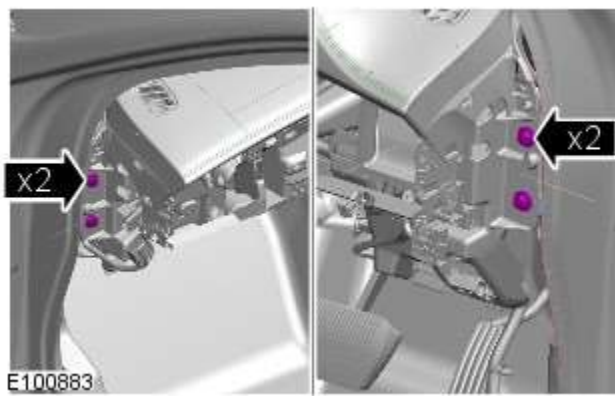
26.

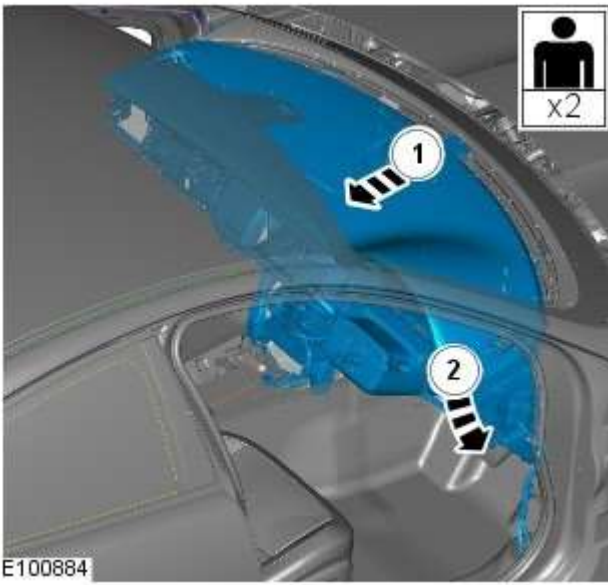


27. Torque: 20 Nm






28. Torque: 20 Nm





29. CAUTIONS:

-  Be prepared to collect escaping coolant.
-  Protect the surrounding paintwork to avoid damage.
-  Protect the surrounding trim to avoid damage.

Installation

1. To install, reverse the removal procedure.

Instrument Panel and Console - Instrument Panel Lower Trim Panel

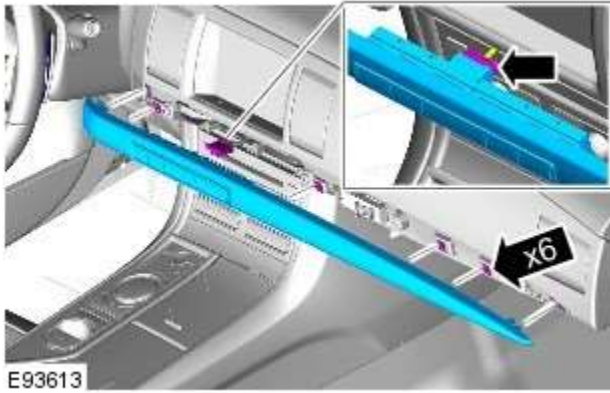
Removal and Installation

Removal

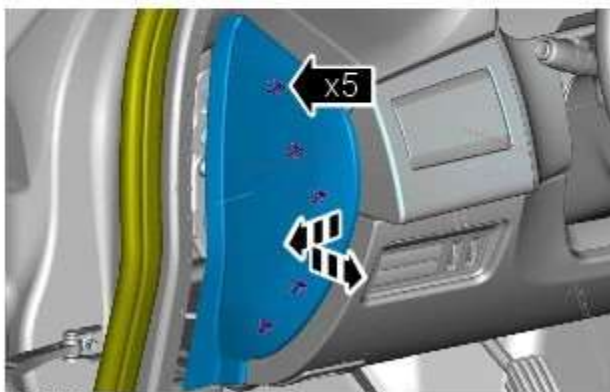


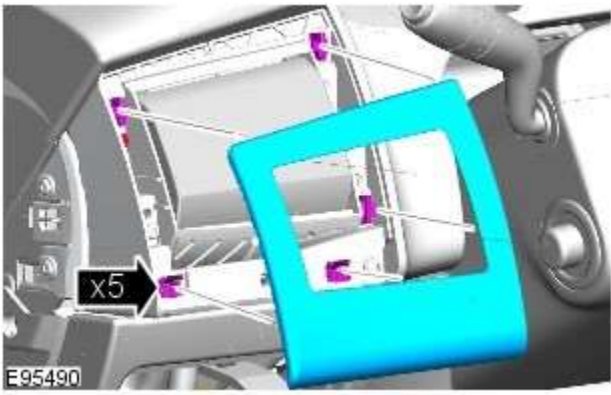
NOTE: Removal steps in this procedure may contain installation details.

1.



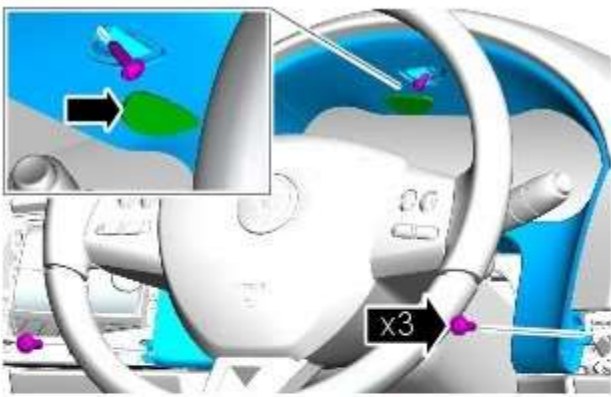
2.



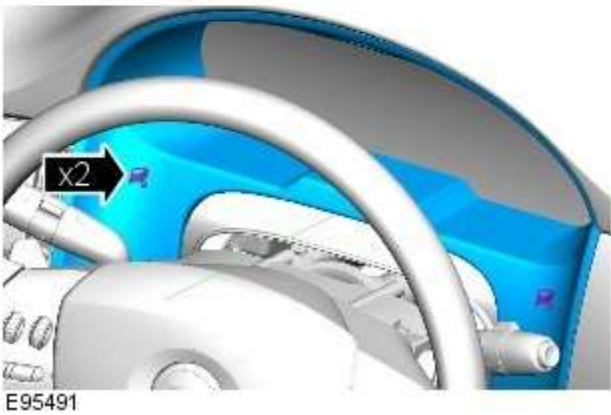


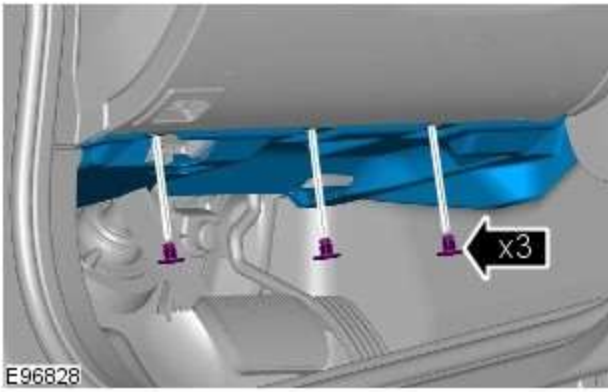
3.

4. Fully extend and lower the steering column for access.

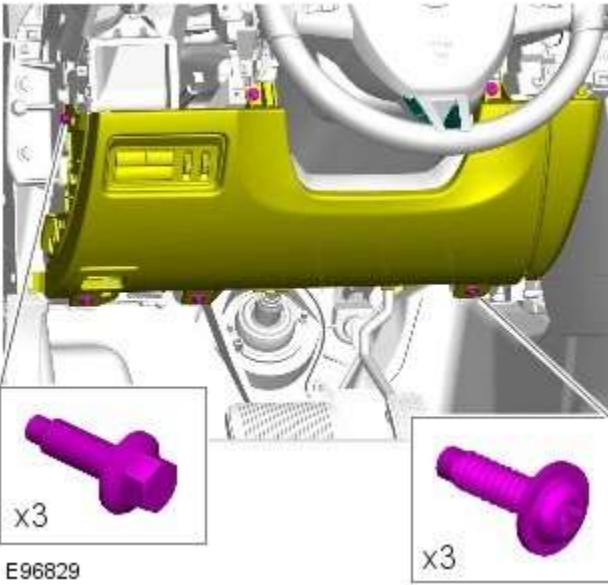


5.





6.



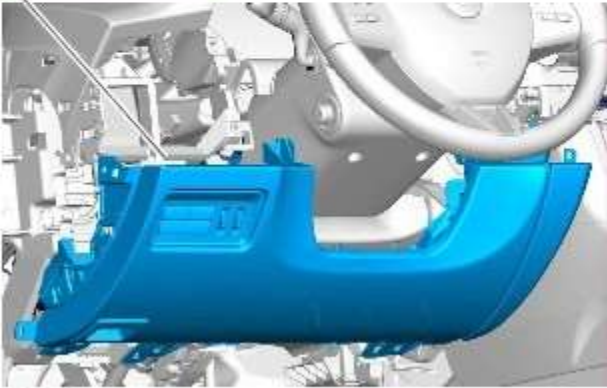
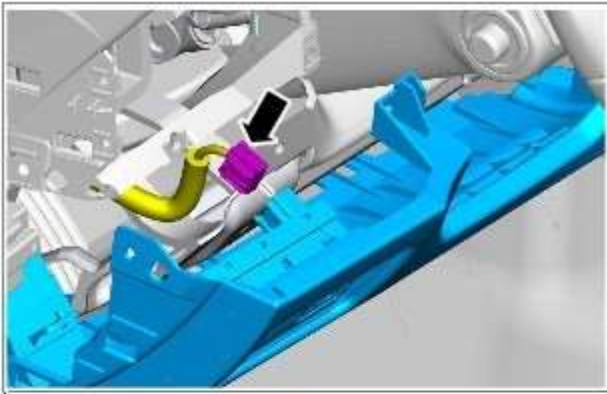
7.  CAUTION: Fixings must be started by hand to avoid damaging threads.

- Upper 3 bolts.

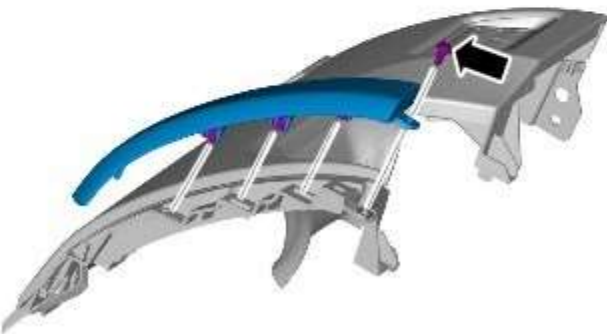
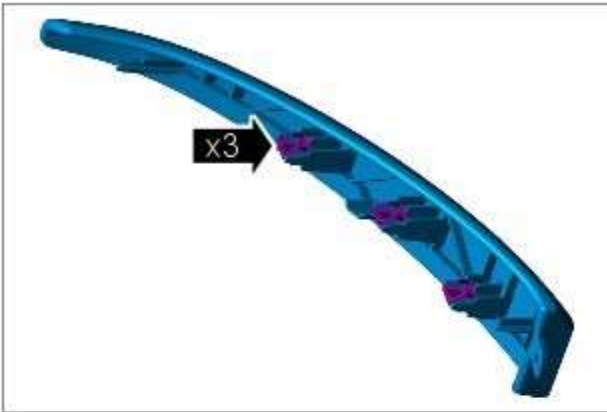
- *Torque: 2.5 Nm*
- Lower 3 bolts.

Torque: 9 Nm


8.



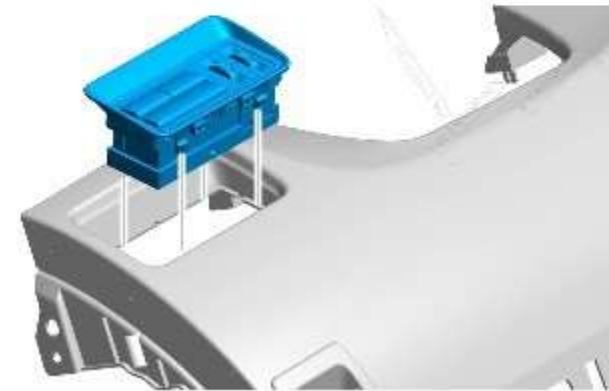
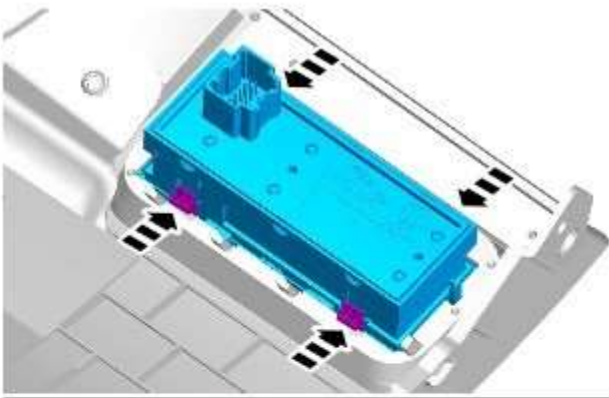
E96830



E96831

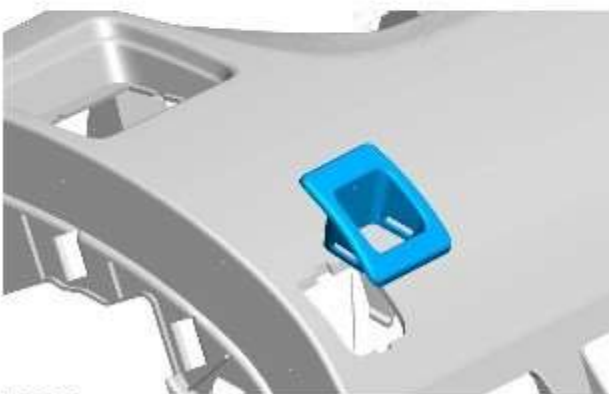
9.  NOTE: Do not disassemble further if the component is removed for access only.

10.



E96832

11.



E96833

Installation

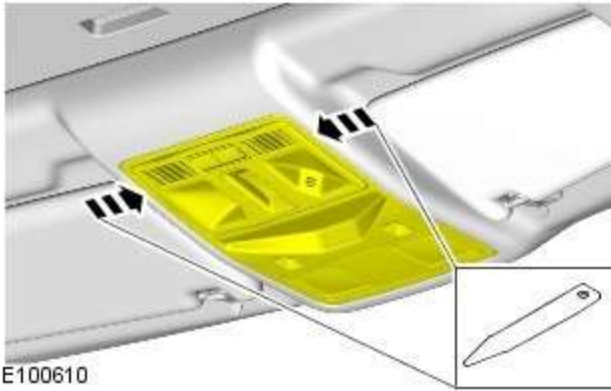
1. To install, reverse the removal procedure.

Instrument Panel and Console - Overhead Console

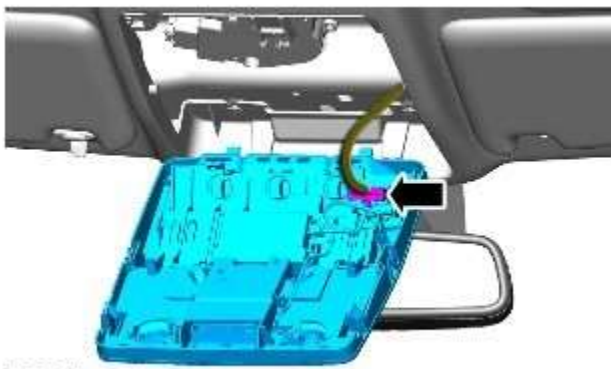
Removal and Installation

Removal

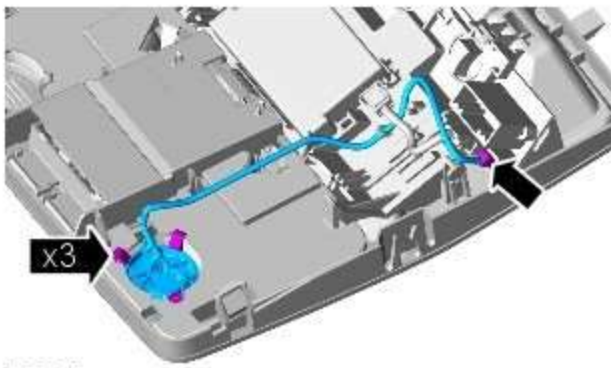
 NOTE: Removal steps in this procedure may contain installation details.



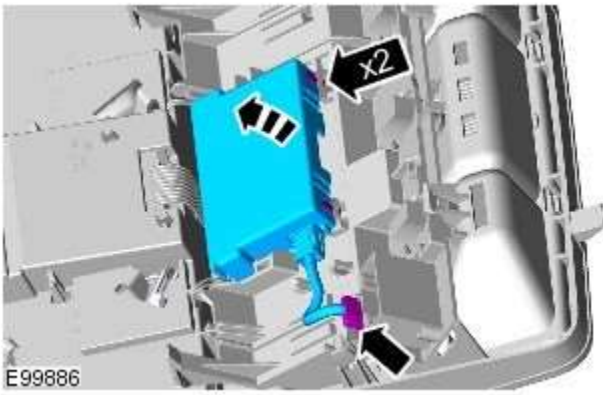
1. CAUTION: Take extra care not to damage the edges of the component.




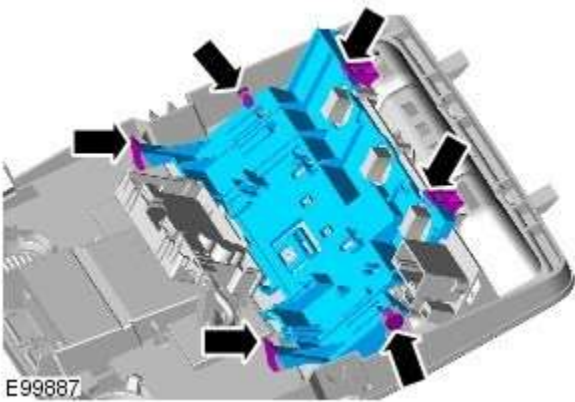
- 2.



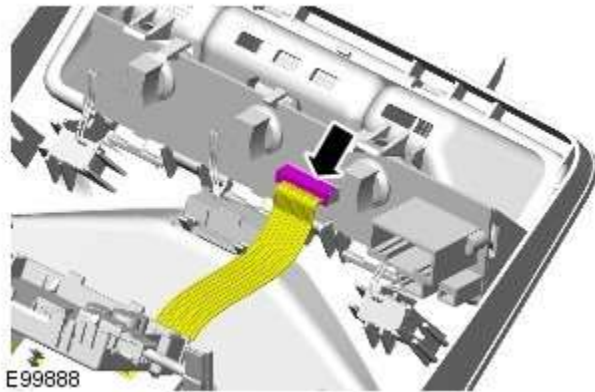
3. NOTE: Do not disassemble further if the component is removed for access only.



4.  **CAUTION:** Take extra care not to damage the wiring harnesses.
- Take precautions to avoid any electrostatic charging, which could damage this component.

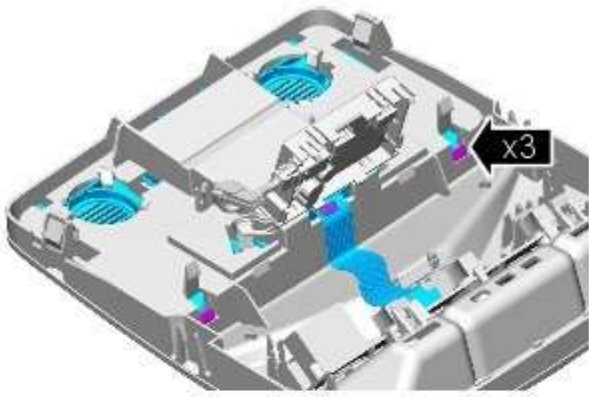


5.



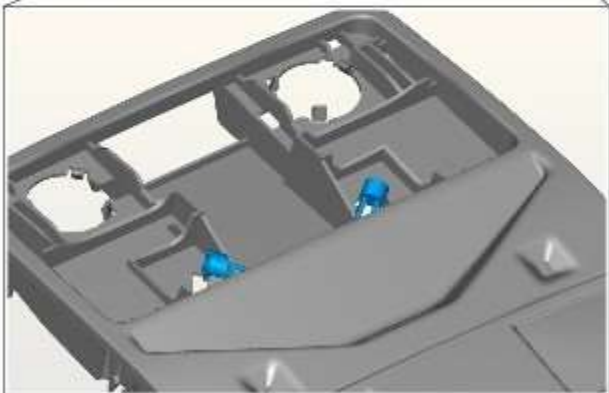
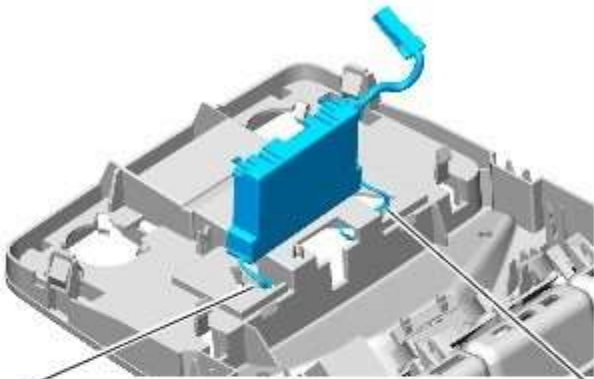
6.  **CAUTION:** Take extra care not to damage the wiring harnesses.

7.



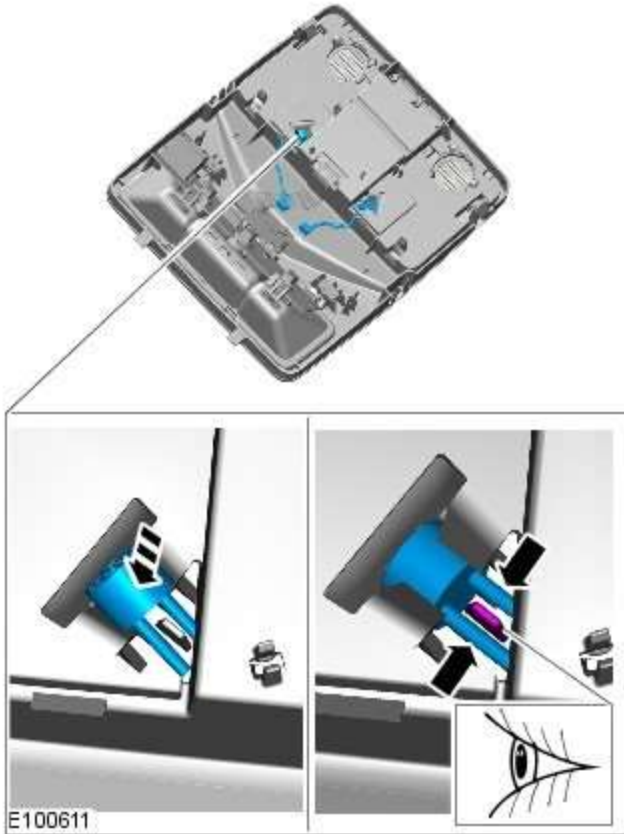
E99889

8.



E99890

Installation



1.  CAUTION: Take extra care not to damage the wiring harnesses.

To install, reverse the removal procedure.

Handles, Locks, Latches and Entry Systems -

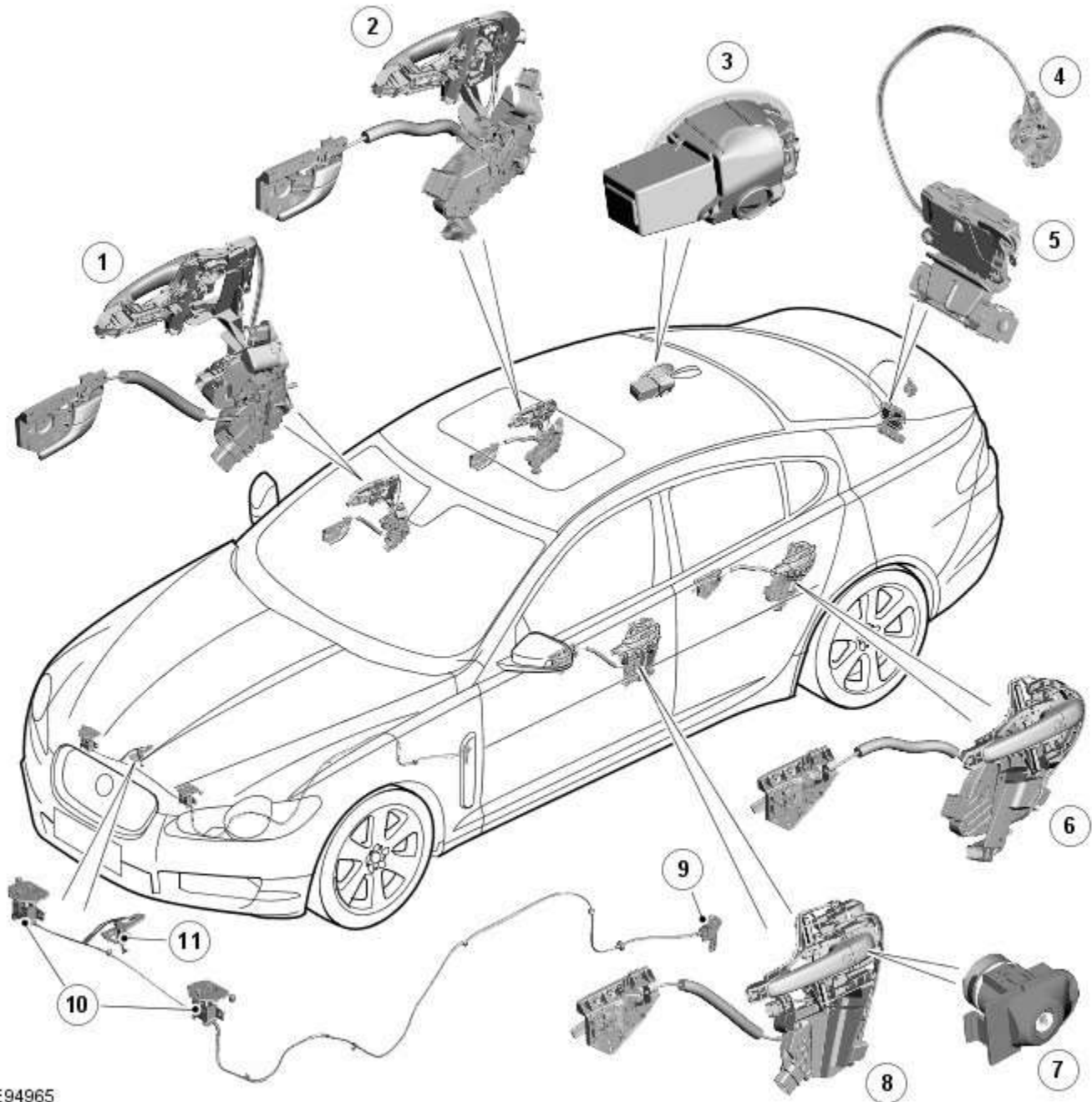
Torque Specifications

Description	Nm	lb-ft	lb-in
Front and rear door latch retaining screw	7	-	62
Front and Rear exterior door handle / Door lock captive retaining screw	4	-	36
Front and Rear Exterior Door handle separate retaining screw	3	-	28
Front and Rear Door striker retaining screw	25	18	-
Interior Door handle retaining Screw	1.3	-	11.5
Hood latch Retaining screw	10	8	-
Hood Striker Retaining screw	22	17	-
Trunk Latch Retaining screw	20	15	-
Trunk Striker Retaining screw	22	17	-
Trunk Lock Retaining screw	3	-	28

Handles, Locks, Latches and Entry Systems - Handles, Locks, Latches and Entry Systems - Component Location

Description and Operation

Locks and Latches

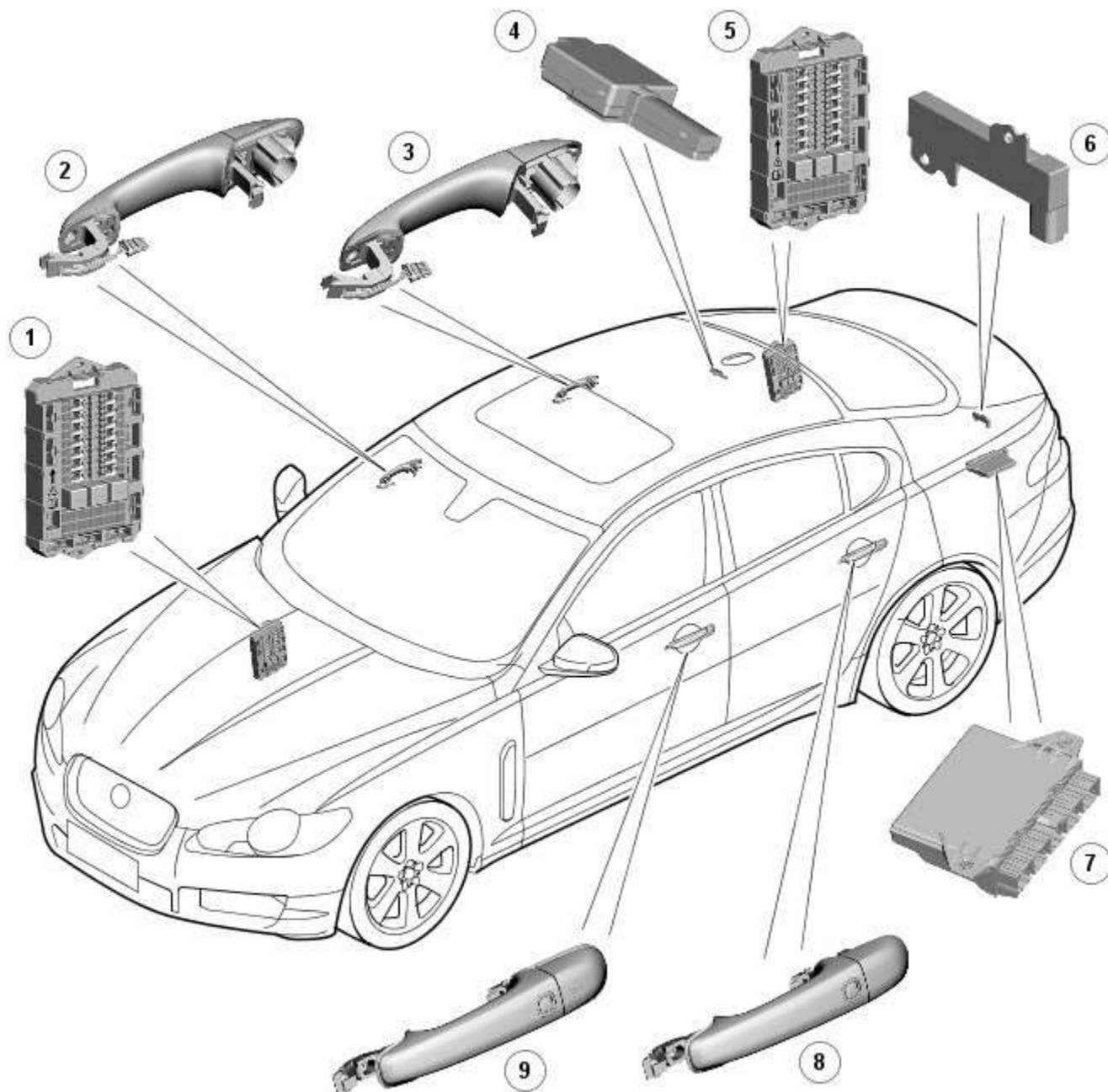


E94965

Item	Description
1	RH (right-hand) front door handles, latch and motor
2	RH rear door handles, latch and motor
3	Fuel filler door and motor
4	Luggage compartment emergency key barrel
5	Luggage compartment latch and motor
6	LH (left-hand) rear door handles, latch and motor
7	Door emergency key barrel - LH front door only
8	LH front door handles, latch and motor

9	Engine-compartment-lid release-lever and cable
10	Engine-compartment-lid striker
11	Engine-compartment-lid safety hook and guide

Central Locking and Keyless Vehicle Locking



E94967

Item	Description
1	CJB (central junction box)
2	Keyless vehicle, RH front door antenna * – integral to the handle
3	Keyless vehicle, RH rear door antenna * – integral to the handle
4	Central locking radio frequency receiver
5	RJB (rear junction box)
6	Keyless vehicle, luggage compartment antenna *
7	Keyless vehicle module
8	Keyless vehicle, LH rear door antenna * – integral to the handle
9	Keyless vehicle, LH front door antenna * – integral to the handle
Comments:	
(* Only with passive entry option fitted)	

Handles, Locks, Latches and Entry Systems - Handles, Locks, Latches and Entry Systems - Overview

Description and Operation

The hinged panels are secured with latches and strikers. A remotely operated central locking system controls the locking and unlocking of the door and luggage compartment latches. A radio frequency Smart Key allows the vehicle to be locked and unlocked by pressing the appropriate handset buttons. Two levels of central locking system are available:

- remote central locking, and an
- optional passive entry system.

The remote central locking system, provides locking and unlocking of the vehicle from inside and outside of the vehicle. The system is operated using buttons on the Smart Key, which transmits radio frequency signals to the central locking radio frequency receiver.

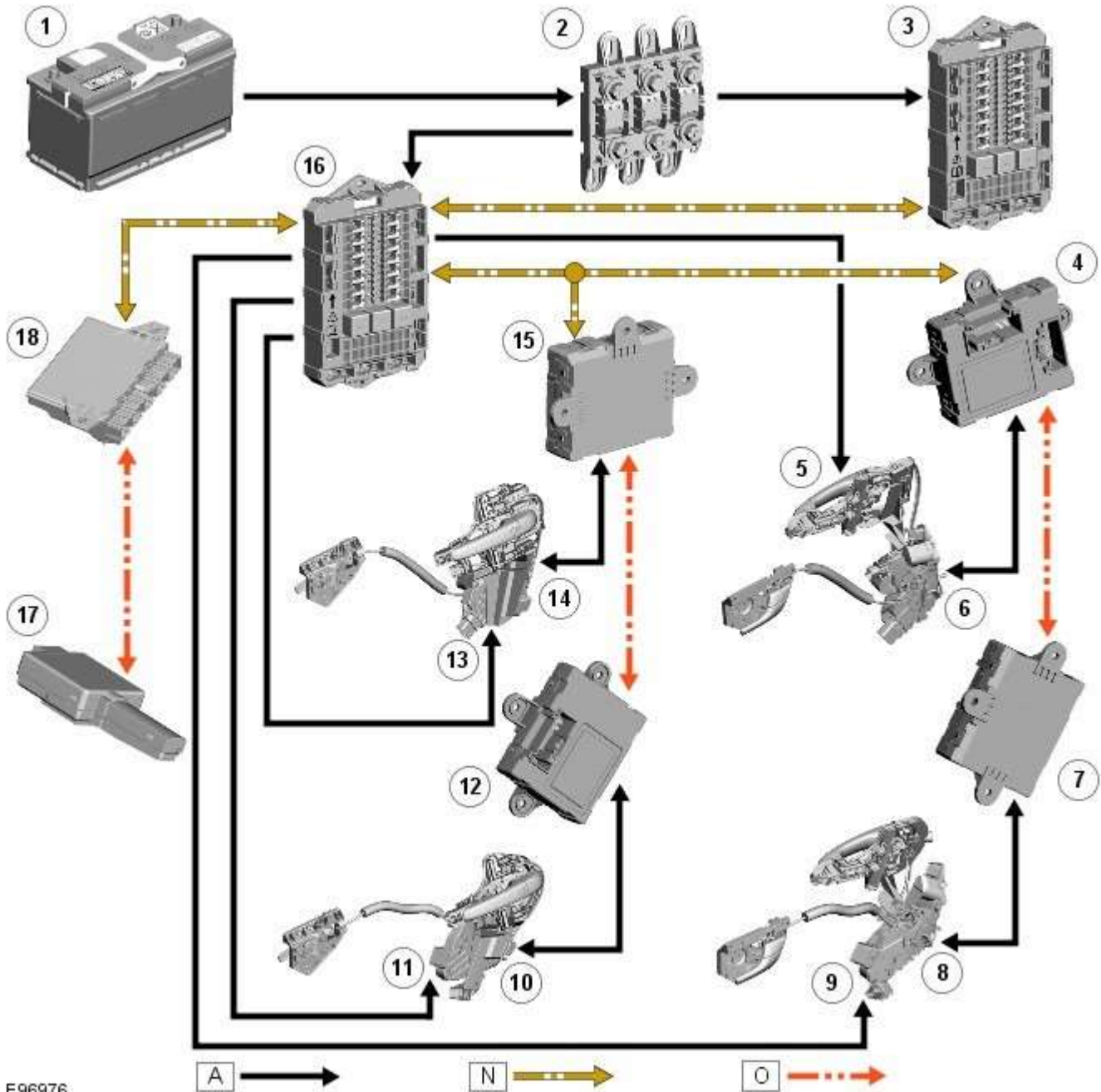
On vehicles fitted with the optional passive entry system, the vehicle can be unlocked without the use of a key or pressing buttons on the Smart Key. The Smart Key operates the passive entry system.

Handles, Locks, Latches and Entry Systems - Handles, Locks, Latches and Entry Systems - System Operation and Component Description

Description and Operation

Control Diagram

Central Locking

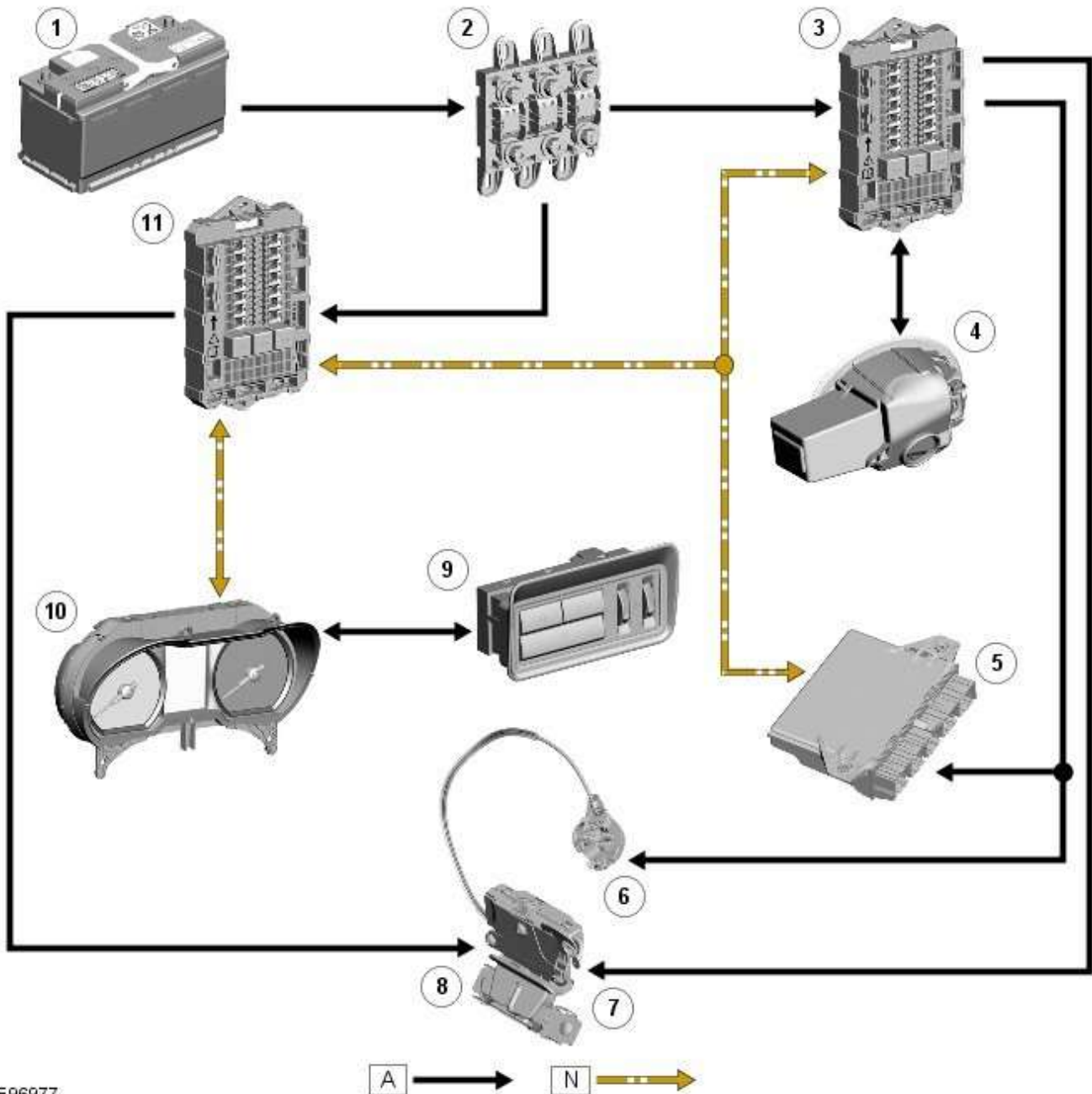


E96976

Item	Description
Note: A = Hardwired; N = Medium speed CAN (controller area network); O = LIN (local interconnect network) bus	
1	Battery
2	Megafuse (250 A)
3	RJB (rear junction box)
4	Door module - front passenger
5	Door ajar switch - front passenger
6	Door latch - front passenger

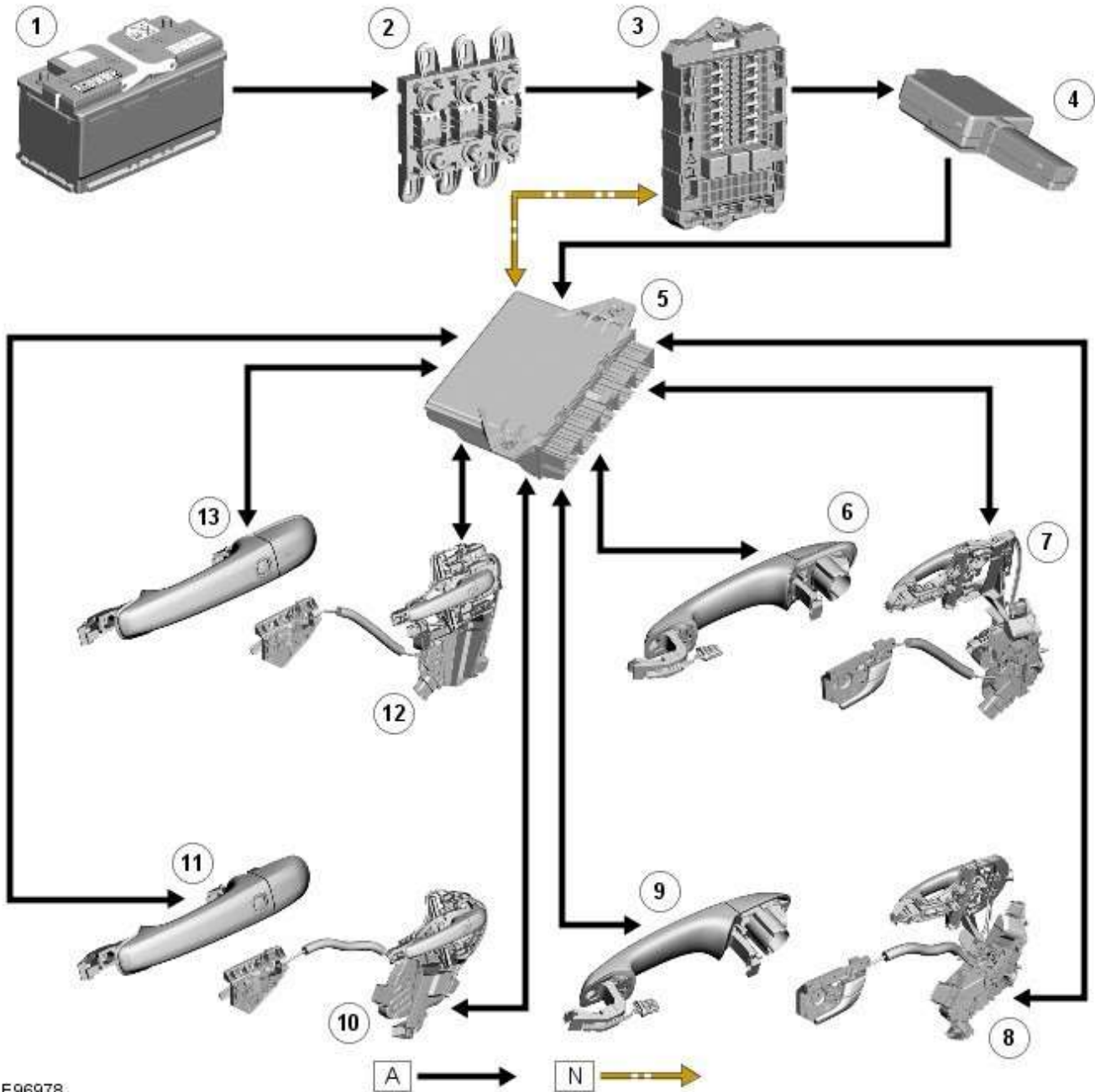
7	Door module - RH (right-hand) rear passenger
8	Door latch - RH rear passenger
9	Door ajar switch - RH rear passenger
10	Door latch - LH (left-hand) rear passenger
11	Door ajar switch - LH rear passenger
12	Door module - LH rear passenger
13	Door ajar switch - driver door
14	Door latch - driver door
15	Door module - driver door
16	CJB (central junction box)
17	Central-locking radio-frequency receiver
18	Keyless vehicle module

Luggage Compartment Lid and Fuel Filler Door Locking



Item	Description
Note: A = Hardwired; N = Medium speed CAN	
1	Battery
2	Megafuse (250 A)
3	RJB
4	Locking motor - fuel door
5	Keyless vehicle module
6	Emergency key barrel - luggage compartment
7	Release latch - luggage compartment lid
8	Ajar switch - luggage compartment lid
9	Fascia switch - luggage compartment lid
10	Instrument cluster
11	CJB

Passive Entry System



Item	Description
Note:	A = Hardwired; N = Medium speed CAN
1	Battery
2	Megafuse (250 A)
3	CJB
4	Radio frequency receiver
5	Keyless vehicle module
6	Door handle, lock/unlock switch and antenna - front passenger
7	Door latch, fast latch - front passenger
8	Door latch, fast latch - RH rear passenger
9	Door handle, lock/unlock switch and antenna - RH rear passenger
10	Door latch, fast latch - LH rear passenger
11	Door handle, lock/unlock switch and antenna - LH rear passenger
12	Door latch, fast latch - driver door
13	Door handle, lock/unlock switch and antenna - driver door

System Operation

The hinged panels are secured with latches and strikers. A remotely operated central locking system controls the locking and unlocking of the door and luggage compartment latches. A radio frequency Smart Key allows the vehicle to be locked and unlocked by pressing the appropriate handset buttons. Two levels of central locking system are available: remote central locking and an optional passive entry system.

The passive entry and associated passive start system allows the driver to unlock and start the vehicle without using a vehicle key in a door-lock or ignition switch. The passive entry system is an optional fitment while the passive start system is a standard fitment on all vehicles. The passive start system is combined with the passive anti-theft immobilization system. Refer to: [Anti-Theft - Passive](#) (419-01B Anti-Theft - Passive, Description and Operation).

Emergency access to the vehicle is provided by two concealed key barrels: one located in the front left-hand door handle and one located on the underside of the luggage compartment lid finisher. An emergency, removable key blade is fitted into the Smart Key.

Operation of either key barrel unlocks the vehicle but does not disarm the alarm system. The key barrels in the door and luggage compartment lid are concealed by a plastic cover which can be removed by inserting the blade of the emergency key into a slot in the cover.

Locking and unlocking conditions using the emergency key in the door key barrel:

- If the alarm is not armed the vehicle can be centrally unlocked.
- If the alarm is armed the door only can be opened and the alarm will be triggered.
- The vehicle cannot be double locked or the alarm system armed using the emergency key.

The vehicle can be centrally locked and unlocked from inside using the interior handle release levers on the front doors only. Central locking and unlocking can also be performed using lock and unlock buttons on the vehicle's fascia. The driver can select locking options, single point entry or drive away locking for example, from a menu available on the touch screen.

Central Locking – Radio Frequency Remote System

The radio frequency central locking system, provides locking and unlocking of the vehicle from inside and outside of the vehicle. The system is operated using buttons on the Smart Key, which transmits radio frequency signals to the central locking radio frequency receiver.

The system provides additional security by double-locking the doors from outside the vehicle if the lock button, on the Smart Key, is pressed twice within 3 seconds; this function is not applicable in North American Specification (NAS) and Japanese markets.

Additional buttons on the Smart Key provide for the convenience operation of the luggage compartment lid release, headlamp delay and panic alarm functions. A global open or close feature is also available in certain markets using the lock/unlock buttons.

Passive Entry

On vehicles fitted with the optional passive entry system, the vehicle can be unlocked without the use of a key blade or pressing buttons on the Smart Key. The Smart Key operates the passive entry system in addition to the passive start system. Refer to: [Anti-Theft - Passive](#) (419-01B Anti-Theft - Passive, Description and Operation).

The passive entry system is controlled by the keyless vehicle module and five low frequency antennas. One antenna located in each door handle and one antenna located behind the rear bumper cover.

When a vehicle door handle is pulled to the first five-percent of its travel and the Smart Key is within one meter of the handle; the Smart Key receives the low-frequency signal transmitted from the keyless vehicle module. The Smart Key responds with a radio frequency transmission of its authorization code. The radio frequency signal is received by the central locking radio-frequency receiver and passed to the keyless vehicle module which checks and approves the code as valid. Once the handle is

pulled to eighty percent of its travel the keyless vehicle module then drives the fast latch directly to allow the door to be opened. The keyless vehicle module also transmits an unlock request to the [CJB](#). The CJB then passes an unlock request to the door modules.

Locking of the vehicle is performed by pressing one of the buttons located on each exterior door handle, with the Smart Key within a one meter range of the vehicle. When the door handle button is pressed, the keyless vehicle module transmits a low-frequency signal via the low-frequency handle antenna to the Smart Key. The Smart Key transmits a radio frequency signal which is verified by the keyless vehicle module and allows the doors to be locked or double locked and the alarm system to be armed.

To double lock the vehicle, the button on the exterior door handle must be pressed twice within three seconds, with the Smart Key within one meter range of the vehicle.

If a door, engine-compartment lid or the luggage compartment lid is ajar when an attempt to lock the vehicle is made, an error tone is emitted and no locking action will occur.

Refer to: [Anti-Theft - Active](#) (419-01A Anti-Theft - Active, Description and Operation).

Component Description

Engine Compartment Lid Latches

Two engine-compartment lid latches are located on the front crossmember. An engine-compartment lid release lever is located below the instrument panel on the left-hand 'A' pillar and is connected with a cable to the latches. An engine-compartment lid ajar switch is integrated in the engine-compartment lid latch.

Door Latches

The door latches are located at the rear of each door and engage with a striker on the adjacent pillar. Each door latch motor assembly contains micro-switches for lock, unlock and door ajar. Motors provide for the central door locking and the double locking feature. The electrical control for the door latch components is provided by the CJB and RJB via the driver's and passenger door modules.

The interior door handles are connected by a cable to the latch release mechanisms. The interior door handles also incorporate a locking facility to allow the doors to be locked from inside the vehicle when all the doors are closed. If a door is ajar the locking feature is inhibited.

Luggage Compartment Lid Latch

The luggage compartment latch is attached to the bottom of the lid. The latch can be released electrically by pressing the interior release button located on the outboard side of driver's lower knee bolster; a release button is also provided on the Smart Key. There is also a release switch on the underside of the luggage compartment lid finisher.

On NAS vehicles an emergency release cable is attached to the latch. This allows the latch to be manually opened by pulling a handle located in the luggage compartment lid interior trim.

Fuel Filler Door

The fuel filler door is electrically locked by a motor located on the fuel door housing. The fuel door is locked when the vehicle is locked and alarmed. The fuel door can be opened when the vehicle is unlocked or locked:

- via an interior handle,
- via drive-a-way locking,
- via the lock switch on the fascia,
- via the external door key barrel.

Handles, Locks, Latches and Entry Systems - Locks, Latches and Entry Systems

Diagnosis and Testing

Principle of Operation

For a detailed description of the locks, latches and entry systems and operation, refer to the relevant Description and Operation section of the workshop manual. REFER to: Handles, Locks, Latches and Entry Systems (501-14, Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle



NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests

1. Verify the customer concern, to be sure the correct issue is investigated
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Incorrectly aligned door(s), hood or tailgate • Fuel filler door lock actuator • Hood release handle • Hood release cables • Hood latch(es) • Exterior door handle(s) • Interior door handle(s) • Cable(s) • Tailgate release switch • Rear window release switch 	<ul style="list-style-type: none"> • Fuses • Wiring harness • Wiring connector(s) • Door lock actuator(s) • Remote transmitter (key-fob or smart key) • Central locking switches • Controller Area Network (CAN) circuits • Radio frequency (RF) receiver • Central junction box (CJB) • Loose or corroded connections

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index

Symptom Chart



NOTE: Complete the diagnostic steps below to confirm any concern prior to replacing any component

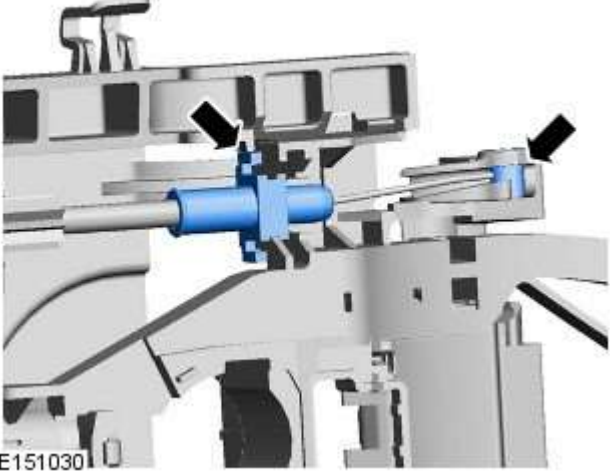
Symptom	Possible Causes	Action
The message center indicates that the hood, the luggage compartment is open when it appears to be closed	<ul style="list-style-type: none"> • Incorrect striker alignment/adjustment • Ajar switch circuit short circuit to ground • Ajar switch failure 	<ul style="list-style-type: none"> • Check/adjust the strikers as necessary • Check for DTCs indicating an ajar switch fault. Refer to the DTC index
Vehicle indicates a miss-lock when the hood, luggage compartment appear to be closed		
Fuel flap does not lock/unlock	<ul style="list-style-type: none"> • Fuel flap cable detached from body • Fuel flap actuator detached from mounting bracket • Fuel flap actuator disconnected • Fuel flap actuator failure 	<ul style="list-style-type: none"> • Check the condition and installation of the fuel flap cable • Check the security of the fuel flap actuator and bracket • Check the security of the actuator electrical connector • Check for DTCs indicating a fuel flap actuator fault. Refer to the DTC index
Door(s) will not unlatch/open when using outside door handle	<ul style="list-style-type: none"> • Exterior door handle condition/installation • Exterior release cable disconnected from exterior door handle or door latch 	<ul style="list-style-type: none"> • Check the exterior door handle condition and installation • Check the condition and security of the exterior release cable • Single door will not open from the

Symptom	Possible Causes	Action
		outside (but opens from the inside) GO to Pinpoint Test A.
Door(s) will not unlatch/open when using inside door handle	<ul style="list-style-type: none"> • Child lock(s) engaged • Interior door handle condition/installation • Interior release cable disconnected from interior door handle or door latch 	<ul style="list-style-type: none"> • Check that the child locks are disengaged • Check the interior door handle condition and installation • Check the condition and security of the interior release cable • Single Door Will Not Open From The Inside (but opens from the outside) GO to Pinpoint Test B.
Door(s) will not lock/unlock from key fob, key or internal lock switch	<ul style="list-style-type: none"> • Wiring harness/connectors • Central junction box (CJB) • Door lock switch • Cable fault 	<ul style="list-style-type: none"> • Check for relevant stored DTCs • Once any DTC related faults have been rectified continue with the diagnostic steps below • No lock / unlock function from key-fob GO to Pinpoint Test C.
Door ajar or miss lock signal at message centre when door(s) are closed or alarm triggering	<ul style="list-style-type: none"> • Wiring harness • Instrument cluster • Incorrect striker alignment/adjustment • Ajar switch circuit short circuit to ground • Ajar switch failure 	<ul style="list-style-type: none"> • Latch Mounted Door Ajar Switch Test GO to Pinpoint Test D.

DTC Index

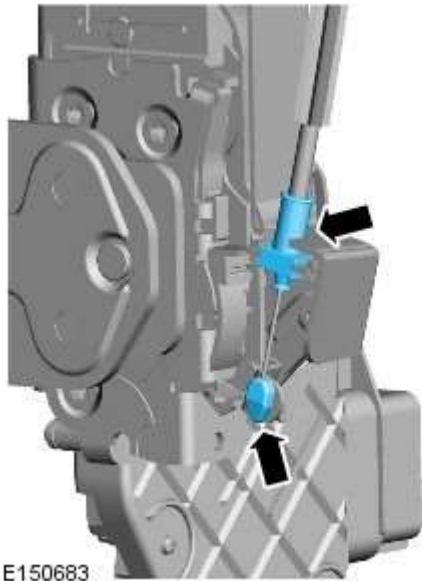
For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: Communications Network (418-00, Diagnosis and Testing) / Locks, Latches and Entry Systems - DTC: With (501-14, Diagnosis and Testing).

Pinpoint Test

PINPOINT TEST A : SINGLE DOOR WILL NOT OPEN FROM THE OUTSIDE (BUT OPENS FROM THE INSIDE)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK THE EXTERIOR DOOR RELEASE CABLE TO EXTERIOR DOOR HANDLE IS INSTALLED CORRECTLY	
	<ol style="list-style-type: none"> 1] Remove the door trim panel as necessary
	<ol style="list-style-type: none"> 2] Confirm the exterior door release cable is correctly installed to the exterior door handle
	<p>Is the cable correctly installed?</p> <p>Yes GO to A2.</p> <p>No</p>

Connect the door release cable correctly. **If the cable is damaged, install a new door release cable.** Test the system for normal operation

A2: CHECK THE EXTERIOR DOOR HANDLE RELEASE CONNECTION TO THE DOOR LATCH



- 1] Confirm the exterior door handle release connection to the door latch is installed correctly

Is the exterior door handle release cable installed correctly?

Yes

GO to Pinpoint Test [C](#).

No

Connect the door release cable correctly. **If the cable is damaged, install a new door release cable.** Test the system for normal operation

PINPOINT TEST B : SINGLE DOOR WILL NOT OPEN FROM THE INSIDE (BUT OPENS FROM THE OUTSIDE)

TEST CONDITIONS

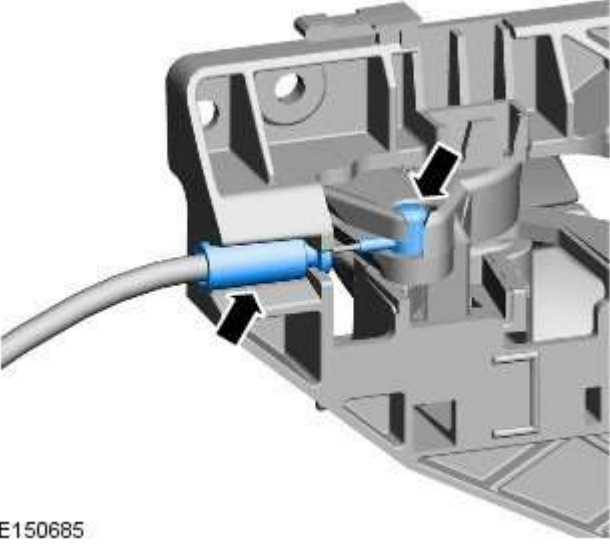
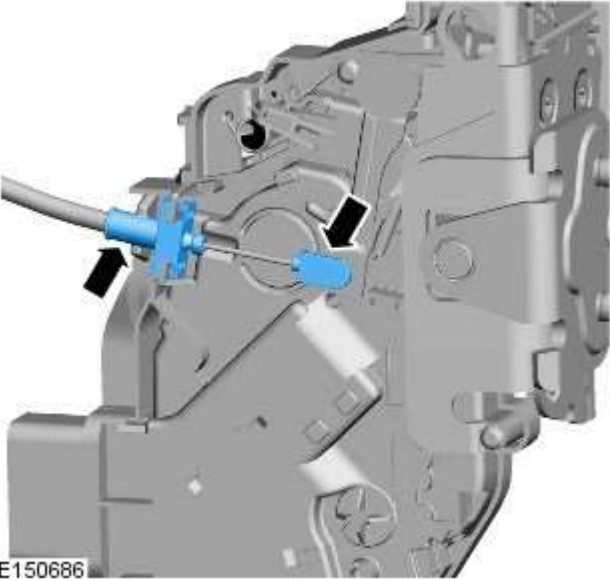
DETAILS/RESULTS/ACTIONS

B1: CHECK THE INTERIOR DOOR RELEASE CABLE TO INTERIOR DOOR HANDLE IS INSTALLED CORRECTLY



 NOTE: Figure A - Child lock off position shown

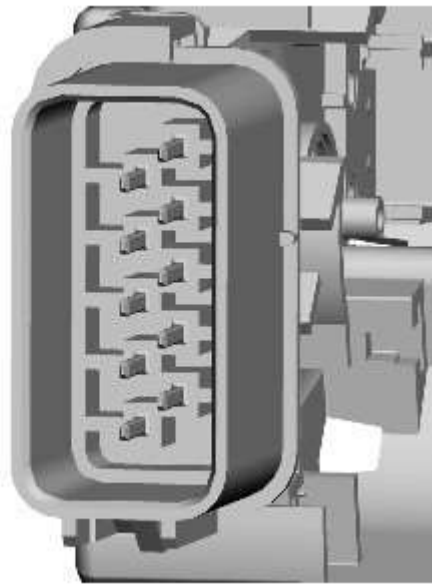
- 1] Make sure the child lock is disengaged (rear door only)

 <p>E150685</p>	<p>2 Remove the door trim panel as necessary</p>
	<p>3 Confirm the interior door release cable is correctly installed to the interior door handle</p>
	<p>Is the cable correctly installed? Yes GO to B2. No Connect the door release cable correctly. If the cable is damaged, install a new door release cable. Test the system for normal operation</p>
<p>B2: CHECK THE INTERIOR DOOR HANDLE RELEASE CONNECTION TO THE DOOR LATCH</p>	
 <p>E150686</p>	<p>1 Confirm the interior door handle release connection to the door latch is installed correctly</p>
	<p>Is the interior door handle release cable installed correctly? Yes GO to Pinpoint Test C. No Connect the door release cable correctly. If the cable is damaged, install a new door release cable. Test the system for normal operation</p>

<p>PINPOINT TEST C : DOOR LATCHING AND LOCKING FUNCTION TEST</p>	
<p>TEST CONDITIONS</p>	<p>DETAILS/RESULTS/ACTIONS</p>
<p>C1: HARNESS CONNECTION</p>	



NOTE: Test as a single component to ensure that the door latch is not replaced unnecessarily, when another component may be at fault



E150687

- 1 Remove the door trim panel as necessary
- 2 Disconnect harness from latch, check for corrosion or damage to both connectors at socket points and pins. Re-connect harness ensuring robust assembly when all parts confirmed to be in good order. If harness or latch connectors are damaged, install new harness/latch as necessary. Test the system for normal operation

Check for normal operation, does latch function correctly?

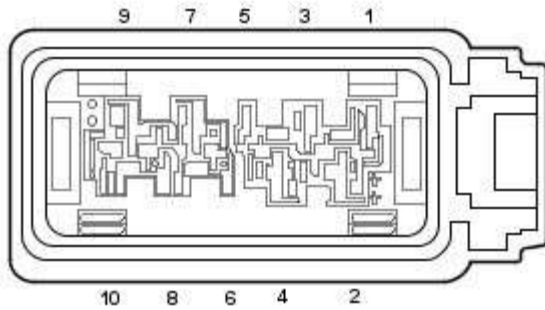
Yes

Re-assemble door trim and test for normal operation

No

GO to C2.

C2: LOCK COMMAND SIGNAL FROM VEHICLE HARNESS



E139357

- 1 Close all vehicle doors apart from door being investigated, please note which door, left side or right side is under investigation

- 2 Disconnect harness from latch to enable access to socket points to carry-out conductivity testing as detailed

- 3 Monitor the circuit for momentary power when locking the vehicle via the key-fob or smart key between terminals **5 and 7 left side** or **5 and 7 right side**

Is there momentary power (for approx 8 seconds) between terminals **5 and 7 left side** or **5 and 7 right side** when locking the vehicle via the key-fob or smart key

Yes

The vehicle electrical system is locking correctly, providing the signal to the latch [GO to C3](#).

No

Refer to the electrical circuit diagrams and investigate why vehicle electrical system is not providing signals to the latch. Using the manufacturer approved diagnostic system check for logged DTCs to localize the fault

C3: UNLOCK COMMAND SIGNAL FROM VEHICLE HARNESS

- 1 Monitor the circuit for momentary power when unlocking the vehicle via the key-fob or smart key between terminals **5 and 7 left side** or **5 and 7 right side**

Is there momentary power (for approx 8 seconds) between terminals **5 and 7 left side** and **5 and 7 right side** when unlocking the vehicle via the key-fob or smart key?

Yes


The vehicle electrical system is unlocking correctly, providing the signal to the latch [GO to C4](#).

No





Refer to the electrical circuit diagrams and investigate why vehicle electrical system is not providing signals to the latch. Using the manufacturer approved diagnostic system check for logged DTCs to localize the fault

C4: PHYSICAL TEST 1

- 1** Remove latch module from door
- 2** Inspect latch module for any visual damage
- 3** With the latch in hand, connect the electrical connector(s) to connect door latch to door harness

-  **NOTE: THE LATCH IS NOW READY TO TEST**
- 4** Close all vehicle doors except the door being investigated

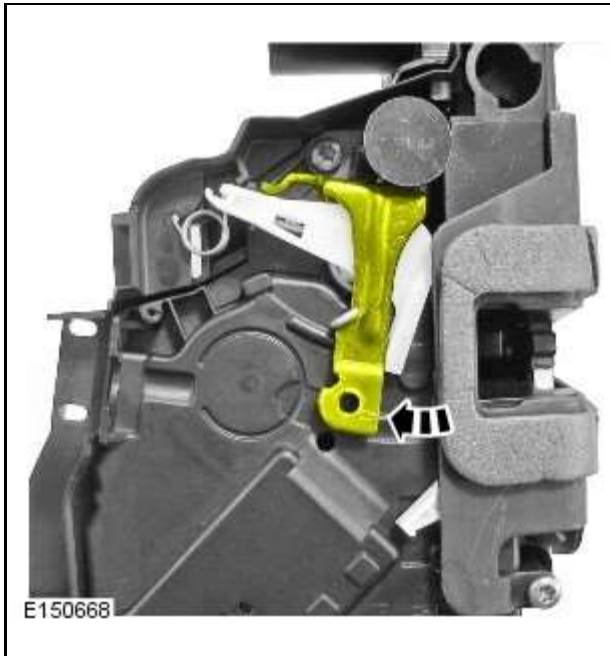
NOTES:

-  Figure 1 - Unlatched position shown
-  Figure 2 - First safety latched position shown
-  Figure 3 - Fully latched position shown
-  Test will not work if latch is only in first safety latch position



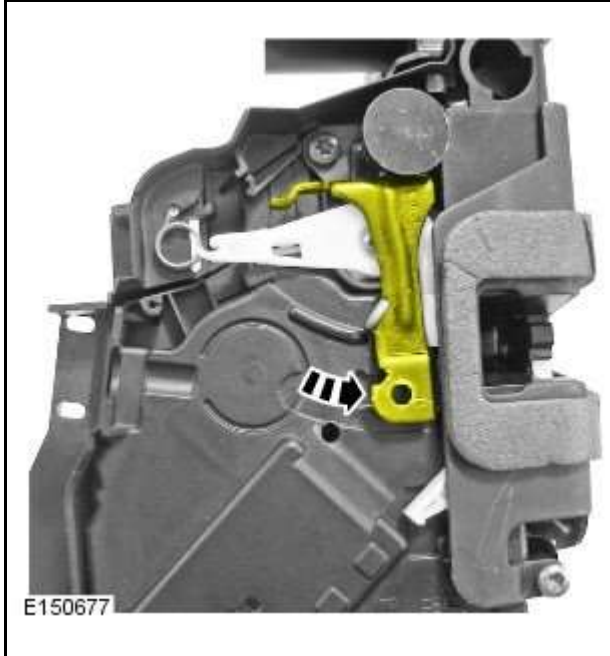
E139349

- 5** Rotate latch claw (using a small screw driver or similar), to the fully latched position (figure 3)



 NOTE: Unlocked position shown

- 6 Confirm that the latch interior release lever is in the unlocked position as shown



 NOTE: Locked position shown

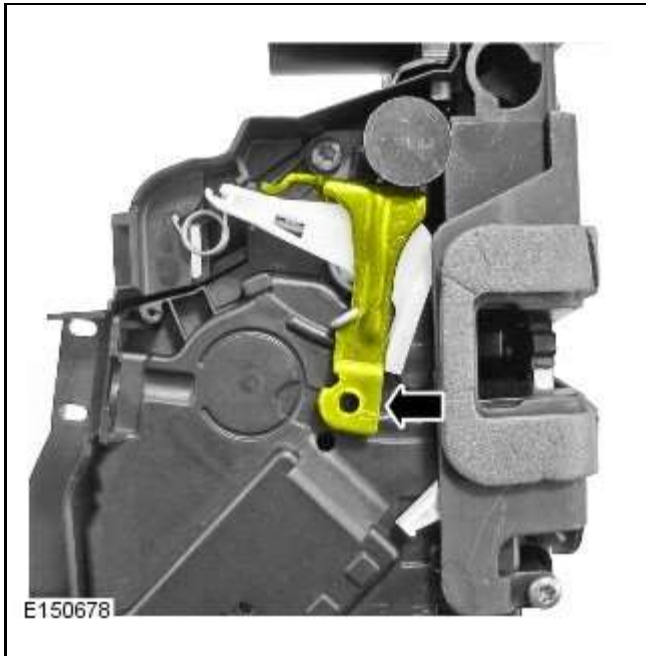
- 7 Press the **lock** button on the key-fob or smart key


Does the latch interior release lever move from the unlocked position to the locked position?

Yes [GO to C5.](#)

No
If this is a repeat test and the vehicle electrical test section has been completed and confirmed that vehicle is working correctly, then replace the door latch. If replacing latch as part of a warranty claim, please quote reference code **LKINOP** in the technician comments section of the warranty claim

C5: PHYSICAL TEST 2



 **NOTE:** Unlocked position shown

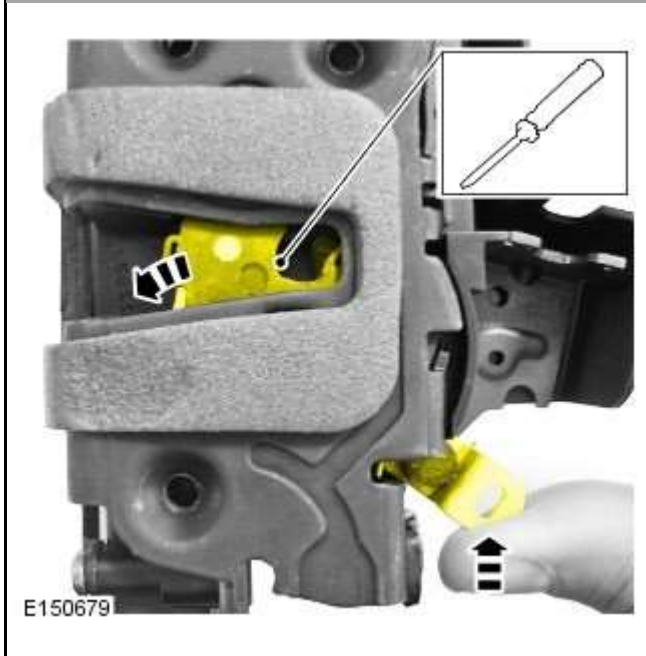
1 With the latch in the locked state (i.e. the latch interior release lever is in the locked position), press the key-fob or smart key **unlock** button


Does the latch interior release lever move from the locked position to the unlocked position?

Yes [GO to C6.](#)

No If this is a repeat test and the vehicle electrical test section has been completed and confirmed that vehicle is working correctly, then replace the door latch. If replacing latch as part of a warranty claim, please quote reference code **LKINOP** in the technician comments section of the warranty claim

C6: PHYSICAL TEST 3



 **NOTE:** Fully latched position shown

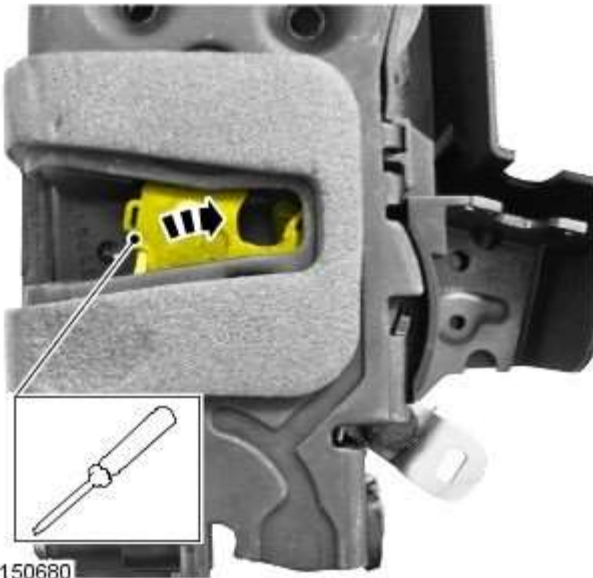
1 With the latch in its unlocked state, push the latch exterior release lever against its return spring, whilst simultaneously applying a light pressure to release the latch claw using a small screw driver or similar

Does the latch claw release?

Yes [GO to C7.](#)

No Repeat tests **C5** and **C6** to confirm the fault [GO to C5](#). If the repeat test has confirmed that the exterior release lever will not release the claw on an unlocked latch replace the door latch. If replacing latch as part of a warranty claim, please quote reference code **EXTINOP** in the technician comments section of the warranty claim

C7: PHYSICAL TEST 4

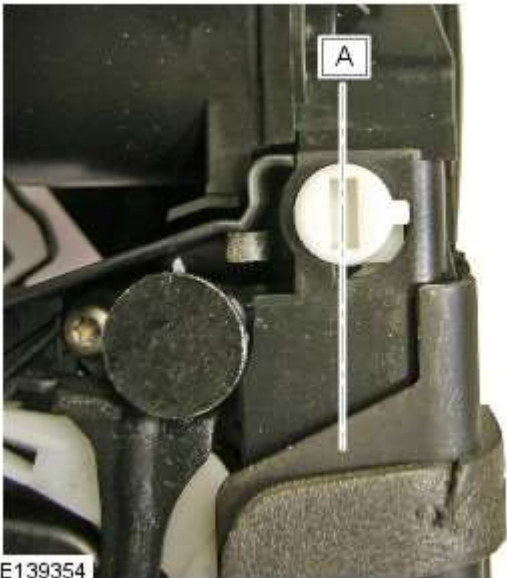


E150680



NOTE: Fully latched position shown

- 1 Using a small screw driver or similar, rotate latch claw to the second fully latched position

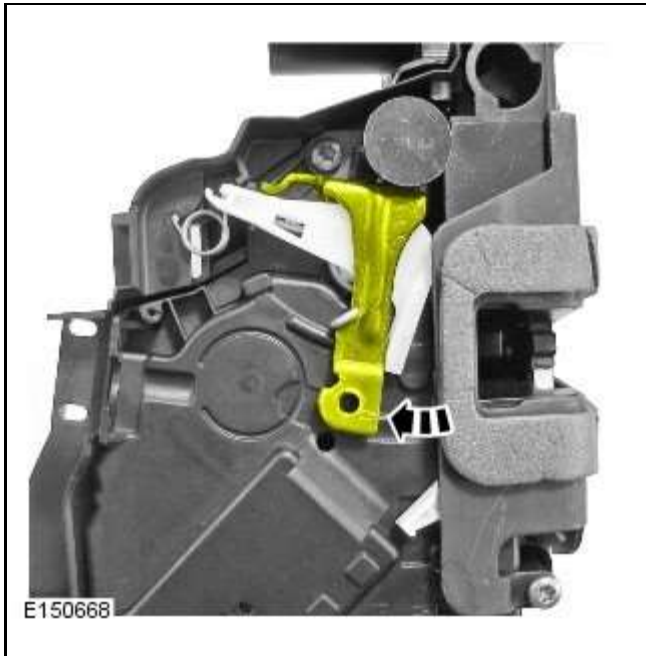



E139354



NOTE: Figure A - Child lock off position shown

- 2 If testing a rear door latch, ensure that the child lock is turned to the off position



 **NOTE:** Unlocked position shown

3 Confirm that the latch interior release lever is in the unlocked position as shown



4 Whilst the latch is still in its unlocked state, push the latch interior release lever against its return spring, whilst simultaneously applying a light pressure to release the latch claw using a small screw driver or similar


Does the latch claw release?
Yes
 Latch has passed all tests to confirm its correct function. **DO NOT REPLACE LATCH** as part of any attempts to resolve any locking functionality issues
No
 Repeat test [GO to C7](#). If repeat test has confirmed that the interior release lever will not release the claw when the latch is in the unlocked state, then replace the latch. If replacing latch as part of a warranty claim, please quote reference code **INTINOP** in the technician comments section of the warranty claim

PINPOINT TEST D : LATCH MOUNTED DOOR AJAR SWITCH TEST

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
-----------------	-------------------------

D1: TEST 4 DOOR LATCH

NOTES:

 If a customer is complaining of issues relating to a door ajar signal e.g. door latch won't lock, or alarm system triggering (indicated via DTC's), there may be several components that generate the fault, including

- Body wiring harness / connectors
- Door wiring harness / connectors
- Alarm control module
- Central junction box (CJB)
- Door Latch ajar switch



To investigate the functioning of the door ajar switch contained within the door latch, to prove or eliminate the door latch mounted door ajar switch as the root cause, follow the process below. This will prevent the unnecessary replacement of a correctly functioning door latch

- 1 Remove door trim from door
- 2 Disconnect door harness from latch for access to connector pins for latch electrical testing
- 3 Inspect latch module for any visual damage



NOTES:



Figure 1 - Unlatched position shown



Figure 2 - First safety latched position shown



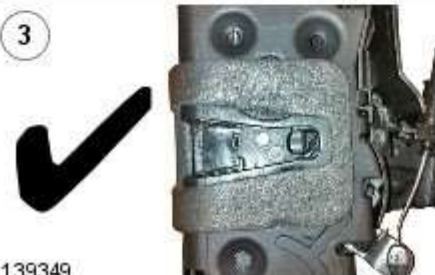
Figure 3 - Fully latched position shown



Test will not work if latch is only in first safety latch position

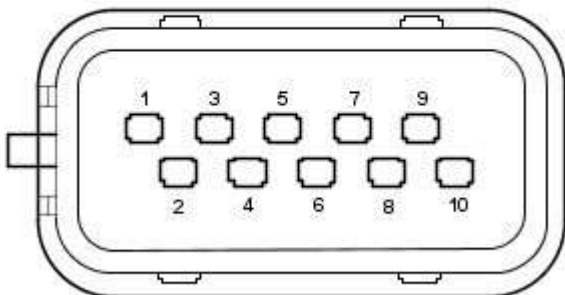


- 4 Using a small screw driver or similar, rotate latch claw to the second fully latched position (figure 3)



E139349

- 5 Carry out continuity test between terminals **1 and 4 (left side)** or **8 and 4 (right side)** with claw closed



E139356

Does the continuity test pass?

Yes

The latch ajar switch is working correctly. **Do not replace latch.** Investigate for fault elsewhere in vehicle system

No

Release latch claw and repeat test from step 4 to confirm result. If this is a repeat test and you are sure that the ajar switch does not provide continuity when fully latched. Replace the latch. If replacing latch as part of a warranty claim, please quote reference code **AJARINOP** in the technician comments section of the warranty claim

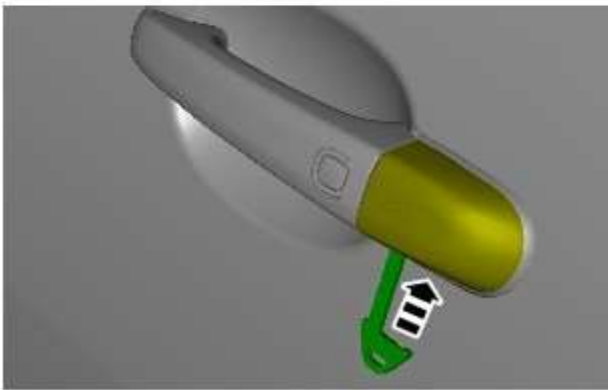
Handles, Locks, Latches and Entry Systems - Door Lock Cylinder Cover

Removal and Installation

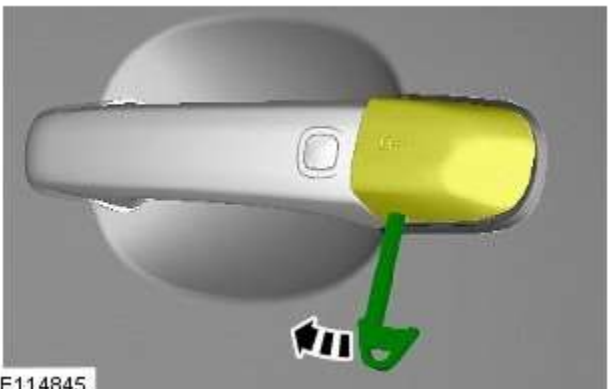
Removal



1. CAUTION: Make sure that excessive force is not used. Failure to follow this instruction may result in damage to the vehicle.

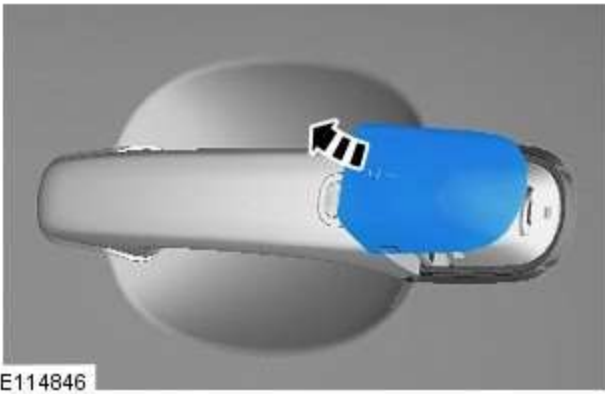


E114844



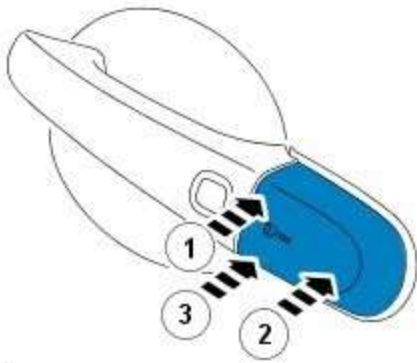
E114845

- 2.




E114846

Installation



E112448

3.

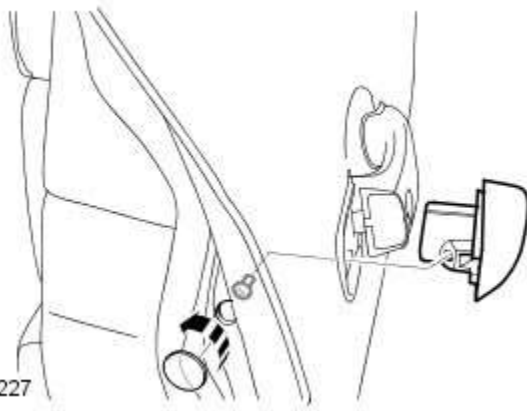
1.  CAUTION: Make sure that the door lock cylinder cover is pushed firmly in the sequence shown to install all 3 clips, and that the door lock cylinder cover is securely attached to the vehicle. Failure to follow this instruction may result in damage to the vehicle.


Handles, Locks, Latches and Entry Systems - Exterior Front Door Handle

Removal and Installation

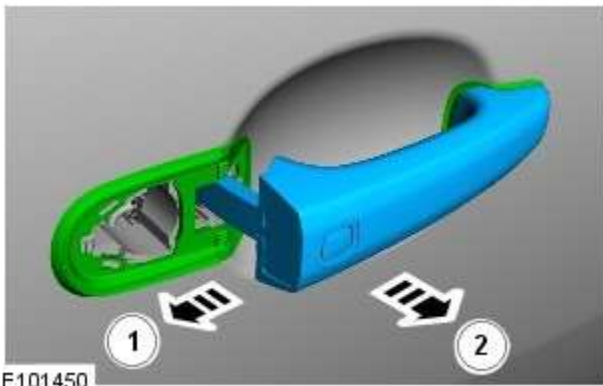
Removal


 NOTE: Removal steps in this procedure may contain installation details.

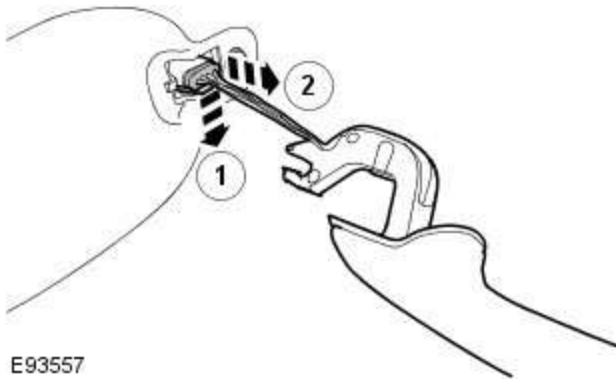
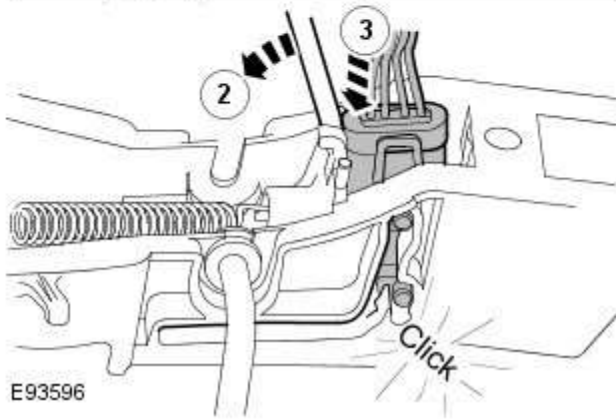
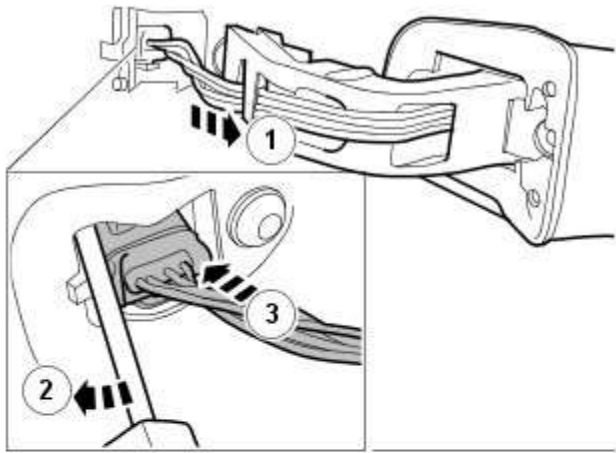


1.  NOTE: Remove the screw sufficiently, only to release the component.

Torque: 4 Nm



2.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

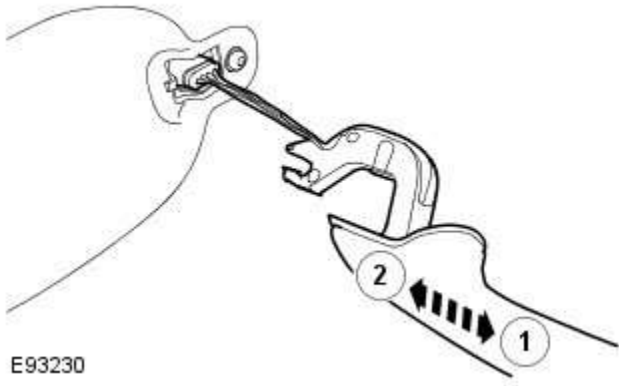


3.  **CAUTION:** Take extra care not to damage the wiring harnesses.


 **NOTE:** Secure the connection in the service position.

4.

Installation



E93230

1.  **CAUTION:** Make sure that the wiring harnesses are correctly located.

To install, reverse the removal procedure.

Handles, Locks, Latches and Entry Systems - Exterior Luggage Compartment Lid Release Switch

Removal and Installation

Removal

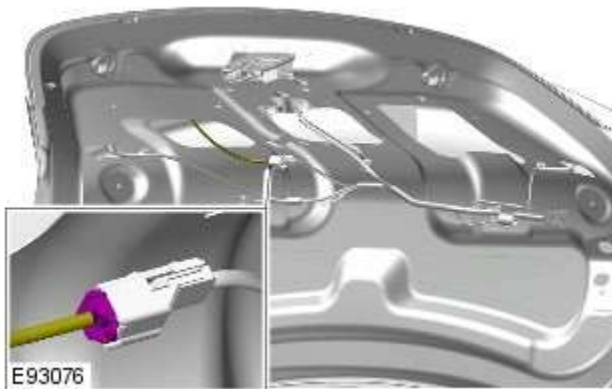
All vehicles



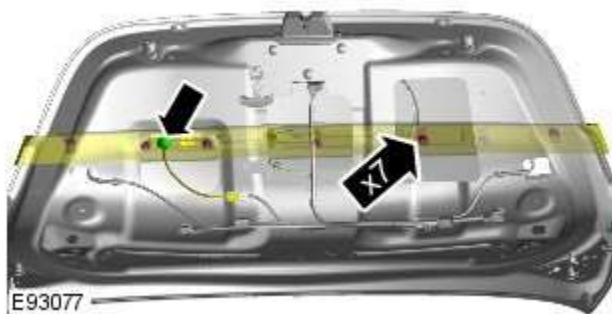
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Luggage Compartment Lid Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.



3. Torque: 3 Nm

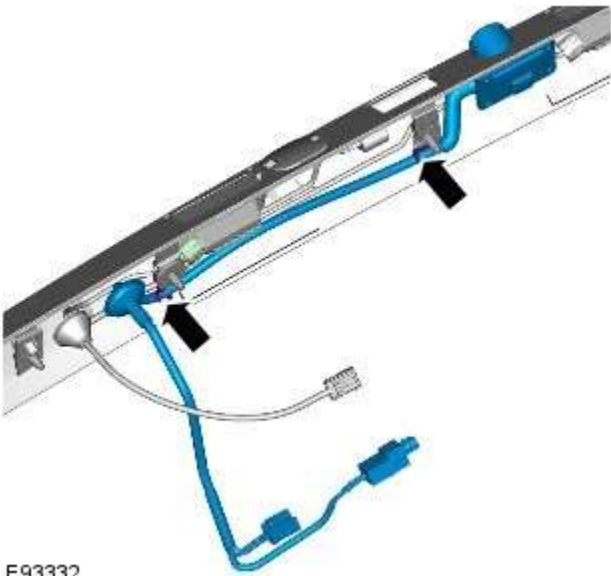


4.



Vehicles with parking aid

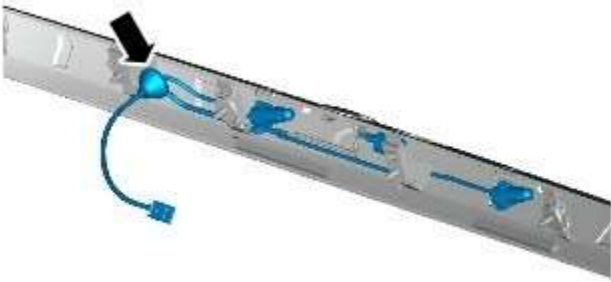
5.



E93332

All vehicles

6.



E93080

Installation

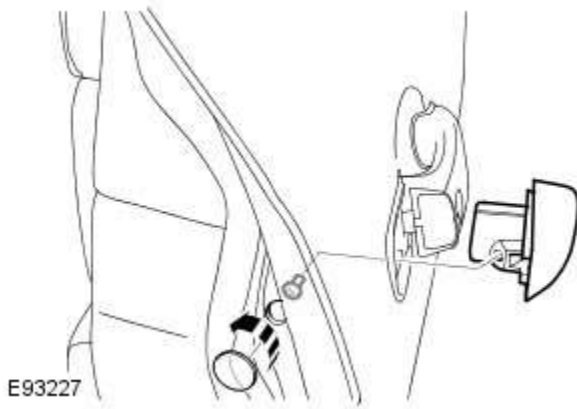
1. To install, reverse the removal procedure.

Handles, Locks, Latches and Entry Systems - Exterior Rear Door Handle

Removal and Installation

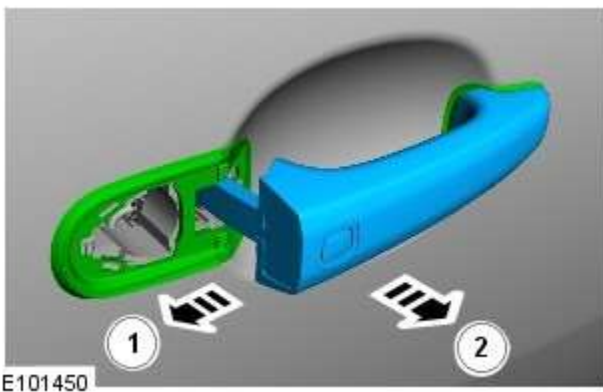
Removal


 NOTE: Removal steps in this procedure may contain installation details.

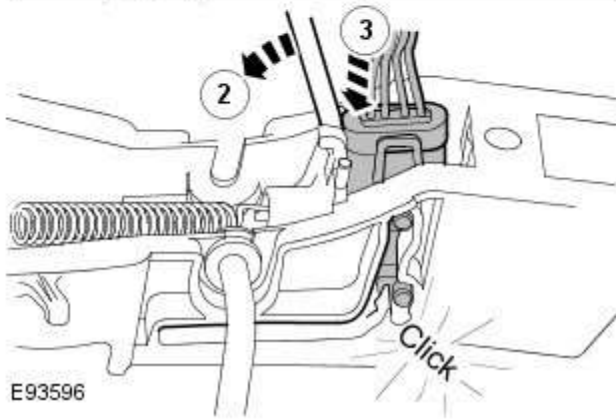
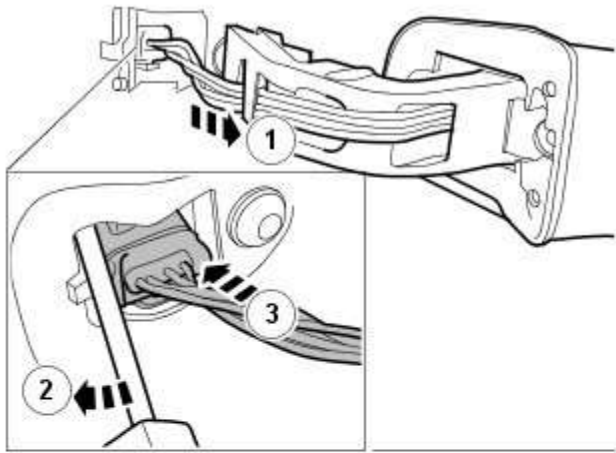


1. NOTE: Remove the screw sufficiently, only to release the component.

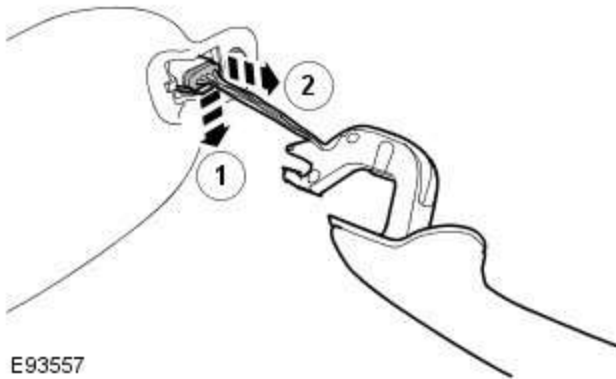
Torque: 4 Nm



2.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



E93596



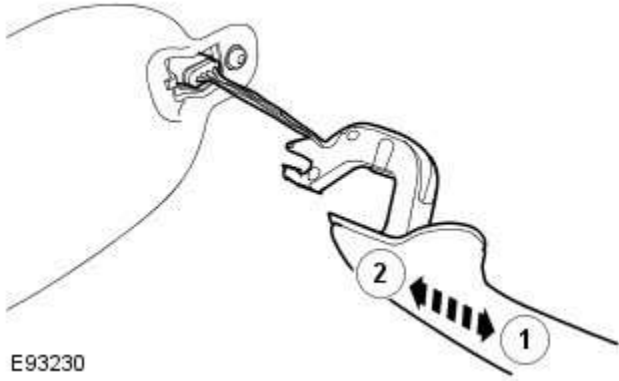
E93557

3.  CAUTION: Take extra care not to damage the wiring harnesses.


 NOTE: Secure the connection in the service position.

4.

Installation



E93230

1.  CAUTION: Make sure that the wiring harnesses are correctly located.

To install, reverse the removal procedure.

Handles, Locks, Latches and Entry Systems - Front Door Latch

Removal and Installation

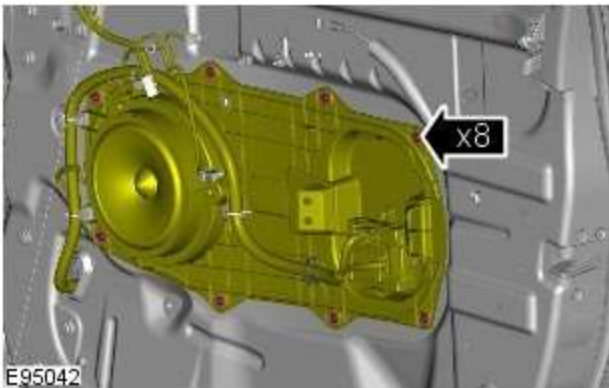
Removal

1. Refer to: [Front Door Window Glass](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).

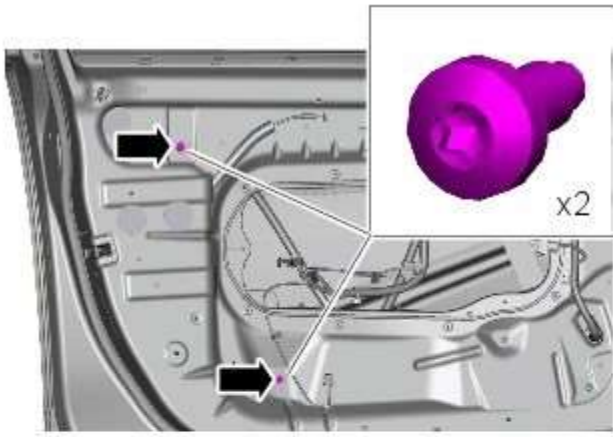
2.  NOTE: Left-hand shown, right-hand similar.

Refer to: [Exterior Front Door Handle](#) (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).

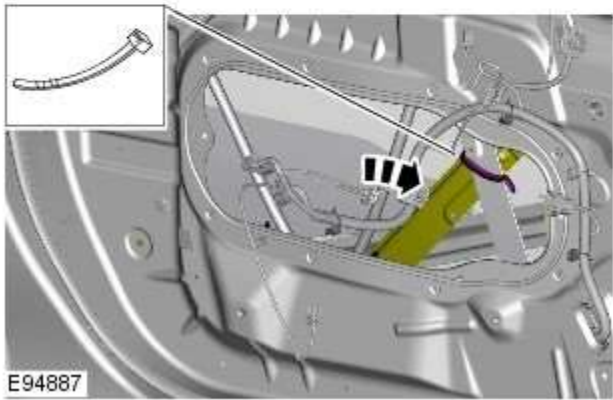
3. Refer to: [Front Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



4.  NOTE: Right-hand shown, left-hand similar.



5.  NOTE: Left-hand shown, right-hand similar.
Torque: 7 Nm



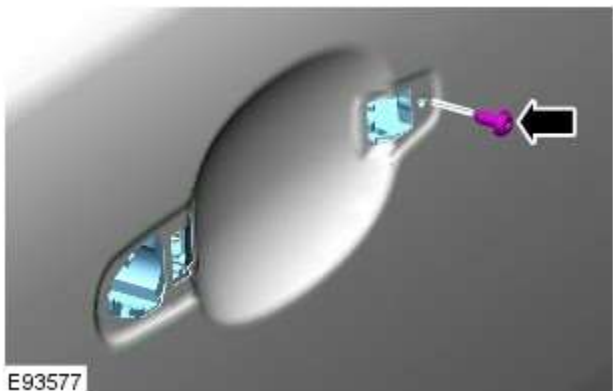
E94887

6.  NOTE: Left-hand shown, right-hand similar.

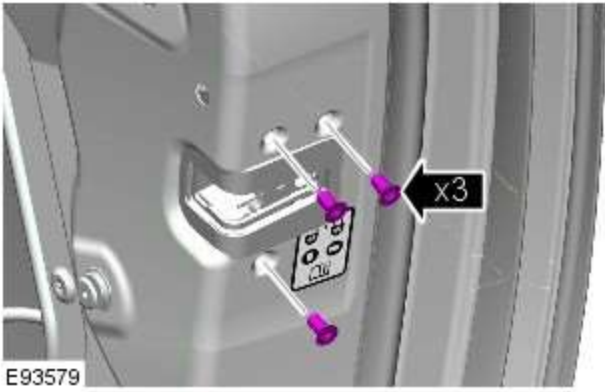


E94886

7.  NOTE: Right-hand shown, left-hand similar.
Torque: 3 Nm

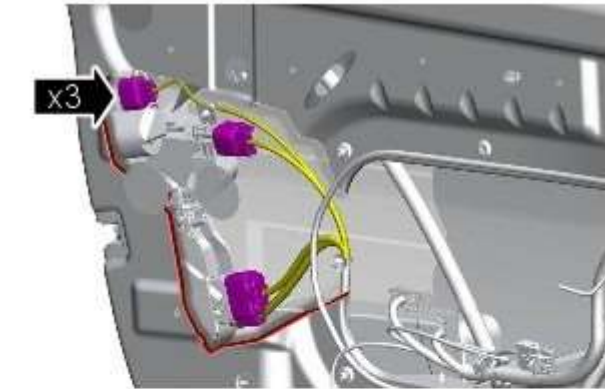


E93577



E93579

8.  NOTE: Right-hand shown, left-hand similar.
Torque: 7 Nm




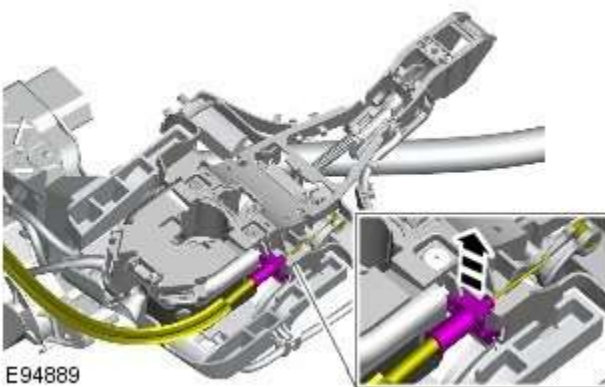
E94888

9.  NOTE: Left-hand shown, right-hand similar.

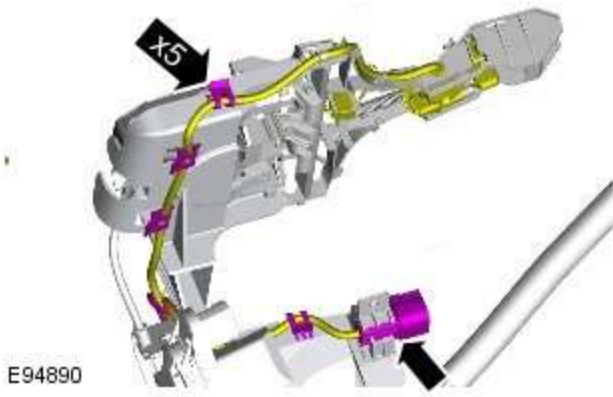



E94888

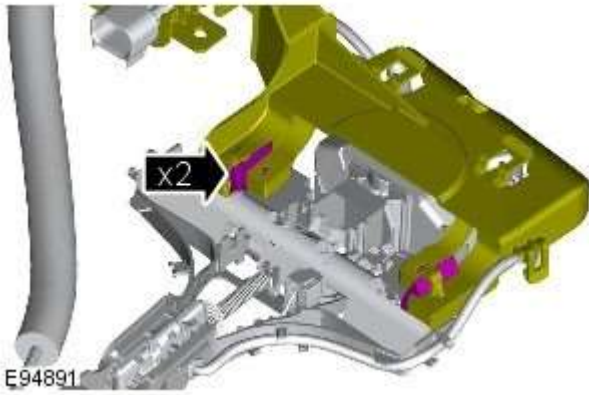
10.  NOTE: Do not disassemble further if the component is removed for access only.




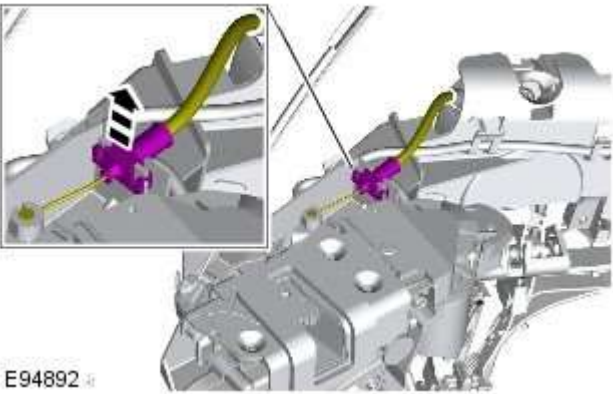
E94889



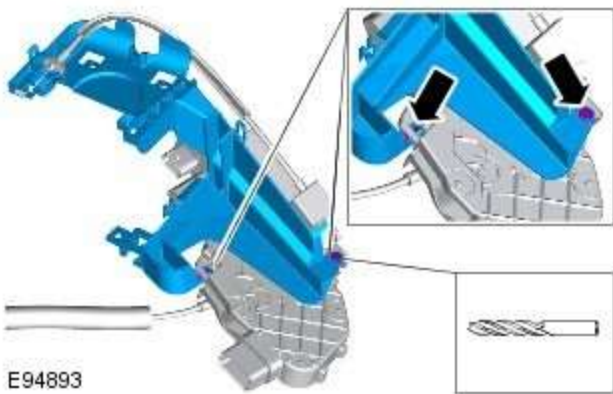
11.  NOTE: Note the position of the wiring harness.



12.  NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

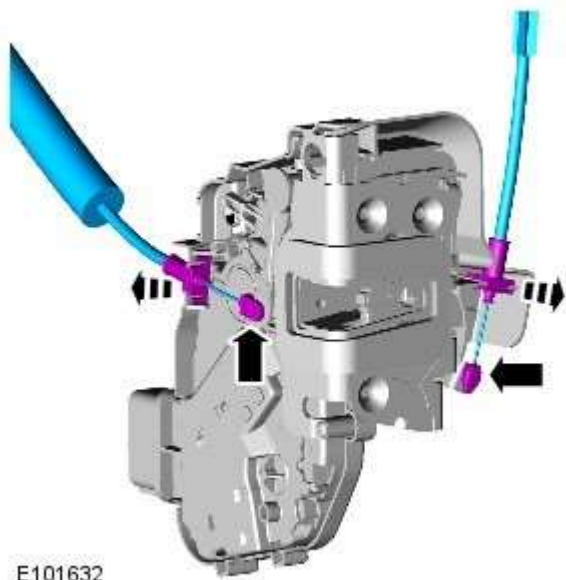


13.



14.

15.



E101632

Installation

1. To install, reverse the removal procedure.

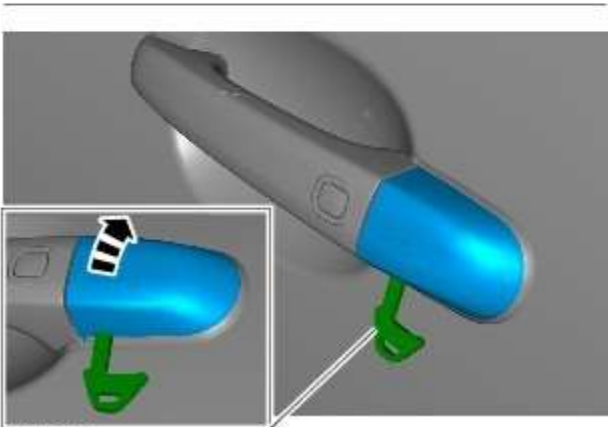
Handles, Locks, Latches and Entry Systems - Front Door Lock Cylinder

Removal and Installation

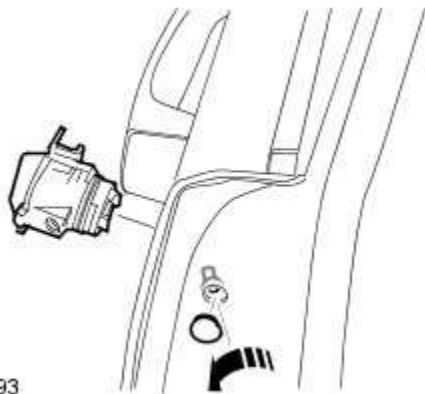
Removal

 NOTE: Removal steps in this procedure may contain installation details.

1.



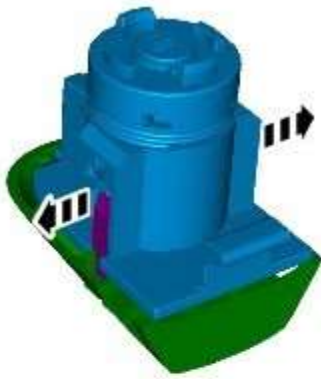
E101264




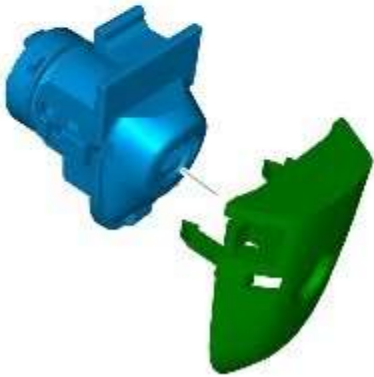
E56293

2.  NOTE: Remove the screw sufficiently, only to release the component.

Torque: 4 Nm



3.  NOTE: Do not disassemble further if the component is removed for access only.



E101265

Installation

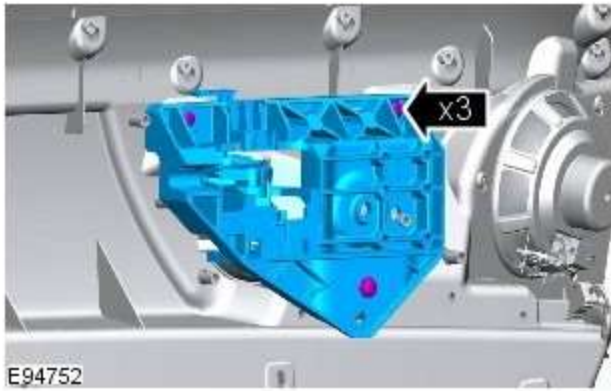
1. To install, reverse the removal procedure.

Handles, Locks, Latches and Entry Systems - Interior Front Door Handle

Removal and Installation

Removal

1. Refer to: [Front Door Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



- 2.

Installation

1. To install, reverse the removal procedure.

Handles, Locks, Latches and Entry Systems - Luggage Compartment Lid Latch Actuator

Removal and Installation

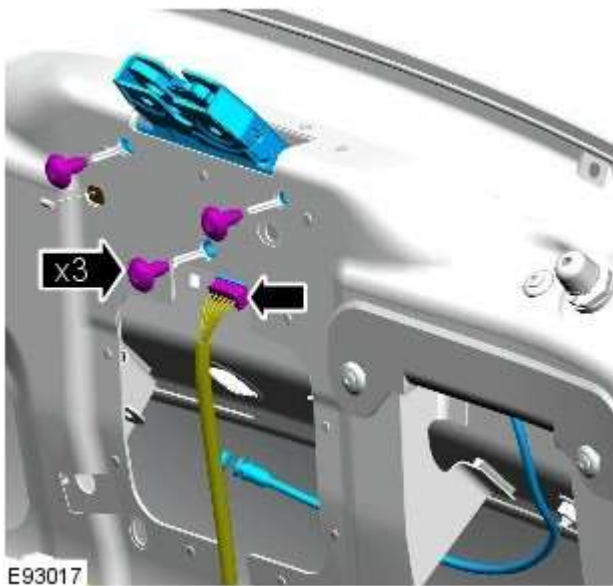
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Luggage Compartment Lid Lock Cylinder](#) (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).

2. Torque: 20 Nm



Installation

1. To install, reverse the removal procedure.

Handles, Locks, Latches and Entry Systems - Luggage Compartment Lid Lock Cylinder

Removal and Installation

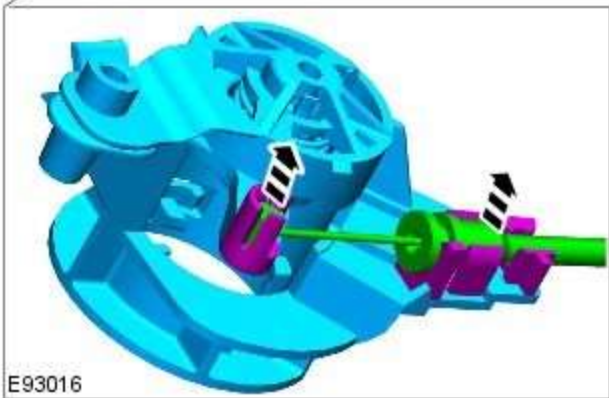
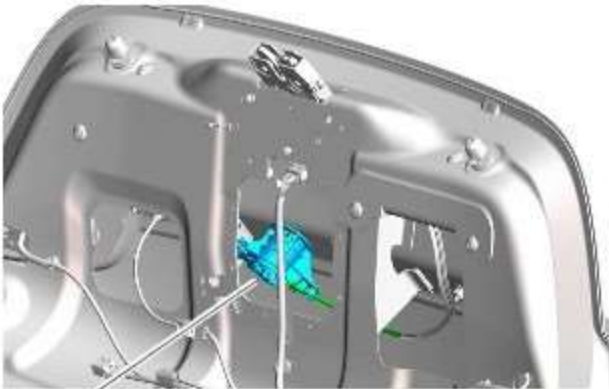
Removal



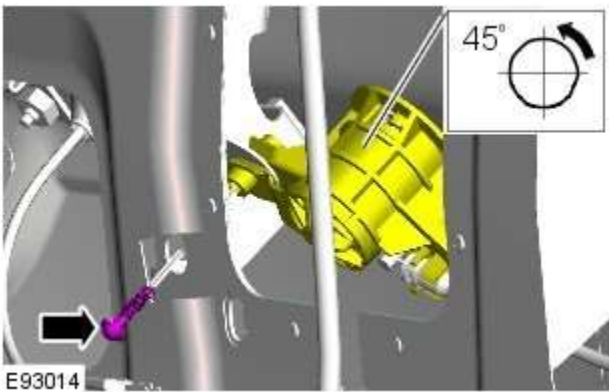
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Luggage Compartment Lid Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

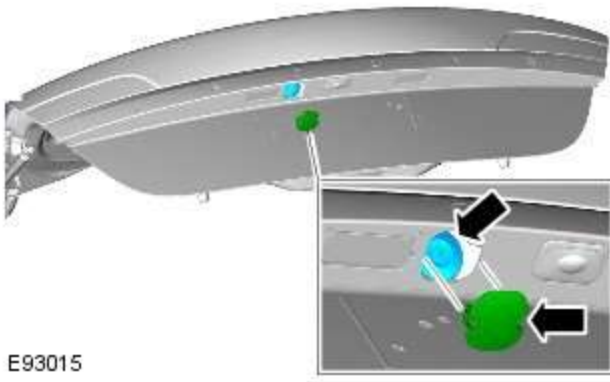
2.



3. Torque: 3.2 Nm



4.



E93015

Installation

1. To install, reverse the removal procedure.

Handles, Locks, Latches and Entry Systems - Rear Door Latch

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

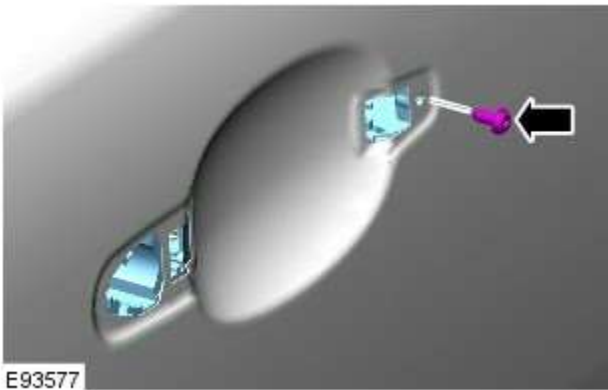
1. Remove the rear door window regulator and motor.

Refer to: [Rear Door Window Regulator and Motor](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).

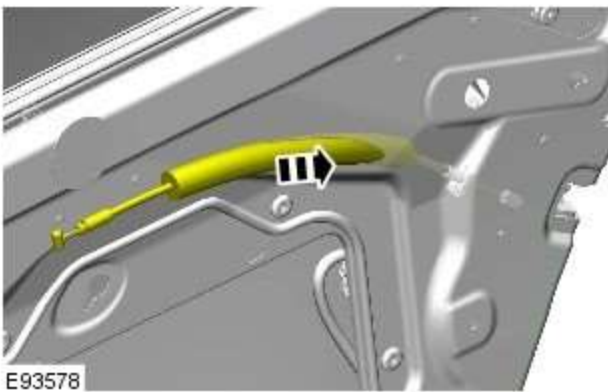
2. Remove the rear door exterior handle.

Refer to: [Exterior Rear Door Handle](#) (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).

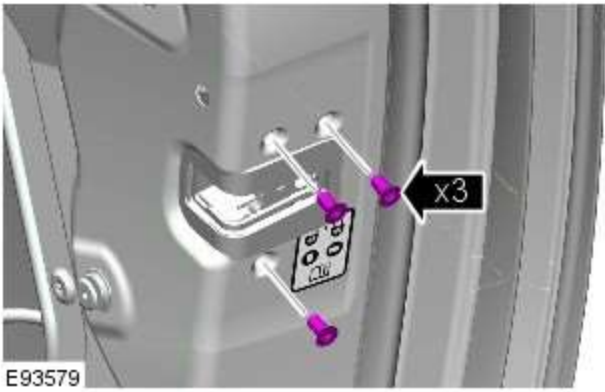
3. Torque: 3 Nm



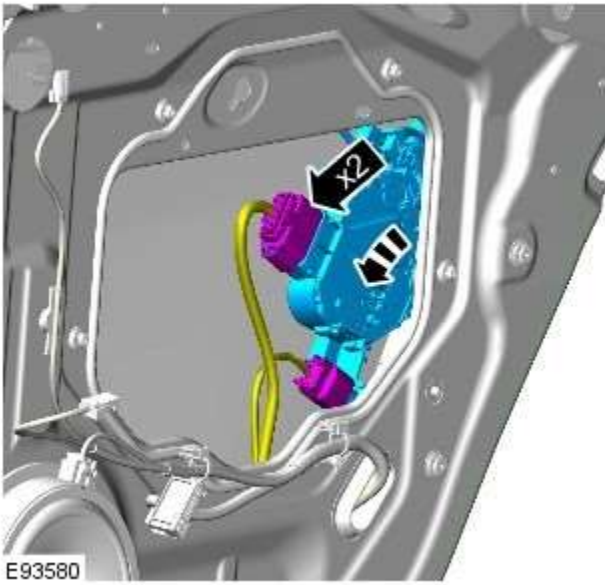
- 4.

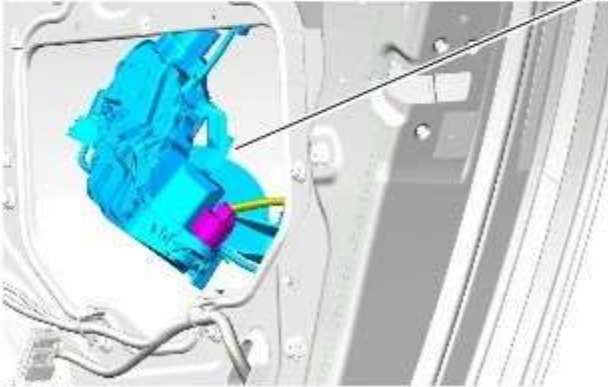
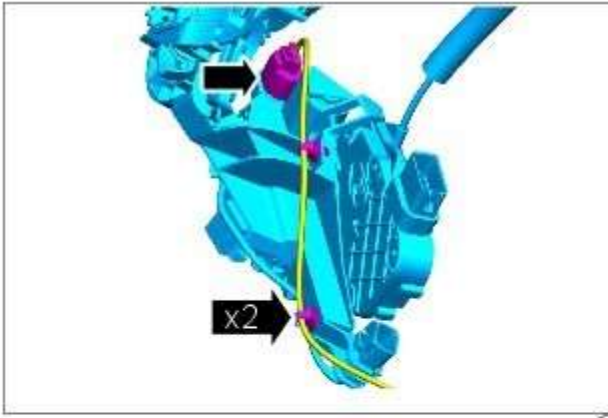


5. Torque: 7 Nm



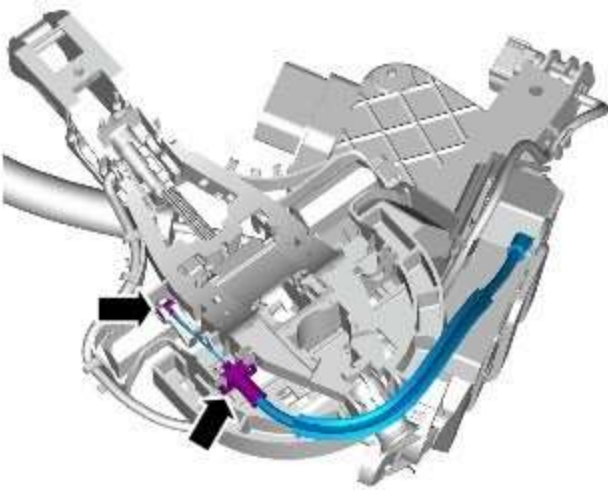
6.






E93581

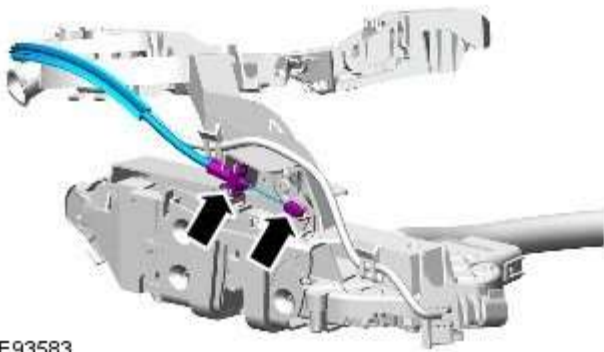
7.  CAUTION: Note of the routing of the wiring harnesses.



E93582

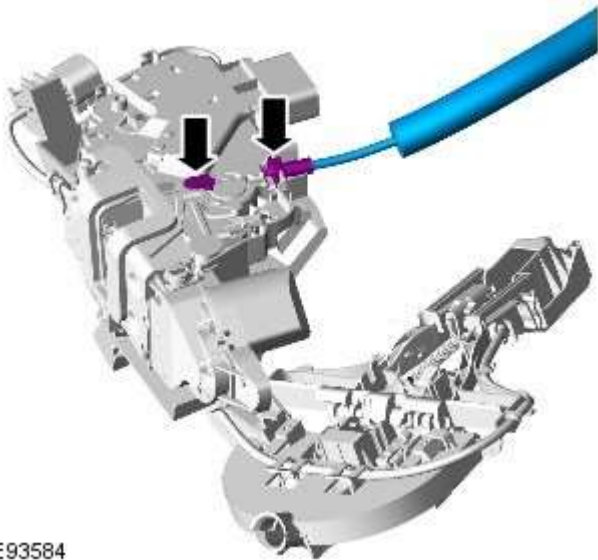
8.  NOTE: Do not disassemble further if the component is removed for access only.

9.



E93583

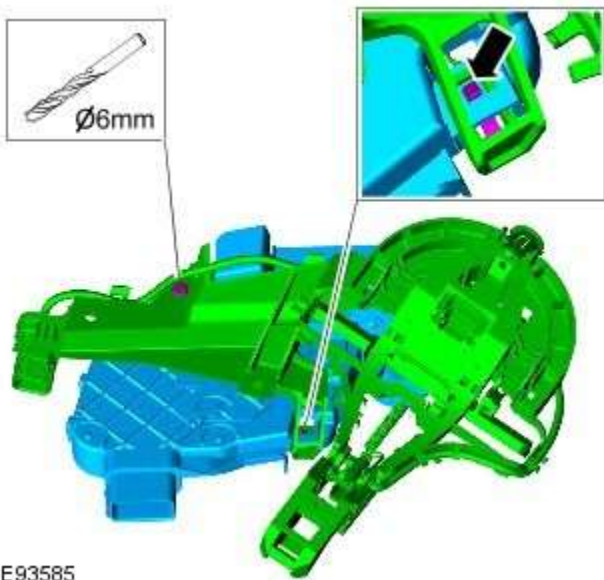
10.




E93584

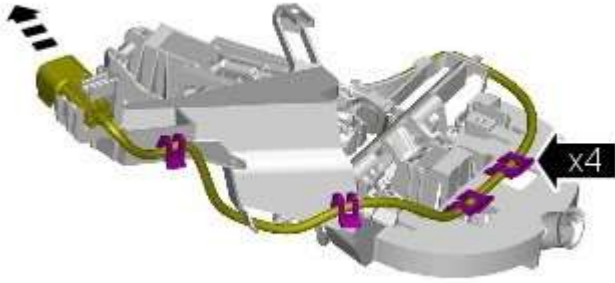
11.

- Drill out the rivet.
- Release the clip.



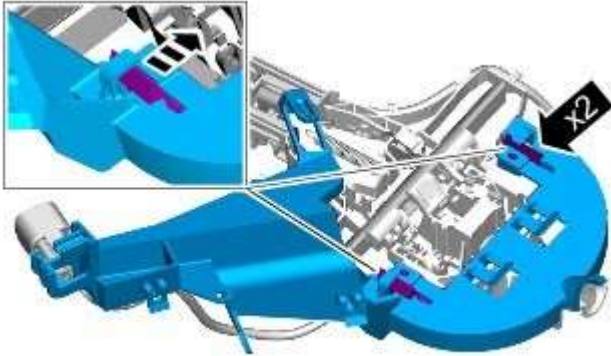
E93585

12.  CAUTION: Note of the routing of the wiring harnesses.




E93586

- 13.



E93587

Installation

1.  CAUTION: Make sure that the wiring harnesses are correctly located.

To install, reverse the removal procedure.

Wipers and Washers -

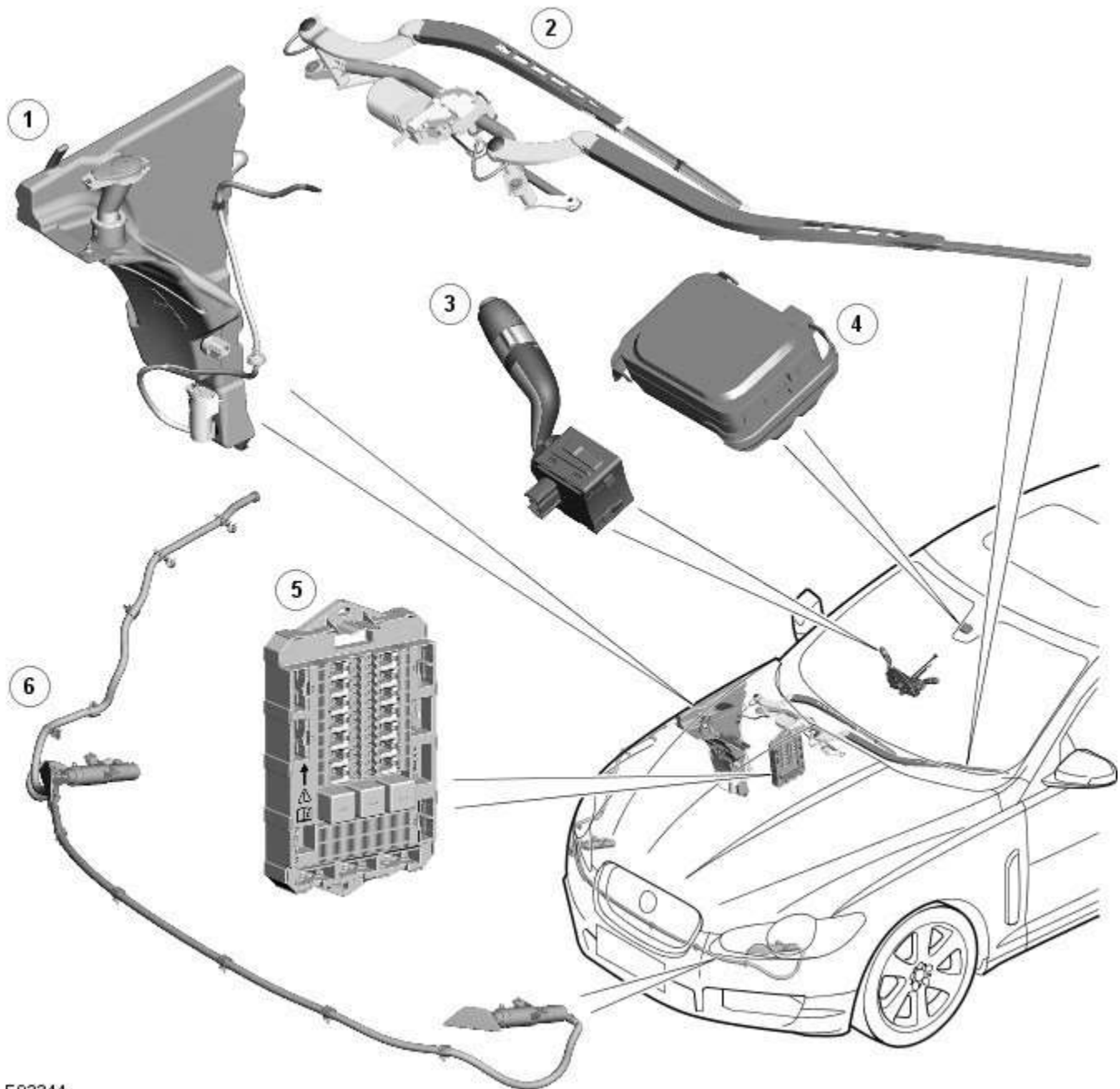
Torque Specifications

Description	Nm	lb-ft	lb-in
Wiper arm retaining nuts	22	16.2	194.7
Wiper linkage bolts / screws	11	8.1	97.4

Wipers and Washers - Wipers and Washers - Component Location

Description and Operation

COMPONENT LOCATION



E93344

Item	Description
1	Washer reservoir
2	Wiper motor and linkage assembly
3	Wiper/washer switch - RH (right-hand) steering column multifunction switch
4	Rain/light sensor
5	CJB (central junction box)
6	Headlamp washer jets (2 off)

Wipers and Washers - Wipers and Washers - Overview

Description and Operation

OVERVIEW

The wipers and washers comprise a windshield wiper system with a conventional wiper linkage and 2 wiper blades and a windshield washer with jets located on the wiper arms. A headlamp powerwash is available on certain models.

The front wipers have 4 operational states:

- Flick wipe
- Auto
- Slow wipe
- Fast wipe.

Operation of the windshield wipers and washers and the headlamp powerwash is controlled by the [CJB \(central junction box\)](#) in response to driver inputs and signals from the rain/light sensor. The instrument cluster monitors the condition of the wiper/washer control switch and transmits driver requests to the [CJB](#) over the medium speed [CAN \(controller area network\)](#) bus.

The 'Auto' function requires an input from the rain sensor. The rain sensor is mounted on the inner surface of the windshield and transmits an infra-red signal to determine the amount of water on the outer surface of the windshield. A value is then transmitted to the [CJB](#) over the [LIN \(local interconnect network\)](#) bus.

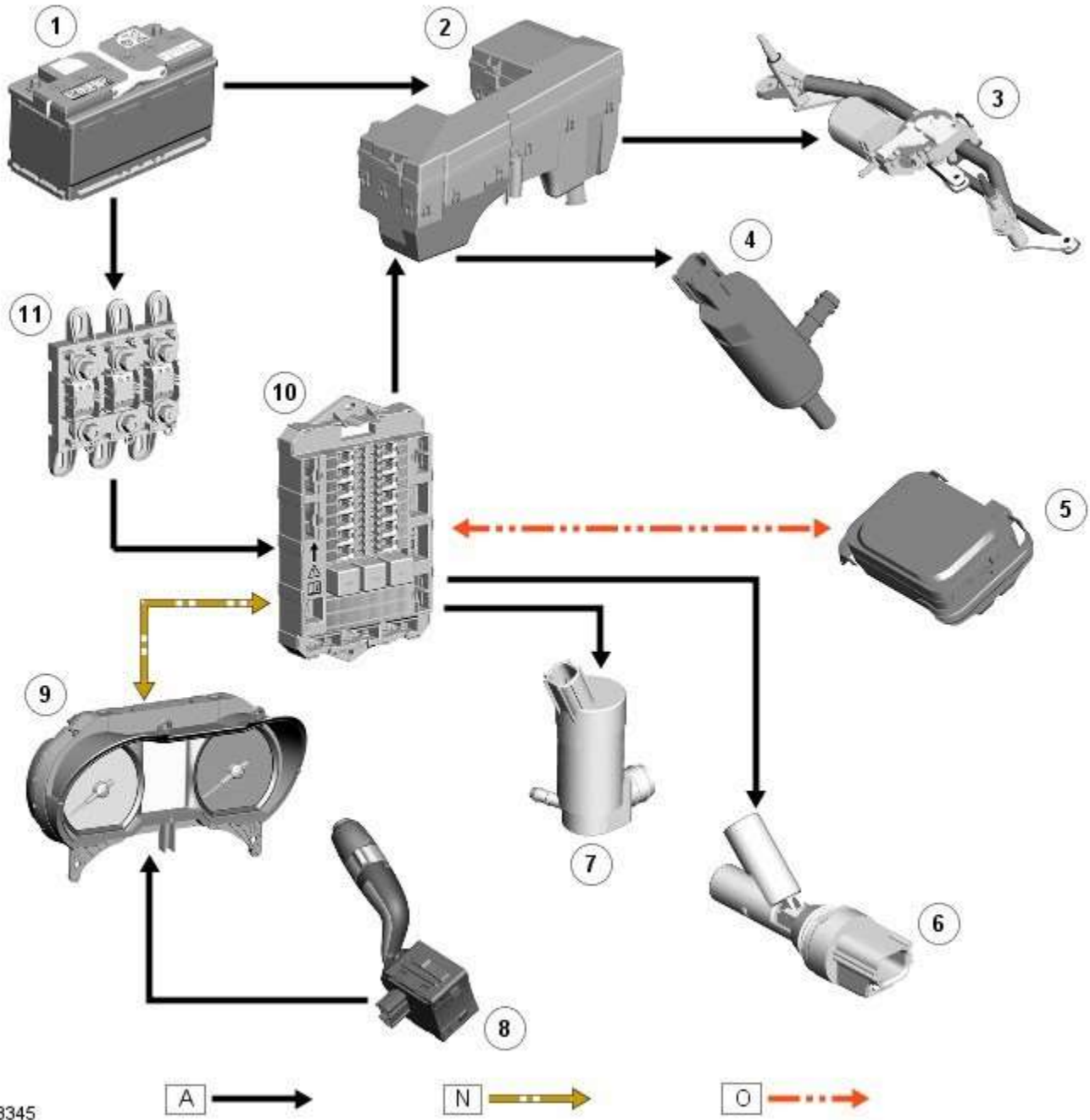
Wipers and Washers - Wipers and Washers - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: **A** = Hardwired; **N** = Medium speed CAN (controller area network) bus; **O** = LIN (local interconnect network) bus



E93345

Item	Description
1	Battery
2	EJB (engine junction box)
3	Wiper motor
4	Headlamp washer pump
5	Rain/Light sensor
6	Washer reservoir fluid level switch

7	Windshield washer pump
8	Wiper/Washer switch - RH (right-hand) steering column multifunction switch
9	Instrument cluster
10	CJB (central junction box)
11	BJB (battery junction box)

System Operation

WINDSHIELD WIPERS

Operation of the wipers and washers is controlled by the [CJB](#) in response to driver inputs from the wiper control switch and signals from the rain/light sensor. The instrument cluster monitors the condition of the wiper/washer control switch and transmits driver requests to the [CJB](#) over the medium speed [CAN](#) bus.

The wiper control switch is connected via hardwired connections to the instrument cluster. The instrument cluster outputs on 4 wires a reference voltage to the wash/wipe switch, the auto wiper switch, the wiper switch and the flick wipe switch. All the switches are connected to the instrument cluster on a common ground. Each switch function is connected to ground via a resistor or series of resistors and the instrument cluster monitors the ground signal and determines which function has been selected. The instrument cluster then outputs the appropriate message on the medium speed [CAN](#) bus to the [CJB](#) which responds to the requested wiper function. The [CJB](#) then activates the appropriate function either directly or via relays in the [EJB](#) for the wipers and headlamp powerwashers.

Speed Dependent Mode

When the wipers are operating, a vehicle speed signal received by the [CJB](#) on the high speed [CAN](#) bus is used to operate a speed dependent mode. If the wipers are in fast wipe and the vehicle speed decreases to below 2 km/h (1.2 mph), the wipers will reduce to the normal wipe speed. When the vehicle speed increases to above 8 km/h (5 mph) the fast wiper speed selection is restored. If slow speed is selected and the vehicle speed drops below 2km/h (1.2 mph), the wipers will operate in the intermittent mode. When the vehicle speed increases to above 8 km/h (5 mph) the slow wiper speed selection is restored – this feature is configurable by the dealer using the approved Jaguar diagnostic system.

Wiper Motor

The wiper motor is controlled by the [CJB](#). The [CJB](#) is connected to a wiper motor normal/fast relay in the [EJB](#) on 2 wires. The [CJB](#) is also connected to a wiper run/park relay, also located in the [EJB](#).

Driver requests are received by the [CJB](#) which energizes the wiper motor normal/fast relay in the appropriate mode (normal or fast wipe) and also energizes the run/park relay in the run mode by providing a ground for the relay coils. When wiper operation is deselected by the driver, the [CJB](#) monitors a park switch which is integral with the wiper motor. On receipt of a signal from the park switch, the [CJB](#) de-energises the run/park relay, removing the power supply through the normal/fast relay, stopping the wipers in the park position on the windshield.

The wiper motor is a **DC (direct current)** motor which drives a gear wheel via a worm drive attached to the motor spindle. The motor has 3 sets of brushes with one brush connected to ground. When the normal/fast relay is energized in the normal position, a power feed is supplied to the brush directly opposite the ground brush and operates the motor at slow speed. When the relay is energized in the fast position, a power feed is connected to the second motor brush, which is offset from the ground brush and operates the motor at the fast speed. With power supplied through the offset brush, the current flows through fewer motor coil windings. This results in a lower resistance to current flow to the ground brush and produces a higher motor rotational speed.

WINDSHIELD WASHERS

The windshield washers are controlled by the [CJB](#). A driver request for washer operation, via the wiper control switch, is passed to the instrument cluster on the [LIN](#) bus. The instrument cluster passes the message to the [CJB](#) on the medium speed [CAN](#) bus.

The [CJB](#) energizes the windshield washer pump during the up stroke of the first 2 wash/wipe cycles. This ensures that wiper fluid is pushed to the sides of the windshield and eliminates the trail of fluid which can occur if the fluid is pushed to the bottom of the windshield. The wipers will continue for 3 more cycles, followed after a delay of 4 seconds, by a single dry wipe.



NOTE: The dry wipe feature is configurable using an approved Jaguar diagnostic system.

The operation of the washer pump on the wiper up stroke only is configurable using an approved Jaguar diagnostic system.

The washer button can be pressed and held and the wipers will operate continuously for up to 10 seconds. After this period when the button is released, the wipers will continue for 3 more cycles, followed after a delay, by a single dry wipe. After this period washing will be inhibited, the wipers will continue for 3 more cycles, followed after a delay, by a single dry wipe. Reactivating the switch will recommence the wash/wipe cycle.

RESERVOIR LEVEL SWITCH

The level switch is connected directly to the [CJB](#). The switch is operated by a float which closes contacts within the switch when the fluid level falls to below the switch level. When the contacts are closed a ground path is completed from the [CJB](#) through the switch. This is sensed by the [CJB](#) which issues a message to the instrument cluster which displays a low fluid level warning.

HEADLAMP POWERWASHERS

The headlamp powerwash is activated when the driver requests windshield washer operation. The [CJB](#) receives the driver request via a [CAN](#) bus message from the instrument cluster. The [CJB](#) then checks for an exterior lights active signal and that a low washer fluid level signal is not present.

The [CJB](#) outputs a control voltage to a headlamp powerwash pump relay located in the [EJB](#). The relay is energized by the [CJB](#) for a pre-determined period to allow the headlamp telescopic washers to operate.

The [CJB](#) monitors the driver washer requests and only operates the headlamp powerwash on every fourth request for windshield washer operation, provided that 10 minutes have elapsed since the last headlamp powerwash operation. The powerwash sequence is reset when the headlamps or the ignition is switched off.



NOTE: If a low fluid reservoir level is present the [CJB](#) prohibits headlamp powerwash.

RAIN/LIGHT SENSOR

On receiving a request for automatic windshield wiper operation, the [CJB](#) interprets [LIN](#) bus messages received from the rain sensor. The rain sensor provides [LIN](#) bus messages with values ranging from 0 to 7.

A signal value of 0 is interpreted by the [CJB](#) as the windshield is dry. A signal value from 1 to 5 is interpreted by the [CJB](#) as a small amount of water hitting the windshield. In this instance, the [CJB](#) initiates a slow wipe. A signal value of 7 is interpreted by the [CJB](#) as a large amount of water hitting the windshield. In this instance, the [CJB](#) initiates a fast wipe.

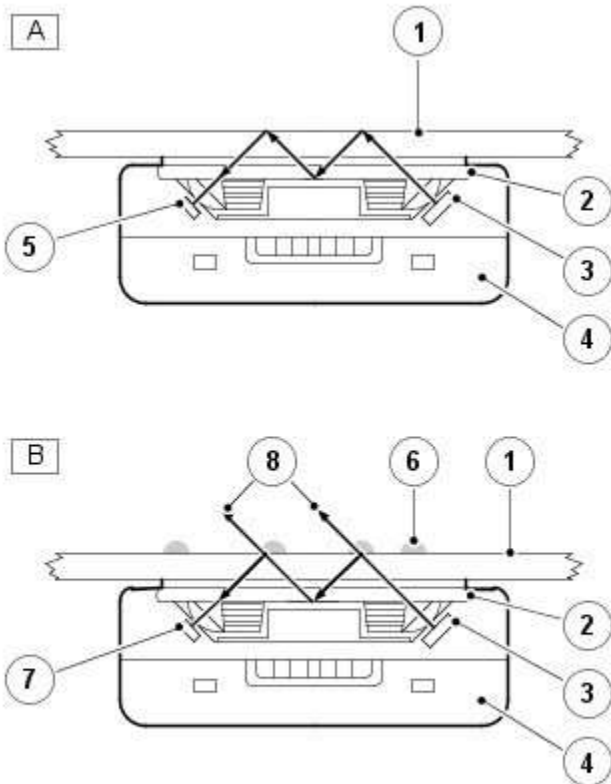
NOTES:



The [CJB](#) will only change a fast wipe routine to a slow wipe routine if the rain sensor value is lower than 7.



A = Clean and dry windshield; **B** = Wet and dirty windshield



E43326

Item	Description
1	Windshield outer surface
2	Optical element
3	Transmitter diodes (100% light transmitted)
4	Rain sensor

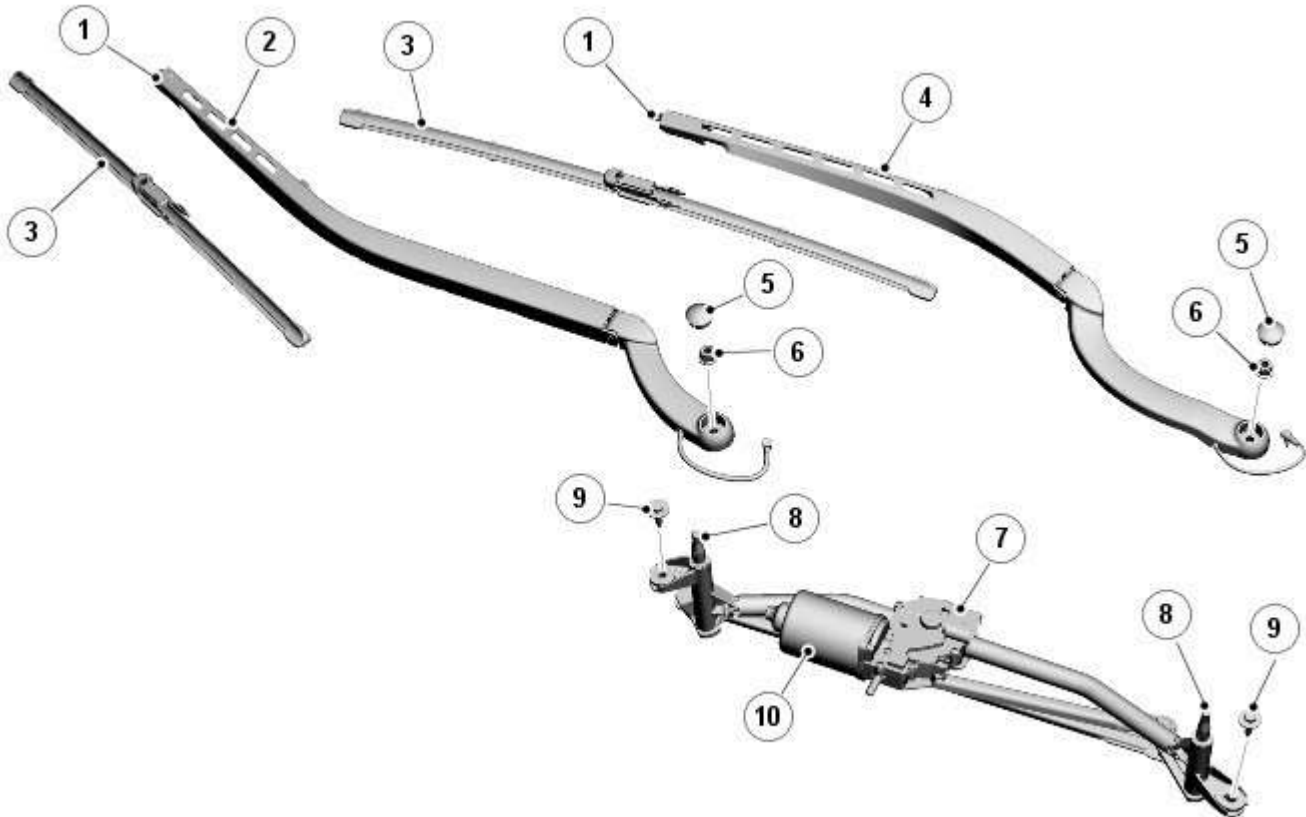
5	Receiver diodes (100% light received)
6	Water droplets/film
7	Receiver diodes (less than 100% light received)
8	Lost light

Component Description

WINDSHIELD WIPER MOTOR AND LINKAGE



NOTE: LHD (left-hand drive) wiper linkage shown



E96944

Item	Description
1	Quick release wiper blade attachment
2	RH wiper arm
3	Wiper blade (2 off)
4	LH (left-hand) wiper arm
5	Wiper arm cap (2 off)
6	Nut (2 off)
7	Wiper linkage location hole (hidden)
8	Pivot housing (2 off)
9	Screw and washer (2 off)
10	Wiper motor

The wiper linkage and motor assembly differs between [LHD](#) and [RHD \(right-hand drive\)](#) models. The wiper linkage and motor assembly is not available as separate service components. If the wiper linkage and motor assembly is replaced, it is important that alignment is made to marks on the windshield and the fixings are tightened in the correct order.

The wiper linkage and motor assembly is attached to the vehicle body with screws and washers at each end. The screws are located in rubber bushes in the linkage assembly which isolate the linkage from the vehicle body. A rubber grommet is located behind the motor and engages on a spigot on the vehicle body to locate the linkage.

The linkage assembly comprises a main tube with a pivot housing located at each end. The motor assembly is attached to the tube by a clamp plate and 4 screws. The motor output shaft is fitted with a crank. A link rod is connected to the motor crank

and is connected at the opposite end to the LH pivot housing via a crank. The LH pivot housing crank is fitted with a second link rod which is connected directly to the crank on the RH pivot housing.

The motor crank converts rotary motion from the motor output shaft into linear movement of the link rods. The cranks connected to each pivot housing, convert the linear motion of the link rods back to rotary motion of the pivot housings. This rotary motion is passed to the wiper arms and blades causing the blades to wipe an arc across the windshield.

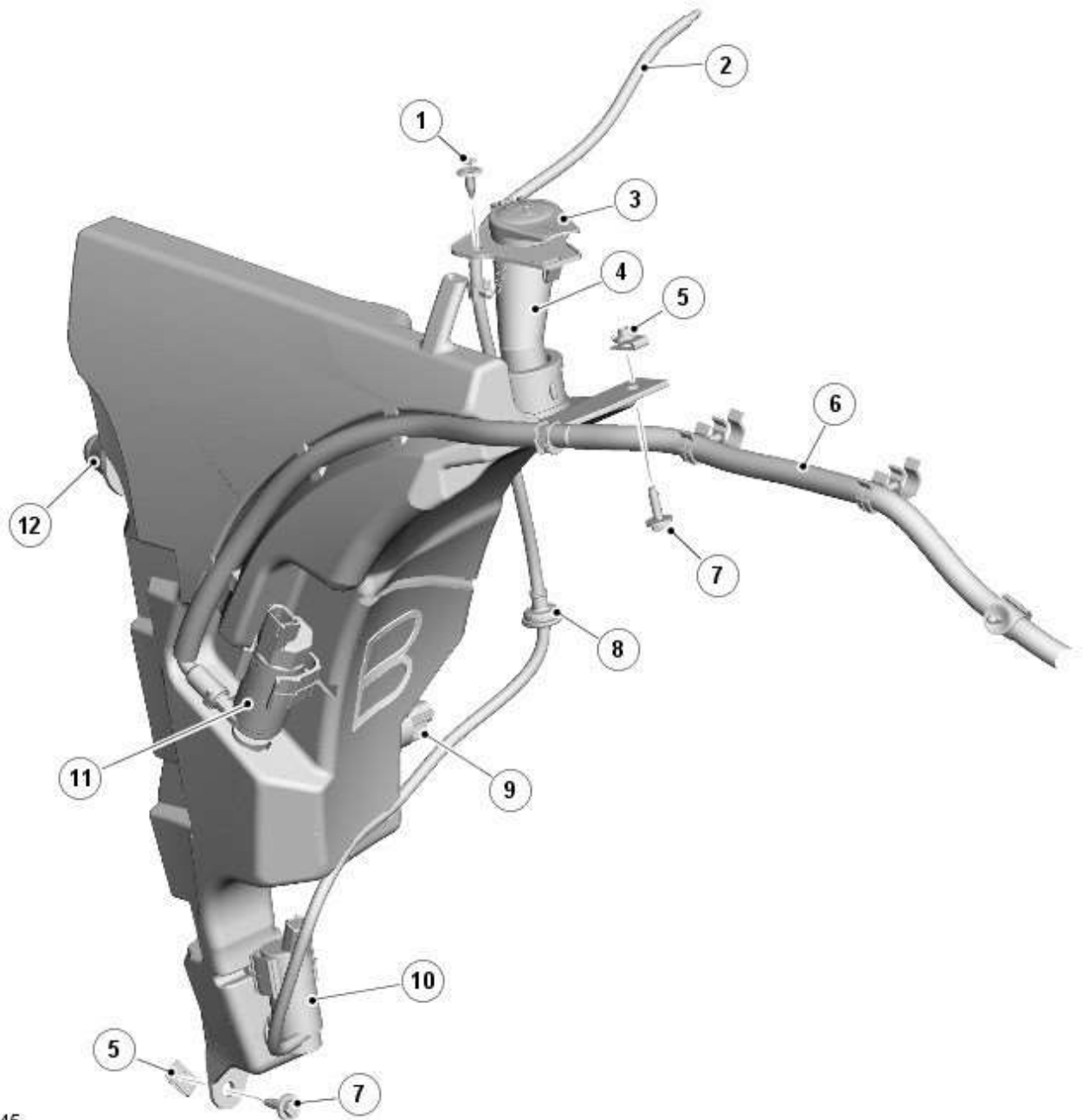
Each wiper arm is located on a taper spline on the respective pivot housing. A nut is screwed on the end of the pivot housing shaft and positively secures the wiper arm on the taper spline.

The wiper blades are attached to the wiper arms with a quick release fittings. The blades are of the flat blade type. These blades have an integral spring along their full length which curves the blade to match the windshield and provides even blade to windshield contact pressure along the entire length of the blade.

WASHER RESERVOIR



NOTE: Type 'B' washer reservoir shown



Item	Description
1	Scrivet
2	Windshield washer feed pipe to washer jets
3	Reservoir cap
4	Reservoir filler neck
5	Captive nut (2 off)
6	Headlamp powerwash feed pipe to telescopic washer jets
7	Screw and washer (2 off)
8	Grommet
9	Washer fluid level sensor
10	Windshield washer pump
11	Headlamp washer pump
12	Location spigot

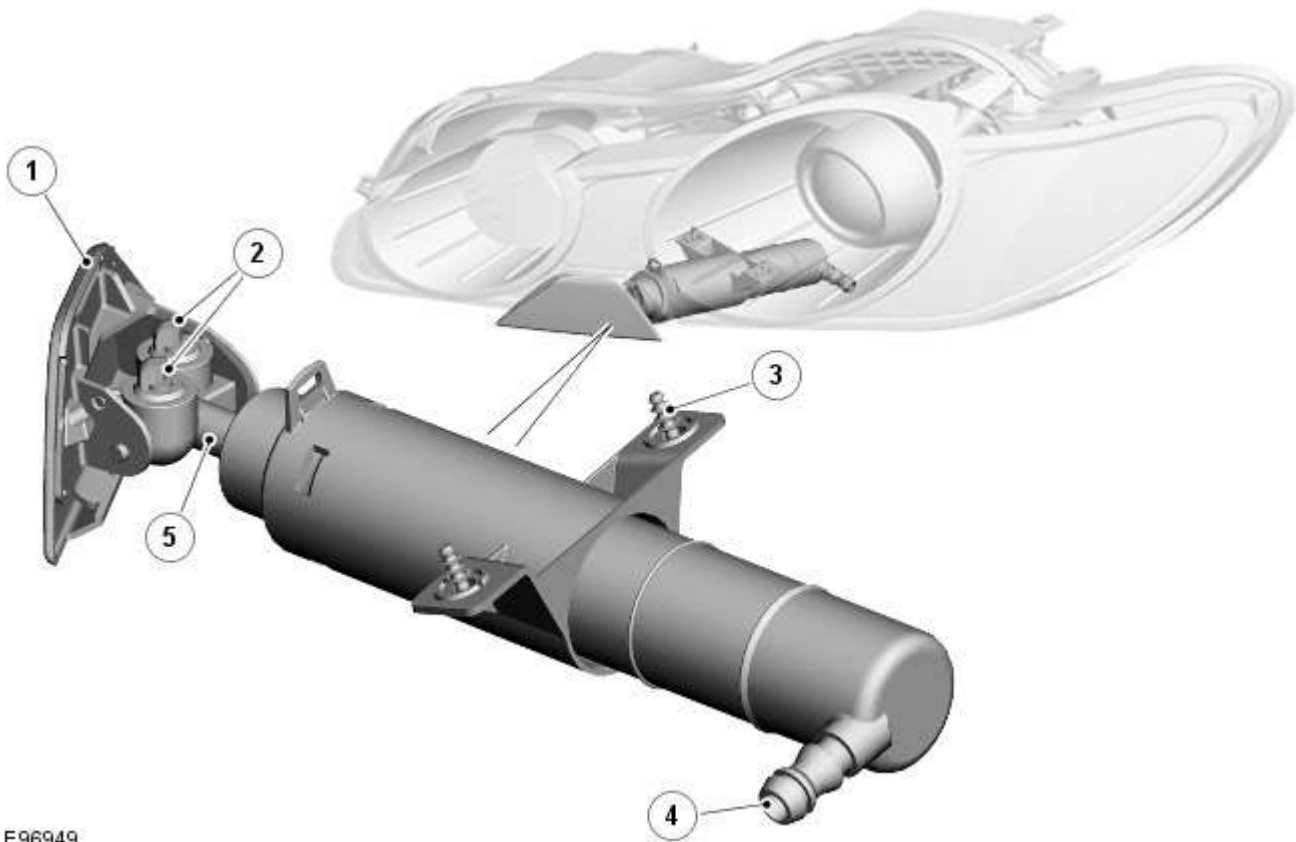
The washer reservoir is located in the [RH](#) wheel arch. The reservoir is a plastic moulding and is secured in the wheel arch with 2 screws and washers and a scrivet. A level sensor is located in the reservoir and is connected to the [CJB](#). The reservoir is fitted with a washer pump which supplies pressurized washer fluid to the windshield washer jets mounted on the wiper arms.

A vehicle fitted with optional headlamp washers is fitted with a larger reservoir and an additional pump for the headlamp washers. The larger reservoir is identifiable by a letter 'B' moulded on the casing and has a capacity of 5.5 liters. Reservoirs moulded with the letter 'A' are for use on vehicles with windshield washers only and have a capacity of 4.4 liters.

A filler cap is located at the top of the reservoir and is accessible from the engine compartment.

The pumps are located in rubber sealing grommets in holes in the reservoir and secured with clips. The pump fluid hoses have quick release connectors which mate with the pumps. The fluid level sensor is a push fit into a sealing grommet in one side of the reservoir body.

HEADLAMP POWERWASHERS (if fitted)



E96949

Item	Description
1	Powerwash trim cap
2	Washer jets
3	Self-tapping screws (2 off)
4	Pressure feed from powerwash pump
5	Telescopic arm

On vehicles with headlamp powerwash, each headlamp assembly is fitted with a headlamp powerwasher. The powerwasher is located on the underside of the headlamp assembly. The powerwasher is located in a clip at the front of the headlamp and secured with 2 self tapping screws to the headlamp body.

The powerwasher is a telescopic unit which extends forwards from the headlamp assembly under washer fluid pressure supplied by the headlamp powerwash pump. When the pump pressure decreases the powerwasher is automatically retracted back into the housing. The outer end of the powerwasher is fitted with a trim which blends the powerwasher into the headlamp when it is not operating. The powerwasher has two washer jets which direct washer fluid under high pressure onto the headlamp lens when the powerwasher is extended.

RAIN/LIGHT SENSOR



E84141

The rain/light sensor is located at the upper edge of the windshield, behind the interior rear view mirror. Contact between the rain sensor and windscreen is provided via a silicon pad which is compressed during the assembly process by two locking retaining clips either side of the sensor.

The rain/light sensor unit attaches to the windshield via two clips, which latch onto formed tags on the windshield bracket.

The sensor provides information to the [CJB](#) for the optimum wiper operation for the prevailing conditions to maintain the shield in a clear condition at all times. The rain/light sensor is an optical unit, which operates on an infrared waveband. The sensor uses the principle of the laws of reflection on interfacing surfaces between materials with differing refraction properties.

The rain/light sensor is connected to the [CJB](#) via a [LIN](#) bus. The sensor also receives a hardwired power and ground from the [CJB](#). The 'auto' wipers are activated when the column stalk is moved to position 1 (first position from off in the upward direction). The sensitivity of the sensor can be adjusted by rotating the sensitivity collar on the wiper column stalk in the clockwise or counterclockwise direction. Clockwise rotation will decrease sensitivity, while counterclockwise adjustment will increase sensitivity. An increase in sensitivity adjustment results in a single wipe of the front wiper motor.



NOTE: The rain sensor also contains a light sensor. The light sensor is used to control operation of the automatic headlamps function. Refer to: [Exterior Lighting \(417-01 Exterior Lighting, Description and Operation\)](#).

WIPER CONTROL SWITCH

The wiper control switch is located on the [RH](#) steering column multifunction switch. The switch allows selection of the following functions:

- Slow wipe
- Fast wipe
- Auto
- Flick wipe
- Windshield wash and headlamp powerwash (if fitted).

All wiper functions are connected to the instrument cluster by a resistor or series of resistors within the switch. The instrument cluster uses the returned current to determine the selected function.

WIPER SERVICE POSITION

The wiper service position allows the wipers to be parked in a position to allow easy access to the wiper blades for replacement. The service position is initiated by pulling the [RH](#) steering column multifunction switch towards the steering wheel and pressing the start/stop button to switch on the ignition. The wipers will move and stop in a vertical position on the windshield. The [RH](#) steering column multifunction switch can be released and the ignition switched off. The service position is terminated at the next ignition on cycle and the wipers return to their normal park position.

Wipers and Washers - Wipers and Washers

Diagnosis and Testing

Principle of Operation

For a detailed description of the wipers and washers, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (501-16 Wipers and Washers)

[Wipers and Washers](#) (Description and Operation),
[Wipers and Washers](#) (Description and Operation),
[Wipers and Washers](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Wiper blade(s) • Wiper pivot arm shaft • Washer reservoir • Hose(s) • Washer jet(s) 	<ul style="list-style-type: none"> • Fuse(s) • Wiring harness • Electrical connector(s) • Washer pump(s) • Wiper motor

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer approved diagnostic system).



When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



Inspect connectors for signs of water ingress, and pins for damage and/or corrosion.



If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B109512	Wiper On/Off Relay	<ul style="list-style-type: none"> • Wiper On/Off relay control 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical

DTC	Description	Possible Cause	Action
		circuit - short to power	circuit diagrams and check wiper On/Off relay control circuit for short to power
B109514	Wiper On/Off Relay	<ul style="list-style-type: none"> Wiper On/Off relay control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check wiper On/Off relay control circuit for short to ground, open circuit
B109612	Wiper High/Low Relay	<ul style="list-style-type: none"> Wiper Fast/Slow relay control circuit - short to power 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check wiper Fast/Slow relay control circuit for short to power
B109614	Wiper High/Low Relay	<ul style="list-style-type: none"> Wiper Fast/Slow relay control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check wiper Fast/Slow relay control circuit for short to ground, open circuit
B10AD09	Rain Sensor	<ul style="list-style-type: none"> Component failures 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Suspect the rain/light sensor, check and install a new sensor as required
B10AD11	Rain Sensor	<ul style="list-style-type: none"> Rain/light sensor power circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check rain/light sensor power circuit for short to ground
B10AD96	Rain Sensor	<ul style="list-style-type: none"> Component internal failure 	Suspect the rain/light sensor, check and install a new sensor as required
B117712	Screenwash Level Switch	<ul style="list-style-type: none"> Screenwash level switch signal circuit - short to power 	Refer to the electrical circuit diagrams and check screenwash level switch signal circuit for short to power
B1C4513	Front Wiper Park Position Switch	<ul style="list-style-type: none"> Windshield wiper motor park switch signal circuit - open circuit 	Refer to the electrical circuit diagrams and check windshield wiper motor park switch signal circuit for open circuit
B1C4523	Front Wiper Park Position Switch	<ul style="list-style-type: none"> Signal stuck low 	Refer to the electrical circuit diagrams and check front wiper park position switch input circuit for short, open circuit
B1C7812	Powerwash Relay	<ul style="list-style-type: none"> Powerwash relay control circuit - short to power 	Refer to the electrical circuit diagrams and check powerwash relay control circuit for short to power
B1C7814	Powerwash Relay	<ul style="list-style-type: none"> Powerwash relay control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check powerwash relay control circuit for short to ground, open circuit
B1C7911	Front Washer Pump	<ul style="list-style-type: none"> Screenwash pump control circuit - short to ground 	Refer to the electrical circuit diagrams and check screenwash pump control circuit for short to ground
B1C7913	Front Washer Pump	<ul style="list-style-type: none"> Screenwash pump control circuit - open circuit 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check screenwash pump control circuit for open circuit

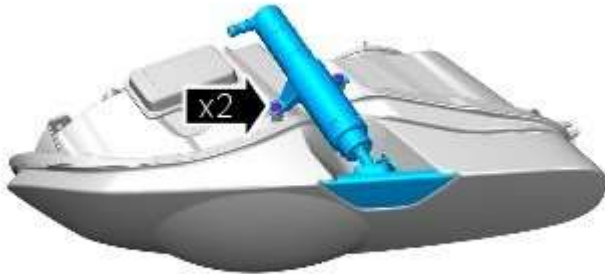
Wipers and Washers - Headlamp Washer Jet

Removal and Installation

Removal

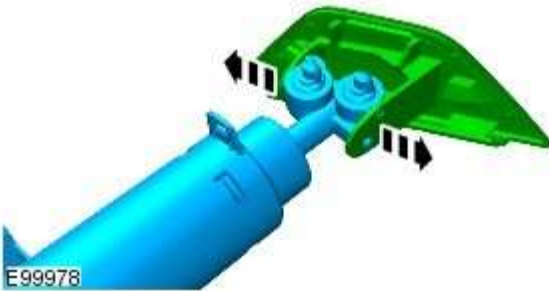
1. Refer to: [Headlamp Assembly](#) (417-01 Exterior Lighting, Removal and Installation).

2.  NOTE: Left-hand shown, right-hand similar.



E99977

3.  NOTE: Left-hand shown, right-hand similar.



E99978

Installation

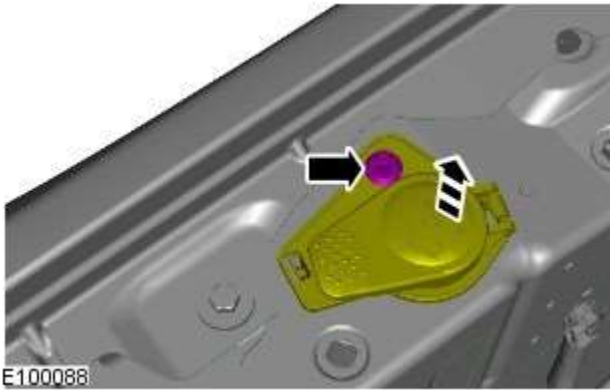
1. To install, reverse the removal procedure.

Wipers and Washers - Headlamp Washer Pump

Removal and Installation

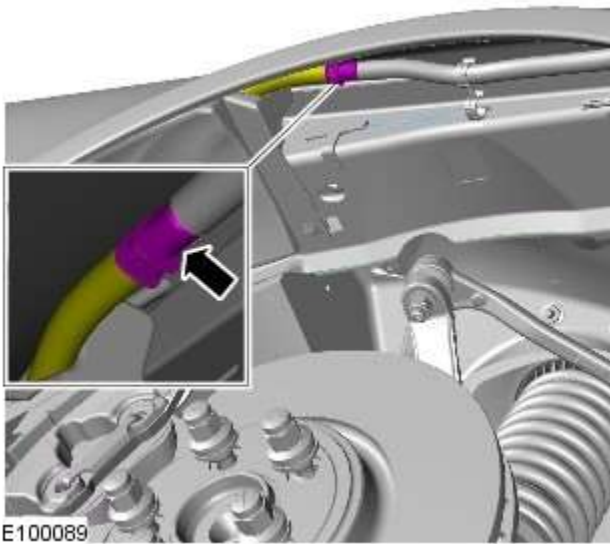
Removal

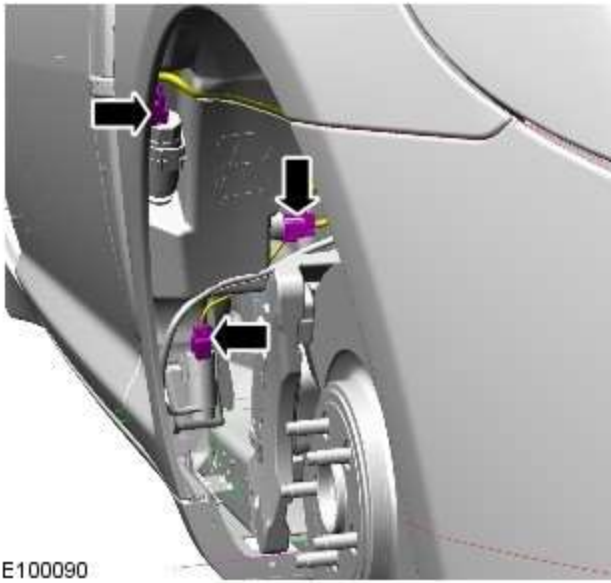
1.



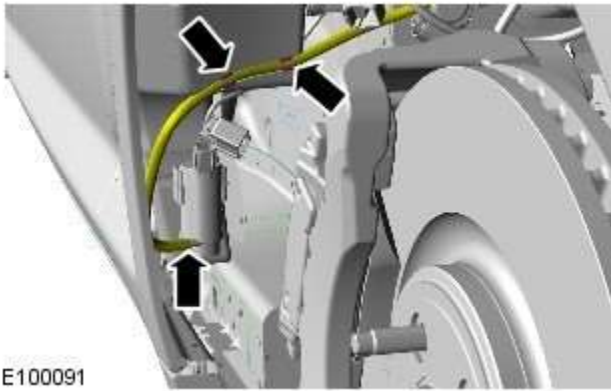
2. Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).

3.  CAUTION: Be prepared to collect escaping fluids.

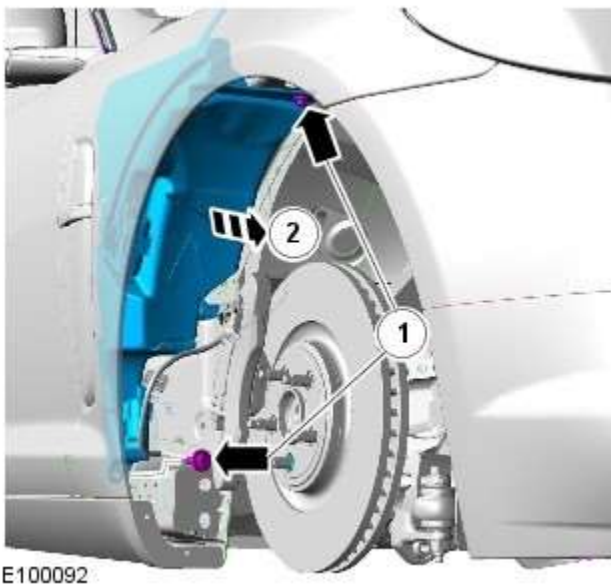




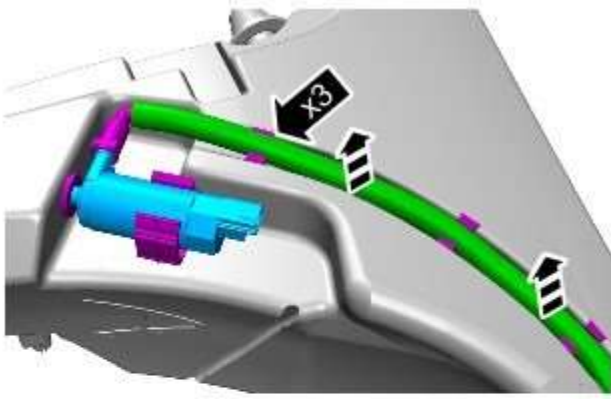
4.



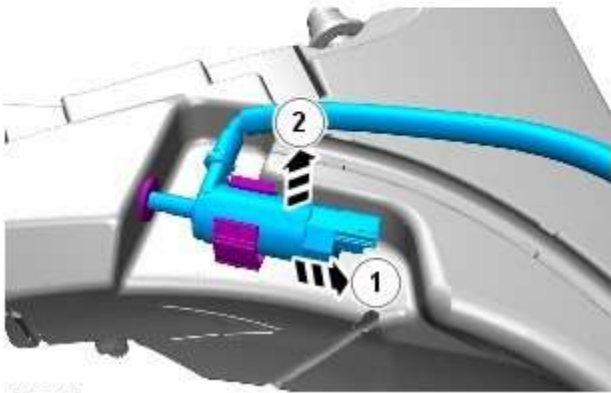
5.  CAUTION: Be prepared to collect escaping fluids.



6.




7.  CAUTION: Take extra care not to damage the seal.



E100151

Installation

1.  CAUTION: The seals are to be reused unless damaged.
To install, reverse the removal procedure.

Wipers and Washers - Rain Sensor

Removal and Installation

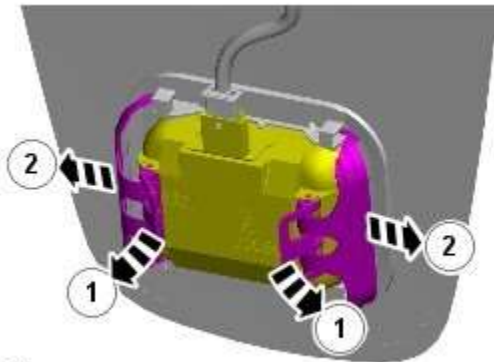
Removal



NOTE: Removal steps in this procedure may contain installation details.

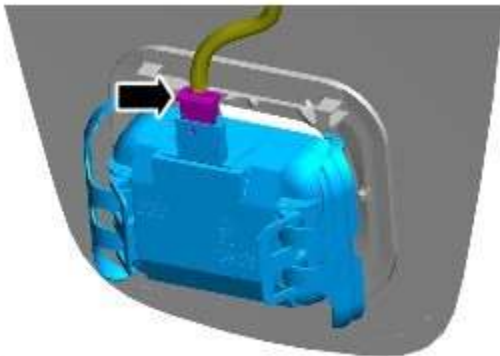
1. Refer to: [Interior Rear View Mirror](#) (501-09 Rear View Mirrors, Removal and Installation).

2.



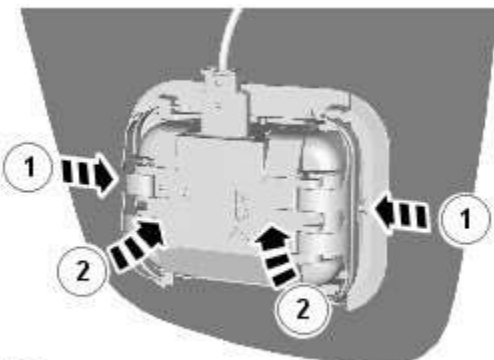
E99897

3.



E99898

Installation



E115433

1. CAUTIONS:



Make sure that the component is secured in the retainer.



Make sure that the clips are correctly located.

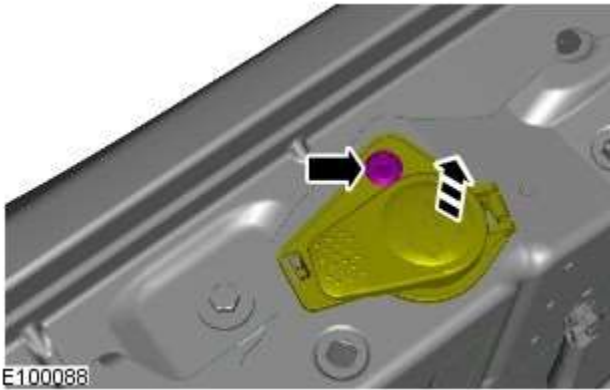
To install, reverse the removal procedure.

Wipers and Washers - Windshield Washer Reservoir

Removal and Installation

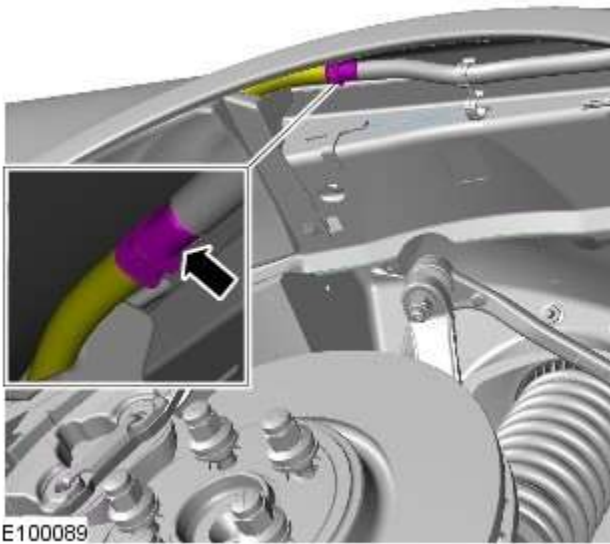
Removal

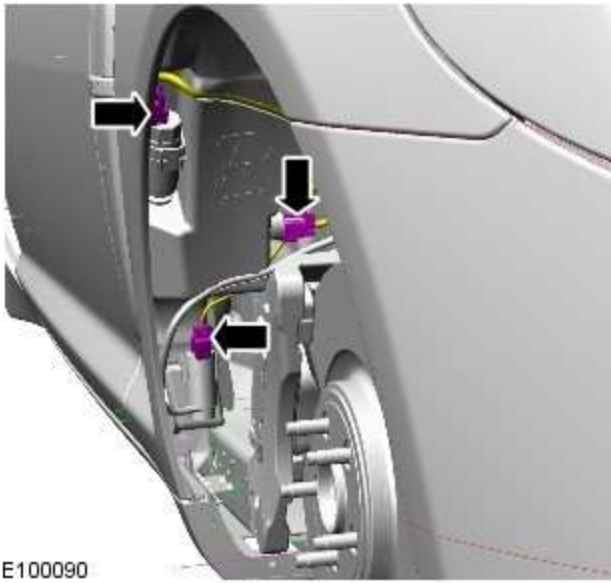
1.



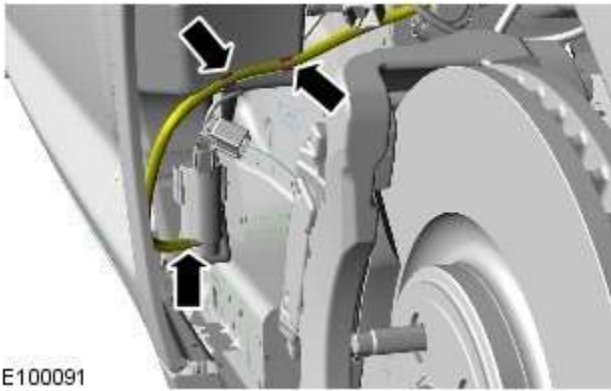
2. Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).

3.  CAUTION: Be prepared to collect escaping fluids.

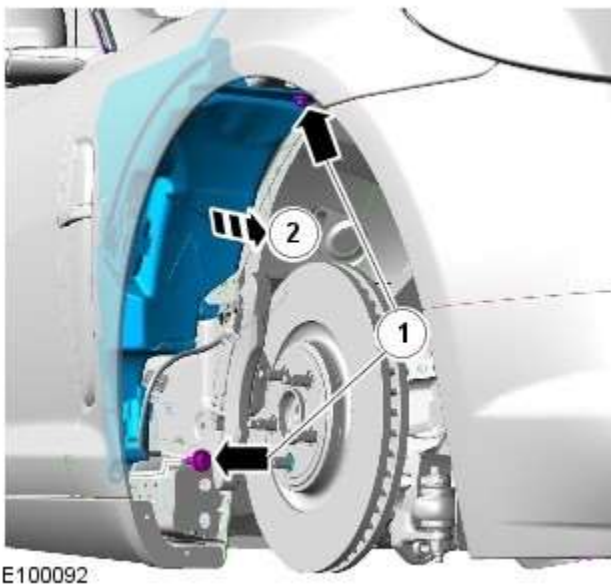




4.

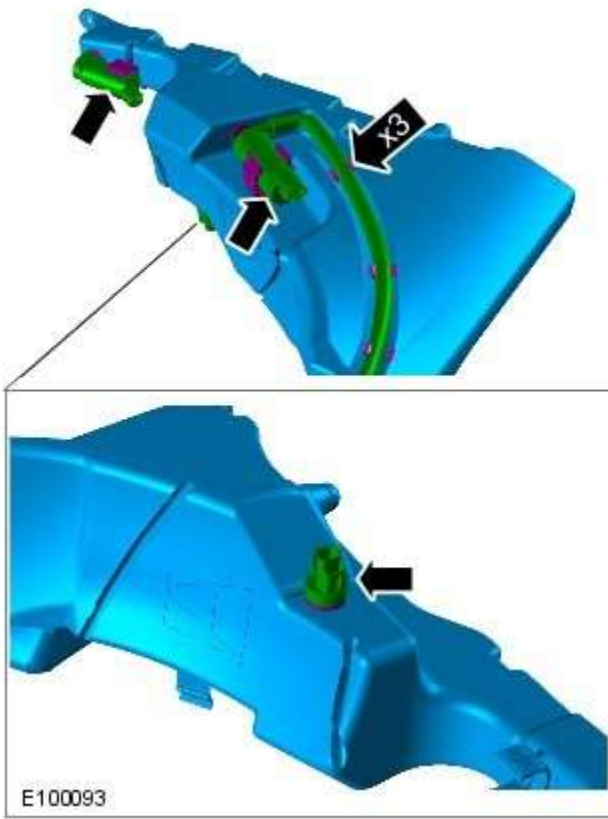


5.  CAUTION: Be prepared to collect escaping fluids.




6.

7.



Installation

1.  CAUTION: The seals are to be reused unless damaged.
To install, reverse the removal procedure.

Wipers and Washers - Windshield Wiper Motor

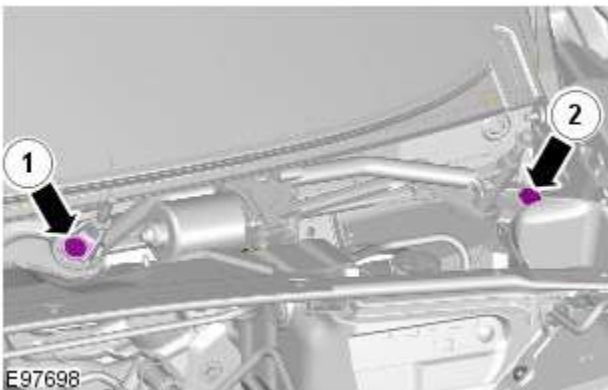
Removal and Installation


Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).

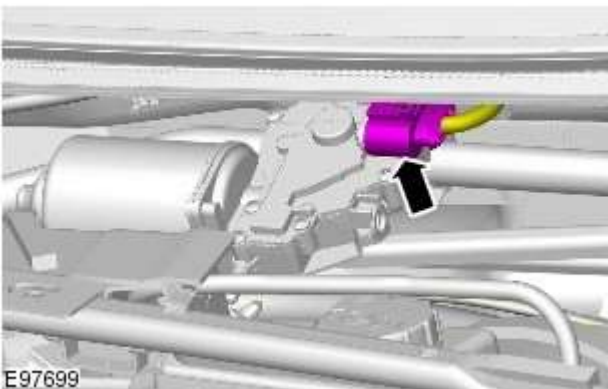


3.  CAUTION: Tighten the bolts in the sequence shown.

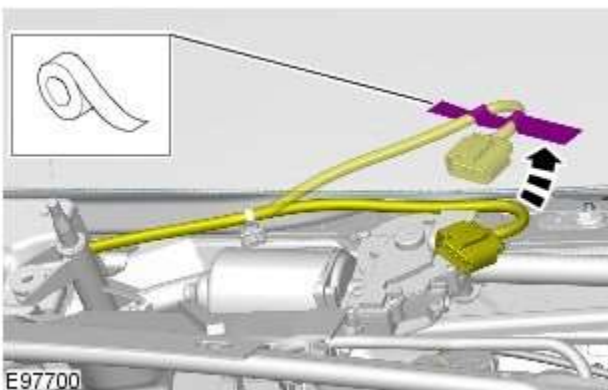


NOTE: LHD illustration shown, RHD is similar.

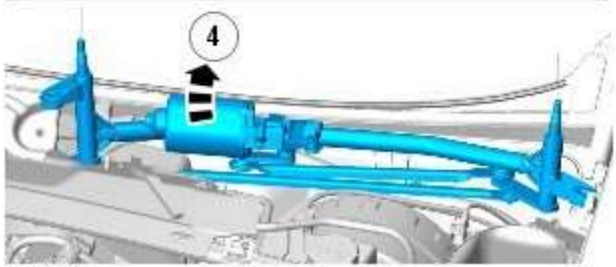
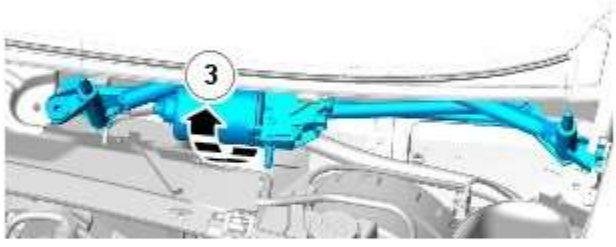
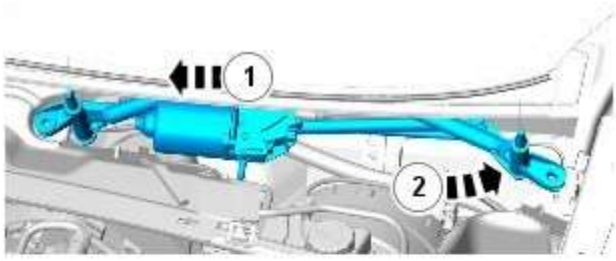
Torque: 12 Nm




4.  NOTE: LHD illustration shown, RHD is similar.



5.  NOTE: LHD illustration shown, RHD is similar.



E97701

6.  CAUTION: Make sure that the component is correctly located on the locating dowels.

 NOTE: LHD illustration shown, RHD is similar.

Installation

1. To install, reverse the removal procedure.

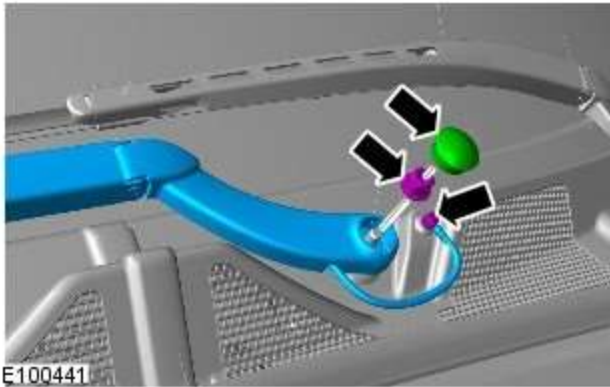
Wipers and Washers - Windshield Wiper Pivot Arm

Removal and Installation

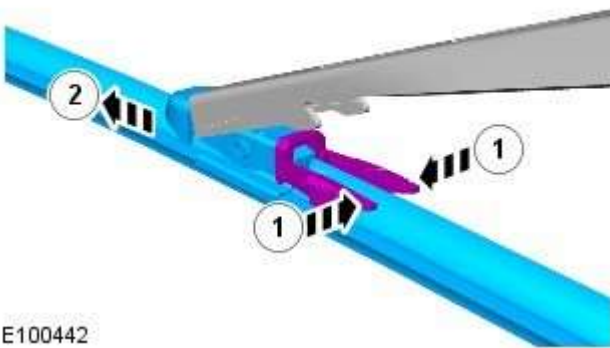
Removal



CAUTION: Always protect paintwork and glass when removing exterior components.



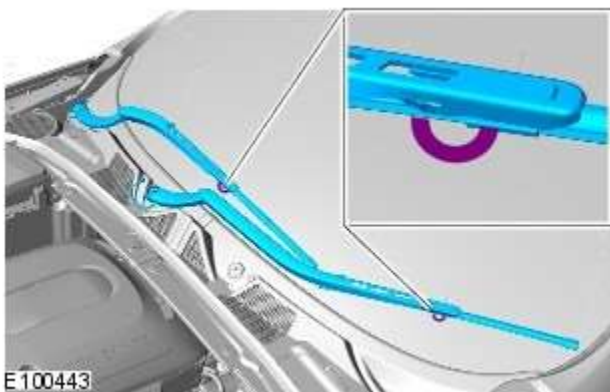
1.




2.  **NOTE:** Do not disassemble further if the component is removed for access only.

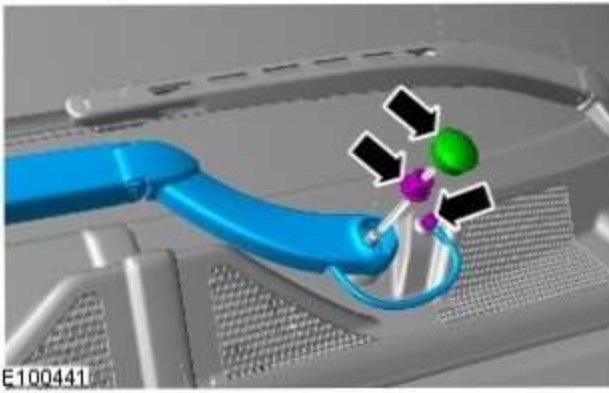
Installation

1. Install the wiper blade.



2.  **CAUTION:** Align the wiper blades onto the centre of the windshield circle mark.

 **NOTE:** After the wiper pivot arm nuts have been tightened to the correct torque value, lift the wiper pivot arm from the windshield and return to the windshield. Make sure that wiper blades are not positioned below any point of the windshield circle mark.



3.

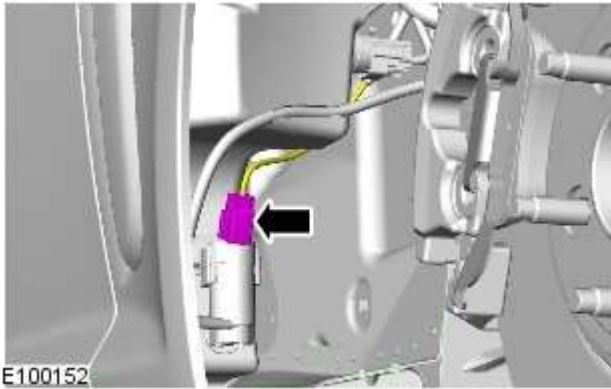
- Torque: 22.1lm

Wipers and Washers - Windshield Washer Pump

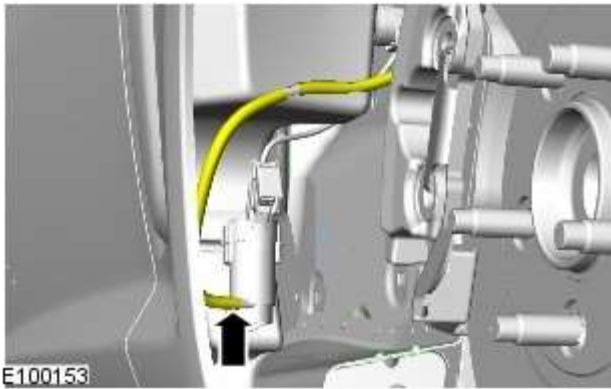
Removal and Installation

Removal

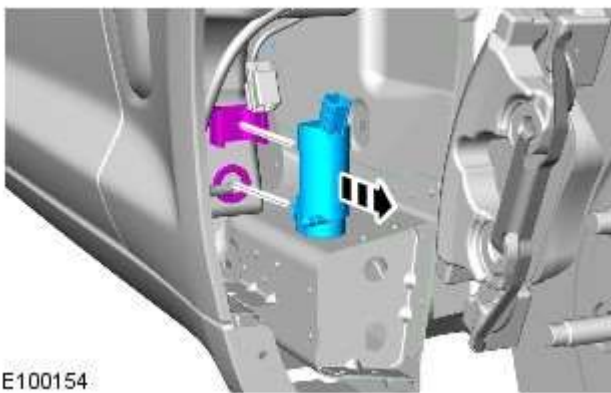
1. Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).



2.




3.  CAUTION: Be prepared to collect escaping fluids.



4.  CAUTION: Take extra care not to damage the seal.

Installation

1.  CAUTION: The seal is to be reused unless damaged. To install, reverse the removal procedure.

Roof Opening Panel -

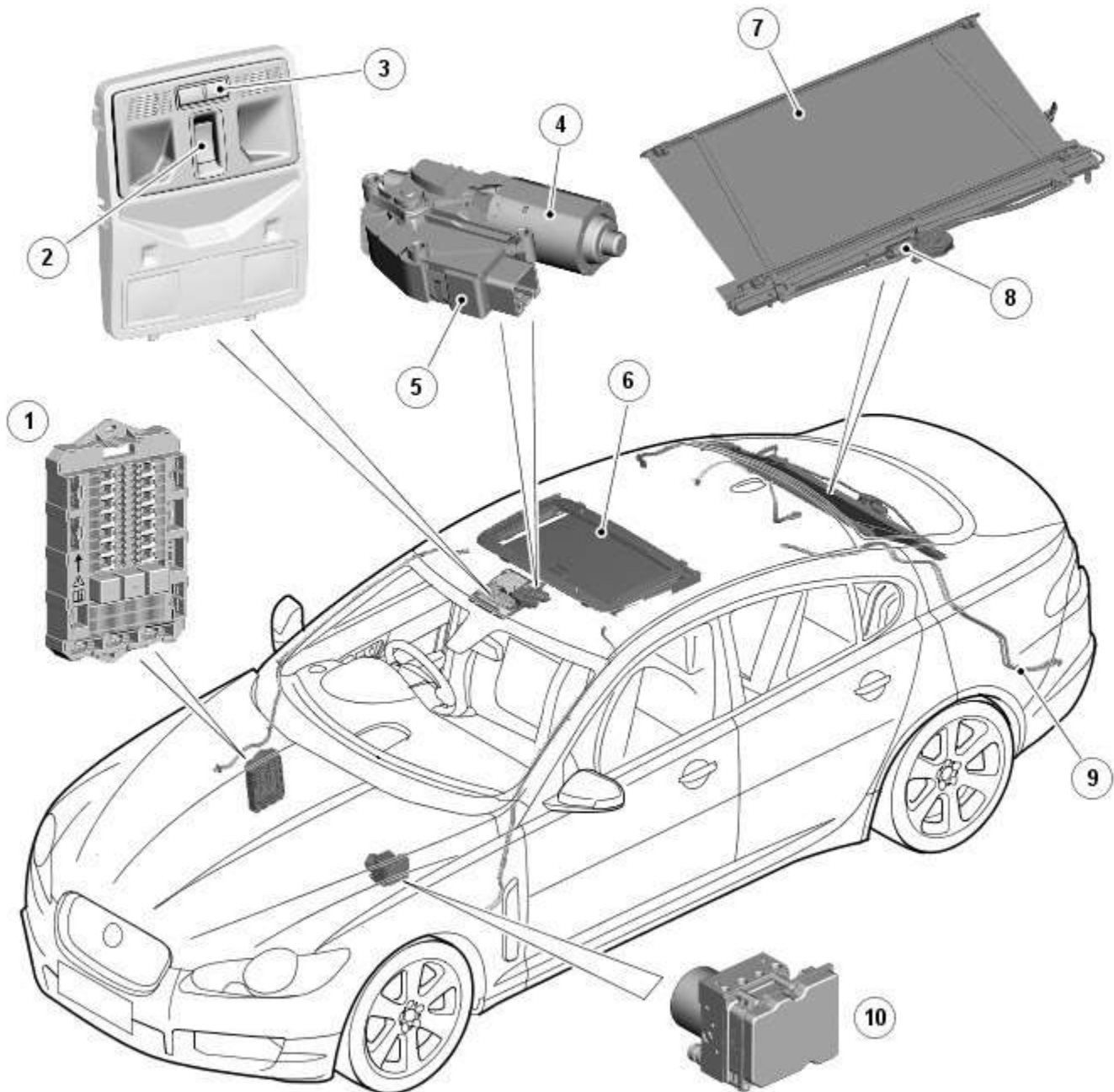
Torque Specifications

Description	Nm	lb-ft	lb-in
Roof opening panel frame retaining bolts	9	—	80
Roof opening panel motor retaining bolts	4	—	35
Roof opening panel glass retaining screws	4	—	35

Roof Opening Panel - Roof Opening Panel - Component Location

Description and Operation

Component Location



E94547

Item	Description
1	CJB (central junction box)
2	Roof opening panel, rocker switch
3	Rear window sunblind, switch
4	Roof opening panel, motor
5	Roof opening panel, control module
6	Roof opening panel
7	Rear window sunblind
8	Rear window sunblind, motor assembly
9	Drain tubes (4 off)
10	ABS (anti-lock brake system) module

Roof Opening Panel - Roof Opening Panel - Overview

Description and Operation

Overview

The roof opening panel is operated through a two-way rocker switch located in the roof console. A motor, attached to the front of the roof-opening-panel frame, drives the glass panel to the tilt, open or closed positions using a pair of steel cables.

Tilt

With the roof opening panel closed, a press and release on the front of the rocker switch, tilts the rear of the panel upwards. If the switch is pressed again before the full tilt position is reached, the panel stops at the chosen position.

Fully open

With the roof opening panel closed, a press and release on the rear of the rocker switch, moves the panel to the fully open position automatically. It can be stopped at any point by pressing the button again.

Close

- From the fully open position, press and release the front of the switch. The panel will return to the closed position automatically.
- From the tilted position, press and release the rear of the switch. The panel will return to the closed position automatically.

Anti-trap

The roof opening panel has an 'anti-trap' function which prevents the panel from closing if an obstruction is sensed. When an obstruction is sensed, the motor will automatically retract the panel as far as possible. When the obstruction is removed, the panel can be closed by the normal method.

Roof opening sunblind

A sunblind integrated into the roof-opening-panel frame, is operated manually and can be opened or closed when the roof opening panel is in either the tilted or closed position. When the roof opening panel opens (slides rearwards) the sunblind automatically slides rearwards and cannot be pulled forward until the roof opening panel is in a forward position.

Rear window sunblind

The rear window sunblind is operated through a switch in the roof console.

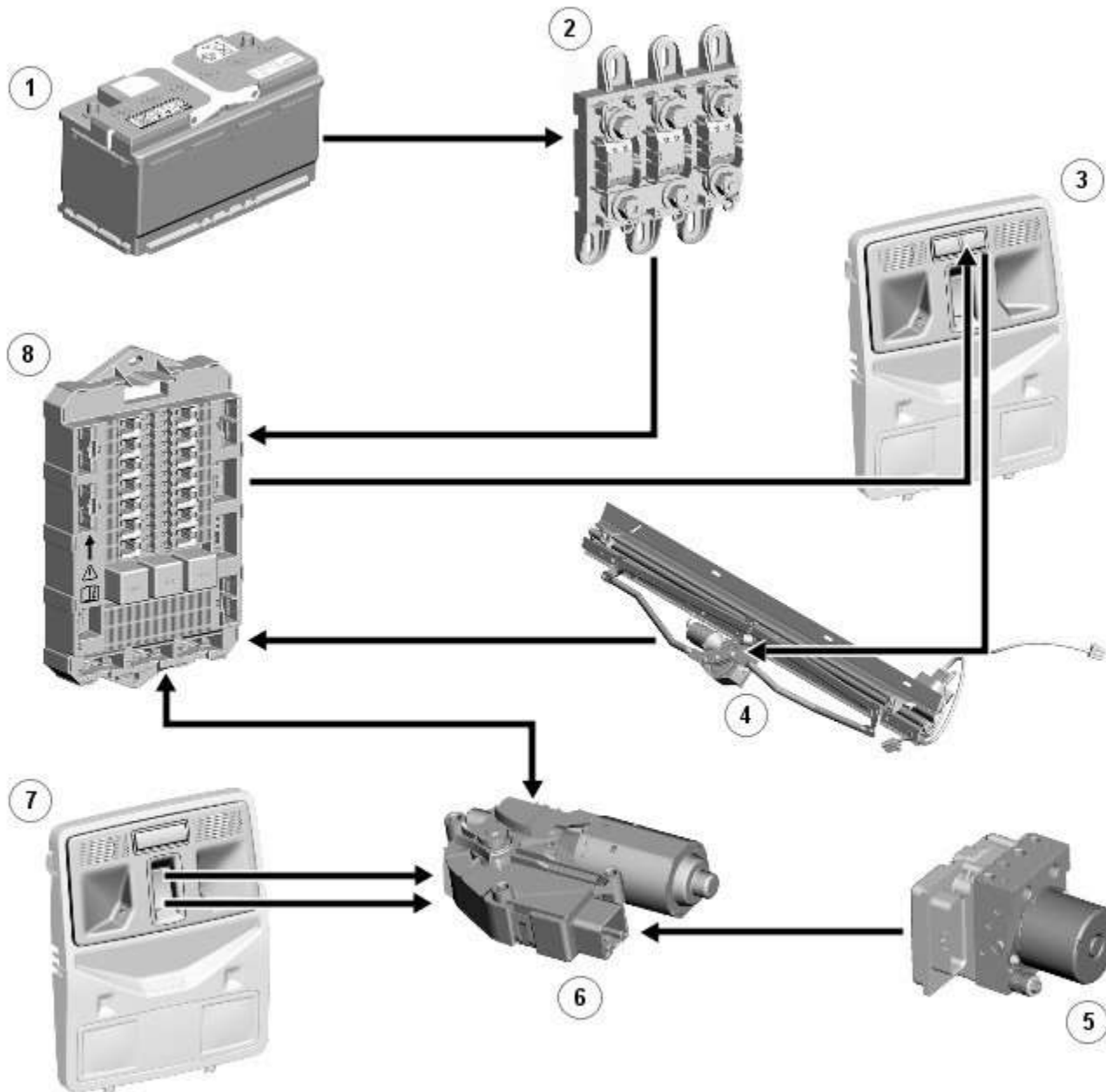
Roof Opening Panel - Roof Opening Panel - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired



E100459



Item	Description
1	Battery
2	Megafuse (250 A)
3	Rear window sunblind, switch
4	Rear window sunblind, motor
5	ABS (anti-lock brake system) module
6	Roof opening panel, control module
7	Roof opening panel, rocker switch
8	CJB (central junction box)

System Operation

Roof opening panel

Operation of the roof opening panel is controlled by the roof opening panel control module, which is integral with the motor. The control module receives inputs from the CJB, which provides an 'open' or 'close' signal for remote handset operation, and an 'enable' signal when the vehicle enters power mode 6.

The control module also receives a vehicle speed signal from the ABS module. The vehicle speed signal is used by the control module to calibrate the anti-trap feature.

If the battery is disconnected, or the power supply is interrupted while the roof opening panel is in a partially open position, the motor and control module will need to be calibrated to restore full functionality. To recalibrate:

1. Switch ignition on.
2. Press the front of the switch, so the roof opening panel is the tilt position, and then release the switch.
3. Press the front of the switch and hold for thirty seconds.
4. After thirty seconds the roof opening panel will begin to move. Keep the front of the switch pressed until the roof opening panel has fully opened and then closed.
5. Once the open/close cycle has completed and the roof opening panel has stopped moving, release the switch.
6. The roof opening panel can now be operated as normal.

Drain hoses are connected to the front and rear corners of the roof opening panel frame. The drain hoses are located inside of the cabin on the 'A' and 'D' post pillars to allow water, which has collected in the frame, to escape. One-way valves fitted to the end of each drain hose, prevent the ingress of dirt and moisture.

Rear window sunblind

The powered rear window sunblind is operated through a switch in the roof console. Power to the sunblind motor is provided by a pair of relays located in the CJB when the vehicle enters power mode 4. The sunblind motor is located beneath the rear parcel shelf and is supplied as a sealed unit with the sunblind mechanism.

If the battery is disconnected or a replacement sunblind is fitted, the motor will require re-calibrating. To re-calibrate the motor the sunblind should be powered through two-full cycles of movement.

Component Description

Roof opening panel, motor

The roof opening panel motor has a worm drive which drives a gear in the cast housing attached to the end of the motor. The gear has a small pinion gear attached to the outer part of its spindle. The pinion engages with two cables to form a rack and pinion drive. Rotation of the motor turns the pinion which in turn drives the cables in the required direction.

The two cables are attached either side of the pinion. One end of each cable is attached to the guide; the opposite end of each cable is held in position on the pinion by a metal insert in the frame. The cables run in channels, in the panel frame to the guides. As the panel is closed the cables are pushed through channels in the front of the frame. The displaced cable is guided into a further two channels in the frame, which protect the cable and prevent it from snagging. The cables manufactured from rigid spring steel can pull as well as push the panel along the guides.

The motor contains a micro-switch and Hall effect sensor. Signals received from these components enable the control module to calculate the exact position of the roof opening panel. The Hall effect sensor is also responsible for the operation of the anti-trap function.

If the anti-trap feature is activated while the roof opening panel is closing, the panel is reversed for 200mm or as far as possible. The Hall effect sensor, located in the motor, monitors the speed of the motor and if the speed decreases below a set threshold, indicating an obstruction, the power feed to the motor is reversed so the panel goes back. In an emergency the anti-trap function can be overridden by holding the switch in the closed position.

Roof opening panel, control module

The roof opening panel control module is integrated within the motor. The control module receives inputs from the CJB, which provides an 'open' or 'close' signal for remote handset operation, and an 'enable' signal when the vehicle enters power mode 6.

The control module also contains the algorithm for the anti-trap system and receives a vehicle speed signal from the ABS module. The vehicle speed signal is used by the control module to calibrate the anti-trap feature.

Roof Opening Panel - Roof Opening Panel

Diagnosis and Testing

Principle of Operation

For a detailed description of the roof opening panel, refer to the relevant Description and Operation sections in the workshop manual. REFER to: (501-17 Roof Opening Panel)

[Roof Opening Panel](#) (Description and Operation),
[Roof Opening Panel](#) (Description and Operation),
[Roof Opening Panel](#) (Description and Operation).

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Roof opening panel • Helixed drive cables • Switch • Control unit/motor 	<ul style="list-style-type: none"> • Fuses/relays (refer to electrical guide) • Wiring harness • Correct engagement of electrical connectors • Loose or corroded connections

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give extra information read by the manufacturer-approved diagnostic system).



When performing voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places and with a current calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



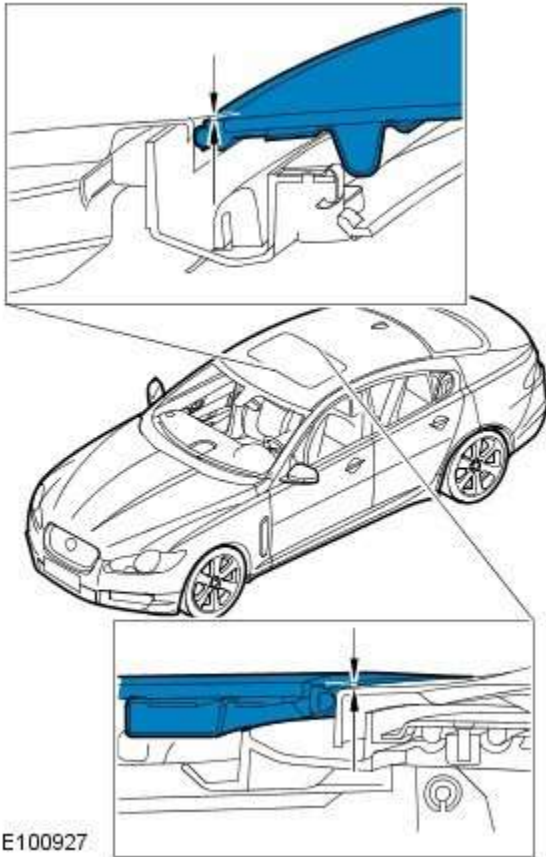
If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

DTC	Description	Possible Cause	Action
B10F211	Sunroof Control	<ul style="list-style-type: none"> • Sunroof enable signal circuit - short to ground 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check sunroof enable signal circuit for short to ground
B10F212	Sunroof Control	<ul style="list-style-type: none"> • Sunroof enable signal circuit - short to power 	Refer to the electrical circuit diagrams and check sunroof enable signal circuit for short to power

DTC	Description	Possible Cause	Action
B10F213	Sunroof Control	<ul style="list-style-type: none"> • Sunroof enable signal circuit - open circuit 	Refer to the electrical circuit diagrams and check sunroof enable signal circuit for open circuit
B113D12	Sunroof Global Open/Close Control	<ul style="list-style-type: none"> • Roof opening panel global open/close control circuit - short to power 	Carry out any pinpoint tests associated with this DTC using the manufacturer approved diagnostic system. Refer to the electrical circuit diagrams and check roof opening panel global open/close control circuit for short to power
B113D14	Sunroof Global Open/Close Control	<ul style="list-style-type: none"> • Roof opening panel global open/close control circuit - short to ground, open circuit 	Refer to the electrical circuit diagrams and check roof opening panel global open/close control circuit for short to ground, open circuit

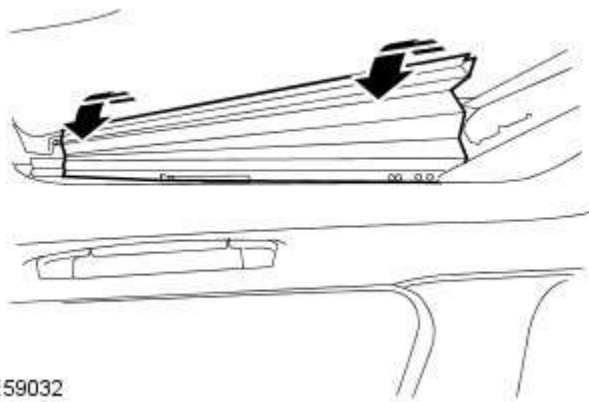
Roof Opening Panel - Roof Opening Panel Alignment

General Procedures

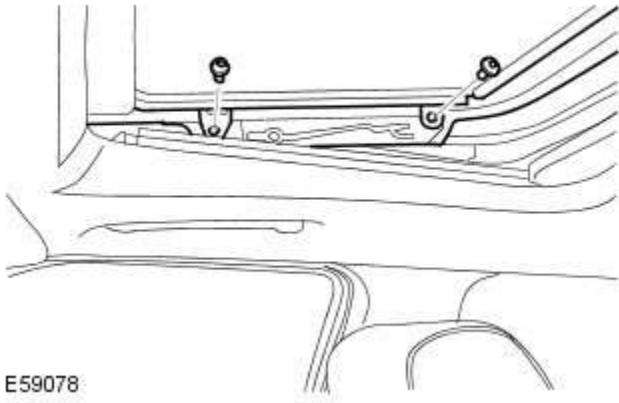


1. With the roof opening panel closed, check the alignment of the glass to the roof panel. The glass should be central in its aperture. Profile of sunroof to body should be flush or up to 1.0 mm (0.40") low all round.

2. Open the roof opening panel blind.



3. Release the cover.
 - Repeat the above procedure for the other side.



4. Loosen the 4 roof opening panel Torx screws.

5. Align the roof opening panel.
• TORQUE: 4 Nm

6. Install the cover.
• Repeat the above procedure for the other side.

7. Close the roof opening panel blind.

Roof Opening Panel - Motor Synchronization

General Procedures

1.  NOTE: If a new component is installed.

Press and hold the front of the switch, hold down until the roof opening panel has completed a full open/close cycle.

- The roof opening panel is now synchronized.

2.  NOTE: If the removed component is re-installed.

Press and hold the the front of the switch, the roof opening panel will move to the tilt postion. Release the switch then press and hold the front of the switch, then the roof opening panel will move slightly more after 20 seconds.

- The roof opening panel is now un-synchronized.

3.  NOTE: If the removed component is re-installed.

Press and hold the front of the switch, hold down until the roof opening panel has completed a full open/close cycle.

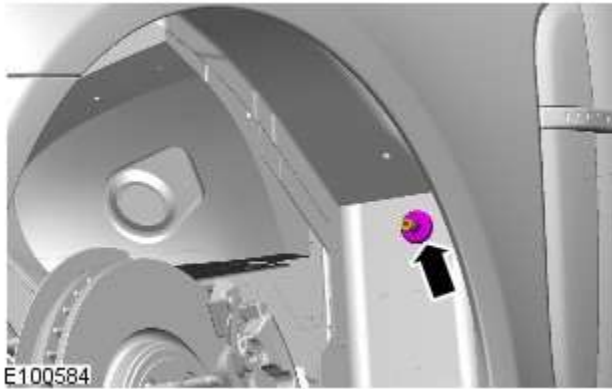
- This action must be done within 2-3 seconds of the last action.
- The roof opening panel is now synchronized.

Roof Opening Panel - Roof Opening Panel Front Drain Hose

Removal and Installation

Removal

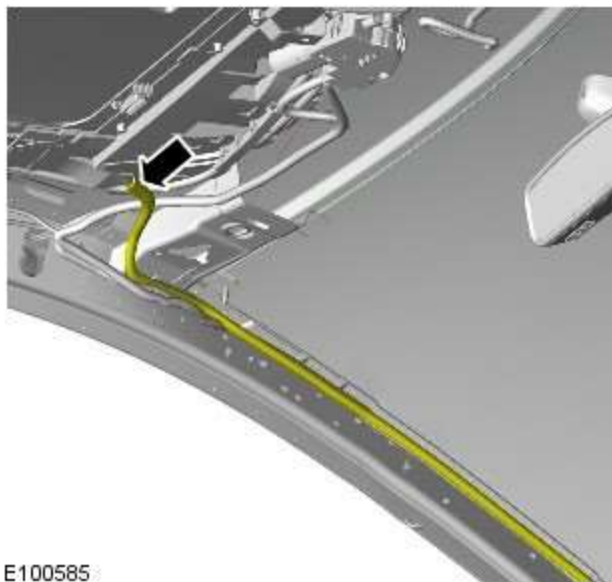
1. Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).



2.

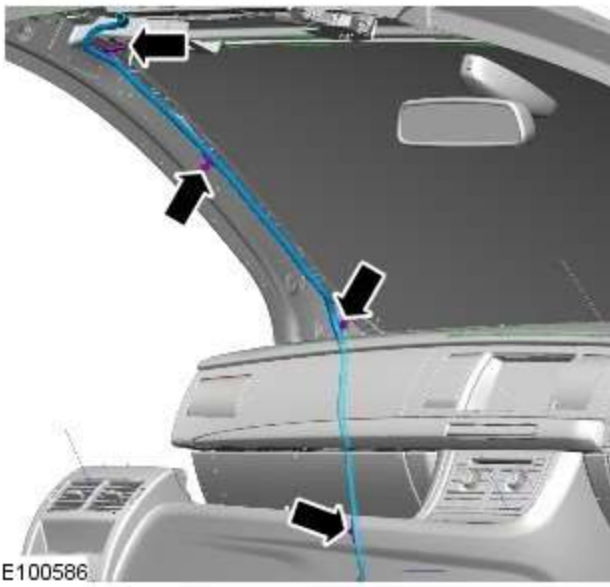
3. Refer to: [Cowl Side Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

4. Refer to: [Headliner](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



5.

6.



Installation

1. To install, reverse the removal procedure.

Roof Opening Panel - Roof Opening Panel Frame

Removal and Installation

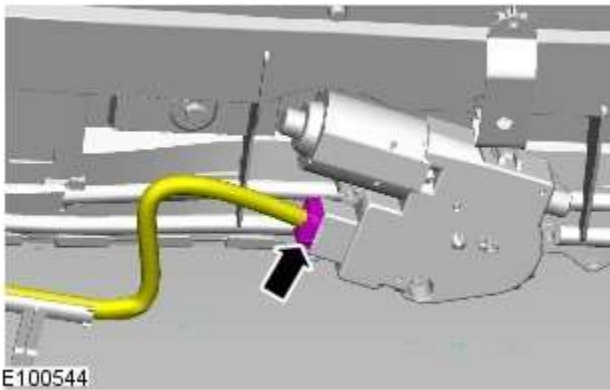
Removal



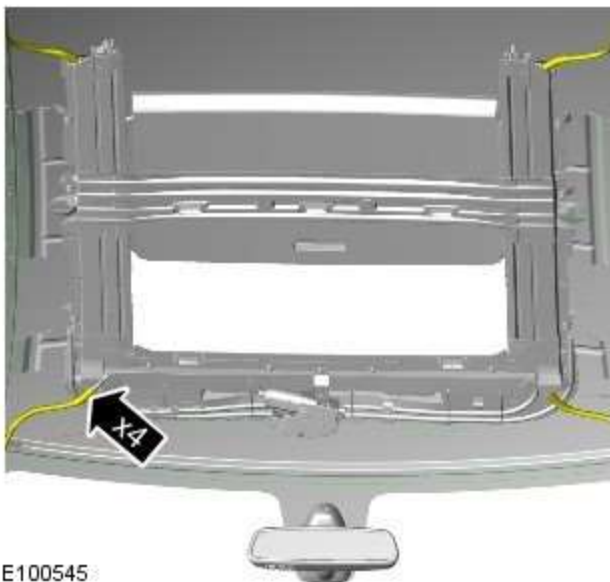
NOTE: Removal steps in this procedure may contain installation details.

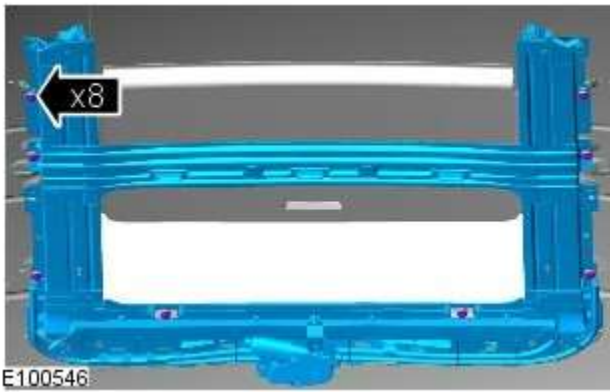
1. Refer to: [Motor Synchronization](#) (501-17 Roof Opening Panel, General Procedures).
2. Refer to: [Headliner](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
3. Refer to: [Roof Opening Panel Glass](#) (501-17 Roof Opening Panel, Removal and Installation).

4.



5.

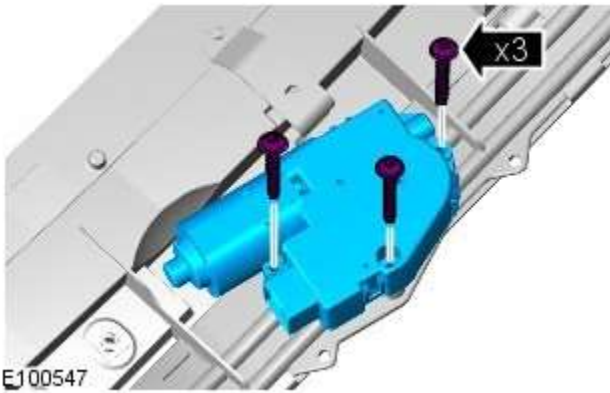





6.  **WARNING:** This step requires the aid of another technician.

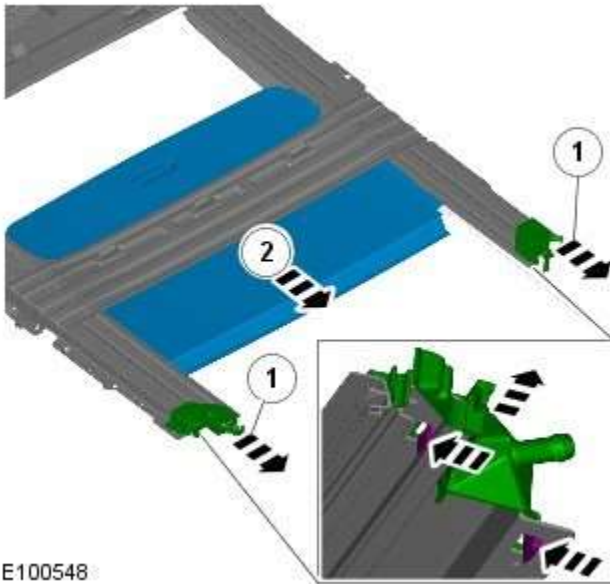
 **NOTE:** Note the fitted position of the spacers.

Torque: 8 Nm



7.  **NOTE:** Do not disassemble further if the component is removed for access only.

Torque: 4 Nm



- 8.

9.



E100549

Installation

1.  CAUTION: Make sure that the component is correctly located on the locating dowels.



NOTE: Replace the spacers to the fitted position.

To install, reverse the removal procedure.

Roof Opening Panel - Roof Opening Panel Glass

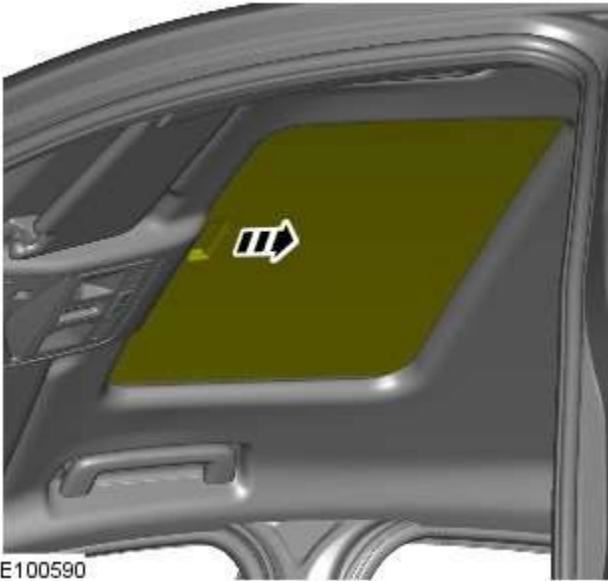
Removal and Installation

Removal

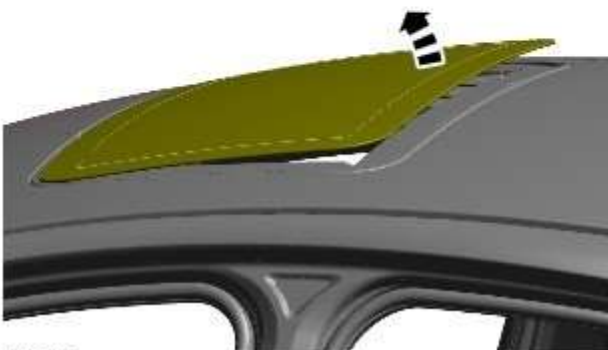


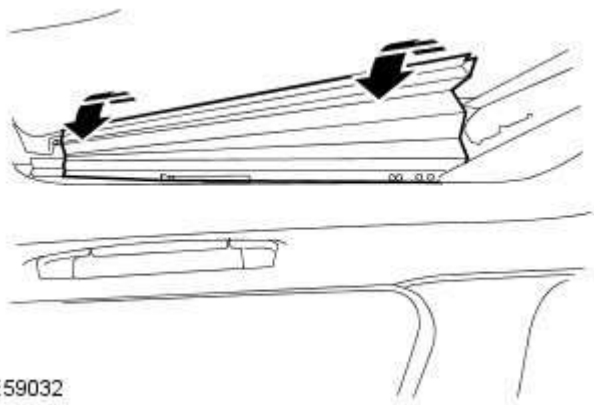
NOTE: Removal steps in this procedure may contain installation details.

1.




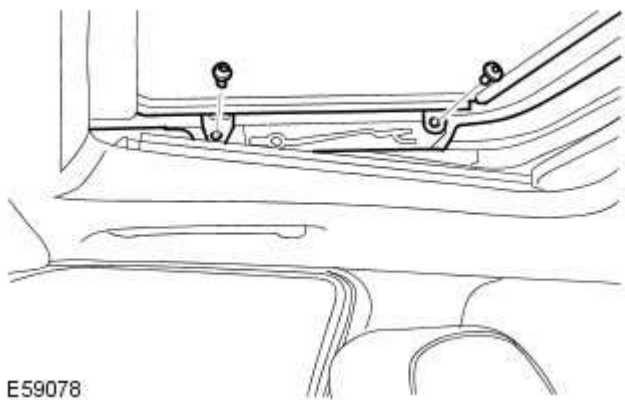
2.





E59032

3.  NOTE: Right-hand shown, left-hand similar.
- Repeat procedure for the other side.



E59078

4.  NOTE: Right-hand shown, left-hand similar.
- Torque: 4 Nm

Installation

1. To install, reverse the removal procedure.

Roof Opening Panel - Roof Opening Panel Motor

Removal and Installation

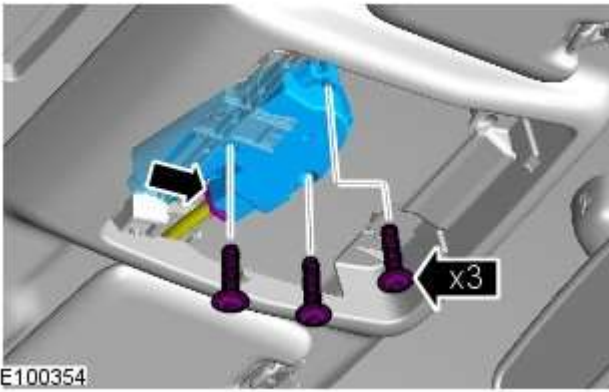
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Overhead Console](#) (501-12 Instrument Panel and Console, Removal and Installation).

2. Torque: 4 Nm



Installation

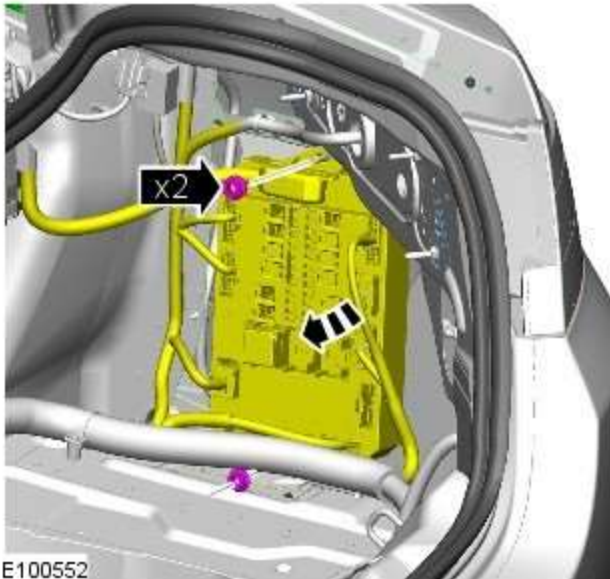
1. To install, reverse the removal procedure.


Roof Opening Panel - Roof Opening Panel Rear Drain Hose

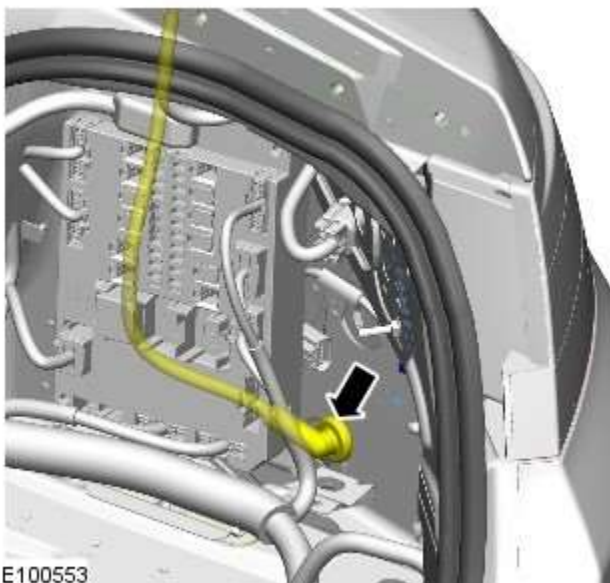
Removal and Installation

Removal

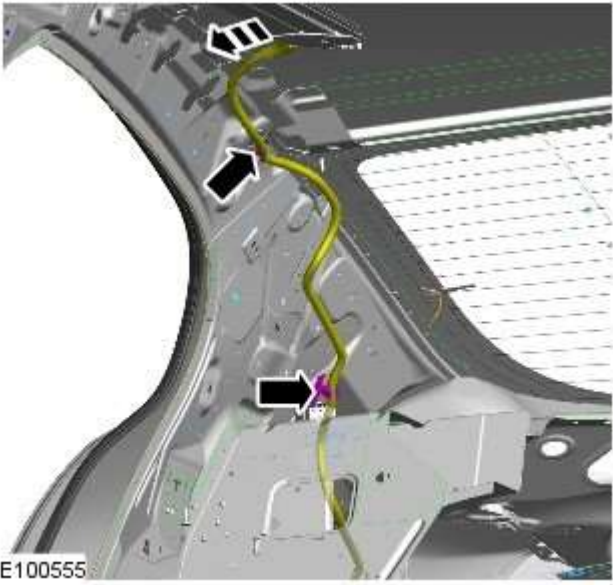
1. Refer to: [Loadspace Trim Panel RH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
2. Refer to: [Headliner](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



3.  NOTE: RH side only.



4.  NOTE: RH illustration shown, LH is similar.



5.  NOTE: RH illustration shown, LH is similar.



6.  NOTE: RH illustration shown, LH is similar.

Installation


1. To install, reverse the removal procedure.

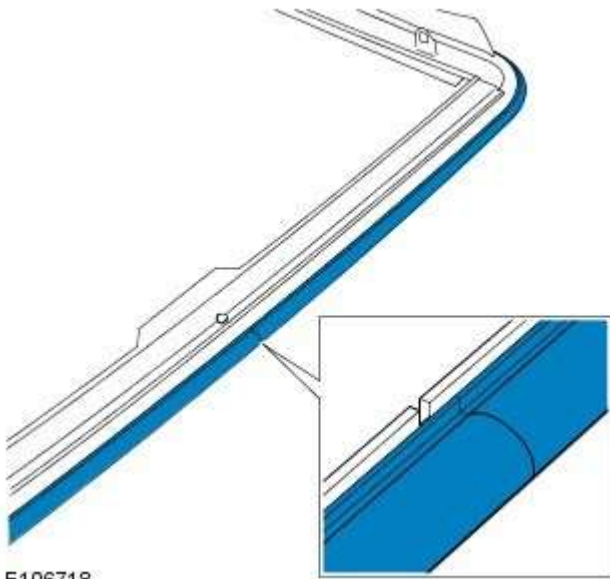
Roof Opening Panel - Roof Opening Panel Weatherstrip

Removal and Installation

Removal

1. Refer to: [Roof Opening Panel Glass](#) (501-17 Roof Opening Panel, Removal and Installation).

2.  NOTE: Make sure that this component is installed to the noted removal position.



Installation

1. To install, reverse the removal procedure.

Bumpers -

Description	Nm	lb-ft	lb-in
Radiator splash shield outer retaining bolts	3	-	26
Radiator splash shield inner retaining bolts	7	-	62
Radiator splash shield inner retaining screws	2	-	18
Front bumper cover retaining bolts	2	-	18
Rear bumper cover retaining bolts	7	-	62
Rear bumper retaining bolts	25	18	-

Bumpers - Front Bumper

Removal and Installation

Removal

1. The front bumper is serviced as a separate bolt-on panel.



E102842

2. The front bumper is replaced in conjunction with:
 - Front bumper cover

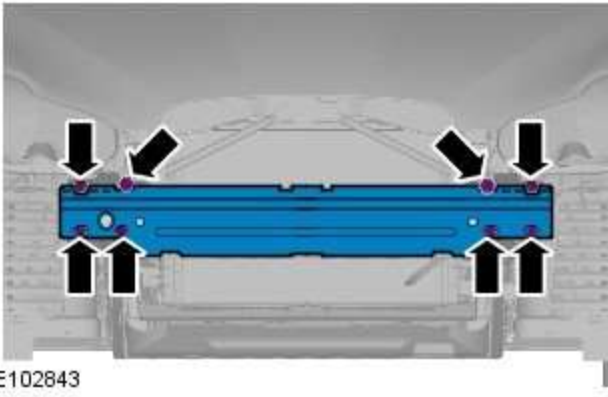


3. **WARNING:** The hood and its associated components form part of the pedestrian protection system, it is essential that any repair or replacement operations do not affect the safe working of the system.

For additional information relating to the pedestrian safety system please see the following:

For additional information, refer to: [Pedestrian Protection System](#) (501-20C Pedestrian Protection System, Description and Operation).

4. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
5. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
6. Remove the front bumper cover.
For additional information, refer to: [Front Bumper Cover](#) (501-19 Bumpers, Removal and Installation).
7. Release and position the front bumper wiring harness and the hood release cable to one side.



8. **NOTE:** Observe the different head sizes of the bolts.

Remove the front bumper.

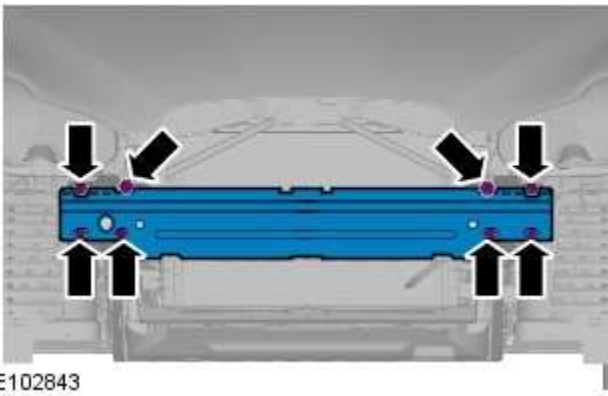
9. **NOTE:** Do not disassemble further if the component is removed for access only.

Remove the horns.

For additional information, refer to: [Horn](#) (413-06 Horn, Removal and Installation).

Installation

1. Offer up the panel. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



2. Install the front bumper.

- Tighten to 25Nm.

3. The installation of associated panels and components is the reversal of removal procedure.


Bumpers - Front Bumper Cover

Removal and Installation

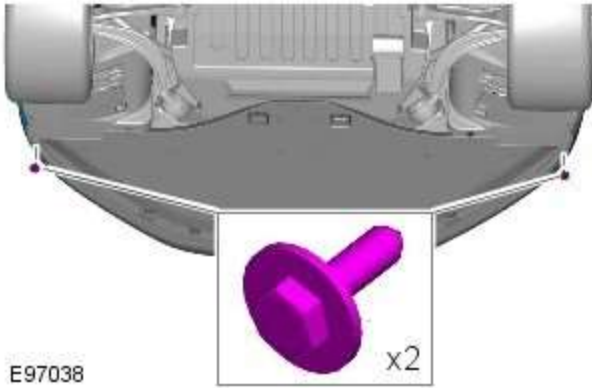
Removal



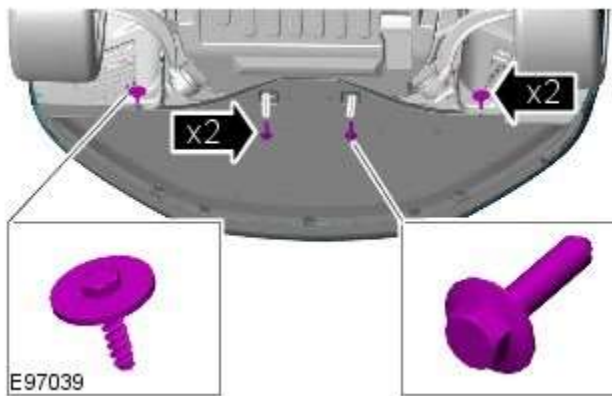
NOTE: Removal steps in this procedure may contain installation details.

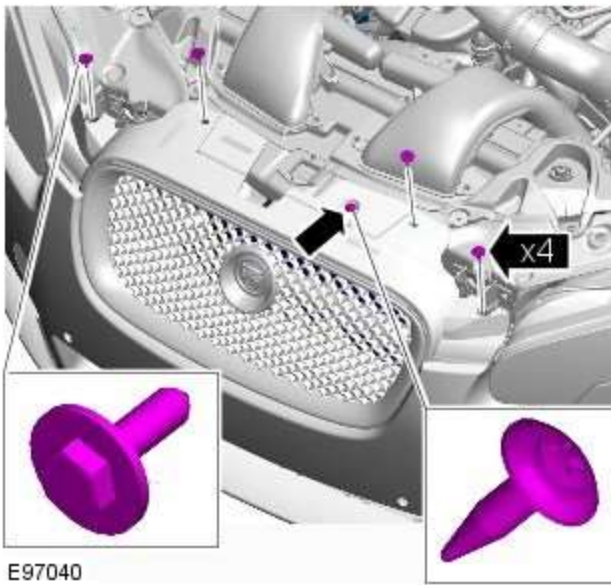
1.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.

2. Torque: 3 Nm



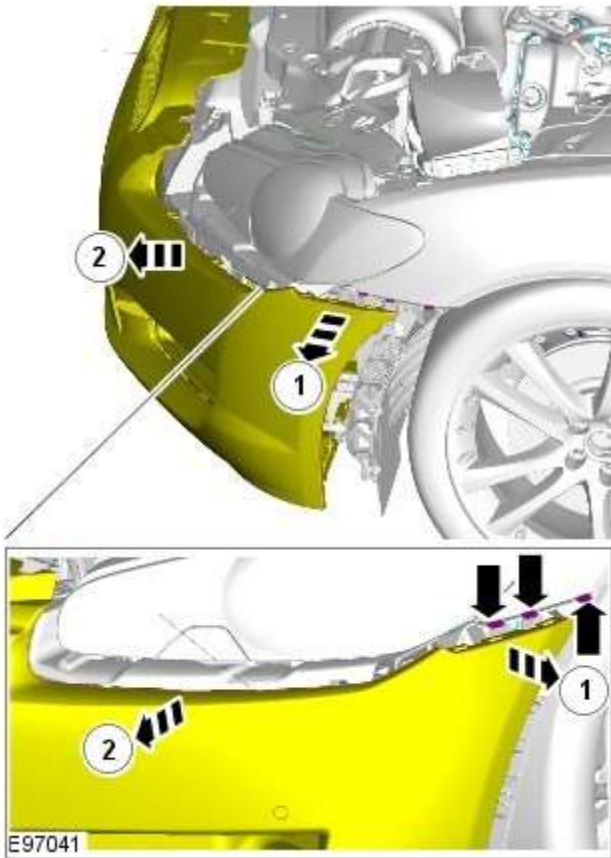
3. Torque:
Retaining screws 2 Nm
Retaining bolts 7 Nm





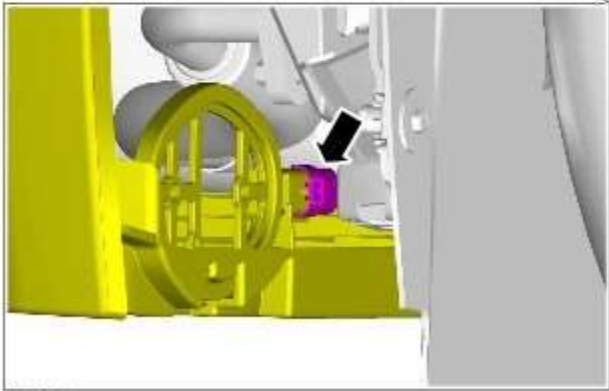
E97040

4. Torque: 2 Nm




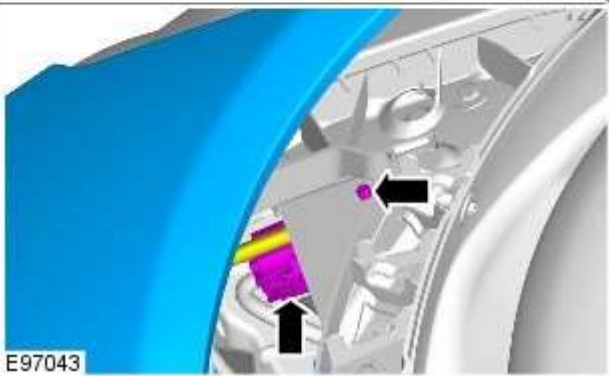
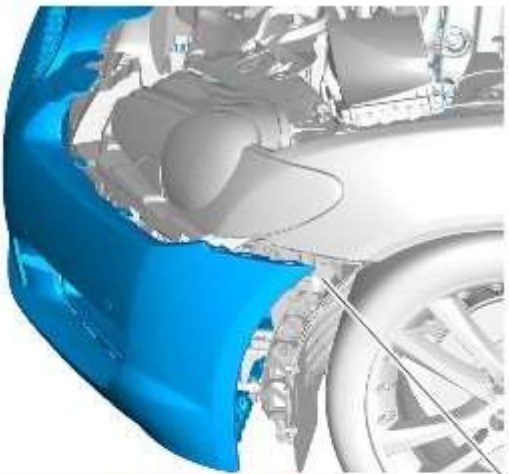
E97041

5.  NOTE: This step requires the aid of another technician.



E97042

6.  NOTE: On both sides.



E97043

7.  NOTE: This step requires the aid of another technician.

Installation

1. To install, reverse the removal procedure

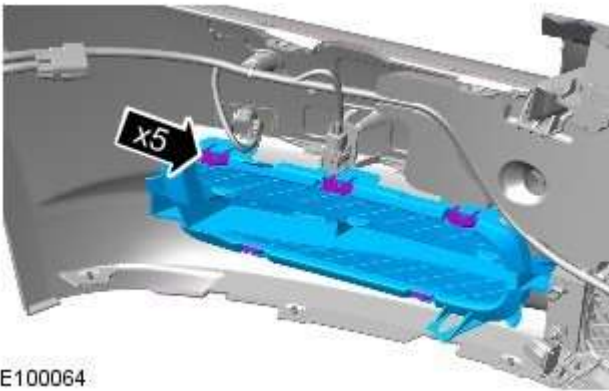
Bumpers - Front Bumper Cover Insert

Removal and Installation

Removal

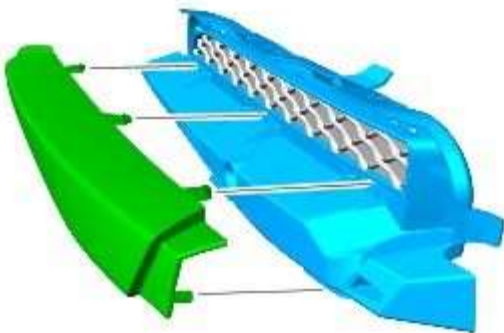
1. Refer to: [Front Bumper Cover](#) (501-19 Bumpers, Removal and Installation).

2.



E100064

3.  NOTE: Do not disassemble further if the component is removed for access only.



E100065

Installation

1. To install, reverse the removal procedure.

Bumpers - Rear Bumper Cover

Removal and Installation

Removal

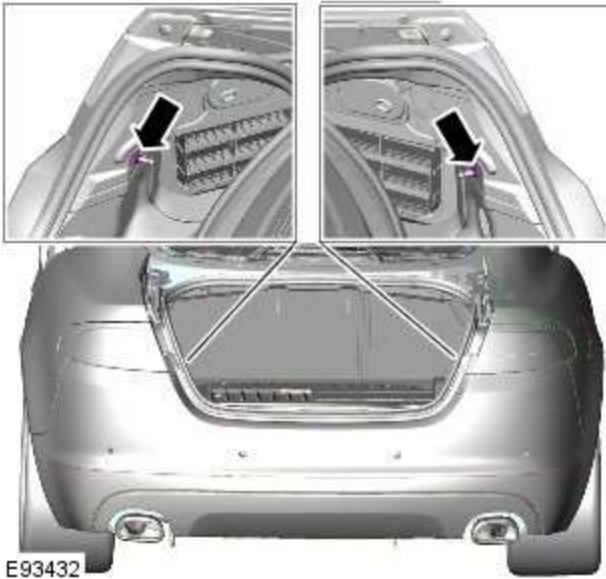


NOTE: Removal steps may contain installation details.

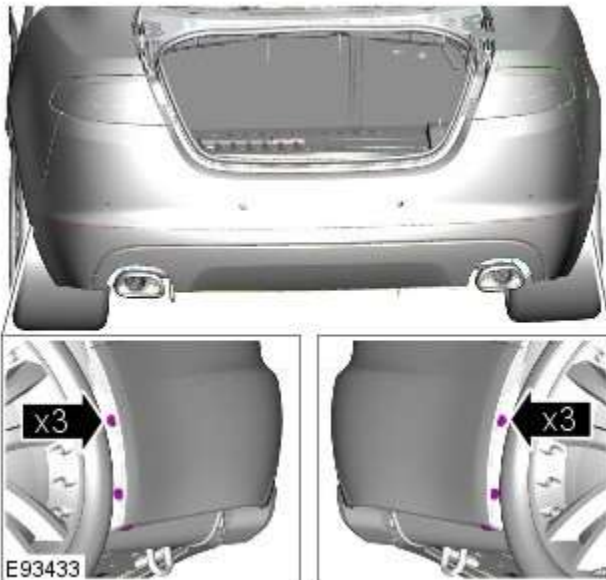
1. Remove the rear lamp assemblies.

Refer to: [Rear Lamp Assembly](#) (417-01 Exterior Lighting, Removal and Installation).

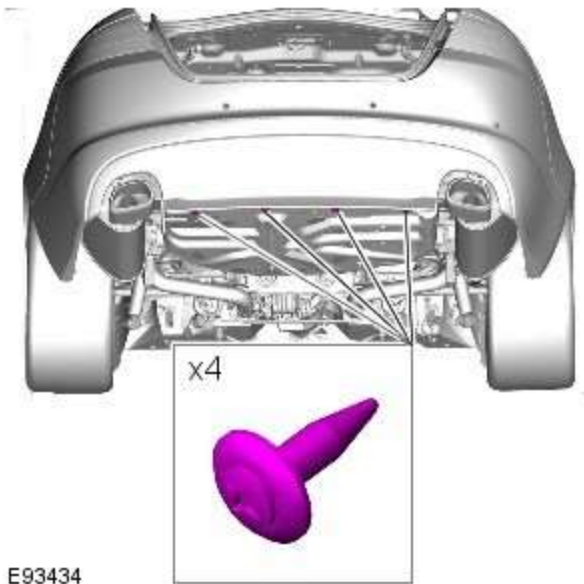
2. Torque: 7 Nm



- 3.



4.



E93434

5.



E93435

Installation

1. To install, reverse the removal procedure.

Bumpers - Rear Bumper

Removal and Installation

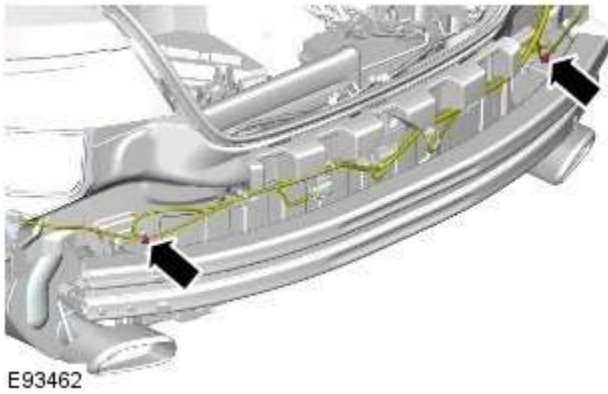
Removal



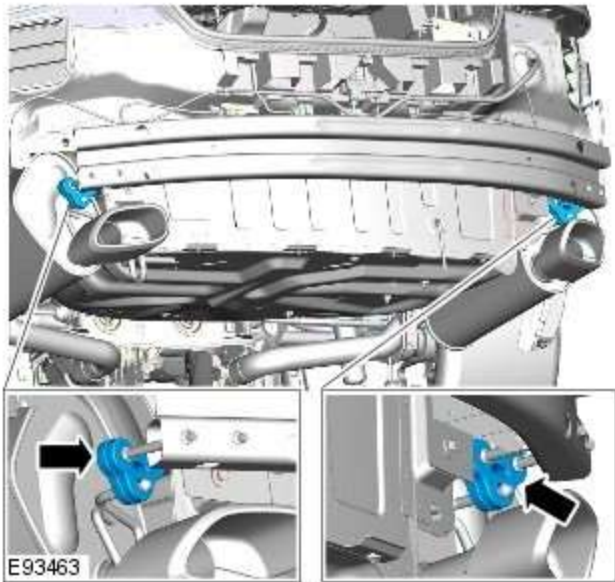
NOTE: Removal steps in this procedure may contain installation details.

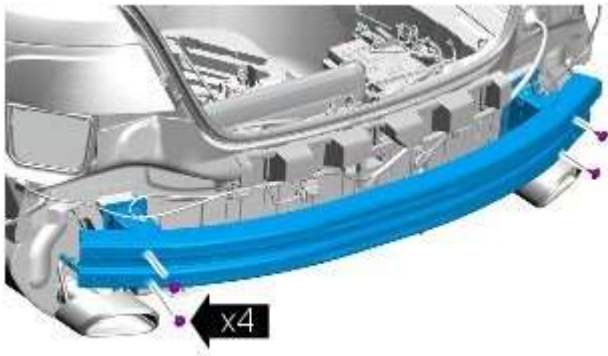
1. Refer to: [Rear Bumper Cover](#) (501-19 Bumpers, Removal and Installation).

2.



3.





E93464

4. *Torque:* 25 Nm

Installation

1. To install, reverse the removal procedure.

Safety Belt System -

Torque Specifications

Description	Nm	lb-ft	lb-in
Front safety belt retractor to seat track retaining bolt	40	30	-
Front safety belt retractor retaining bolt	40	30	-
Front safety belt D loop retaining bolt	40	30	-
Front safety belt buckle retaining bolt	40	30	-
Front safety belt shoulder height adjuster retaining bolts	25	18	-
Rear centre safety belt retractor retaining bolts	40	30	-
Rear safety belt long end retaining bolts	40	30	-
Rear safety belt D loop retaining bolt	40	30	-
Rear safety belt long end retaining bolt	40	30	-
Rear safety belt buckle retaining bolts	40	30	-

Safety Belt System - Safety Belt System - Component Location

Description and Operation

 NOTE: Authoring Template



E93457

Item	Description
1	Belt tension sensor - if fitted
2	RH (right-hand) front safety belt retractor
3	RH front safety belt
4	RH rear safety belt
5	RH rear safety belt retractor
6	Child seat tethers (3 off)
7	Center rear safety belt retractor
8	LH (left-hand) rear safety belt retractor

9	LH rear safety belt buckle
10	RH rear and center safety belt buckles
11	LH front safety belt
12	LH front safety belt retractor
13	LH front safety belt buckle and pre-tensioner
14	RH front safety belt buckle and pre-tensioner

Safety Belt System - Safety Belt System - Overview

Description and Operation

Authoring Template

OVERVIEW

A three point safety belt is fitted to all seating positions. Each safety belt retractor incorporates an emergency locking feature. The emergency locking retractor incorporates 2 mechanical inertia devices. One inertia device activates if the safety belt is subjected to a sharp pull. The second inertia device activates if the vehicle is subject to a sudden deceleration or is on a severe incline.

North American Specification (NAS) safety belt retractors also include an automatic locking feature. The Automatic Locking Retractor (ALR) is fitted to all passenger seating positions and allows the safety belt to be tensioned to aid the safe fitment of child or booster seats. For additional information, refer to the Owners Handbook.

NAS vehicles are also fitted with a belt tension sensor on the front passenger seat. The belt tension sensor is incorporated into the seat belt lower anchorage and is attached to the seat frame by an M10 Torx head bolt. The belt tension sensor forms part of the [SRS \(supplemental restraint system\)](#) occupancy detection and classification feature.

The center rear safety belt features a mini-buckle lower anchorage. The mini-buckle is disengaged by inserting a suitable tool into the small aperture on the front face of the housing.

To aid the fitment of child seats, 3 tethers are located on the rear parcel shelf. Each tether is attached to the parcel shelf with an M10 Torx head bolt.

A safety belt warning indicator is located in the instrument cluster to remind front seat passengers to fasten their safety belts. The warning indicator will illuminate if the safety belt of an occupied front seat is not fastened. Refer to: Instrument Cluster (413-01, Description and Operation).

Safety Belt System - Safety Belt System - System Operation and Component Description

Description and Operation

System Operation

Refer to: [Safety Belt System](#) (501-20A Safety Belt System, Description and Operation).

Safety Belt System - Safety Belt System

Diagnosis and Testing

Principle of Operation

For a detailed description of the seatbelt system and operation, refer to the relevant description and operation section of the workshop manual REFER to: (501-20A Safety Belt System)

[Safety Belt System](#) (Description and Operation),
[Safety Belt System](#) (Description and Operation),
[Safety Belt System](#) (Description and Operation).

Safety Information

WARNINGS:



To avoid accidental deployment the back-up power supply must be depleted before beginning any work on the SRS system or its components. Failure to follow this instruction may result in personal injury



Do not use a multimeter to probe an SRS module. It is possible for the power from the multimeter battery to trigger the activation of the module. Failure to follow this instruction may result in personal injury



NOTE: Do not use a cellular phone or to have a cellular phone in close proximity when working on the SRS system or components

Power supply depletion

Before beginning any work on the SRS system or related components:

1. Remove the ignition key
2. Disconnect the battery leads, ground first
3. Wait 2 minutes for the power circuit to discharge

There are comprehensive instructions on the correct procedures for SRS system repairs, refer to the relevant section of the workshop manual

Inspection and Verification



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle



NOTE: Check and rectify basic faults before beginning diagnostic routines including pinpoint tests

1. Verify the customer concern by operating the seatbelt
2. Visually inspect for obvious signs of mechanical or electrical damage


Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> • Check for the installation of non-standard accessories which may affect or obstruct the function of the seatbelt system • Frayed or damaged webbing • Missing or damaged button stop • Pretensioner(s) Buckles/Stalks 	<ul style="list-style-type: none"> • Fuses • Wiring harness fault • Correct engagement of electrical connectors • Loose or corroded connections • Warning lamp bulb(s) • Impact sensor(s) • Buckle sensor(s) • Pretensioner(s) • Belt tension sensor(s) • Restraints control module

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, carry out the test methods described below, alternatively check for diagnostic trouble codes and refer to the relevant diagnostic trouble code index

For a complete list of all diagnostic trouble codes that could be logged on this vehicle, please refer to section 100-00. REFER to: [Supplemental Restraint System \(SRS\) Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / Diagnostic Trouble Code (DTC) Index - DTC: Restraints Control Module (RCM) (100-00, Description and Operation).

Symptom Chart for Seatbelt Rows 1, 2

Symptom	Possible Causes	Action
Seatbelt jammed - Webbing tight	<ul style="list-style-type: none"> • Backlock effect in action (webbing retracted quickly and came to sudden stop) • Seatbelt retractor not installed correctly • Automatic locking retractor activated (clicking - during retraction only) 	<ul style="list-style-type: none"> • GO to Pinpoint Test A. • GO to Pinpoint Test F. • See the automatic locking retractor description below
Seatbelt jammed - Webbing loose	<ul style="list-style-type: none"> • Seatbelt webbing trapped in seat • Seatbelt retractor webbing guide loose • Twist in webbing • Interference in webbing routing • D-loop not rotating correctly 	<ul style="list-style-type: none"> • GO to Pinpoint Test B. • GO to Pinpoint Test C. • GO to Pinpoint Test D. • GO to Pinpoint Test E. • GO to Pinpoint Test G.
Seatbelt - Intermittent jamming	<ul style="list-style-type: none"> • Seatbelt retractor not installed correctly 	<ul style="list-style-type: none"> • GO to Pinpoint Test F.
Seatbelt - Slow retraction	<ul style="list-style-type: none"> • Seatbelt retractor webbing guide loose • Twist in seatbelt webbing • Interference in webbing routing • Seatbelt retractor not installed correctly • D-loop not rotating correctly • Foreign object/debris 	<ul style="list-style-type: none"> • GO to Pinpoint Test C. • GO to Pinpoint Test D. • GO to Pinpoint Test E. • GO to Pinpoint Test F. • GO to Pinpoint Test G. • GO to Pinpoint Test E.
Seatbelt - Not retracting	<ul style="list-style-type: none"> • Seatbelt retractor webbing guide loose • Twist in seatbelt webbing • D-loop not rotating correctly • Interference in webbing routing • Foreign object/debris 	<ul style="list-style-type: none"> • GO to Pinpoint Test C. • GO to Pinpoint Test D. • GO to Pinpoint Test G. • GO to Pinpoint Test E. • GO to Pinpoint Test E.
Seatbelt - Not extracting	<ul style="list-style-type: none"> • Backlock effect-in action (webbing retracted quickly and came to sudden stop) • Seatbelt retractor not installed correctly • Seatbelt retractor webbing guide loose • Twist in seatbelt webbing • D-loop not rotating correctly • Interference in webbing routing • Foreign object/debris • Automatic locking retractor activated (clicking - during retraction only) 	<ul style="list-style-type: none"> • GO to Pinpoint Test A. • GO to Pinpoint Test F. • GO to Pinpoint Test C. • GO to Pinpoint Test D. • GO to Pinpoint Test G. • GO to Pinpoint Test E. • GO to Pinpoint Test E. • See the automatic locking retractor description below
Seatbelt - Noisy during operation	<ul style="list-style-type: none"> • Automatic locking retractor activated (clicking-during retraction only) • Interference in webbing routing (rubbing) 	<ul style="list-style-type: none"> • GO to Pinpoint Test B. • GO to Pinpoint Test E.
Seatbelt buckle - Not latching / jammed	<ul style="list-style-type: none"> • Foreign object/debris 	 CAUTION: Do not insert any objects or tools into the buckle head <ul style="list-style-type: none"> • GO to Pinpoint Test H.

Inertia Reel Seatbelts

The vehicle is equipped with (two row one) and (three row two) inertia reel seatbelts


These seatbelts are "**dual sensitive**" which means that they have:

- **Car sense system - A vehicle motion sensor, which locks the seatbelt webbing under braking, cornering, on steep hills and in adverse camber conditions, when parked on a steep incline or driveway or two wheels on a high curb**
- **Web sense system - A webbing motion sensor, which locks when the seatbelt webbing is extracted suddenly**

The seatbelts in the following positions are equipped with an automatic locking retractor function:

Carline	Market	Seat position	Automatic Locking Retractor Installed	From Model Year
XK (X150)	All	Driver	No	2007
XK (X150)	ROW	Passenger	No	2007
XK (X150)	US	Passenger	Yes	2007
XK (X150)	ROW	Row 2	Yes	2007
XK (X150)	US	Row 2	Yes	2007
XF (X250)	All	Driver	No	2009
XF (X250)	ROW	Passenger	No	2009
XF (X250)	US	Passenger	Yes	2009
XF (X250)	ROW	Row 2	No	2009
XF (X250)	US	Row 2	Yes	2009
XJ (X351)	All	Driver	No	2010
XJ (X351)	ROW	Passenger	No	2010
XJ (X351)	US	Passenger	Yes	2010
XJ (X351)	ROW	Row 2	No	2010
XJ (X351)	US	Row 2	Yes	2010

The **automatic locking retractor function** is a feature to secure a child seat or heavy load to the seat

Activation	Deactivation
 <p>NOTE: When automatic locking retractor is activated, no further webbing can be drawn from the seatbelt retractor, prior to disengagement of the automatic locking. This can be mistaken as a jammed seatbelt retractor</p> <p>Activated by total extraction of the webbing</p> <p>When activated the automatic locking retractor is identified by a clicking noise during webbing retraction</p>	<p>Automatic locking retractor is deactivated by allowing the webbing to retract until the clicking stops (close to park position)</p> <p>When deactivated the automatic locking retractor seatbelt changes state, from a static seatbelt to an automatic seatbelt</p>

Seatbelt Locking Test

With the vehicle stationary and on level ground take firm hold of the seatbelt webbing (on the tongue side of the upper seatbelt anchor) and withdraw sharply, **the retractor should lock**. Preventing further webbing release (**repeat this test 3 times**). Any seatbelt retractor which fails to lock **must not be used** and a **new seatbelt must be installed**.

DTC Index

For a list of diagnostic trouble codes that could be logged on this vehicle, please refer to Section 100-00 or for removal and installation/description and operation see Section 501-20.

Diagnostic Guide Inertia Reel Seatbelts

PINPOINT TEST A : BACKLOCK	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: BACKLOCK	
1	Visually inspect the condition of the suspect seatbelt
2	Draw a maximum of 20mm of the webbing from the seatbelt retractor with moderate force. Then release the webbing
3	Check for correct operation twice
	Does the webbing move freely then retract correctly? Yes No further action required No For first row seatbelt GO to Pinpoint Test C. For second and third row seatbelts GO to Pinpoint Test B.

PINPOINT TEST B : WEBBING-TRAPPED IN SEAT	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: WEBBING-TRAPPED IN SEAT	
1	Visually inspect the condition of the suspect seatbelt
2	Lift the seat base or release the seat backrest as required
3	Free the trapped webbing, allow the webbing to retract Note: If the automatic locking retractor is activated, allow the webbing to retract until the clicking stops
4	Check for correct operation twice
	Does the webbing move freely then retract correctly? Yes No further action required No GO to Pinpoint Test C.


PINPOINT TEST C : SEATBELT RETRACTOR-WEBBING GUIDE LOOSE	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: SEATBELT RETRACTOR-WEBBING GUIDE LOOSE	
	1 Refer to 501-20 removal and installation section of the workshop manual, remove any trim panels required to expose the D loop (anchor point) and seatbelt retractor
	2 Check the webbing is not trapped or twisted and is centrally located on the seatbelt retractor spindle
	3 Attempt to withdraw the webbing from the seatbelt retractor NOTE: If the seatbelt webbing is jammed, the automatic locking retractor could be engaged
	4 To release the automatic locking retractor, manually wind the webbing onto the spindle until the automatic locking retractor deactivates (clicking stops)
	5 Fully extract webbing
	6 Confirm webbing guide location is correct , Confirm the fixing lugs are correctly located in the retractor frame
	7 Allow webbing to retract
	8 Check for correct operation twice
	Does the webbing move freely then retract correctly? Yes Refer to the 501-20 removal and installation section of the workshop manual, reinstall any trim panels, ensure there are no obstructions and the webbing does not catch or rub. No further action required No GO to Pinpoint Test D .

PINPOINT TEST D : TWIST IN WEBBING	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: TWIST IN WEBBING	
	1 Refer to section 501-20 removal and installation section of the workshop manual, remove any trim panels required to expose the D loop (anchor point)
	2 Twist the webbing back the correct way in the loop
	3 Pass the twist through the pillar loop or escutcheon as required
	4 Check for correct operation twice
	Does the webbing move freely then retract correctly? Yes Refer to the 501-20 removal and installation section of the workshop manual, reinstall any trim panels, ensure there are no obstructions and the webbing does not catch or rub. No further action required No GO to Pinpoint Test E .

PINPOINT TEST E : INTERFERENCE-WEBBING ROUTING	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
E1: INTERFERENCE-WEBBING ROUTING	
	1 Refer to the 501-20 removal and installation section of the workshop manual, remove any trim panels required to expose the D loop (anchor point)
	2 Remove obstructions and foreign objects ensure the webbing does not catch or rub
	3 Confirm the seatbelt does not contact the wiring harness
	4 Check for correct operation twice
	Does the webbing move freely then retract correctly? Yes Refer to the 501-20 removal and installation section of the workshop manual, reinstall any trim panels, ensure there are no obstructions and the webbing does not catch or rub. No further action required No GO to Pinpoint Test E .

PINPOINT TEST F : SEATBELT RETRACTOR-INCORRECT INSTALLATION	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
F1: SEATBELT RETRACTOR-INCORRECT INSTALLATION	
	1 Refer to the 501-20 removal and installation section of the workshop manual, remove any trim panels required to expose the D loop (anchor point) and the seatbelt retractor
	2 Refer to the 501-20 removal and installation section of the workshop manual, correctly reinstall the seatbelt retractor ensure that the locating "T bar" and "anti rotation pins" are correctly located
	3 Check for correct operation twice
	Does the webbing move freely then retract correctly? Yes Refer to the 501-20 removal and installation section of the workshop manual, reinstall any trim panels, ensure there are no obstructions and the webbing does not catch or rub. No further action required No GO to Pinpoint Test G .

PINPOINT TEST G : D-LOOP NOT ROTATING CORRECTLY	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
G1: D-LOOP NOT ROTATING CORRECTLY	
	1 Refer to the 501-20 removal and installation section of the workshop manual, remove any trim panels required to expose the D loop (anchor point) and the seatbelt retractor
	2 Ensure there are no obstructions and the webbing does not catch or rub, the D loop (anchor point) rotates correctly and if installed the confirm the height adjuster operates correctly
	3 Check for correct operation twice
	Does the webbing move freely then retract correctly? Yes Refer to the 501-20 removal and installation section of the workshop manual, reinstall any trim panels, ensure there are no obstructions and the webbing does not catch or rub. No further action required No Replace as required. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

PINPOINT TEST H : SEATBELT BUCKLE – NOT LATCHING/JAMMED	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
H1: SEATBELT BUCKLE – NOT LATCHING/JAMMED	
 CAUTION: Do not insert any objects or tools into the buckle head	
	1 Visually inspect the buckle head for evidence of damage. If damaged replace as required
	2 Depress the buckle release (red button) and (Using a torch) carry out visual inspection for any evidence of debris/material or foreign objects in the buckle head
	3 If required remove the pretensioner from the vehicle. Remove the seat. Remove the pretensioner from the seat frame
	4 Do not insert any objects or tools buckle head With the buckle removed invert and attempt to shake out any debris
	5 Attempt to latch the tongue in the buckle
	Does the seat belt buckle operate correctly Yes Reinstall any components, no further action required No Replace the pretensioner, REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Restraints Control Module (RCM) (100-00 General Information, Description and Operation), Rear Safety Belt Buckle (501-20A Safety Belt System, Removal and Installation).

Safety Belt System - Front Safety Belt Buckle

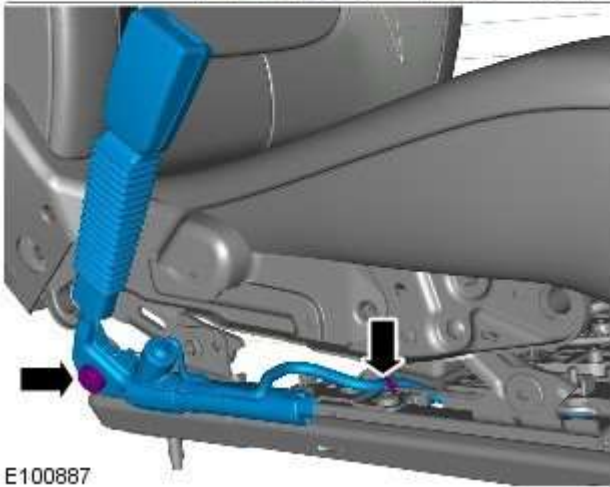
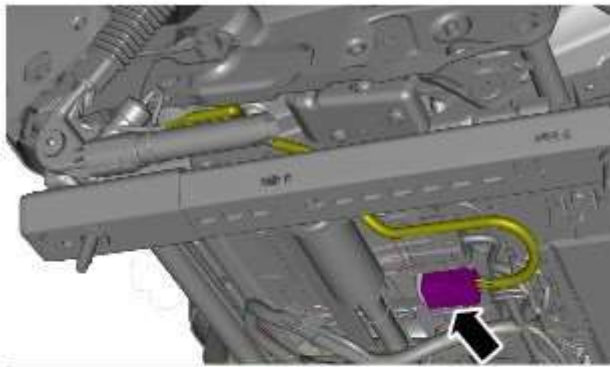
Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).
2. Refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).



3. CAUTION: Discard the bolt.

Torque: 35 Nm

Installation

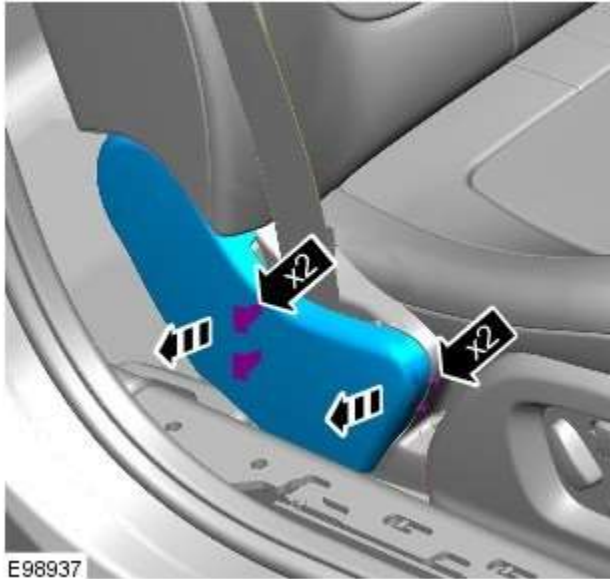
1. CAUTION: Make sure that a new bolt is installed. To install, reverse the removal procedure.

Safety Belt System - Front Safety Belt Retractor

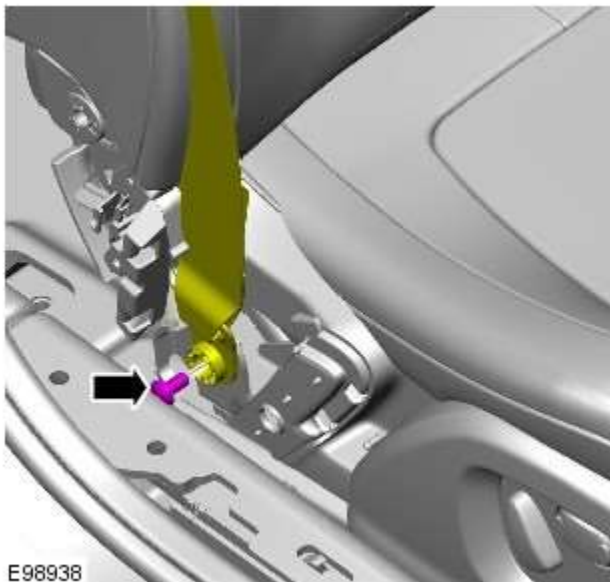
Removal and Installation

Removal

 NOTE: Removal steps in this procedure may contain installation details.

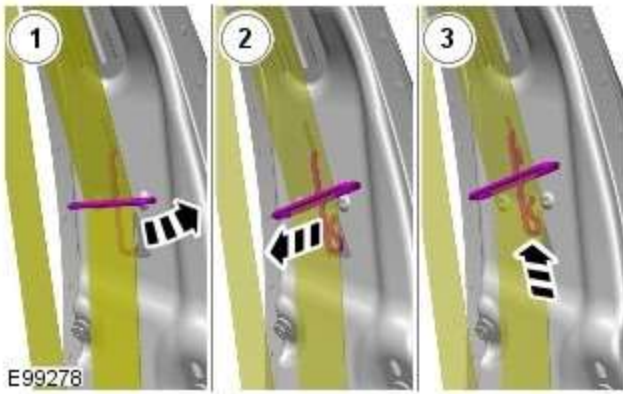


1.  NOTE: Right-hand shown, left-hand similar.

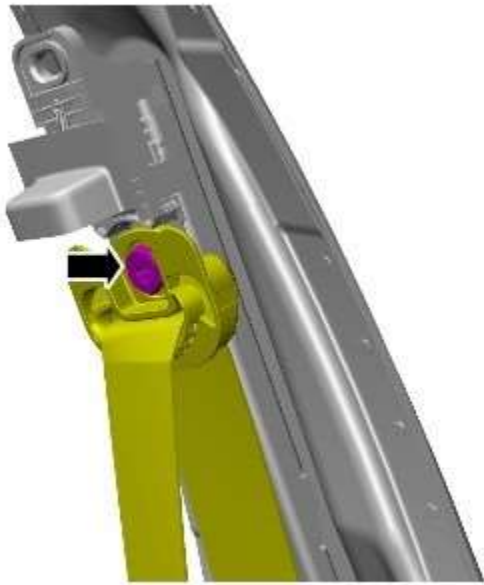


2.  NOTE: Right-hand shown, left-hand similar.
Torque: 40 Nm

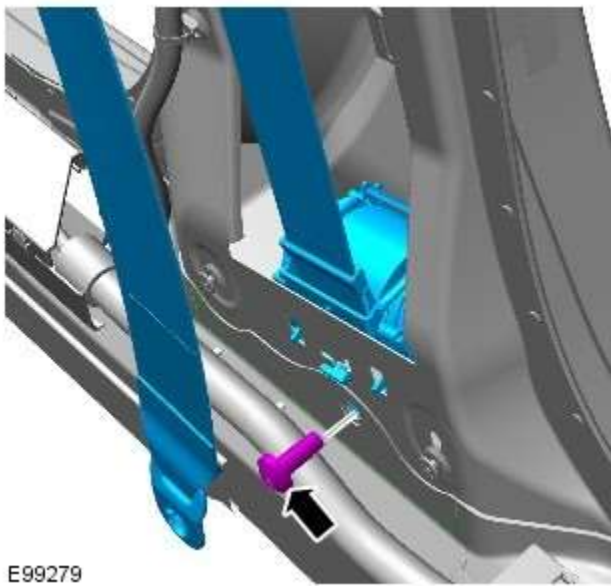
3. Refer to: [B-Pillar Upper Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



4.



5. Torque: 40 Nm



6. Torque: 40 Nm

Installation



1. CAUTION: Fixings must be started by hand to avoid damaging threads.

To install, reverse the removal procedure.

Safety Belt System - Rear Center Safety Belt Retractor

Removal and Installation

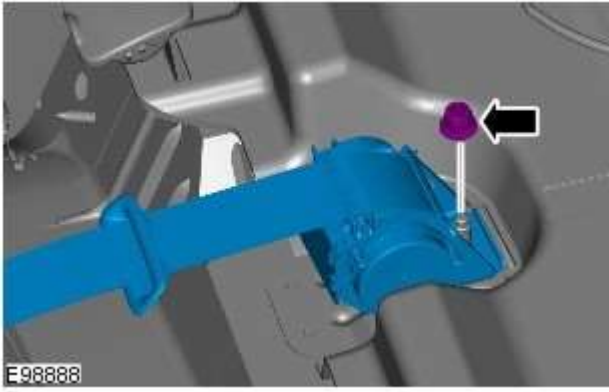
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Parcel Shelf](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. Torque: 40 Nm



Installation

1. To install, reverse the removal procedure.

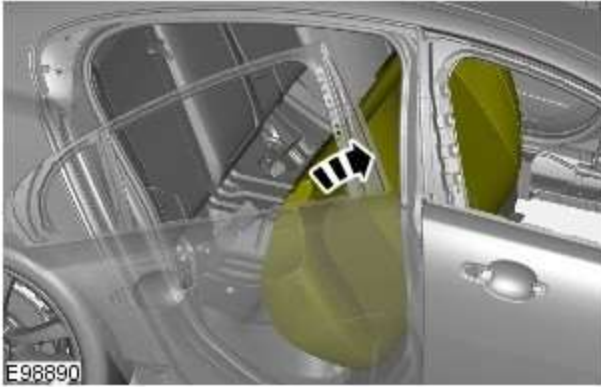
Safety Belt System - Rear Safety Belt Buckle

Removal and Installation

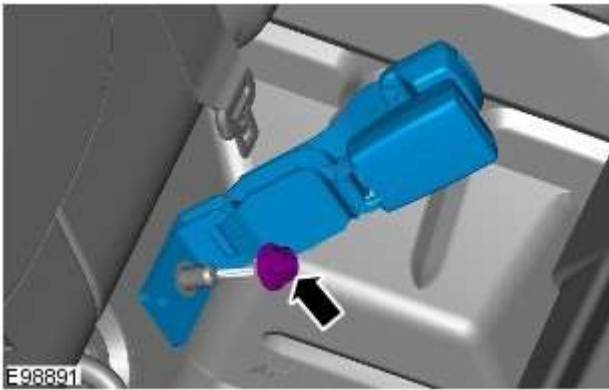
Removal



NOTE: Removal steps in this procedure may contain installation details.



1.



2. Torque: 40 Nm

Installation

1. To install, reverse the removal procedure.

Safety Belt System - Rear Safety Belt Retractor

Removal and Installation

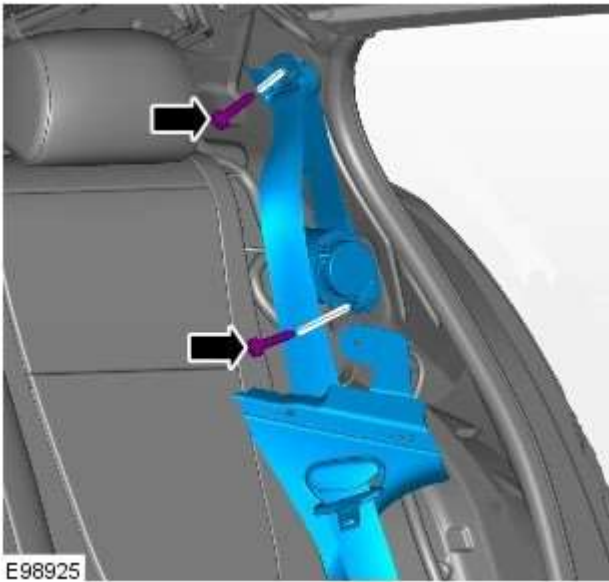
Removal



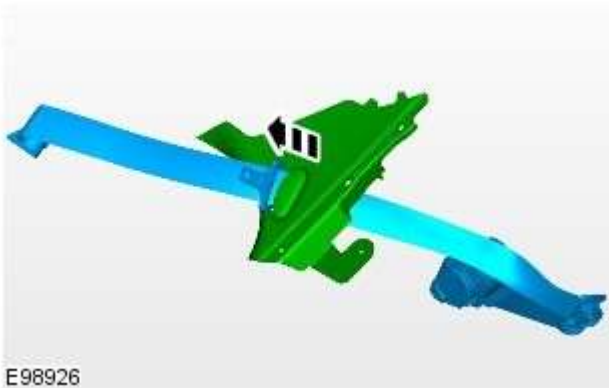
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [C-Pillar Lower Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. Torque: 40 Nm



- 3.



Installation

1. To install, reverse the removal procedure.

Safety Belt System - Safety Belt Shoulder Height Adjuster

Removal and Installation

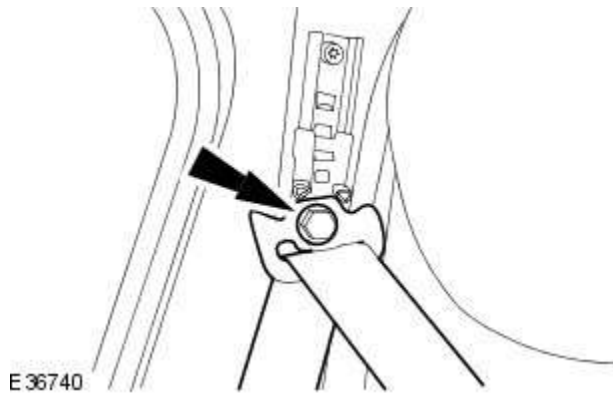
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [B-Pillar Upper Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. Torque: 40 Nm



3. Torque: 25 Nm



Installation

1. To install, reverse the removal procedure.

Supplemental Restraint System -

Torque Specifications

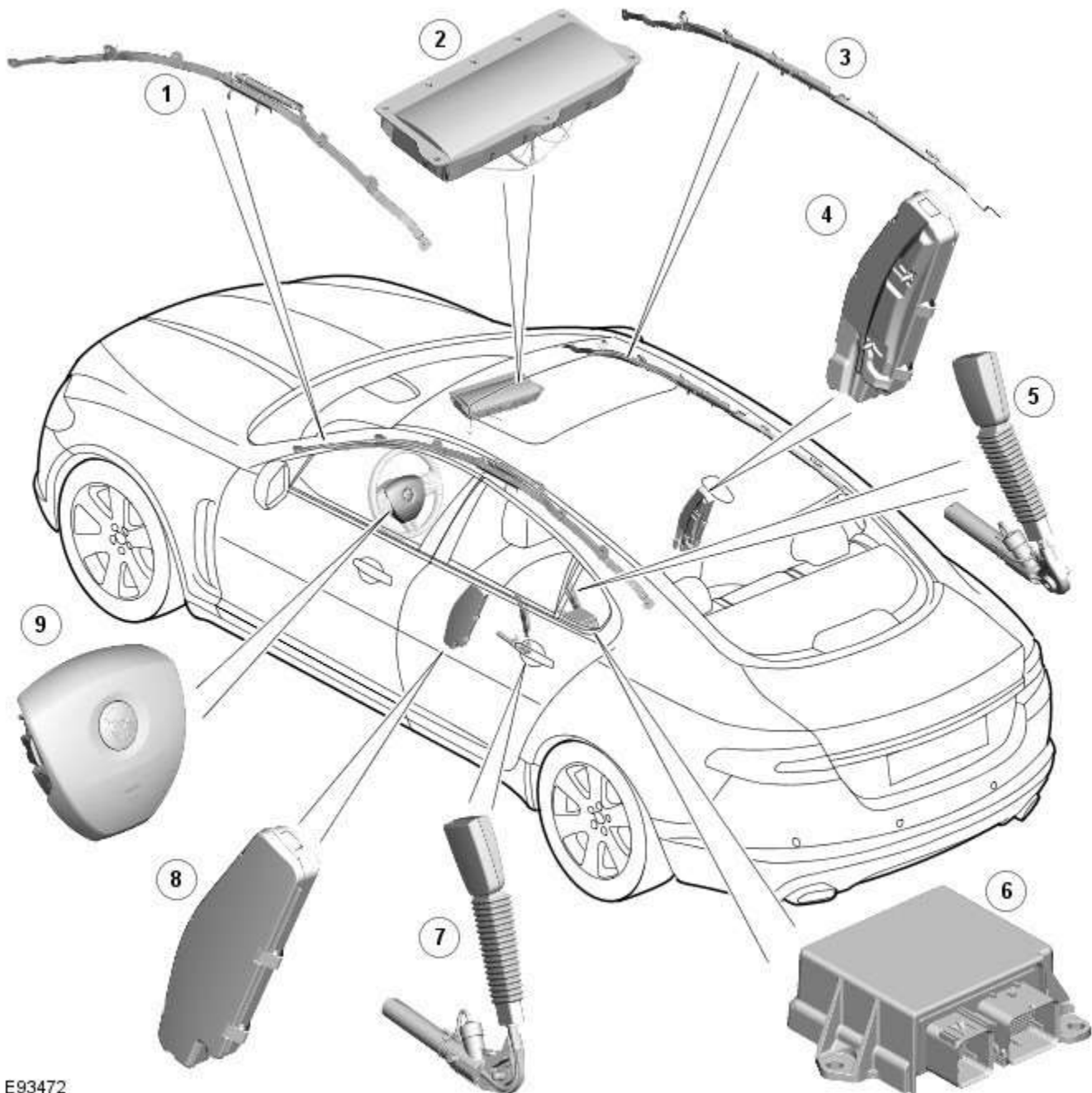
Description	Nm	Lb/Ft	Lb/In
Passenger air bag module retaining nuts	6	-	55
Passenger air bag earth lead retaining bolt	9	-	80
Restraints control module (RCM) retaining nuts	10	-	89
Side air curtain module inflator retaining bolts	9	-	80
Side air curtain module tether straps retaining bolts	9	-	80
Side air bag module retaining nuts	7	-	62
Side impact sensor retaining bolt	10	-	89
Front crash sensor retaining bolt	10	-	89
Clock spring retaining screws	5	-	44

Supplemental Restraint System - Air Bag and Safety Belt Pretensioner

Supplemental Restraint System (SRS) - Component Location

Description and Operation

COMPONENT LOCATION SHEET 1 OF 2



E93472

Item	Description
1	LH (left-hand) curtain airbag
2	Front passenger airbag
3	RH (right-hand) curtain airbag
4	Passenger thorax airbag
5	Front passenger seat safety belt pretensioner
6	RCM (restraints control module)
7	Driver's seat safety belt pretensioner
8	Driver's thorax airbag
9	Driver's airbag

COMPONENT LOCATION SHEET 2 OF 2



E137153

Item	Description
1	Occupant classification system pressure pad (NAS only)
2	Safety belt tension sensor (NAS only)
3	Occupant detection system pad (all, except NAS)
4	Occupant classification system control module (NAS only)
5	RH side impact sensor (pressure sensor)
6	RH rear impact sensor
7	LH rear impact sensor
8	Passenger airbag deactivation LED (light emitting diode)
9	Driver's seat position sensor
10	LH side impact sensor (pressure sensor)
11	Instrument cluster
12	LH front impact sensor
13	RH front impact sensor

Supplemental Restraint System - Air Bag and Safety Belt Pretensioner

Supplemental Restraint System (SRS) - Overview

Description and Operation

OVERVIEW



WARNING: All pyrotechnic devices are dangerous. Before performing any procedures on any pyrotechnic device, read all information contained within the Standard Workshop Practices section of this manual.

Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

The [SRS \(supplemental restraint system\)](#) provides additional protection for the vehicle occupants in certain impact conditions. The system is controlled by the [RCM \(restraints control module\)](#), which is mounted beneath the floor console. The system includes twin stage drivers and front passenger airbags.

The [RCM](#) receives inputs from various sensors around the vehicle and determines which, if any, airbags should be deployed.

The [SRS](#) features an occupant detection system. The occupant detection system comprises a mat fitted inside the front passenger seat. By monitoring the condition of the mat, the [RCM](#) can determine if the front passenger seat is occupied. It uses this information to determine which airbags to deploy in the event of an impact. This information is also used to illuminate the safety belt instrument cluster warning lamp if the front passenger seat is occupied and the safety belt is not engaged.

North American Specification (NAS) vehicles also feature an occupant classification system. The occupant classification system comprises a control module, pressure pad and safety belt tension sensor. The system can determine the size and weight of the front seat passenger. This information is transmitted to the [RCM](#) over the high speed [CAN \(controller area network\)](#) bus. The [RCM](#) uses this information to help determine which airbags to deploy in the event of an impact.

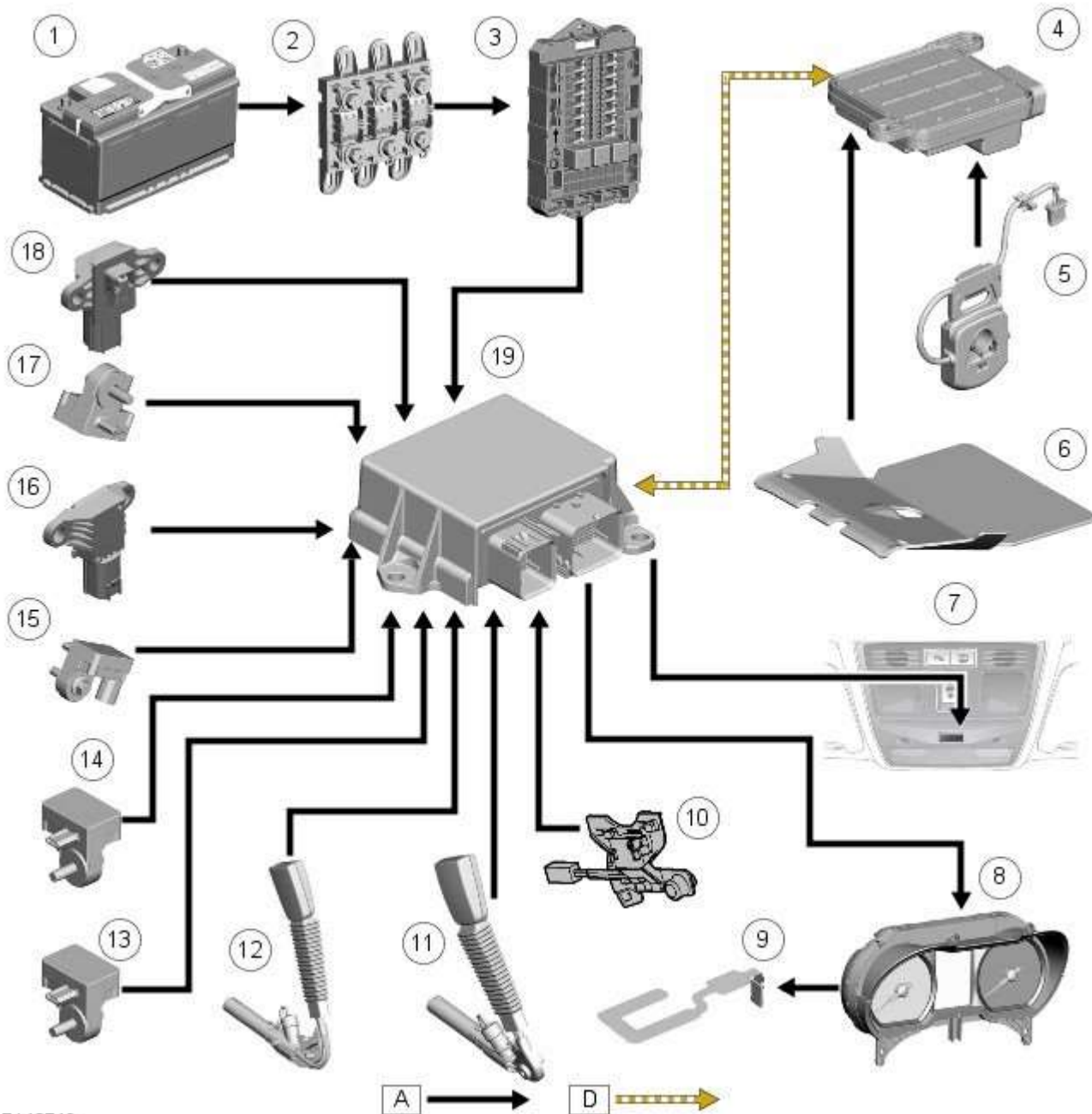
Supplemental Restraint System - Air Bag and Safety Belt Pretensioner Supplemental Restraint System (SRS) - System Operation and Component Description

Description and Operation

Control Diagram



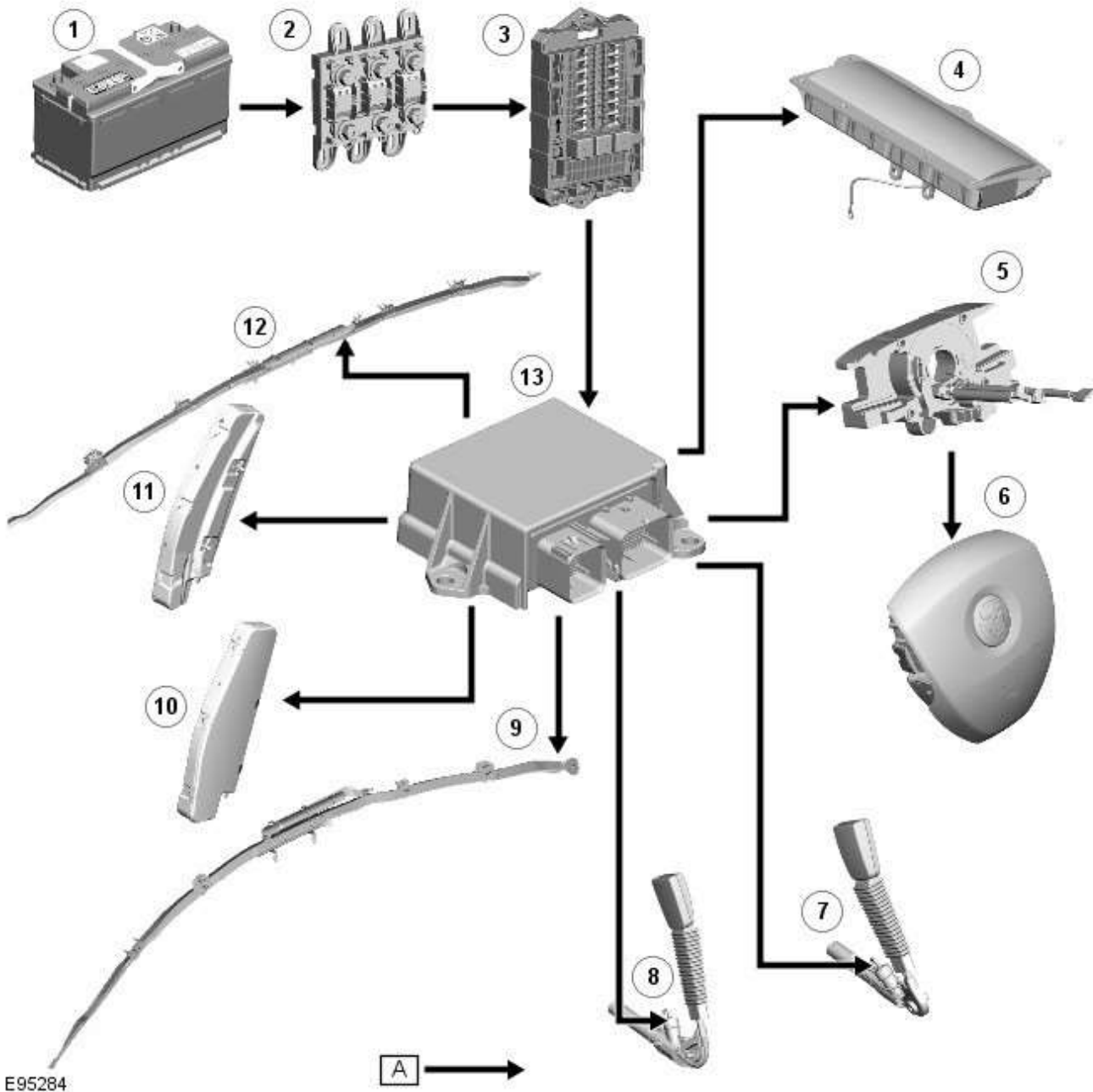
NOTE: **A** = Hardwired; **D** = High speed CAN (controller area network) bus



E142749

Item	Description
1	Battery
2	BJB (battery junction box)
3	RJB (rear junction box)
4	Occupant classification system control module (NAS only)
5	Safety belt tension sensor (NAS only)

6	Occupant classification system pressure pad (NAS only)
7	Passenger airbag deactivation LED (light emitting diode)
8	Instrument cluster
9	Occupant detection system pad (all, except NAS)
10	Driver's seat position sensor
11	Front passenger seat safety belt pretensioner
12	Driver's seat safety belt pretensioner
13	LH (left-hand) front impact sensor
14	RH (right-hand) front impact sensor
15	RH rear impact sensor
16	RH side impact sensor
17	LH rear impact sensor
18	LH side impact sensor
19	RCM (restraints control module)



Item	Description
1	Battery
2	BJB
3	RJB
4	Front passenger airbag
5	Clockspring
6	Driver's airbag
7	Front passenger seat safety belt switch
8	Driver's seat safety belt switch
9	LH curtain airbag
10	Driver's seat thorax airbag
11	Front passenger seat thorax airbag
12	RH curtain airbag
13	RCM

System Operation

System Operation

In a collision, the sudden deceleration or acceleration is measured by the impact sensors and the accelerometers in the restraints control module. The restraints control module evaluates the readings to determine the impact point on the vehicle and whether the deceleration/acceleration readings exceed the limits for firing any of the airbags, pretensioners, and battery disconnect unit. During a collision, the restraints control module only fires the airbags and pretensioners if the safing function confirms that the data from the impact sensor(s) indicates an impact limit has been exceeded.

The [RCM](#) incorporates the following impact thresholds to cater for different accident scenarios:

- Front impact, pretensioners
- Front impact, driver and passenger airbags stage 1, belt unfastened
- Front impact, driver and passenger airbags stage 1, belt fastened
- Front impact, driver and passenger airbags stage 2, belt unfastened
- Front impact, driver and passenger airbags stage 2, belt fastened
- Rear impact
- Driver side impact
- Passenger side impact.

The front impact thresholds increase in severity from pretensioners to driver and passenger airbag stage 2, belt fastened (refer to list above).

Firing Strategies

The safety belt pretensioners are fired when the pretensioner impact limit is exceeded. The [RCM](#) only fires the pretensioners if the related safety belt is fastened.

The driver and passenger airbags are only fired in a frontal impact. If an impact exceeds a stage 1 limit, but is less than the corresponding stage 2 limit, only one inflator in each airbag is fired (stage 2 is still fired for disposal after a delay of 100ms). If an impact exceeds the stage 2 limit, the two inflators in each airbag are fired simultaneously.

The passenger airbag is disabled unless the front passenger seat is occupied by a large person (NAS only), or the passenger airbag deactivation switch is on (all except NAS & AUS).

The stage 2 inflator of the driver airbag is disabled if the driver seat is forward of the switching point of the seat position sensor.

If there is a fault with a safety belt buckle sensor, the [RCM](#) assumes the related safety belt is fastened for the pretensioner firing strategy and unfastened for the driver and passenger airbag firing strategies. If there is a fault with the occupant classification sensor, the [RCM](#) disables the passenger airbag. If there is a fault with the passenger airbag deactivation switch, the [RCM](#) disables the passenger airbag.

If a side impact limit is exceeded, the [RCM](#) fires the side airbag and the side head airbag on that side of the vehicle. If the side impact limit on the front passenger side of the vehicle is exceeded, the [RCM](#) also evaluates the input from the occupant classification sensor, and fires the side airbag only if the front passenger seat is occupied by a large person (NAS only).

If multiple impacts occur during a crash event, after responding to the primary impact the [RCM](#) will output the appropriate fire signals in response to any further impacts if unfired units are available.

Front and Rear Impact Firing Strategy (All Except NAS)

Safety Belt Status		Strategy		
Driver	Passenger	Applicable Pretensioner	Driver airbag	Passenger airbag
Fastened	-	Fired at pretensioner threshold	Fired at belt fastened threshold	-
Unfastened	-	Not fired	Fired at belt unfastened threshold	-
-	Fastened	Fired at pretensioner threshold	-	Fired at belt fastened threshold
-	Unfastened	Not fired	-	Fired at belt unfastened threshold

Front and Rear Impact Firing Strategy (NAS Only)

Safety Belt Status		Passenger Seat Status	Strategy		
Driver	Passenger		Applicable Pretensioner	Driver airbag	Passenger airbag
Fastened	-	-	Fired at pretensioner threshold	Fired at belt fastened threshold	-
Unfastened	-	-	Not fired	Fired at belt unfastened threshold	-
-	Fastened	Occupied allow	Fired at pretensioner threshold	-	Fired at belt fastened threshold
-	Fastened	Unoccupied inhibit/empty	Fired at pretensioner threshold	-	Not fired
-	Unfastened	Occupied allow	Not fired	-	Fired at belt unfastened threshold
-	Unfastened	Unoccupied inhibit/empty	Not fired	-	Not fired

The battery disconnect unit is fired:

- At driver and passenger airbag belt fastened threshold in a frontal impact
- At the driver and passenger side impact threshold in a side impact
- At the rear impact threshold in a rear impact.

Crash Signal

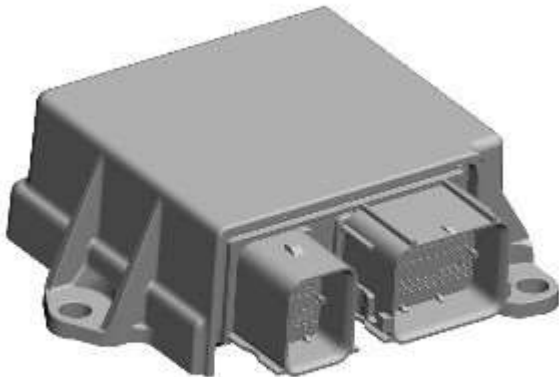
When the [RCM](#) outputs any of the fire signals it also outputs a crash signal to the [RJB](#) and the [ECM \(engine control module\)](#) on the high speed [CAN](#). The crash signal is also hardwired to the [ECM](#) and the [RJB](#). The instrument cluster picks up the crash signal from the high speed [CAN](#) and gateways it to the [LCM \(lighting control module\)](#). On receipt of the crash signal, the [RJB](#) goes into a crash mode and the [ECM](#) cuts the power supply to the fuel pump relay. In the crash mode, the [RJB](#):

- Activates all of the unlock signals of the vehicle locking system, even if the vehicle is already unlocked.
- Ignores all locking/superlocking inputs until it receives an unlock input, when it returns the locking system to normal operation.
- Activates the interior lamps. The interior lamps remain on permanently until they are manually switched off at the lamp unit, or the [RJB](#) crash mode is switched off and they return to normal operation.
- Disables the rear window child lock input until the crash mode is switched off.
- Sends a crash message to the [LCM](#), to activate the hazard flashers. The hazard flashers remain on until cancelled by the hazard warning switch or the crash mode is switched off.

The [RJB](#) crash mode is switched off by a valid locking and unlocking cycle of the locking system.

Component Description

Restraints Control Module



E142834

The [RCM](#) is installed on the top of the transmission tunnel, in line with the B pillars, and controls operation of the [SRS \(supplemental restraint system\)](#). The main functions of the [RCM](#) include:

- Crash detection and recording
- airbag and pre-tensioner firing
- Self-test and system monitoring, with status indication via the airbag warning lamp and non-volatile storage of fault information.

The [RCM](#) determines which elements of the [SRS](#) are to be deployed by using two internal areas:

- Crash severity evaluation
- Deployment handler.

Crash severity evaluation evaluates crash severity by using data from the [RCM](#) internal accelerometer, the front crash sensor and the safety belt buckle sensor. Based on this data, the [RCM](#) decides which level of airbag module deployment is required and forwards the information to the second area, the deployment handler.

The deployment handler evaluates the status of the seat track position sensor and safety belt buckle sensors before a decision is made about which restraints should finally be deployed.

Data from the side crash sensors is used by the [RCM](#) in conjunction with acceleration data from the [RCM](#) internal accelerometer to make a deployment decision. The [RCM](#) processes the acceleration data and subject to an impact being of high enough severity, decides whether the side airbag module should be deployed.

On board testing of the airbag modules, front safety belt pretensioner firing circuits, warning indicator circuits and module status (the crash and side impact sensors perform basic self-tests) is performed by the [RCM](#) together with the storing of fault codes.

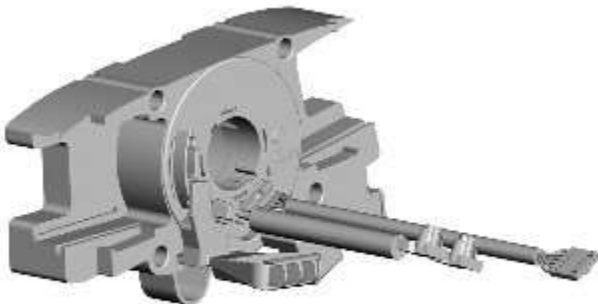
The [RCM](#) drives the [SRS](#) indicator on the instrument pack via a [CAN](#) signal. If the warning lamp fails, a fault code is recorded and a warning tone is sounded in place of the lamp if a further fault occurs. It also provides a temporary back-up power supply to operate the airbag modules in the event that in crash conditions, the battery supply is lost. In the event of a crash, it records certain data which can be accessed via the diagnostic connector.

A safing sensor in the [RCM](#) provides confirmation of an impact to verify if airbag and pretensioner activation is necessary. A roll-over sensor monitors the lateral attitude of the vehicle. Various firing strategies are employed by the [RCM](#) to ensure that during an accident only the appropriate airbags and pretensioners are fired. The firing strategy used also depends on the inputs from the safety belt switches and the occupant monitoring system.

An energy reserve in the [RCM](#) ensures there is always a minimum of 150 milliseconds of stored energy available if the power supply from the ignition switch is disrupted during a crash. The stored energy is sufficient to produce firing signals for the driver airbag, the passenger airbag and the safety belt pretensioners.

When the ignition is switched on, the [RCM](#) performs a self-test and then performs cyclical monitoring of the system. If a fault is detected the [RCM](#) stores a related fault code and illuminates the airbag warning indicator. The faults can be retrieved by the recommended Jaguar diagnostic tool over the [CAN](#) bus. If a fault that could cause a false fire signal is detected, the [RCM](#) disables the respective firing circuit, and keeps it disabled during a crash event.

Clock Spring



E98177

The clockspring is installed on the steering column to provide the electrical interface between the fixed wiring harness of the steering column and the components that rotate with the steering wheel, i.e. the driver airbag, the horn and the steering wheel switch packs.

The clockspring consists of a plastic cassette which incorporates an outer cover fixed to the steering column and an inner rotor which turns with the steering wheel. Four securing lugs attach the cover to the multifunction switch on the steering column. The rotor is keyed to the steering wheel by a drive peg. A lug on the underside of the rotor operates the self-cancelling feature of the turn signal indicator switch. A ribbon lead, threaded on rollers in the rotor, links two connectors on the cover to two connectors on the rotor. Link leads for the driver airbag are installed in one of the connectors on the rotor.

To prevent damage to the ribbon lead, both the steering and the clockspring must be centralized when removing and installing the clockspring or the steering wheel. The clockspring is centralized when the drive peg is at six o'clock and 50 - 100% of a yellow wheel is visible in the viewing window.

Replacement clocksprings are fitted with a stopper, which locks the cover to the rotor, in the central position. The stopper must be broken off when the replacement clockspring is installed.

Drivers Airbag Module



E98175

The driver airbag module is controlled by the [RCM](#) which chooses between single or dual stage deployment, depending on the occupant position and the crash severity. To reduce the risk of an airbag module induced injury to a driver that is positioned close to the steering wheel, the airbag module deploys radially. It has a non-azide propellant that reduces particulates and effluents. It consists of a two stage inflator with separate chambers for the two inflation stages, each being independently activated by the [RCM](#). It has two electrical connectors that are color coded and mechanically keyed to the respective connector on the inflator.

Passenger Airbag Module



E98176

The passenger airbag module is controlled by the [RCM](#) which chooses between single or dual stage deployment, depending on the occupant status and the crash severity. It consists of a two stage inflator with two airbag electrical connectors to accommodate the two stage inflation.

The heated gas inflator consists of a high-pressure mix of clean air and hydrogen gas, triggered by two separate ignition squibs. It produces a controlled generation of clean gas to rapidly fill the airbag. It is classified as a stored flammable gas (not as an explosive) and as such, has less restrictive storage and transportation requirements. It produces a very clean burn and almost no particulates and is almost free of any toxins, making disposal or recycling much easier.

Side Air Curtains



E98180

Side air curtains protect against head injuries in a side impact, while also helping to ensure unrestrained occupants are not ejected through open or broken windows during a rollover event.

A single inflator mounted behind the rear seat unfurls the curtain and fills five separate chambers to provide head protection cushions for occupants in side-impact and roll-over events. Steel ramps guarantee the curtain does not snag on the interior trim as it unfurls, while tethers at the front and rear of the curtain ensure the curtain is held taut.

The side air curtain deflation characteristics are deliberately slow to ensure it remains inflated throughout the duration of a vehicle rollover event.

Airbag - Side (Passenger/Driver) Module



E98181

A side airbag is attached to the outside of each front seat backrest frame, under the backrest cover.

The side airbags are handed, and each consist of a molded plastic case which contains the folded airbag and the inflator. A

cable connects the igniter of the inflator to a connector in the main seat harness connector block located under the front edge of the seat cushion.

When the airbag deploys it forces the front edge of the molded plastic case apart and splits open the backrest cover.

The side airbags use compressed argon as the inflation medium. The inflated volume of each side airbag is 12 liters (0.42 ft³).

Impact/Pressure Sensors

Impact Sensor



E98182

Pressure Sensor



E142839

Impact sensors are installed in the front and both sides of the vehicle. The use of multiple impact sensors provides shorter airbag trigger times, through faster detection of lateral and longitudinal acceleration, and improves detection accuracy.

There are two front impact sensors attached to the inner side of the upper front crossmember.

There are four side impact/pressure sensors located in the passenger compartment, as follows:

- One on each side mounted in the front door panels (pressure sensors)
- One on each side attached to the body by the rear wheel arch.

Each impact sensor incorporates an accelerometer and a microchip powered by a feed from the [RCM](#). The power feed also provides the interface connection through which the side impact sensor communicates with the [RCM](#) using serial data messages. Acceleration is evaluated by the microchip and transmitted to the restraints control module, which then makes the decision on whether or not to activate the airbags and pretensioners.

When the ignition is switched on, the [RCM](#) supplies power to the impact sensors, which perform a self-test. After satisfactory self tests the impact sensors continually output 'digital acceleration' messages to the restraints control module. If a fault is detected the relevant impact sensor sends a fault message, instead of the digital acceleration message, to the restraints control module. The [RCM](#) then stores a related fault code and illuminates the airbag warning indicator. Faults can be retrieved by the Jaguar approved diagnostic system from the [RCM](#) via the high speed [CAN](#) bus connection.

Seat Position Sensor

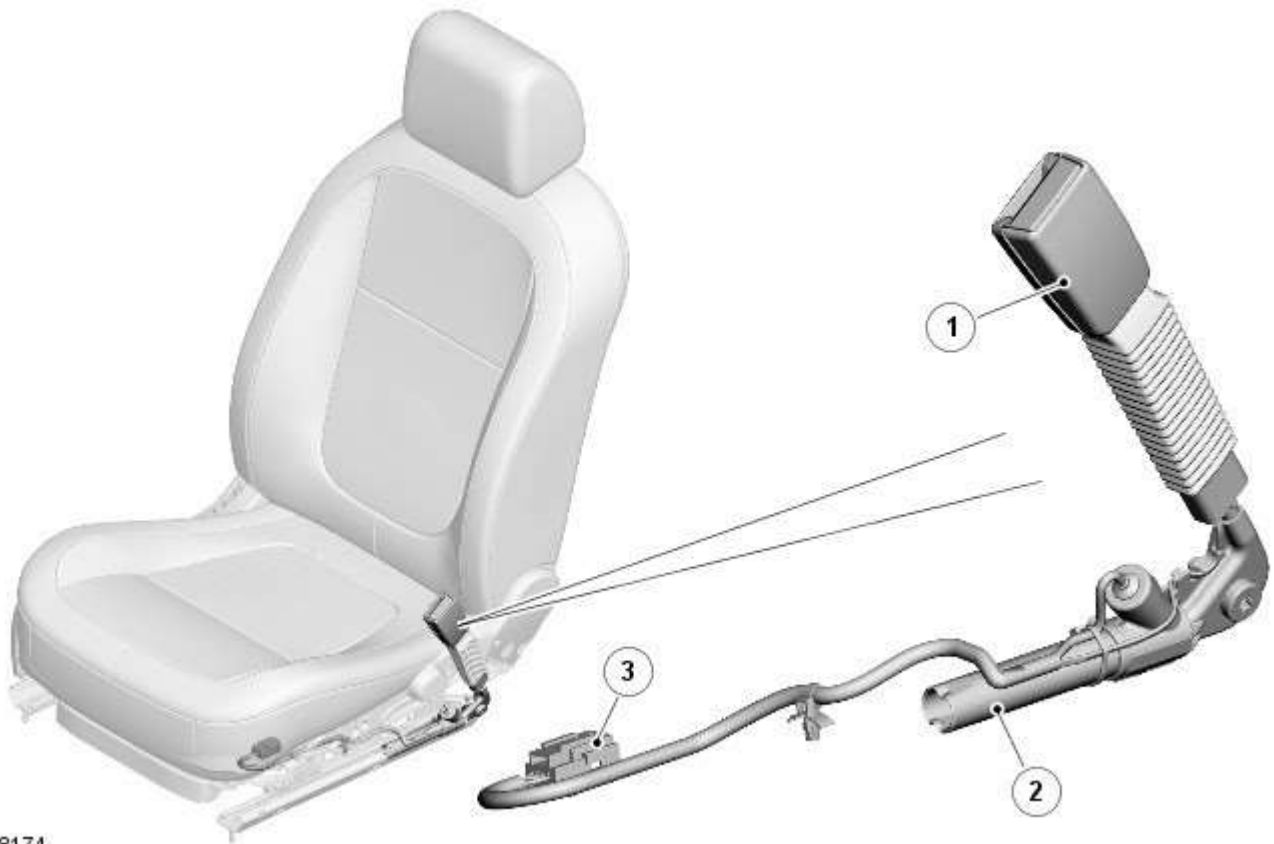
The seat position sensor allows the [RCM](#) to detect when the driver seat is forward of a given point on the seat track. The seat position sensor consists of a Hall effect sensor attached to the driver seat frame. While the ignition is on, the [RCM](#) supplies the sensor with power, and monitors the return current. When the seat frame moves forwards, the sensor moves over the edge of the seat track, which changes the reluctance of the sensor. The change of current is detected by the [RCM](#) and used as a switching point. The switching point is when the center of the sensor is 3 ± 4 mm from the leading edge of the seat track.

When the driver seat is forward of the switching point, the [RCM](#) increases the time delay between firing the two stages of the inflator in the driver airbag. When the driver seat is rearward of the switching point, the [RCM](#) uses the normal time delay between firing the two stages.

Safety Belt Sensor

A safety belt switch is installed in the buckle of each front safety belt to provide the [RCM](#) with a status signal of the related safety belt(s). When the safety belt is unfastened the switch outputs a low current to the [RCM](#). When the safety belt is fastened the switch outputs a high current to the [RCM](#).

Pretensioners



E98174

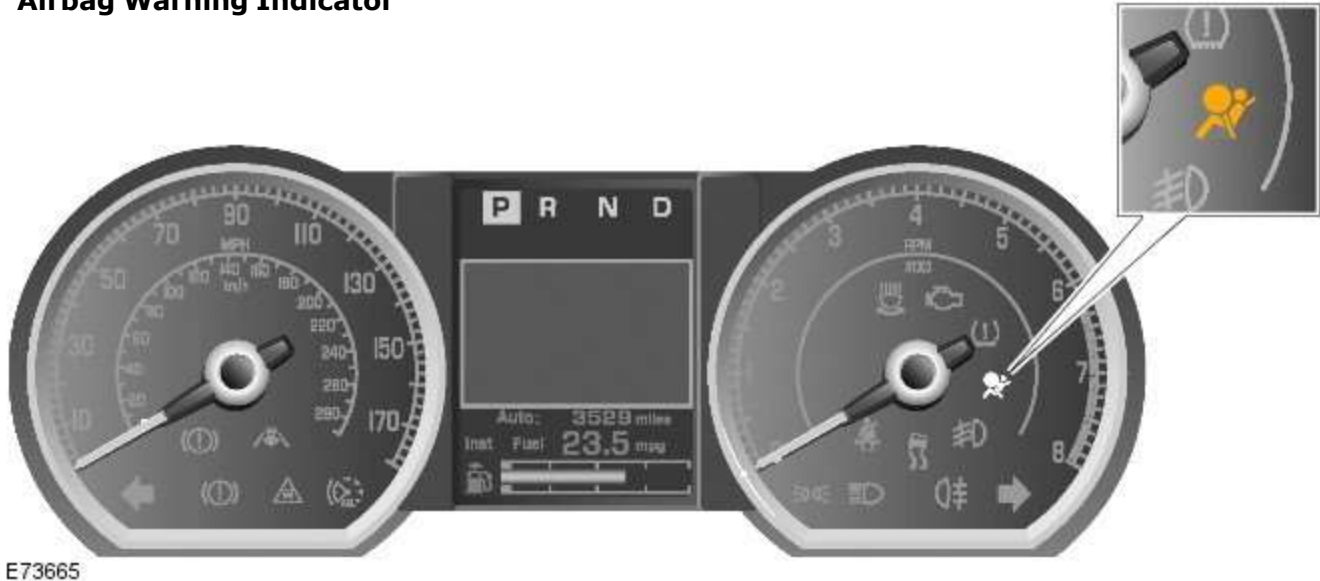
Item	Description
1	Front seat safety belt switch
2	Front seat safety belt pretensioner
3	Electrical connector

The pretensioners are used to tighten the front safety belts during a collision to ensure the occupants are securely held in their seats. A pretensioner is integrated into each front safety belt buckle and attached to a bracket on the inboard side of the seat.

Each pretensioner has a tube containing propellant and a piston. The piston is attached to a steel cable, the opposite end of which is attached to the safety belt buckle. A squib in the base of the tube provides an ignition source when triggered by a fire signal from the [RCM](#).

On receipt of a fire signal from the [RCM](#), the squib ignites the propellant. The propellant produces nitrogen gas that rapidly expands to drive the piston along the tube, pulling the cable and drawing the buckle downwards.

Airbag Warning Indicator



The airbag warning indicator consists of a red [LED](#) behind a [SRS](#) graphic in the instrument cluster.

Operation of the airbag warning indicator is controlled by a high speed [CAN](#) bus message from the [RCM](#) to the instrument cluster. The [RCM](#) sends the signal to illuminate the airbag warning indicator if a fault is detected, and for approximately 6 seconds during the bulb check at the beginning of each ignition cycle.

Occupant Monitoring

There are two types of occupant monitoring:

- In all markets except NAS & Australia, vehicles have an occupant detection sensor
- In NAS markets, vehicles have an occupant classification system

For markets which have an occupant detection sensor, this has no interface with the restraints system and only provides the belt reminder function.

For markets that have an occupant classification system, this provides the [RCM](#) with the occupancy status of the front passenger seat. The restraints control module uses this and the seat buckle status in the evaluation of the firing strategy for the passenger front airbag, side airbag, and pretensioner.

Safety Belt Sensors

The buckle of each front safety belt incorporates a Hall effect sensor that provides a safety belt status signal to the [RCM](#). The [RCM](#) broadcasts the status of the two front safety belts on the high speed [CAN](#) bus for use by the instrument cluster. In the event of a front impact the [RCM](#) will deploy the pretensioners provided the safety belt buckles are fastened. The safety belt buckle pretensioners have a lower deployment threshold than that required by the airbags. Hence it is possible during a minor collision, which exceeds the deployment threshold and will deploy only the safety belt buckle pretensioners.

Passenger Airbag Deactivation Indicator

Passenger Airbag Deactivation Warning Lamp



E98223

The passenger airbag deactivation indicator is installed on the center switch pack of the instrument panel. When appropriate, the indicator illuminates to advise front seat occupants that the passenger airbag is disabled. Operation of the indicator is controlled by the [RCM](#). The [RCM](#) illuminates the indicator when:

- There is a fault with the passenger airbag firing circuit(s).
- The passenger airbag is deactivated with the passenger airbag deactivation switch (where fitted).
- Required by passenger seat occupant monitoring (see below).

Passenger Airbag Deactivation Switch (All Except NAS)

The passenger airbag deactivation switch provides a method of manually disabling the passenger airbag. The switch is installed in the front passenger end of the instrument panel and operated by the ignition key.

When the passenger airbag deactivation switch is operated, it changes a ground connection between two pins in the connectors of the [RCM](#). When the passenger airbag deactivation switch is selected to OFF, the [RCM](#) disables the passenger airbag and, if the front passenger seat is occupied, illuminates the passenger airbag deactivation indicator.

Occupant Detection System

There are two types of occupant monitoring:

- In all markets except NAS & Australia, vehicles have an occupant detection sensor
- In NAS markets, vehicles have an occupant classification system

For markets which have an occupant detection sensor, this has no interface with the restraints system and only provides the belt reminder function.

For markets that have an occupant classification system, this provides the [RCM](#) with the occupancy status of the front passenger seat. The [RCM](#) uses this and the seat buckle status in the evaluation of the firing strategy for the passenger front airbag, side airbag, and pretensioner.

The occupant classification system can determine if the front passenger seat is unoccupied, occupied by a small person, or occupied by a large person. The occupant classification system consists of:

- A pressure pad, installed under the cushion of the front passenger seat, which is connected to a pressure sensor
- A safety belt tension sensor, integrated into the anchor point of the front passenger safety belt
- An occupant classification module, installed under the front passenger seat.

The pressure pad is a silicone filled bladder. Any load on the pressure pad is detected by the pressure sensor.

The safety belt tension sensor is a strain gauge that measures the load applied by the safety belt anchor to the anchor bolt. The sensor is located in the lower safety belt anchor point.

SAFETY BELT TENSION SENSOR (NAS only)



E98178

The occupant classification module supplies a reference voltage to the pressure sensor and the safety belt tension sensor and, from the returned signals, measures the loads acting on the pressure pad and the safety belt tension sensor. The load measurement from the safety belt tension sensor is used to produce a correction factor for the load measurement from the pressure pad. The tightness of the safety belt affects the load acting on the pressure pad, so without the correction factor the occupant classification module cannot derive an accurate occupancy status.

The occupant classification module translates the load readings into a seat occupancy status and transmits the result to the [RCM](#), on a dedicated high speed [CAN](#) bus link. The occupant classification module incorporates two load limits for the seat cushion: When the load exceeds the lower limit, but is less than the upper limit, the occupant is classified as small; when the upper limit is exceeded, the occupant is classified as large.

Supplemental Restraint System - Air Bag and Safety Belt Pretensioner

Supplemental Restraint System (SRS)

Diagnosis and Testing

Principle of Operation

For a detailed description of the supplemental restraints system and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (501-20B Supplemental Restraint System)

[Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) (Description and Operation),
[Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) (Description and Operation),
[Air Bag and Safety Belt Pretensioner Supplemental Restraint System \(SRS\)](#) (Description and Operation).

Inspection and Verification



WARNING: TO AVOID ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY, THE BACKUP POWER SUPPLY MUST BE DEPLETED BEFORE REPAIRING OR REPLACING ANY AIR BAG SUPPLEMENTAL RESTRAINT SYSTEM (SRS) COMPONENTS. TO DEplete THE BACKUP POWER SUPPLY ENERGY, DISCONNECT THE BATTERY GROUND CABLE AND WAIT ONE MINUTE. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN PERSONAL INJURY.



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.



NOTE: Given the legal implications of a restraints system failure, harness repairs to Air Bag module circuits are not acceptable. Where the text refers to "REPAIR the circuit", this will normally mean the replacement of a harness.

1. Verify the customer concern.
2. Visually inspect for obvious signs of damage and system integrity.

Visual Inspection

Electrical

- Battery condition, state of charge
- Make sure all electrical connector(s) are engaged correctly on the air bag circuits
- Wiring harness
- Air bag module(s)
- Make sure the restraints control module (RCM) is correctly installed
- Fuse(s)
- Sensor(s)
- Pretensioner(s)
- Warning lamp bulb(s)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.
4. If the cause is not visually evident, check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.


DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Restraints Control Module \(RCM\)](#) (100-00 General Information, Description and Operation).


Supplemental Restraint System - Air Bag Disposal

General Procedures

Deployed Air Bag


1.  **WARNING:** Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.


Deployed air bag modules are to be disposed of as special waste and must comply with local environmental requirements, if in doubt, contact Authority for disposal requirements.

2.  **NOTE:** The storage, transportation, disposal, and/or recycling of air bag module components must be carried out in accordance with all applicable federal, state and local regulations including, but not limited to, those governing building and fire codes, environmental protection, occupational health and safety, and transportation.

Modules removed and deployed by Jaguar service are to be returned to the importer for disposal.

Undeployed Air Bag – Inoperative

1.  **WARNING:** Carry a live air bag module with the air bag and trim cover or deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment. Failure to follow this instruction may result in personal injury.


 **NOTE:** All inoperative air bag modules have been placed on the Mandatory Return List. All discolored or damaged air bag modules must be treated the same as any inoperative live air bag being returned. Failure to follow this instruction may result in personal injury.


Remove the inoperative driver air bag module or passenger air bag module. For additional information [Driver Air Bag Module](#) or [Passenger Air Bag Module](#) in this section.


Undeployed Air Bag – Scrapped Vehicle

Remote Deployment

1. **WARNINGS:**

 Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.

 Carry a live air bag module with the air bag and trim cover or deployment door pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment. Failure to follow this instruction may result in personal injury.

 Remote deployment is to be carried out outdoors with all personnel at least 6.1 meters (20 feet) away to ensure personal safety. Due to the loud report which occurs when the air bag is deployed, hearing protection is required. Failure to follow this instruction may result in personal injury.



Do not place the driver or passenger air bag module with the trim cover or deployment door facing down, as the forces of the deploying air bag can cause it to ricochet and cause personal injury. Failure to follow this instruction may result in personal injury.

Equipment required: Universal deployment tool-Part N° 418-135 and 12V Battery.

2. The deployment procedure should be carried out outdoors away from other personnel.
3. Remove any loose debris from around air bag. Make sure that no flammable liquids are present.
4. Disconnect the battery ground and positive cables.
5. Disconnect the relevant air bag module electrical connector.
6. Connect the appropriate adaptor lead to the restraint device.
7. Connect the deployment lead to the adaptor lead. Pass wire of the deployment tool through window, close all doors, leave window with lead for deployment tool open.



8. **WARNING:** Before proceeding, make sure precautions have been taken to warn personnel of a possible loud noise upon activation. Do not allow anybody to approach closer to restraint device than six meters. Failure to follow this instruction may result in personal injury.

Move as far from restraint device as possible and connect the tool clips to a 12V vehicle battery.



9. **WARNING:** Do not handle the deployed device immediately after activation - it may be hot. Allow the unit to cool for at least 20 minutes. Cooling modules should be continuously monitored to make sure heat does not create a fire with spilled liquids or other debris. Failure to follow this instruction may result in personal injury.

Deploy the module by depressing both switches on the tool. If activation does not occur, disconnect battery from tool and seek advice from Jaguar Engineering and wait for further instructions.

10. Repeat procedure for all air bags in vehicle.
11. The vehicle is now to be scrapped in the normal manner with modules installed.

Disposal of live air bag modules for all air bags, using tyres

1. Equipment required: Deployment tool 418-S135, Battery (12V), Safety goggles to BS2092 grade 2, Rubber gloves to PrEN 374 class 2, Ear protectors that have been measured to BS.EN 24869, Particulate respirator to EN 149 grade FFP2S
2. The deployment procedure should be carried out outdoors, away from other personnel.
3. Stack four scrap tyres, securing together with heavy gauge wire or cable.

while disconnected from any electrical power source, connect deployment harness and place air bag adaptor portion under tyre stack, ready for connection to air bag.



4. **WARNING:** Power must not be connected during this step. Failure to follow this instruction may result in personal injury.



CAUTION: Make sure the connector is not in contact with the inflator or it will be damaged during the test.

Connect air bag to air bag connector, make sure the locking sleeve is fully engaged. position the air bag with the cover facing upwards.

5. Make sure battery connections of deployment harness are ten meters away from the tyre stack
6. Remove any loose from around the air bag . Make sure that no flammable liquids are present.



7. **WARNING:** Before proceeding, make sure precautions have been taken to warn personnel of a possible loud noise upon activation. Do not allow anybody to approach closer to restraint device than six meters. Failure to follow this instruction may result in personal injury.

Move as far from restraint device as possible and connect the tool clips to a 12V vehicle battery.



8. **WARNING:** Do not handle the deployed device immediately after activation - it may be hot. Allow the unit to cool for at least 20 minutes. Cooling modules should be continuously monitored to make sure heat does not create a fire with spilled liquids or other debris. Failure to follow this instruction may result in personal injury.

Deploy the module by depressing both switches on the tool. If activation does not occur, disconnect battery from tool and seek advise from Jaguar Engineering and wait for further instructions.

9. Allow the air bag to cool for at least 20 minutes. Cooling modules should be continuously monitored to make sure heat generated a fire with spilled liquids or other debris.
10. Remove the air bag from the tyre stack and seal in a plastic bag, ready for disposal.
11. In the event of any problems or queries arising from this procedure, contact Jaguar Engineering.

Supplemental Restraint System - B-Pillar Side Impact Sensor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Make the air bag supplemental restraint system (SRS) safe.

Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

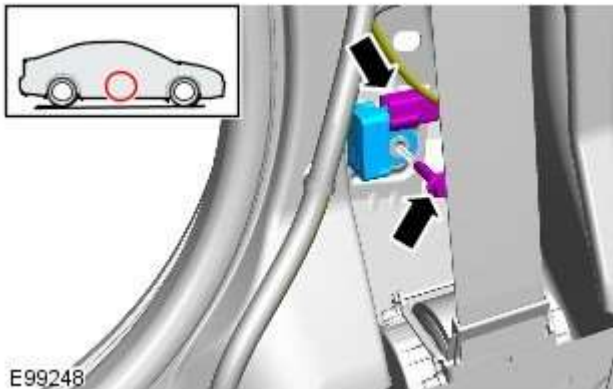


2. **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplementary restraints system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait for one minute. Failure to follow this instruction may result in personal injury.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: [B-Pillar Lower Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

4. Torque: 12 Nm




Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Supplemental Restraint System - Clockspring

Removal and Installation

Special Tool(s)

 <p>E43628</p>	<p>211-326 Locking Tool, Clockspring</p>
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Removal

WARNINGS:



Always wear safety glasses when repairing an air bag supplemental restraint system (SRS) vehicle and when handling an air bag module.



Carry a live air bag module with the air bag and trim cover pointed away from your body. This will reduce the risk of injury in the event of an accidental deployment. Failure to follow this instruction may result in personal injury.



Do not set a live air bag module down with the trim cover face down. Failure to follow this instruction may result in personal injury.



After deployment, the air bag surface can contain deposits of sodium hydroxide, a product of the gas generant combustion that is irritating to the skin. Wash your hands with soap and water afterwards. Failure to follow this instruction may result in personal injury.



Never probe the connectors on the air bag module. Doing so may result in air bag deployment, which may result in personal injury. Failure to follow this instruction may result in personal injury.



Air bag modules with discolored or damaged trim covers must be replaced, not repaired.



Vehicle sensor orientation is critical for correct system operation. If a vehicle equipped with an air bag supplemental restraint system (SRS) is involved in a collision, inspect the sensor mounting bracket and wiring pigtail for deformation. If damaged, replace the sensor whether or not the air bag is deployed.



To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplemental restraint system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait one minute. Failure to follow this instruction may result in personal injury.



CAUTION: Make sure the wheels are in the straight-ahead position. Failure to follow this instruction may result in damage to the component.



NOTE: Removal steps in this procedure may contain installation details.


1. Make the SRS system safe.

Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

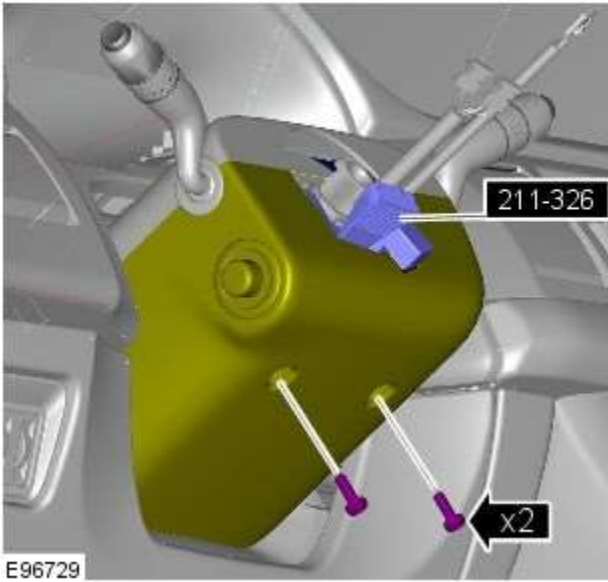
2. **CAUTIONS:**



Make sure that special tool 211-326 is installed to the clockspring.

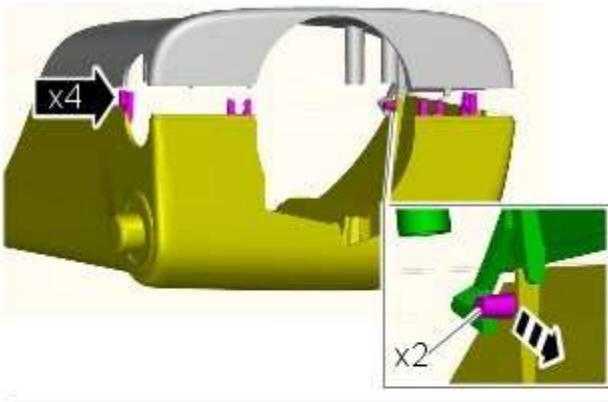
 Make sure that the road wheels are in the straight ahead position, failure to follow this instruction may result in damage to the vehicle.

Refer to: [Steering Wheel](#) (211-04 Steering Column, Removal and Installation).

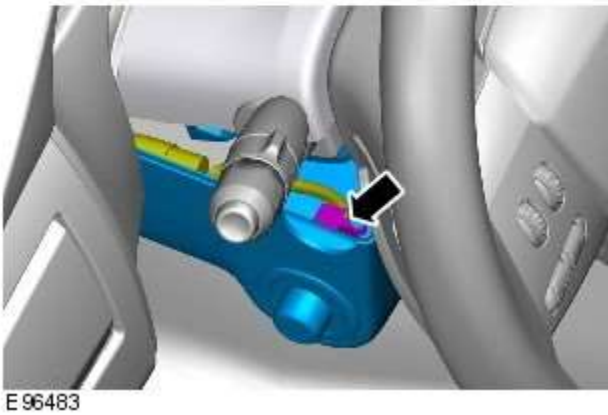


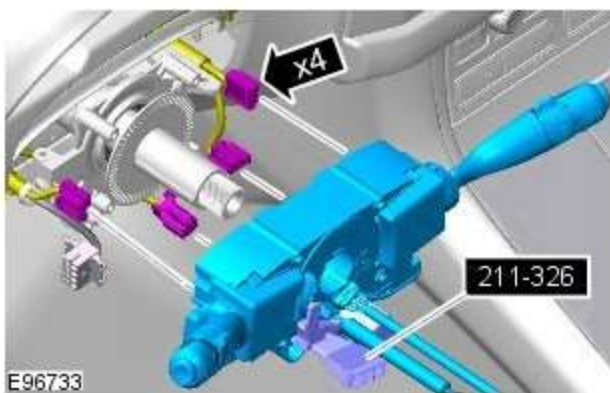
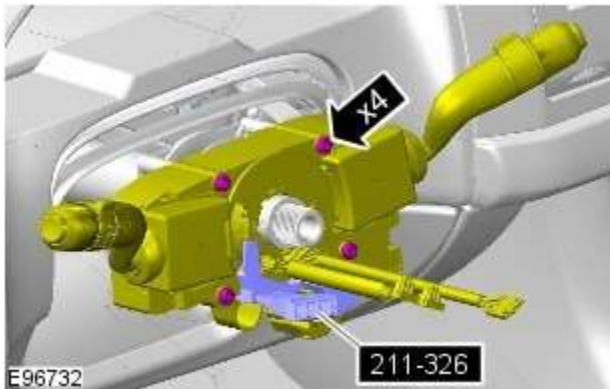
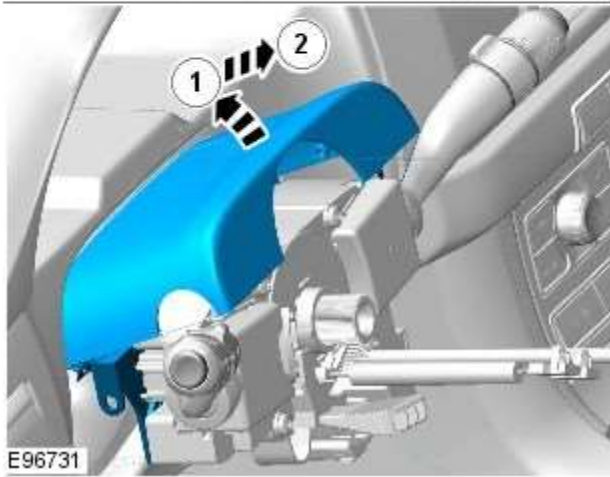
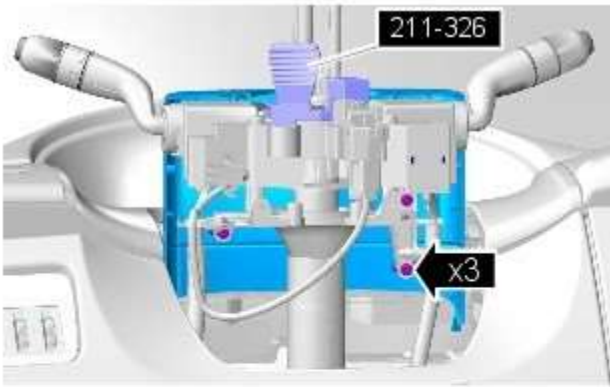
3. CAUTION: Failing to install the special tool to the clockspring may result in damage to the vehicle.

Special Tool(s): [211-326](#)



4.




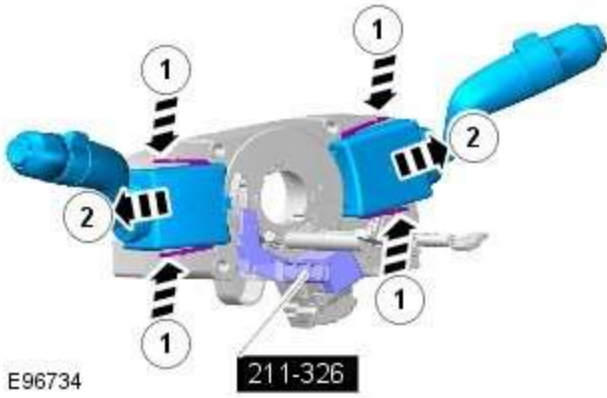


5.


6.  CAUTION: Failing to install the special tool to the clockspring may result in damage to the vehicle.

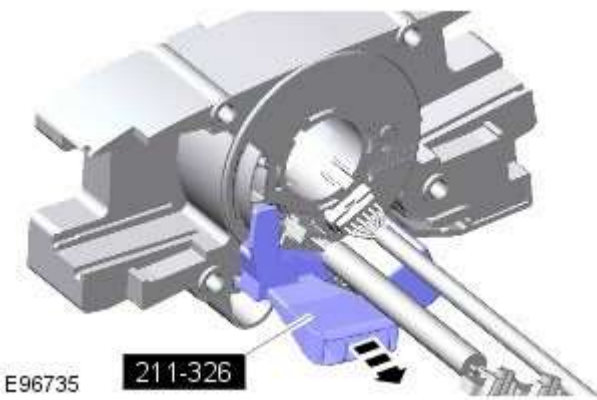
Torque: 6 Nm

7.  CAUTION: Make sure no damage is occurred to the electrical connectors. Failure to follow this instruction may result in damage to the vehicle.



E96734

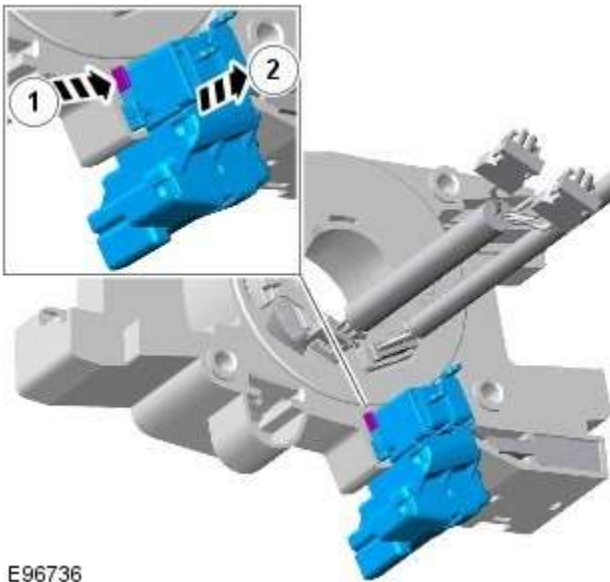
8.  NOTE: Do not disassemble further if the component is removed for access only.



E96735

9. Remove the special tool from the clockspring.

Special Tool(s): [211-326](#)



E96736

- 10.

Installation



1. CAUTIONS:



Make sure that special tool 211-326 is installed to the clockspring.



Make sure that the arrow on the cassette is centered and pointing vertically (**make sure that the steering wheel has remained in the 12 o'clock position and that it has not been turned by +/- 360 degrees**) prior to the steering wheel installation. On removal of the special tool, keep the clockspring cables taught to prevent the cassette moving from the set position. Failure to follow this instruction may result in damage to the component.



Make sure that the road wheels are in the straight ahead position, failure to follow this instruction may result in damage to the vehicle.

To install, reverse the removal procedure.

Supplemental Restraint System - C-Pillar Side Impact Sensor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Make the air bag supplemental restraint system (SRS) safe.

Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

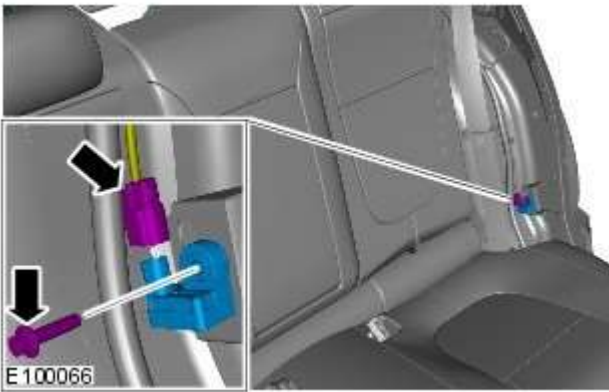


2. **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplementary restraints system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait for one minute. Failure to follow this instruction may result in personal injury.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: [Rear Seat Bolster](#) (501-10 Seating, Removal and Installation).

4. Torque: 12 Nm



Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Supplemental Restraint System - Crash Sensor

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Make the air bag supplemental restraint system (SRS) safe.

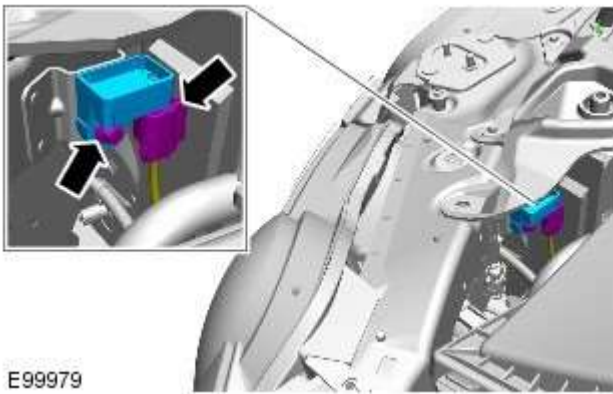
Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).



2. **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplementary restraints system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait for one minute. Failure to follow this instruction may result in personal injury.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

3. Torque: 10 Nm



Installation

1. Install is the reverse of removal.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Supplemental Restraint System - Driver Air Bag Module

Removal and Installation

Special Tool(s)

 <p>501-120 E65858</p>	<p>501-120 Remover, Driver Air Bag</p>
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Removal

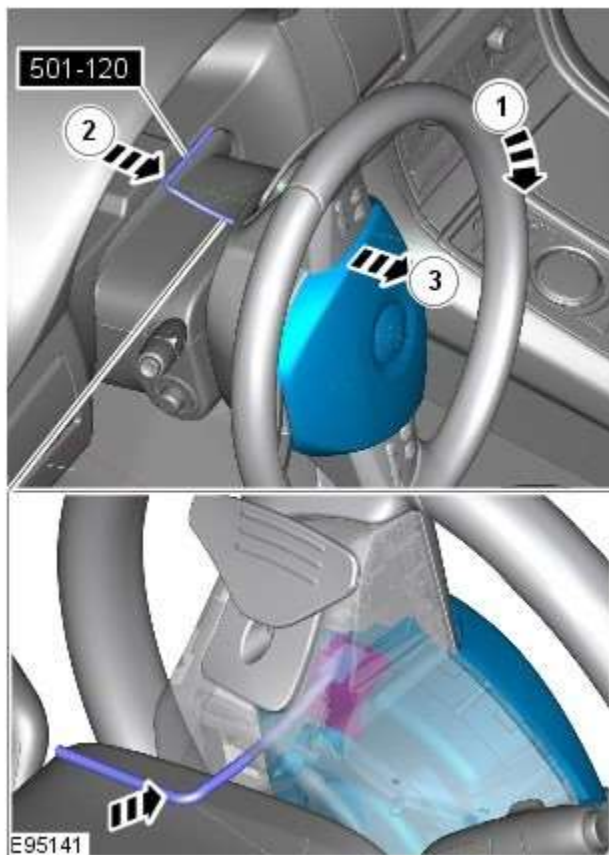


WARNING: Refer to: Supplemental Restraint System (SRS) Health and Safety Precautions (100-00, Description and Operation).



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01, General Procedures).



2. **NOTES:**

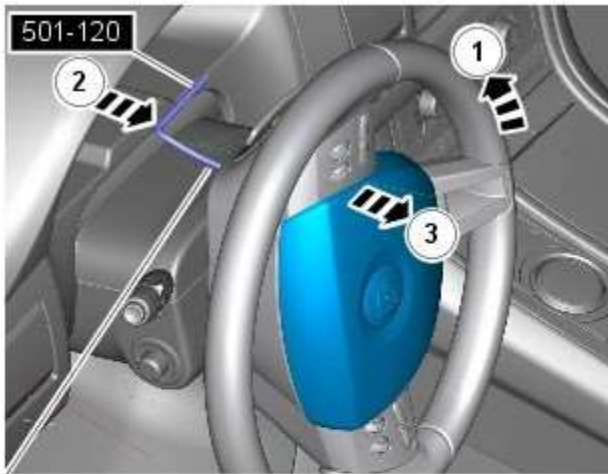


Gentle pressure applied to the air bag towards the instrument panel aids release.

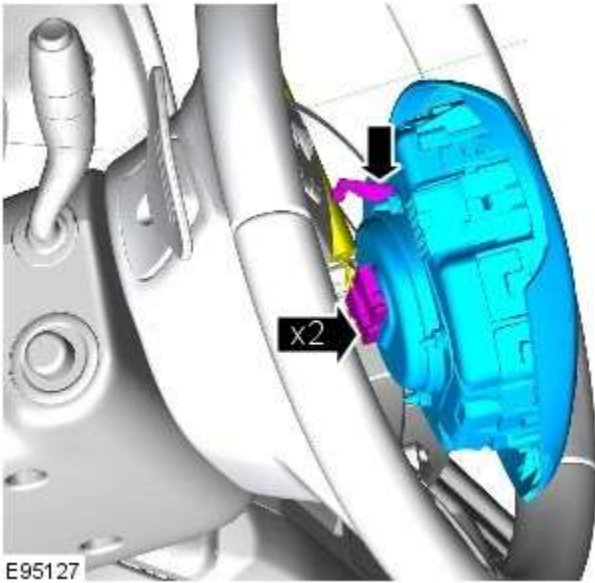
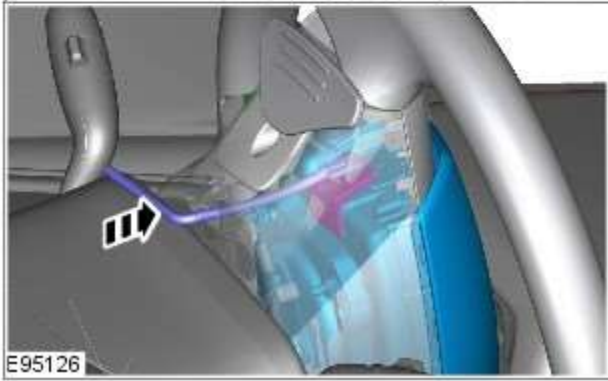


Driver air bag module installation can be confirmed by hearing 2 audible clicks, 1 for each clip.

Special Tool(s): [501-120](#)



3.



4.

Installation

1. To install, reverse the removal procedure.

Supplemental Restraint System - Occupant Classification Sensor

Removal and Installation

Removal

WARNINGS:



To avoid accidental deployment, the restraints control module backup power supply must be depleted. Wait at least one minute after disconnecting the battery ground cable(s) before commencing any repair or adjustment to the supplemental restraint system (SRS), or any component(s) adjacent to the SRS sensors. Failure to follow these instructions may result in personal injury.



Always wear safety glasses when working on an air bag equipped vehicle and when handling an air bag module. Failure to follow this instruction may result in personal injury.



To minimize the possibility of premature deployment, do not use radio key code savers when working on the supplemental restraint system. Failure to follow this instruction may result in personal injury.



To minimize the possibility of injury in the event of premature deployment, always carry a live air bag module with the bag and trim cover pointed away from the body. Failure to follow this instruction may result in personal injury.



To minimize the possibility of premature deployment, live air bag modules must only be placed on work benches which have been ground bonded and with the trim cover facing up. Failure to follow these instructions may result in personal injury.



Never probe the electrical connectors of air bag modules or any other supplemental restraint system component. Failure to follow this instruction may result in personal injury.



Painting over the driver air bag module trim cover or instrument panel could lead to deterioration of the trim cover and air bags. Do not for any reason attempt to paint discoloured or damaged air bag module trim covers or instrument panel. Install a new component. Failure to follow this instruction may result in personal injury.

CAUTIONS:



The front passenger seat occupant classification sensor is available only as a service kit. No attempt should be made to replace individual components. Failure to follow this instruction may result in personal injury.



Check for correct operation of the front seat after completion of the procedure to make sure that the wiring harness has not become trapped or stretched.

NOTES:



Note the routing of the seat harness.



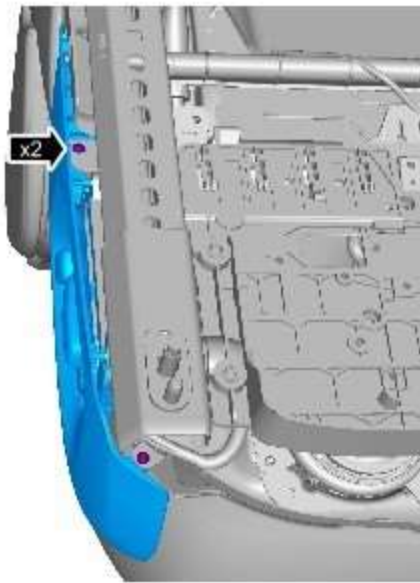
Some variation in the illustrations may occur, but the essential information is always correct.

1. Make the air bag supplemental restraint system (SRS) safe.

Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

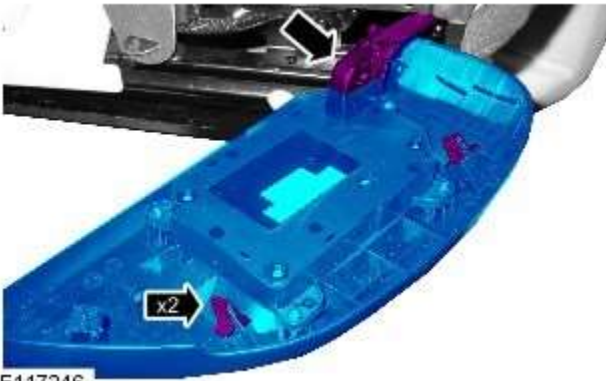
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: [Front Seat Backrest Cover](#) (501-10 Seating, Removal and Installation).



E117245

4.

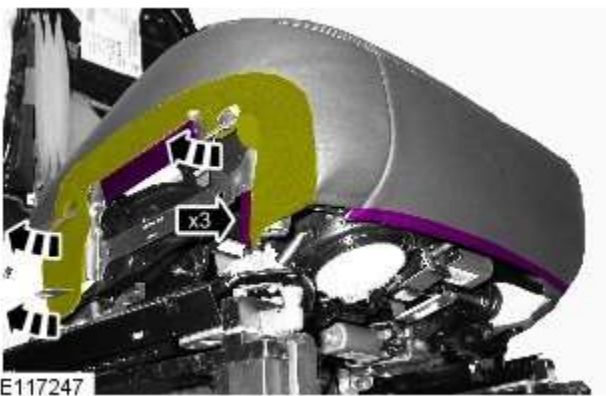


E117246

5. NOTES:

 An audible click is heard when the clips are fully latched.

 Make sure the electrical connector is securely connected.



E117247

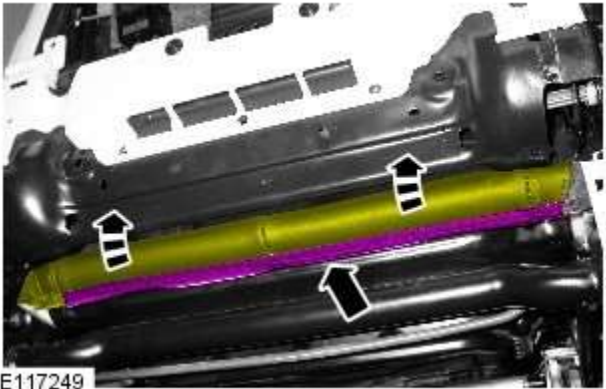
6.

7.



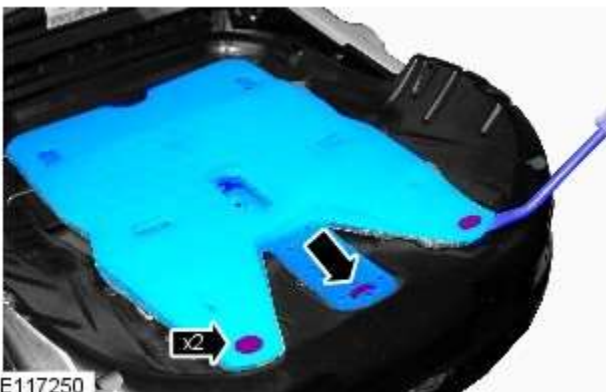
E117248

8.

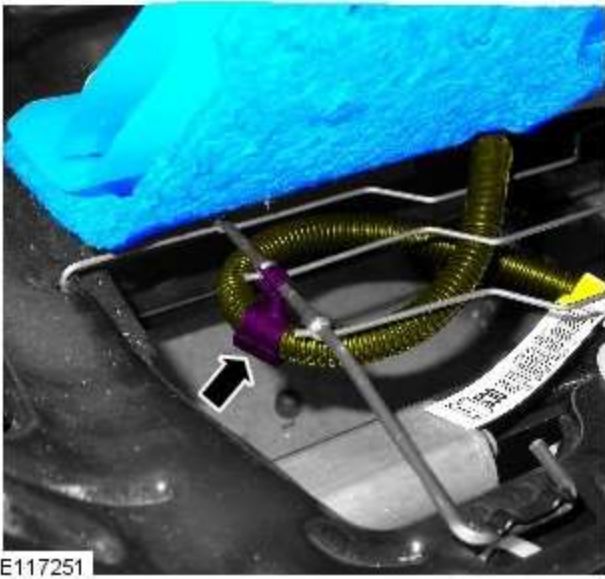


E117249

9.



E117250



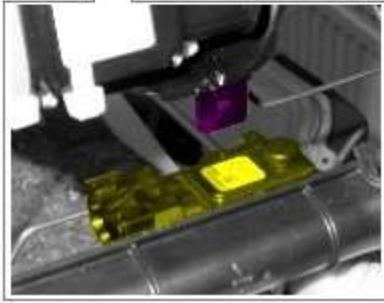
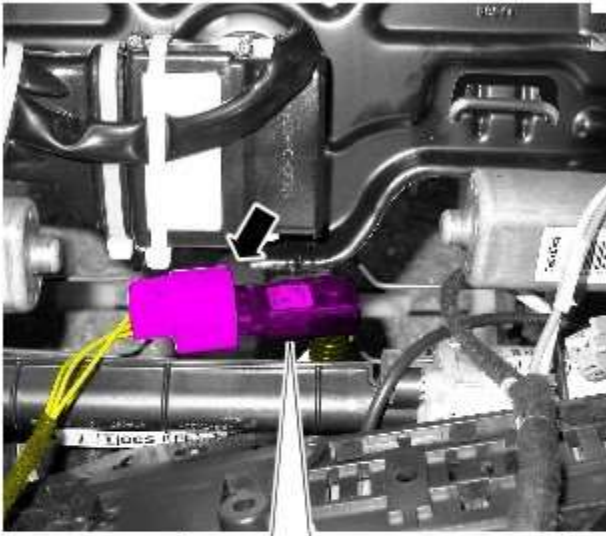
E117251

10.  NOTE: Note the position of the wiring harnesses to aid installation.



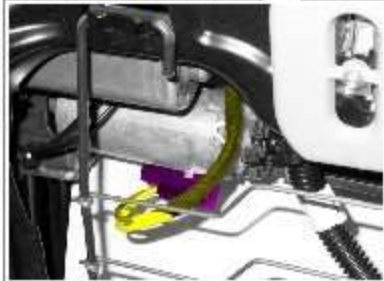
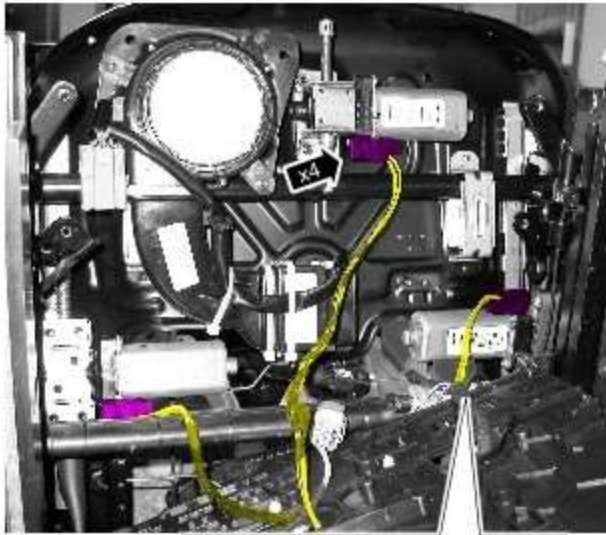
E117252

- 11.



E117253

12.  CAUTION: Take extra care not to damage the clips.

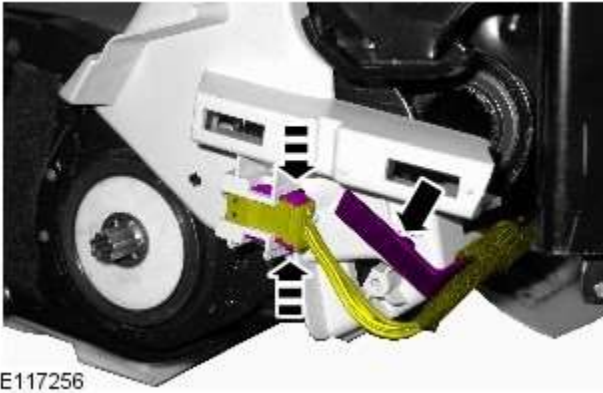


E117254

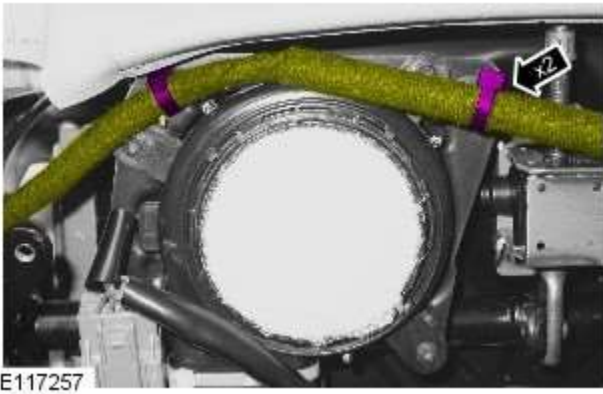
13.  NOTE: Note the position of the wiring harnesses to aid installation.



14.

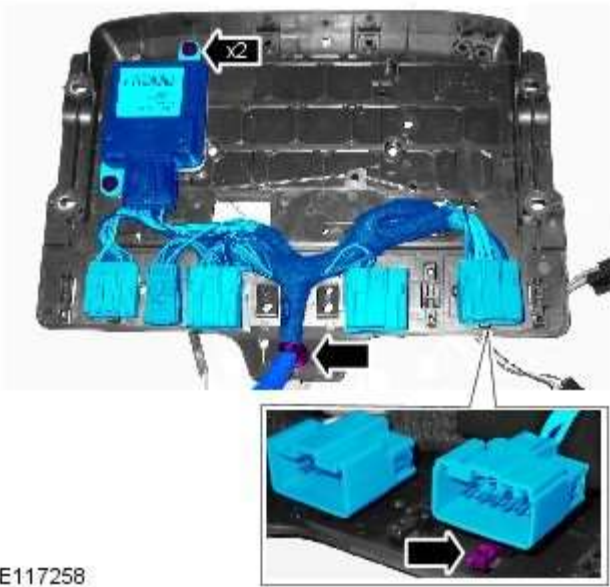


15.



16.

17.



E117258

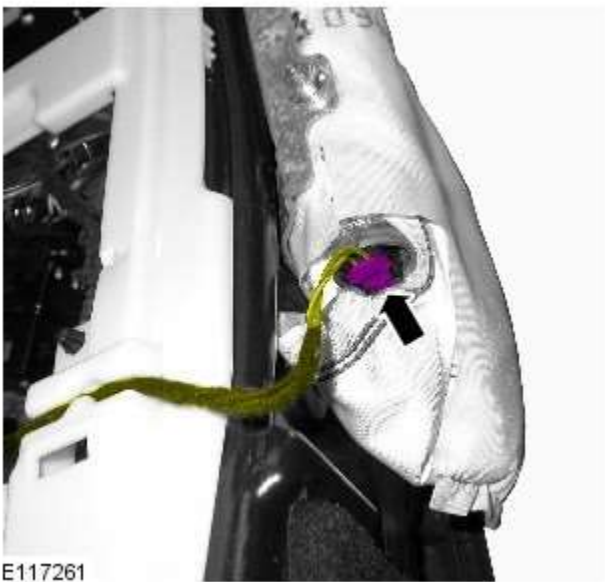
18.



E117260

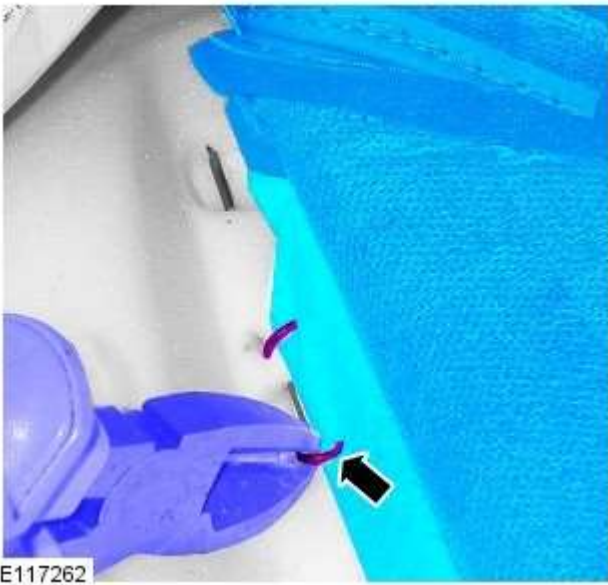
19.

 **WARNING:** Do not probe supplemental restraint system (SRS) electrical connectors.

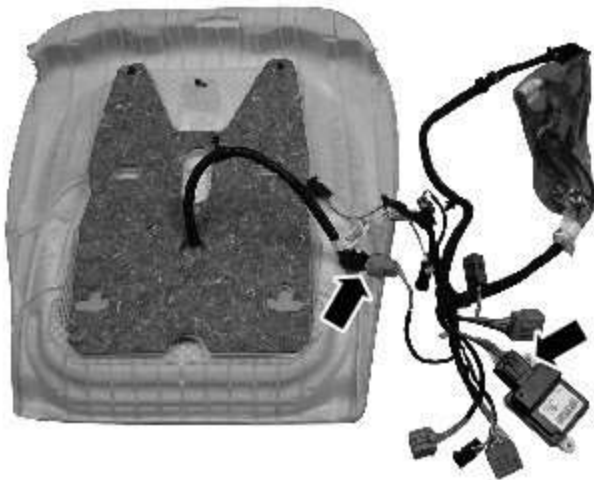


E117261

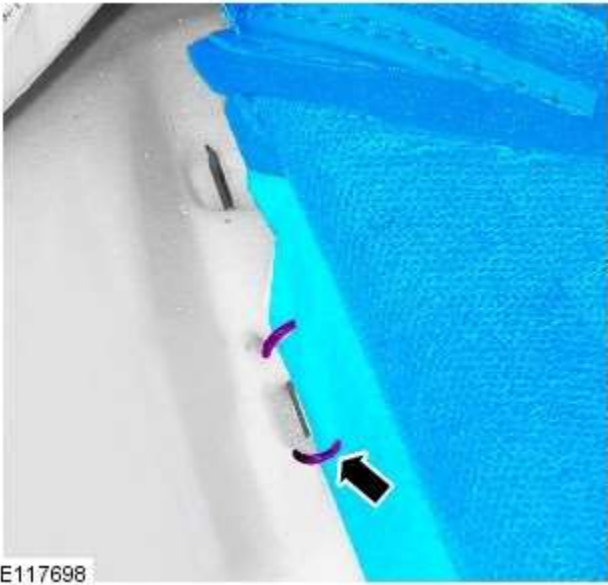
20.



Installation




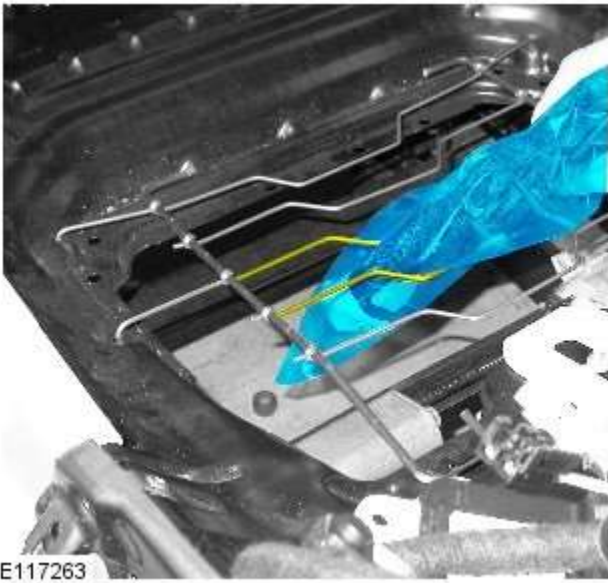
1. CAUTION: The front passenger seat occupant classification sensor is available only as a service kit. No attempt should be made to replace individual components. Failure to follow this instruction may result in personal injury.



2. NOTES:

 Make sure that new hog rings are installed.

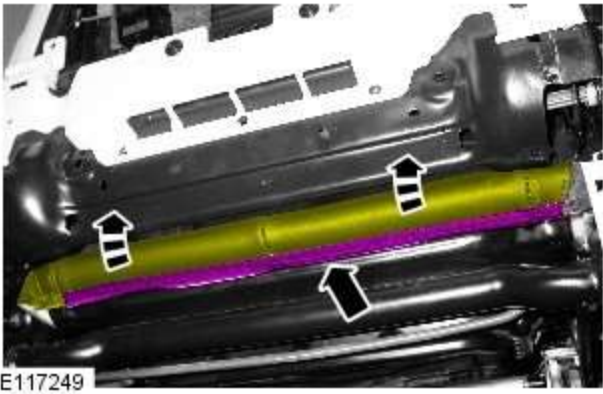
 Use hog ring pliers to close the hog rings. Do not use any other tool. The hog rings must be closed to overlap as illustrated.



3.

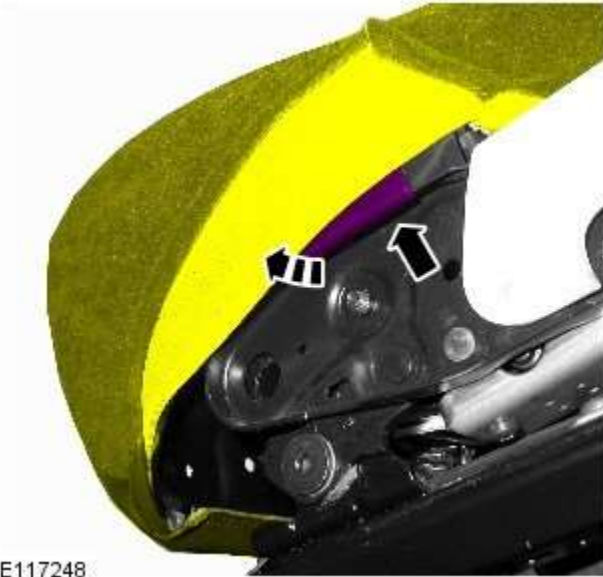


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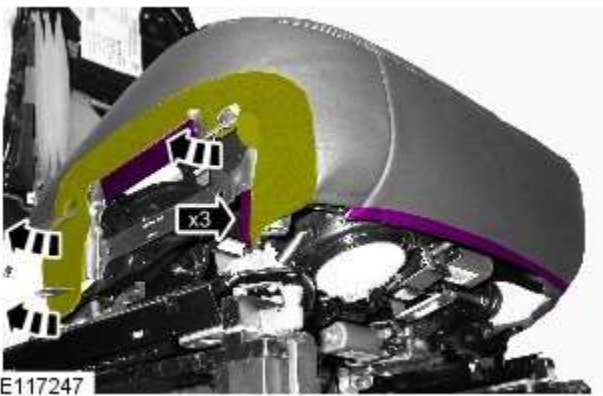
E117249

5.



E117248


6.

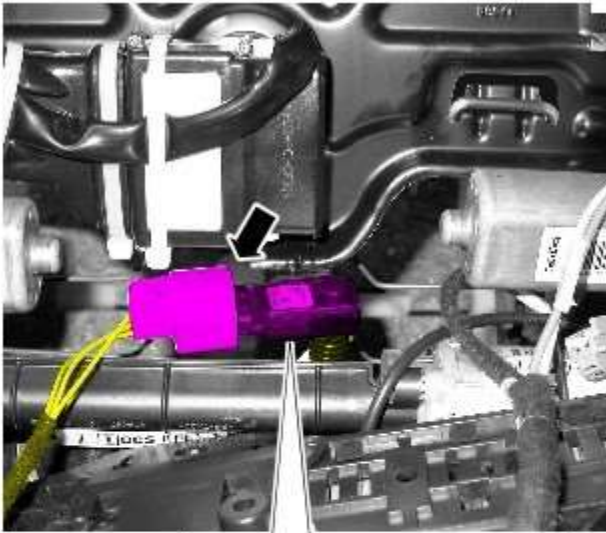


E117247

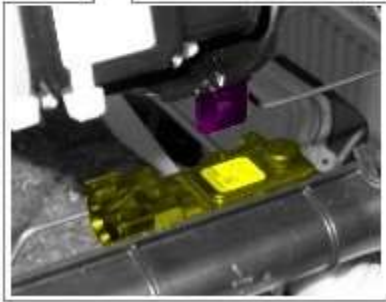
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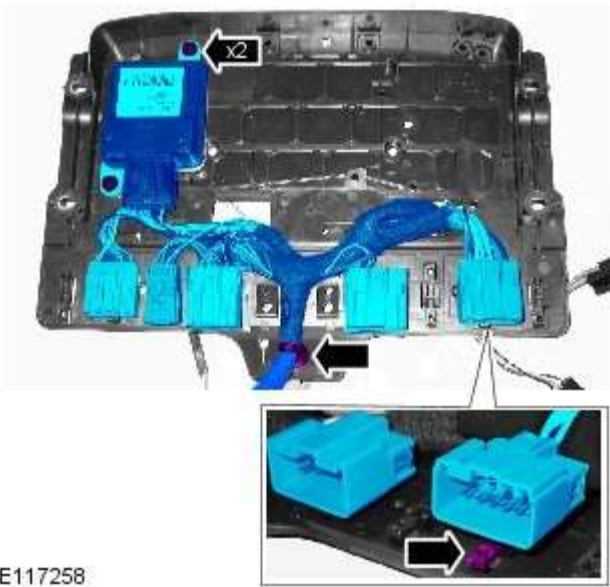
8.  NOTE: Make sure that the harness is routed to the position noted on removal.




- 9.

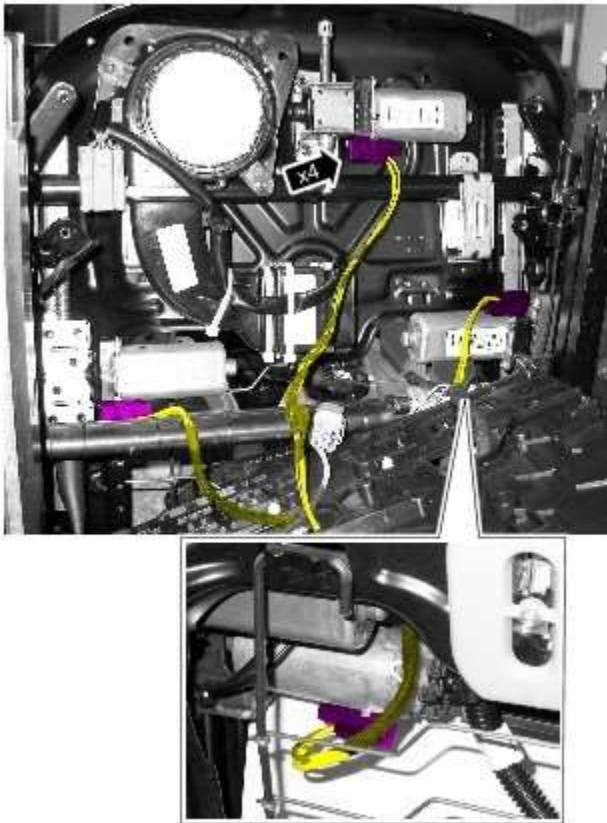


10. Torque: 4 Nm

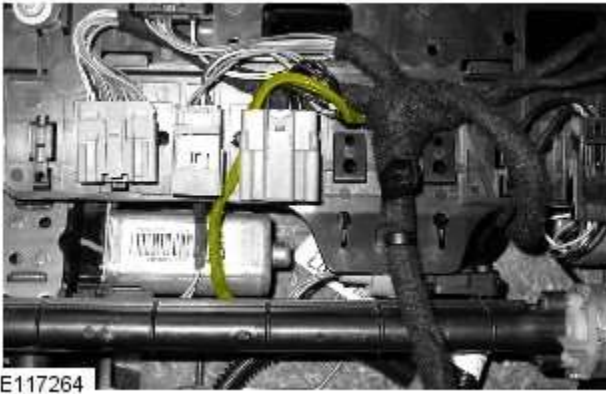



E117258

11.  NOTE: Make sure that the harness is routed to the position noted on removal.



E117254



12.  CAUTION: Make sure that the wiring harness is routed above the drive bar as shown, to avoid damage to the wiring harness during movement of the front seat.



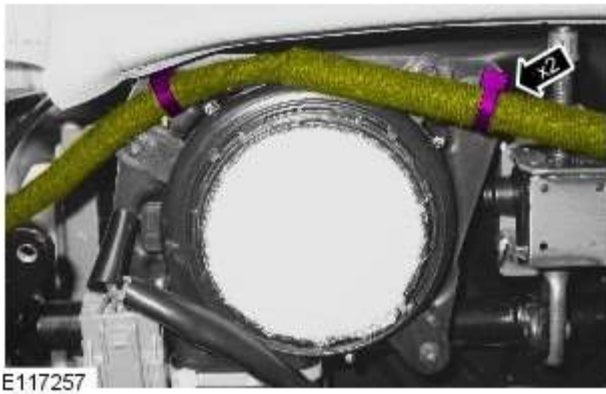
13. NOTES:

 An audible click is heard when the clips are fully latched.

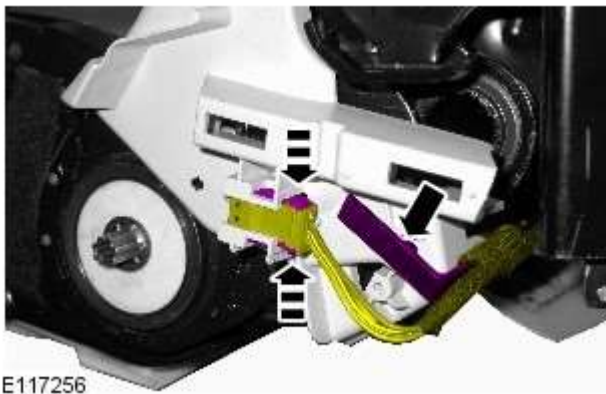
 Make sure the electrical connector is securely connected.



14. Torque: 1.3 Nm



15.




16.



17. Torque: 9 Nm



E117261

18.  **WARNING:** Do not probe supplemental restraint system (SRS) electrical connectors.



E117260

- 19.



E117258


- 20.

21. Refer to: [Front Seat Backrest Cover](#) (501-10 Seating, Removal and Installation).
22. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Supplemental Restraint System - Passenger Air Bag Module

Removal and Installation

Special Tool(s)

 E43628	211-326 Locking Tool, Clockspring
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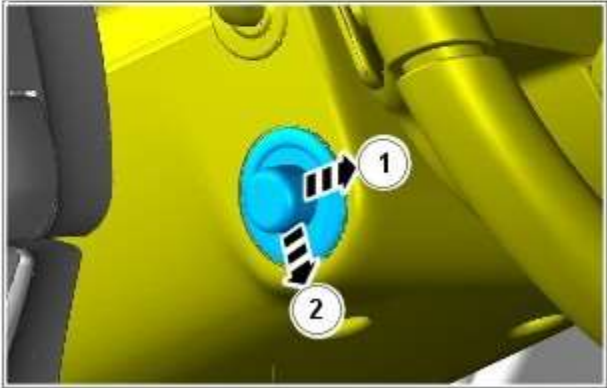
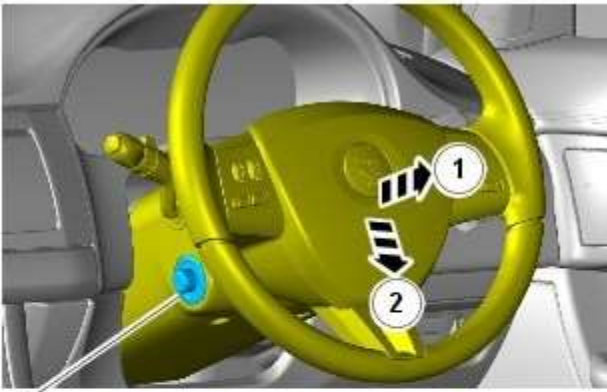
Removal



NOTE: Removal steps in this procedure may contain installation details.

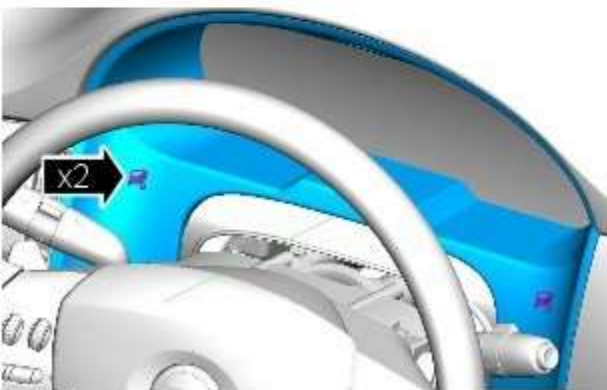
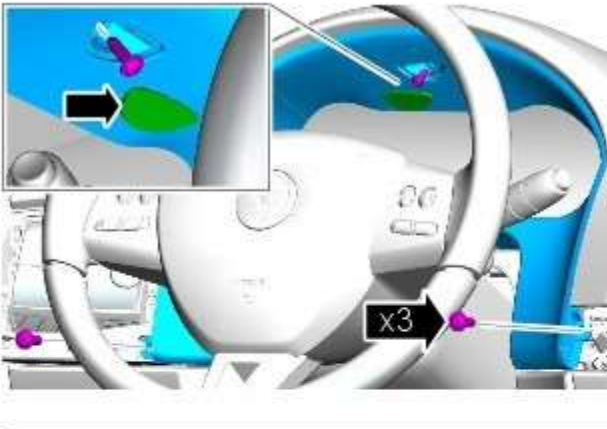
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Steering Wheel](#) (211-04 Steering Column, Removal and Installation).
3. Refer to: [Driver Side Register](#) (412-01 Climate Control, Removal and Installation).
4. Refer to: [Information and Entertainment Display](#) (415-01A Information and Entertainment System, Removal and Installation).
5. Refer to: [Instrument Panel Speaker](#) (415-01A Information and Entertainment System, Removal and Installation).
6. Refer to: [A-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
7. Refer to: [Audio and Climate Control Assembly](#) (415-01A Information and Entertainment System, Removal and Installation).

8.

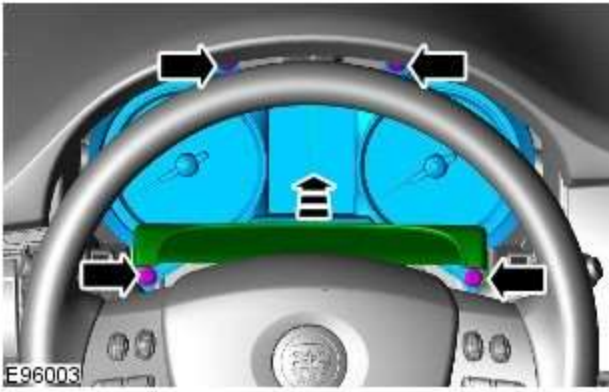


E100689

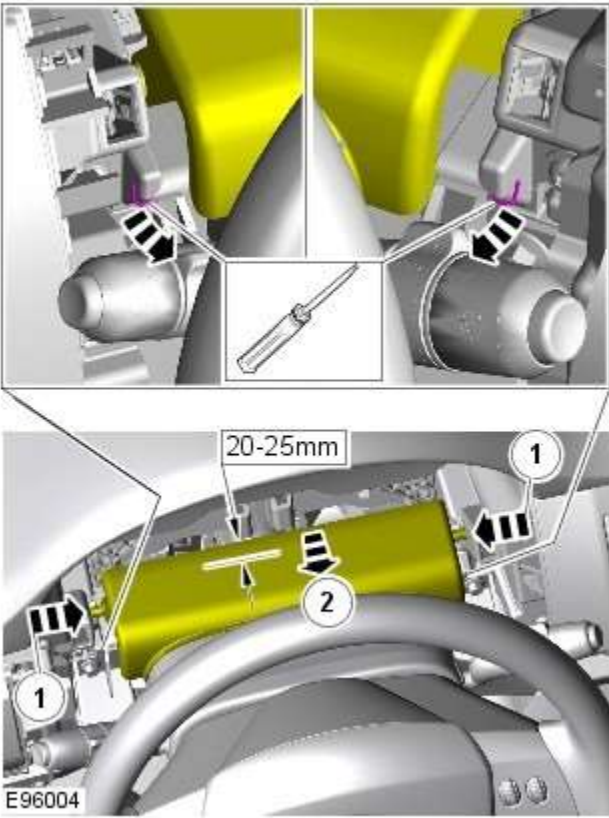
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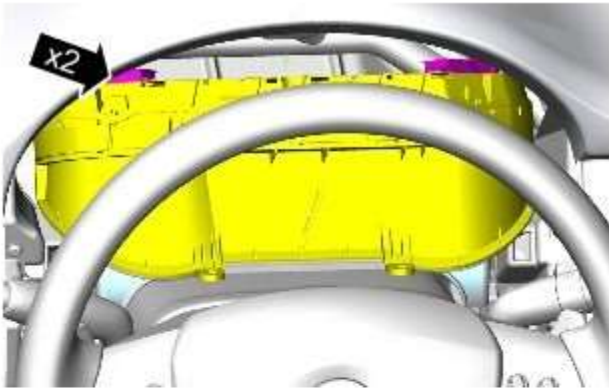
E95491



10.



11.

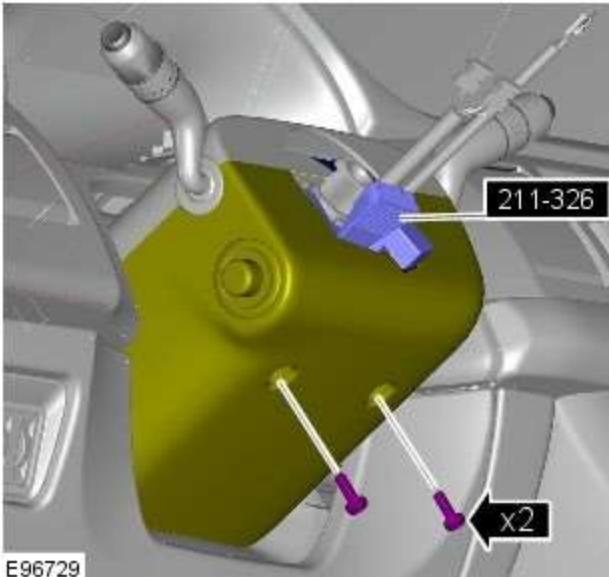


12.  CAUTION: Take extra care not to damage the instrument cluster face.



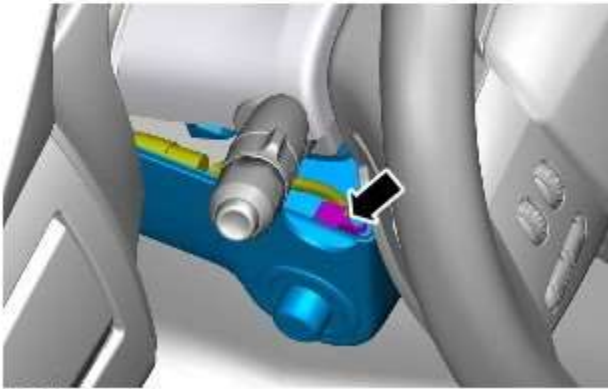
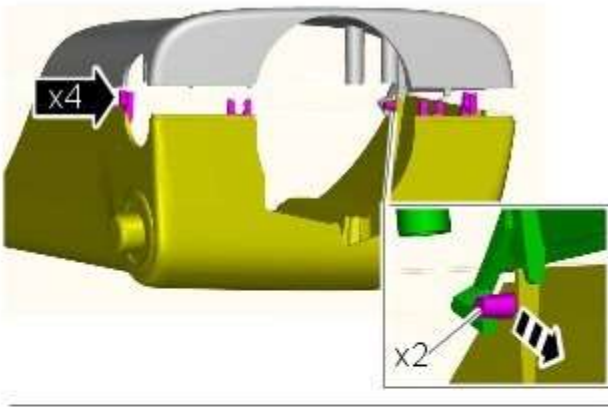
E96005

13. *Special Tool(s):* [211-326](#)



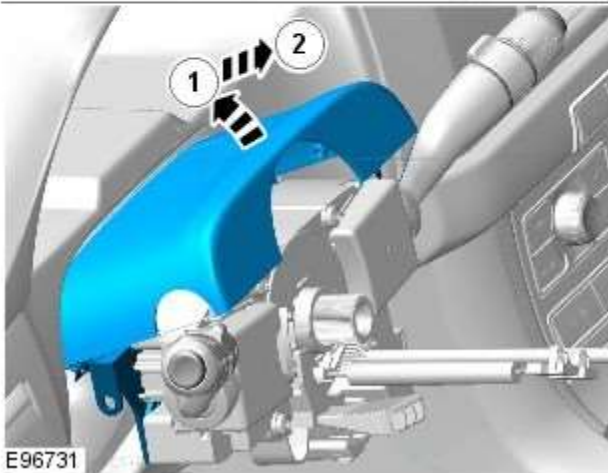
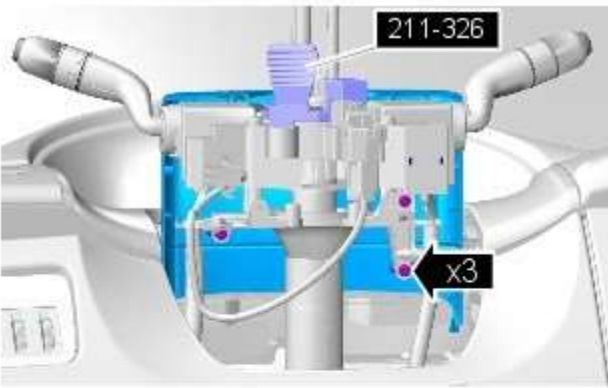
E96729

14.

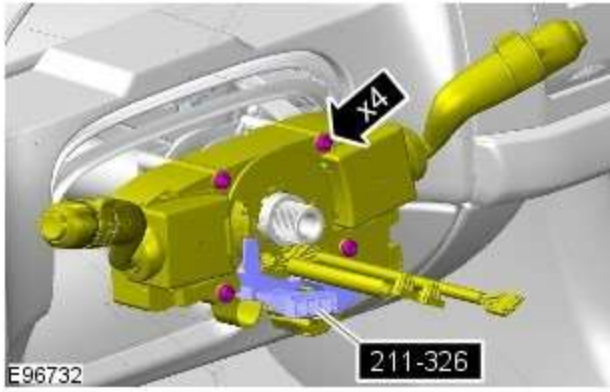


E 96483

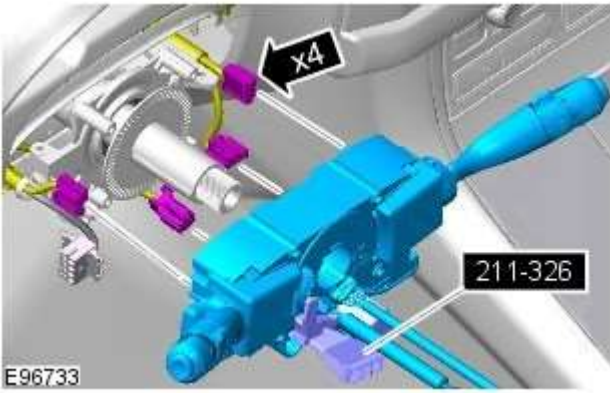
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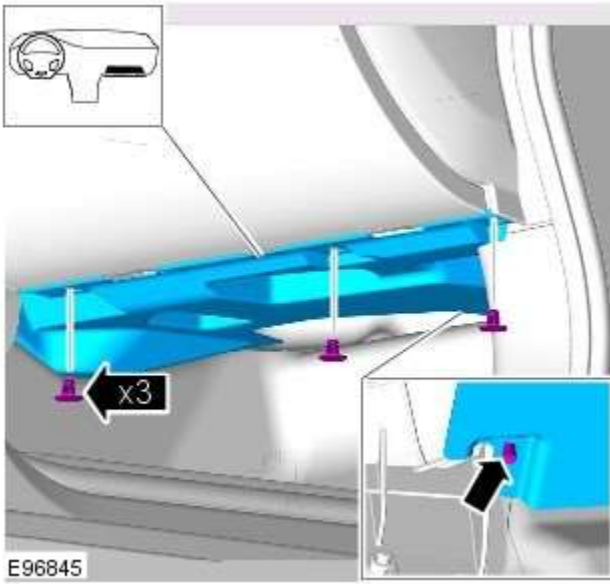
E96731



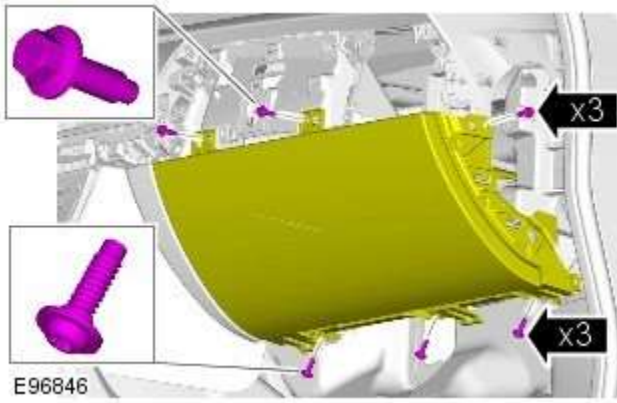
16. Torque: 6 Nm



17.

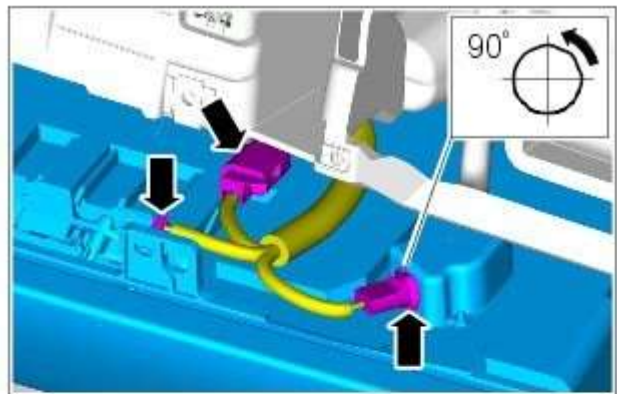


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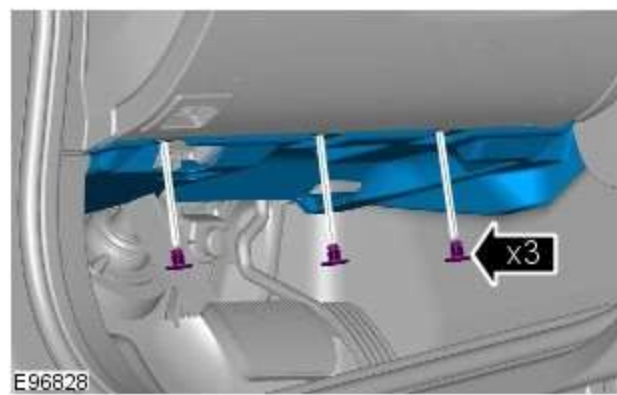
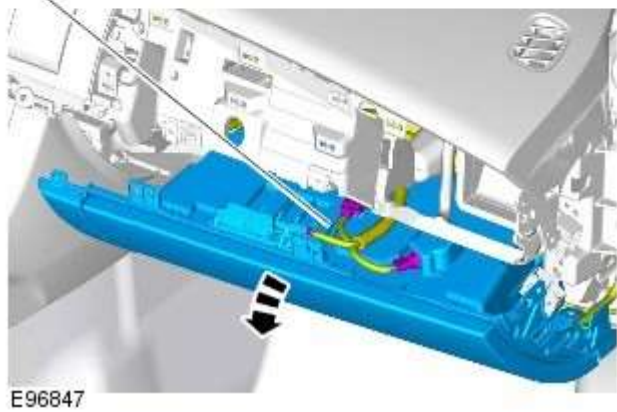


19.  **CAUTION:** Fixings must be started by hand to avoid damaging threads.

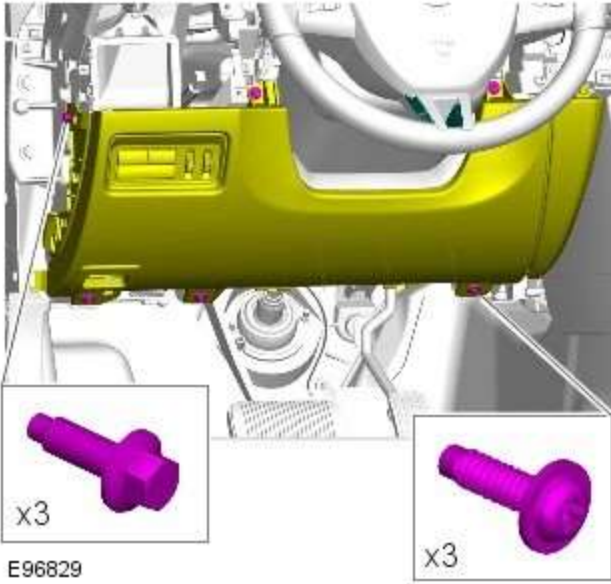
Torque:
M8 2.5 Nm
T27 9 Nm



- 20.



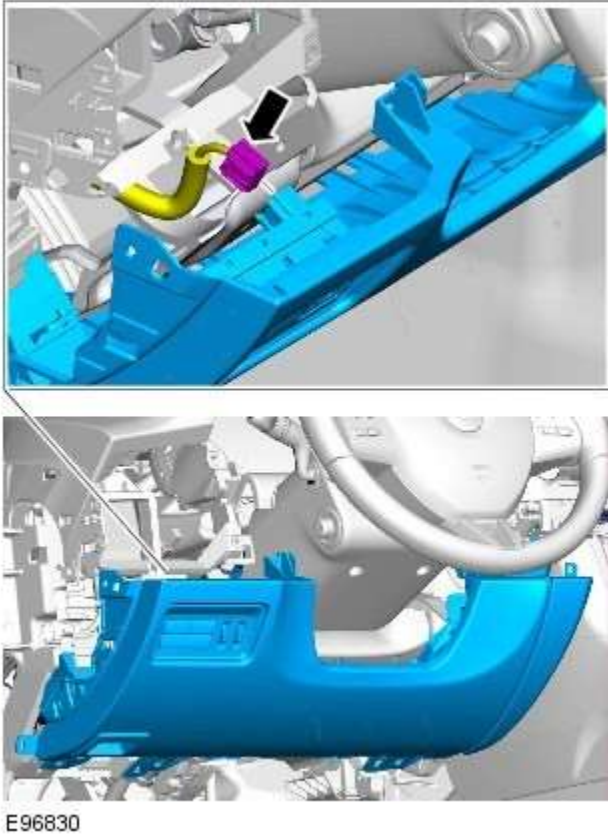
- 21.



22.  CAUTION: Fixings must be started by hand to avoid damaging threads.

Torque:
M8 2.5 Nm
T27 9 Nm

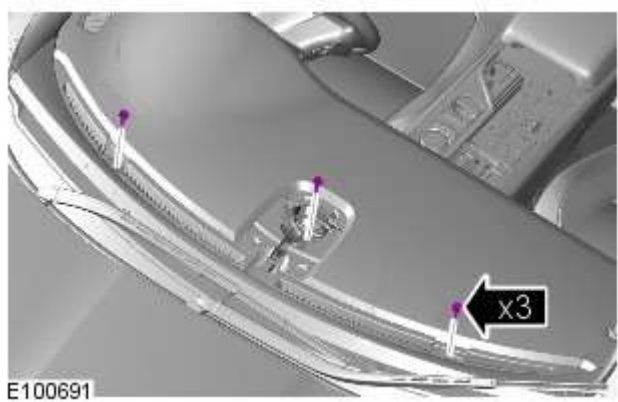
- 23.



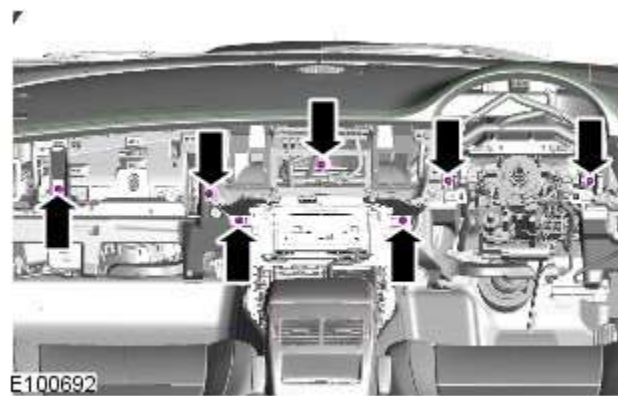
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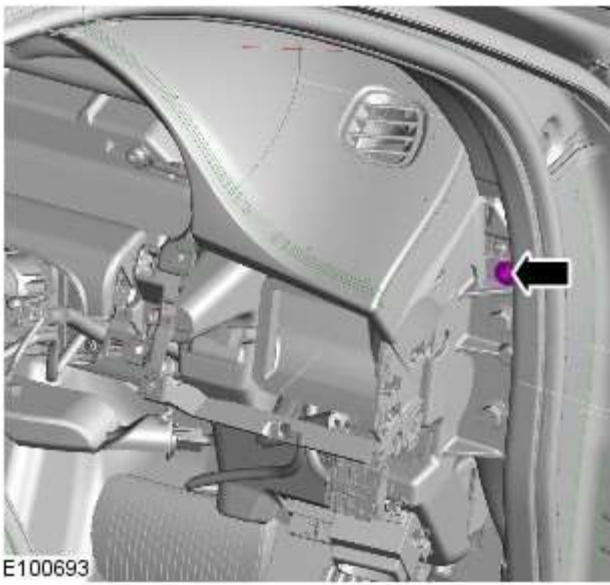
25. Torque: 20 Nm



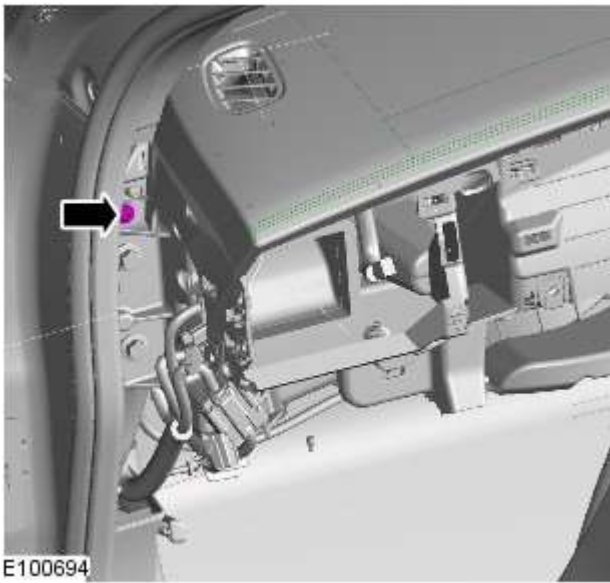
26. Torque: 20 Nm



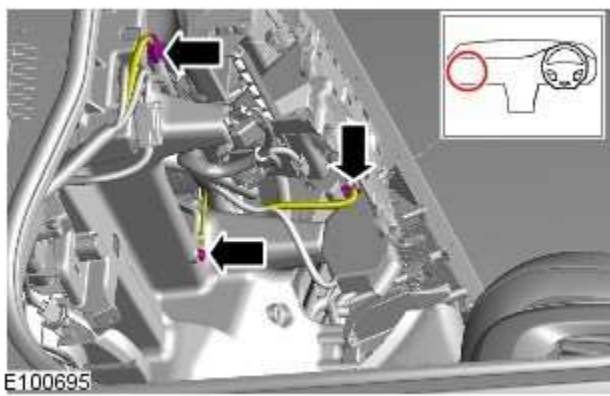
27. Torque: 20 Nm



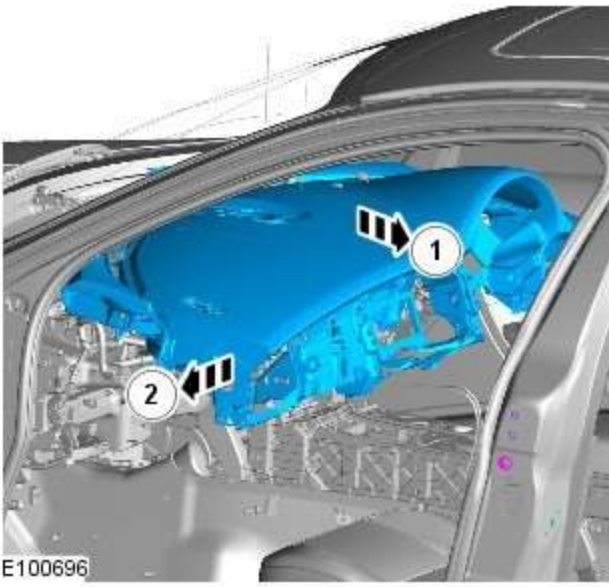
28. Torque: 20 Nm



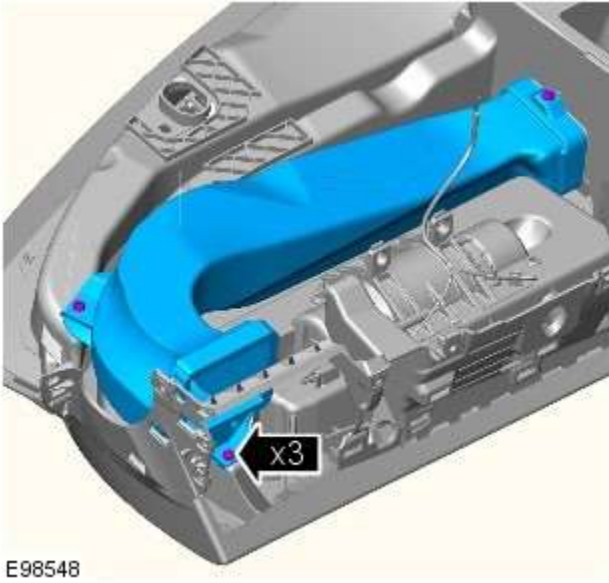
29.



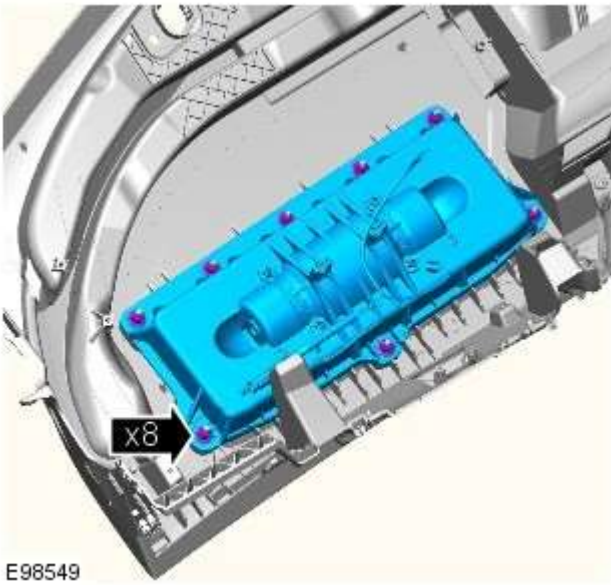
30.



31.



32. Torque: 6 Nm



Installation

1. To install, reverse the removal procedure.

Supplemental Restraint System - Restraints Control Module (RCM)

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Make the air bag supplemental restraint system (SRS) safe.

Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).



2. **WARNING:** To avoid accidental deployment and possible personal injury, the backup power supply must be depleted before repairing or replacing any air bag supplementary restraints system (SRS) components. To deplete the backup power supply energy, disconnect the battery ground cable and wait for one minute. Failure to follow this instruction may result in personal injury.

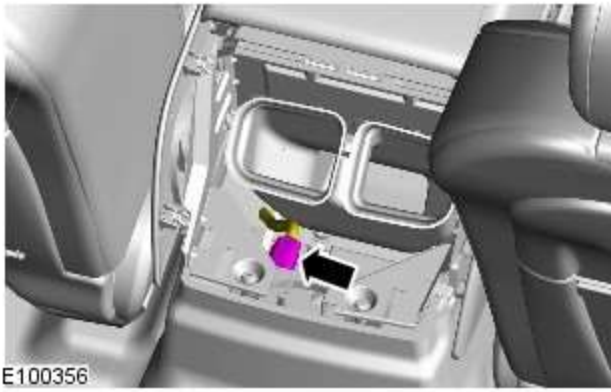
Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

- 3.

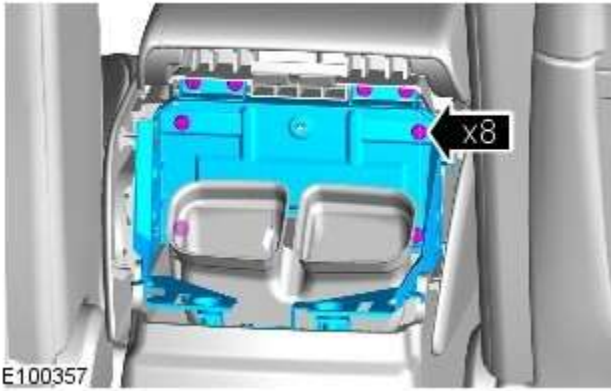


- 4.

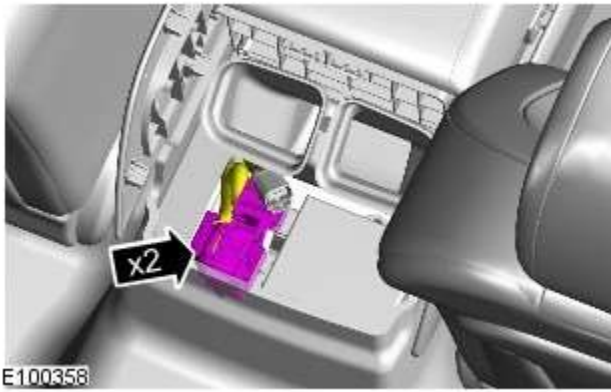




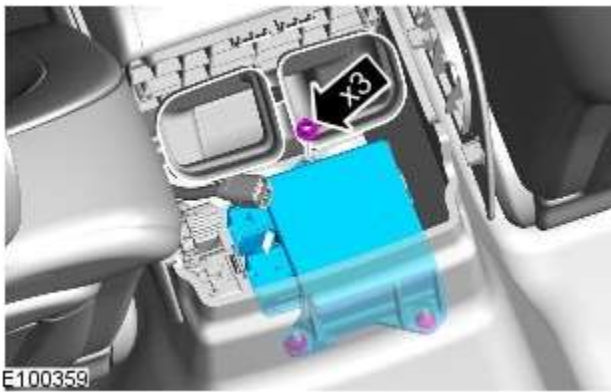
5.




6. Torque: 6 Nm




7.



8. NOTES:

 If the SRS component is to be replaced, the bar code of the new unit must be recorded.

 The RCM will record and store impact data. The module must be replaced when three records are noted.

Torque: 10 Nm

Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Supplemental Restraint System - Side Air Bag Module

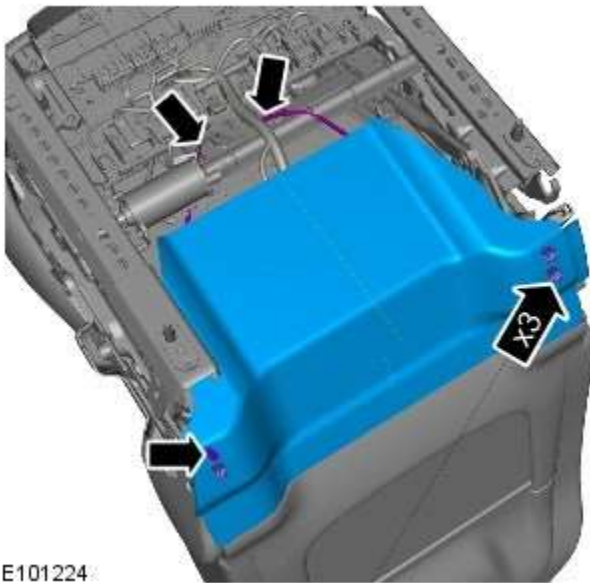
Removal and Installation

Removal



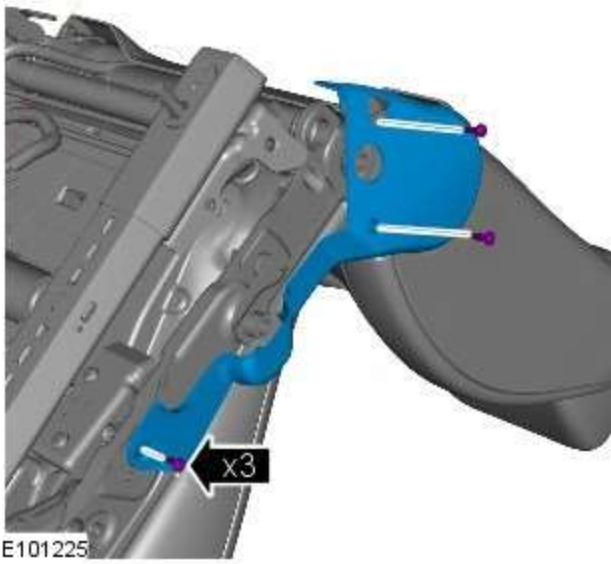
NOTE: Removal steps in this procedure may contain installation details.

1. Make the air bag supplemental restraint system (SRS) safe.
For additional information, refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).
2. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Remove the front seat.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
4. Remove the front seat backrest lower rear cover.

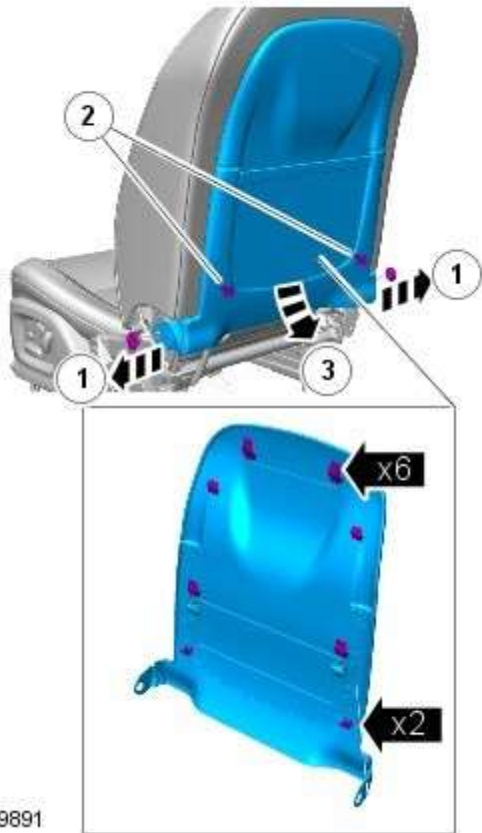


E101224

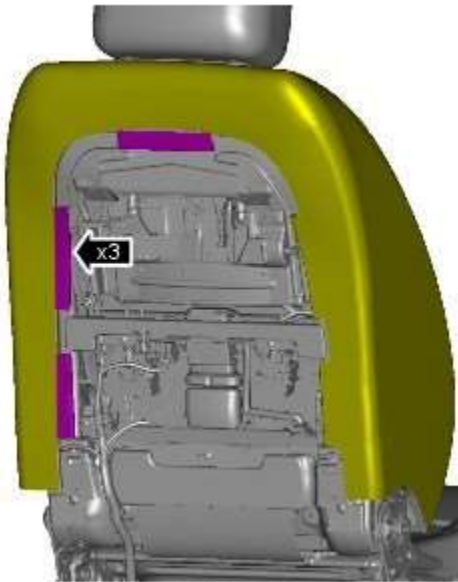
5. Remove the front seat hinge cover.



6. Remove the front seat backrest cover upper trim panel.



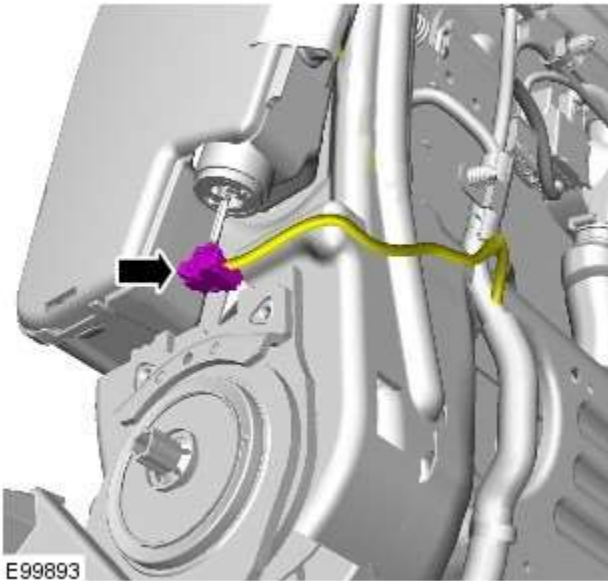
7. Release the front seat backrest cover.



E139058

8.  **WARNING:** The SRS electrical connectors are unique. DO NOT force, or attempt to connect electrical connectors to the wrong sockets.

Disconnect the side air bag module electrical connector.

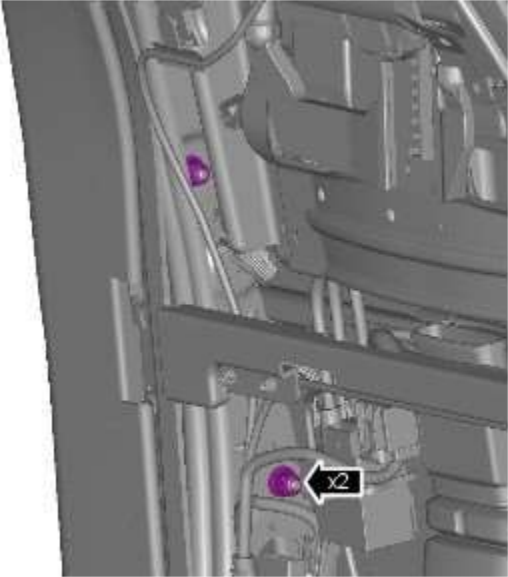


E99893

9. Release the retaining strap.



10. TORQUE: 7 Nm





E139059

11. Release the locking tab.



E139060

12. Remove the side air bag module.

Installation

1. To install, reverse the removal procedure.
2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Supplemental Restraint System - Side Air Curtain Module

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

All vehicles

1. Make the air bag supplemental restraint system (SRS) safe.

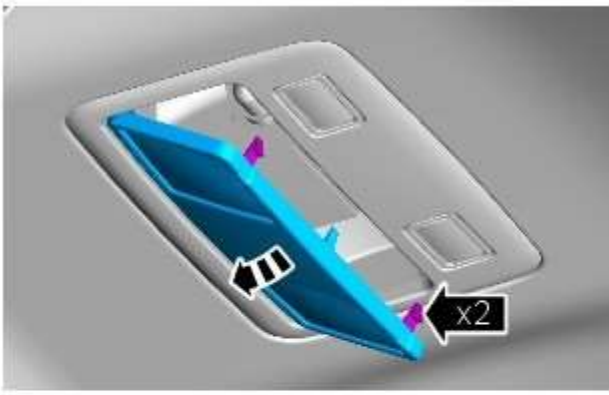
Refer to: [Standard Workshop Practices](#) (100-00 General Information, Description and Operation).

2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: [Interior Rear View Mirror](#) (501-09 Rear View Mirrors, Removal and Installation).
4. Refer to: [Overhead Console](#) (501-12 Instrument Panel and Console, Removal and Installation).
5. Refer to: [Sun Visor](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
6. Refer to: [A-Pillar Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
7. Refer to: [B-Pillar Upper Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
8. Refer to: [C-Pillar Lower Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

9. Torque: 2 Nm

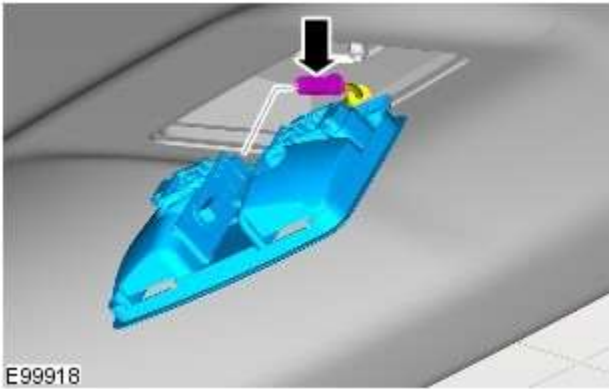


10.

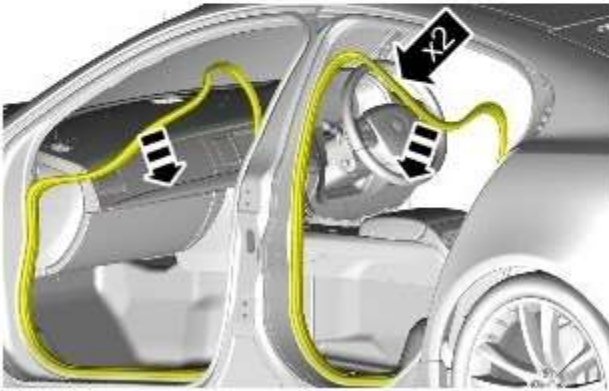
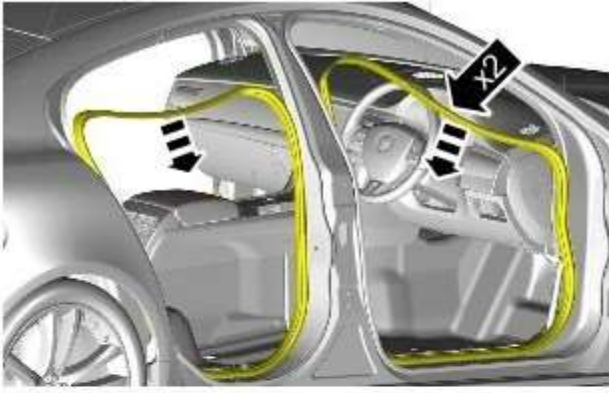


E99917

11.

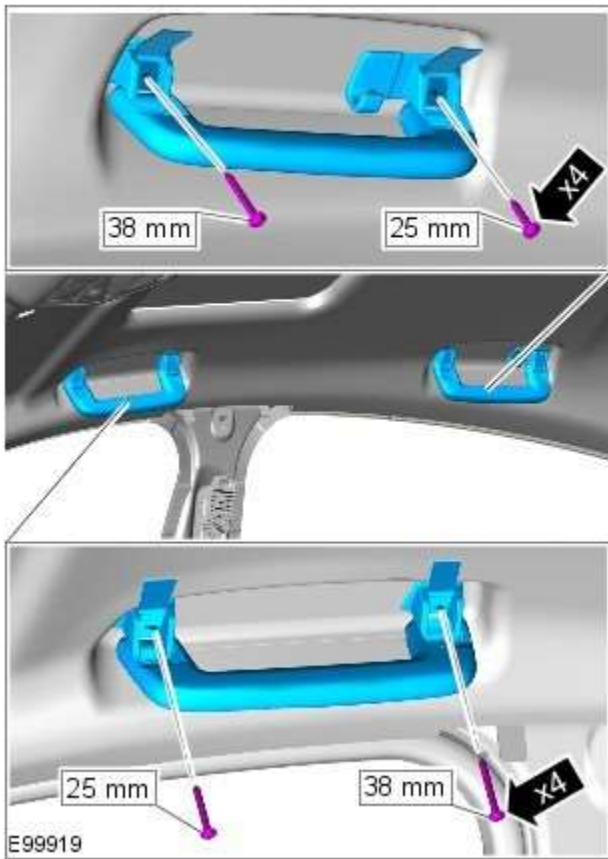


E99918




E100343

Vehicles with roof opening panel



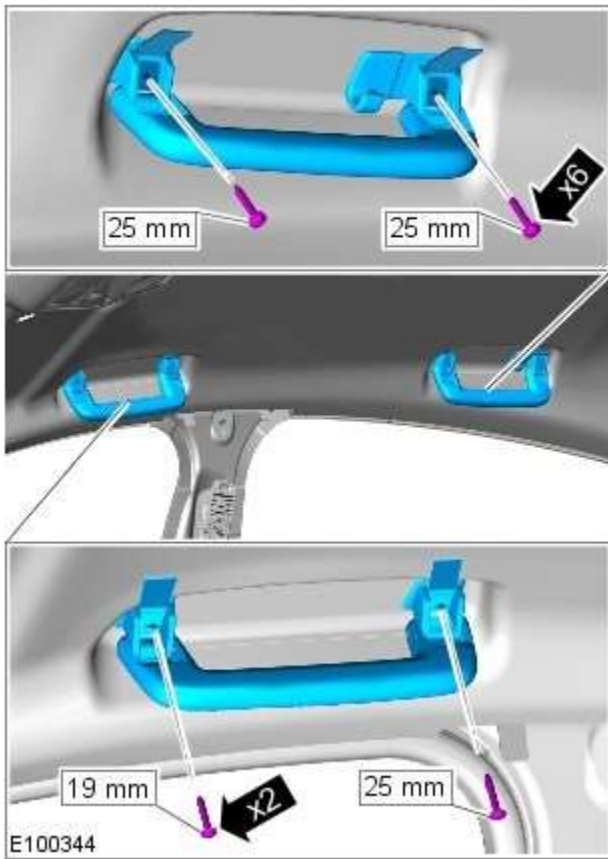
13. NOTES:

 Note the different lengths of screws.

 Make sure that the component is installed to the position noted on removal.


Torque: 2 Nm

Vehicles without roof opening panel



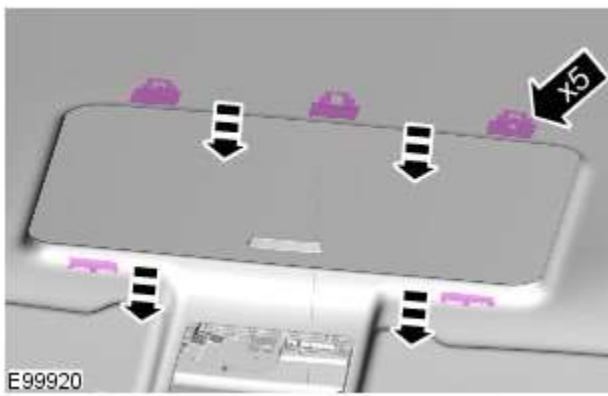
14. NOTES:

 Note the different lengths of screws.

 Make sure that the component is installed to the position noted on removal.

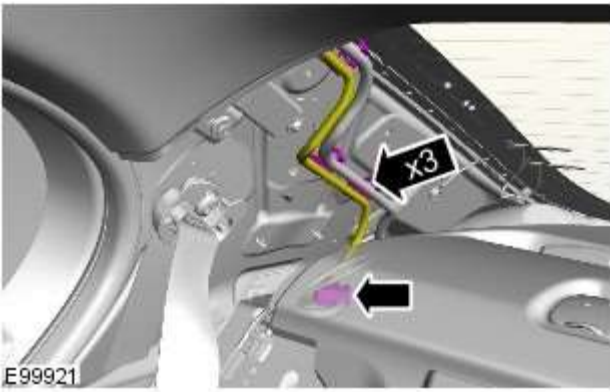
Torque: 2 Nm

All vehicles

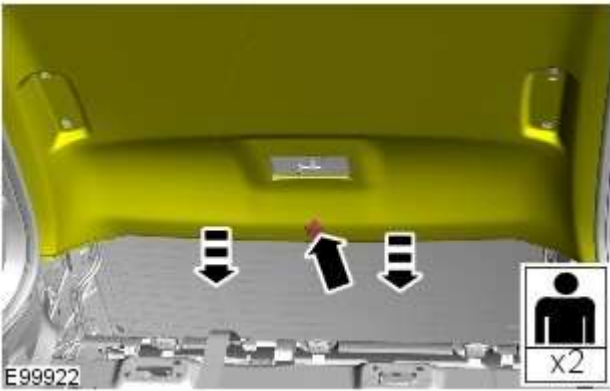


15.

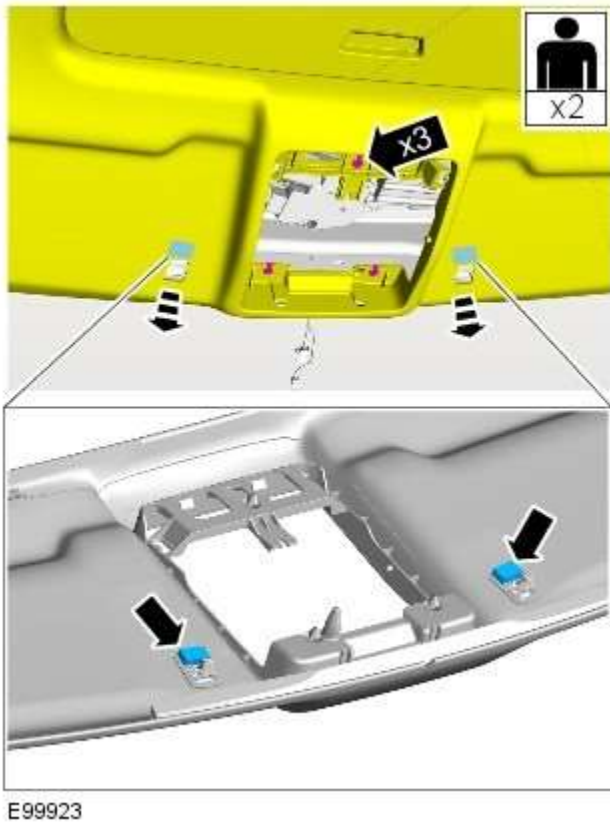
16.

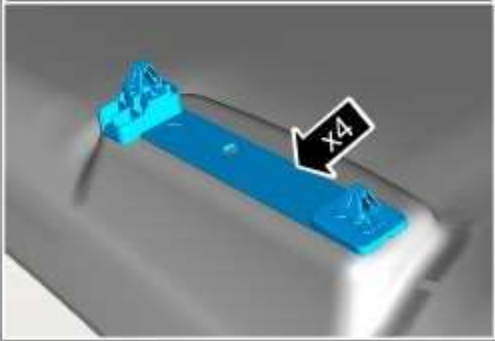


17.  **WARNING:** This step requires the aid of another technician.




18.  **WARNING:** This step requires the aid of another technician.

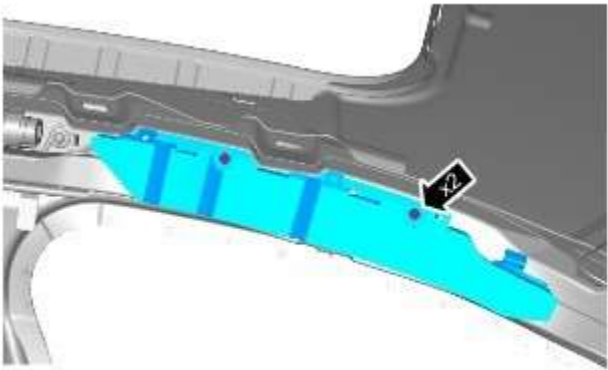




E99924

19.  **CAUTION:** Note the fitted position of the component prior to removal.

 **NOTE:** Make sure that the component is installed to the position noted on removal.



E114287

20. **CAUTIONS:**

 Make sure that the clips are correctly located.

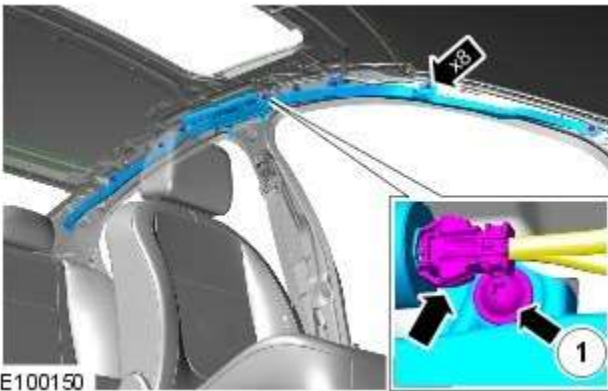
 Note the fitted position of the component prior to removal.

NOTES:

 Make sure that this component is installed to the noted removal position.

 Federal vehicles only.

Torque: 9 Nm




E100150

21.  **WARNING:** The SRS electrical connectors are unique. **DO NOT** force, or attempt to connect electrical connectors to the wrong sockets.

 **CAUTION:** Note the fitted position of the component prior to removal.

NOTES:

 Make sure that the component is installed to the noted removal position.



Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 9 Nm

Installation



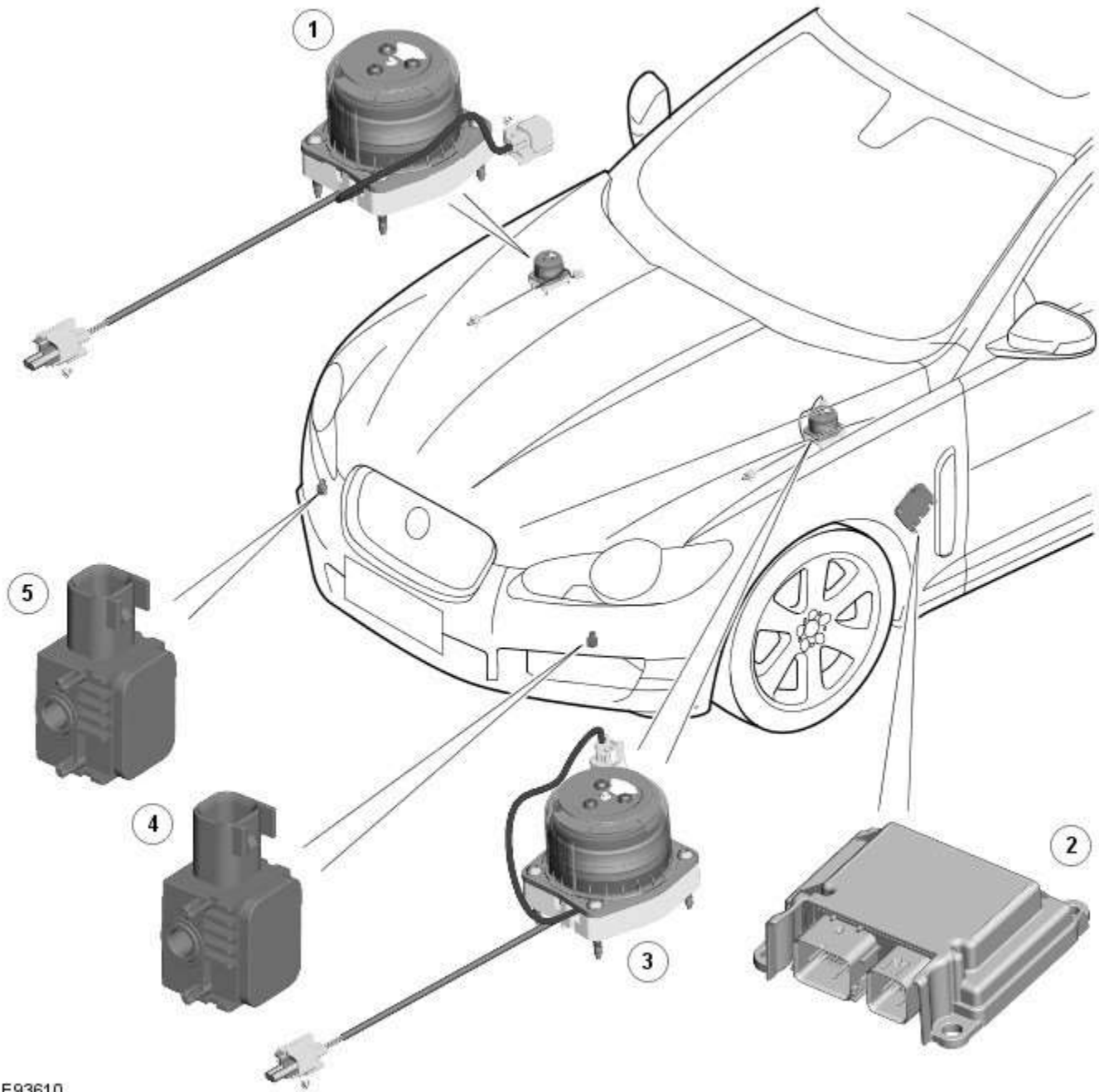
1. CAUTION: Make sure that the component is correctly located on the locating pegs.

To install, reverse the removal procedure.

2. If a new component has been installed, configure using Jaguar approved diagnostic equipment.

Pedestrian Protection System - Pedestrian Protection System - Component Location

Description and Operation



E93610

Item	Description
1	RH (right-hand) hood actuator
2	Pedestrian protection system control module
3	LH (left-hand) hood actuator
4	LH accelerometer
5	RH accelerometer

Pedestrian Protection System - Pedestrian Protection System - Overview

Description and Operation

OVERVIEW



WARNING: All pyrotechnic devices are dangerous. Before performing any procedures on any pyrotechnic device, read all information contained within the Standard Workshop Practices section of this manual. Refer to: [Standard Workshop Practices \(100-00 General Information, Description and Operation\)](#).

The pedestrian protection system is designed to mitigate injuries in a pedestrian collision with the vehicle. It does this by utilizing a pair of pyrotechnic actuators to lift the hood away from the engine, creating a cushioned impact between the pedestrian and the vehicle.

The pedestrian protection system also includes passive protection integrated into the bumper system and bonnet structure.



WARNING: Do not fit any non-Jaguar approved accessories to the vehicle.



NOTE: The pedestrian protection system operates independently from the SRS (supplemental restraint system).

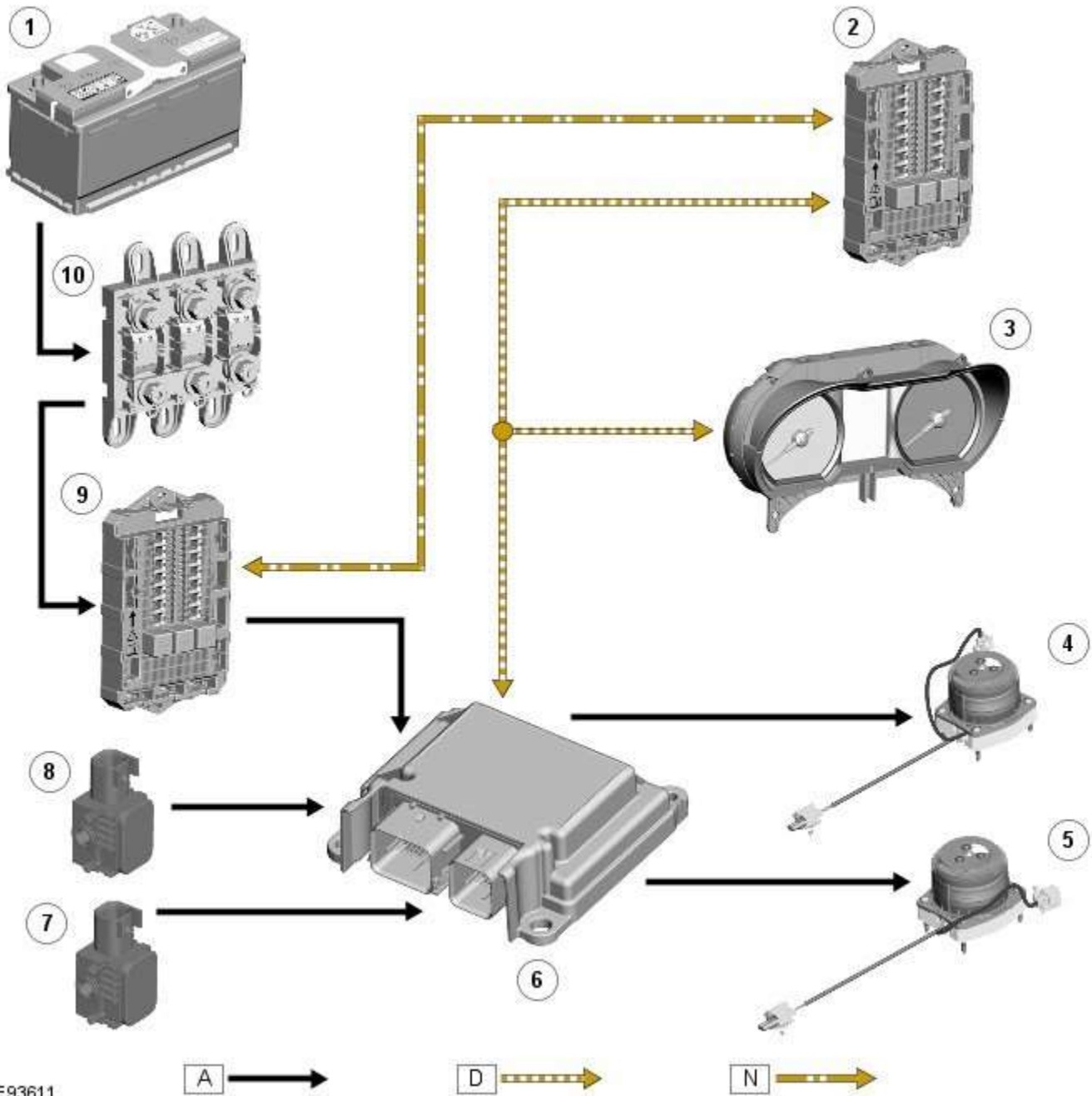
Pedestrian Protection System - Pedestrian Protection System - System Operation and Component Description

Description and Operation

Control Diagram



NOTE: A = Hardwired; D = High speed CAN (controller area network) bus; N = Medium speed CAN bus



E93611

Item	Description
1	Battery
2	CJB (central junction box)
3	Instrument cluster
4	LH (left-hand) hood actuator
5	RH (right-hand) hood actuator
6	Pedestrian protection system control module

7	RH accelerometer
8	LH accelerometer
9	RJB (rear junction box)
10	BJB (battery junction box)

System Operation

The pedestrian protection system is operational when the vehicle is traveling at speeds between approximately 20 km/h (12.4 mph) and 45 km/h (28 mph). A vehicle speed signal is received by the pedestrian protection system control module over the high speed [CAN](#) bus.

The system is able to determine if contact is made with a pedestrian or another object, such as a traffic cone, using signals from accelerometers mounted behind the front bumper. When the system determines contact is made with a pedestrian it fires the actuators to lift the rear of the hood approximately 130 mm within 35 ms of the 'fire' signal.

When an impact condition is registered, the pedestrian protection system control module outputs an impact signal on the high speed [CAN](#) bus. This signal is used by the [RJB](#) to initiate the hazard warning lamps. If this occurs, the hazard warning lamp switch is disabled for the remainder of the current ignition cycle.

If the pedestrian protection system control module detects a fault with the system, it outputs a message on the high speed [CAN](#) bus to the instrument cluster message center. On receipt of this, the message center will display the message 'CHECK PEDESTRIAN SYSTEM'.

The pedestrian protection system control module also stores the [VIN \(vehicle identification number\)](#). If a new control module is fitted to the vehicle the Jaguar approved diagnostic tool must be used to program the unit with the vehicles [VIN](#).

When the vehicle is delivered from the factory the pedestrian protection system is in a 'safe' plant mode. Normal operating mode should be activated using the Jaguar approved diagnostic tool during the Pre-Delivery Inspection (PDI) prior to delivery to the customer. For additional information, refer to the PDI manual.

If any damage is caused to the front of the vehicle, be it cosmetic or structural, repairs must be carried out in line with the processes contained in the workshop manual. Failure to carry out the correct repair process could compromise operation of the pedestrian protection system. Refer to GTR for the latest information.

The vehicle must be left for 1 minute after disconnecting the battery before any work can be carried out on the pedestrian protection system.

Failure Mode Detection

In service, if any fault is detected, or any part of the system is recognized as not being present, the message center displays the warning 'Check Pedestrian System'.

The bonnet deployment actuators are non-serviceable components, and if they must be replaced due to a fault, or due to having been deployed, or following any other accident, their barcode labels must be read and recorded in the service database against the vehicle VIN for security purposes.

After deployment of the pedestrian protection system, the vehicle must be stopped as soon as it is safe to do so. The hazard warning lamps will be activated and can only be switched off by pressing the engine START/STOP button to turn the engine off and on again. A warning message 'CHECK PEDESTRIAN SYSTEM' will appear on the message center and the vehicle should be transported to the nearest dealer/authorised repairer. The vehicle must not be driven when the bonnet has been deployed.



NOTE: If the warning message 'CHECK PEDESTRIAN SYSTEM' appears in the message center when the bonnet has not been deployed, the vehicle should be taken to the nearest dealer/authorised repairer immediately. It can be driven.

If any significant damage occurs to the front bumper it should be inspected by a dealer/authorised repairer as soon as possible.

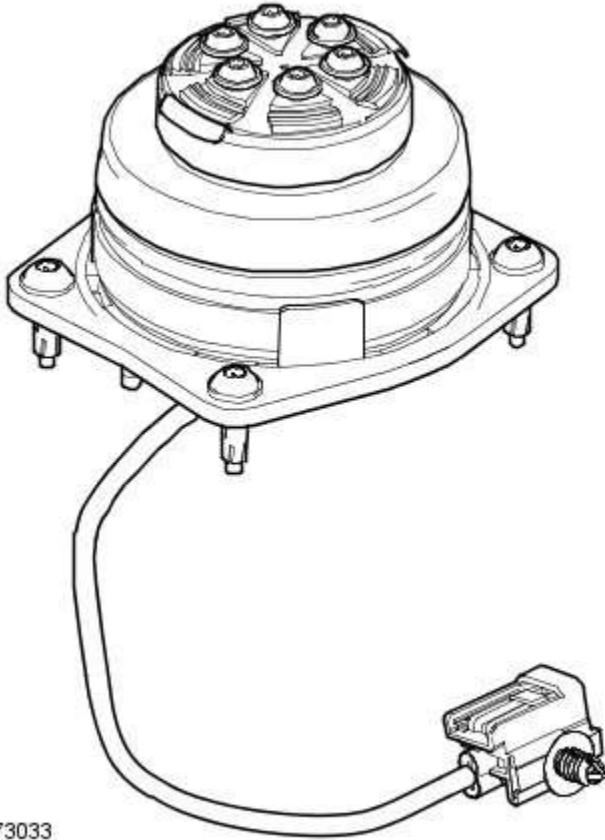
Component Description

CONTROL MODULE

The control module is mounted below the hood release lever behind the side trim in the left hand front footwell.

The deployment signal is received from the pedestrian protection system control module. The second-generation system adopted for XF is all-new to Jaguar and, although similar, differs from that introduced on XK by having an accelerometer-based sensing system rather than a contact-sensing system. The accelerometer-based system is supplied by Bosch. Mounted very close to the skin of the bumper, it examines the characteristics of vibration waves caused by impact. Its response time is quicker, because it does not rely on the front of the bumper being loaded. It uses the 'saved' time to make more complex decisions, and so has fewer error states. The speed of vehicle and the length of the bonnet define the time available to get the bonnet into its deployed and stabilized position. It is possible, therefore, to create a time-line counting back from the predicted moment of head impact to the time when the deployment signals need to be sent. That in turn defines a time from first contact to decision time.

HOOD ACTUATORS



E73033

The hood actuators are pyrotechnic air bags. The hood actuators are located just forward of the hood latches on either side of the hood. The actuators comprise a pyrotechnic device to raise the hood, a secondary hood latch mechanism and a tether sleeve. Once fired a locking device mounted on top of the actuator couples with the secondary hood latch before the airbag inflates to raise the hood. This ensures that the hood can only deploy to a pre-determined height (approximately 130 mm). As the hood actuator is fired two prongs located in the secondary latch housing are moved out of their retaining clamp. The prongs are spring loaded to grip the secondary hood latch striker securing it to the actuator tether cone. Hood Actuator and Secondary Latch.

They are mounted to brackets in the secondary bulkhead and interface to reinforced areas on the lower surface of the bonnet.

Engine Compartment Lid

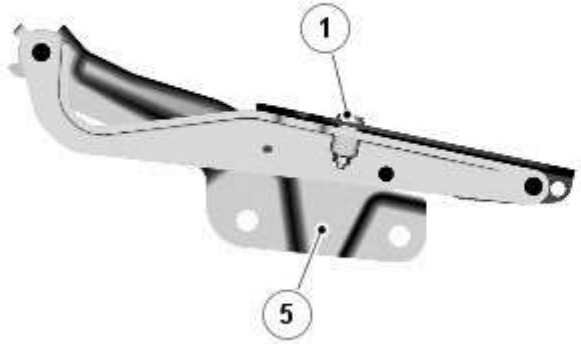
The two-piece engine compartment lid is in aluminum and the inner panel has a hexagonal panel structure, which allows energy from a pedestrian head impact to be absorbed effectively across the full area of the bonnet. It also has sufficient strength in the rear cross-beam to accept the forces from the actuators and maintain a stable condition.

When deployed, front bonnet latch acts as the pivot point and the rear hinges allow a controlled degree of upward movement before retaining the bonnet at the end of its deployment, thus limiting its total upward travel and stabilizing its position.

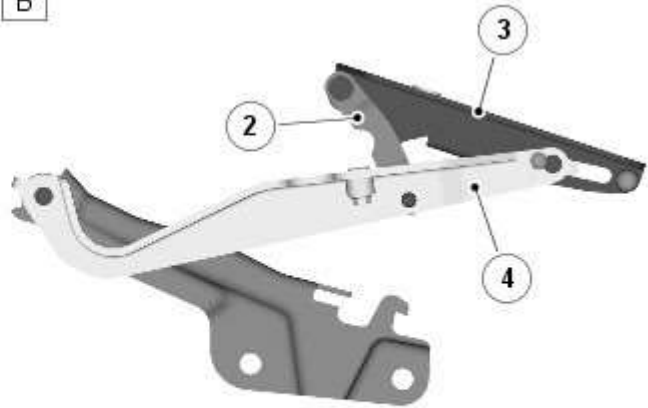


NOTE: A = Non-deployed hinge; B = Deployed hinge

A



B



E95115

Item	Description
1	Firing pin
2	Stabilizing link
3	Engine compartment lid leaf
4	Intermediate leaf
5	Body leaf

The hinge system incorporates a number of leaves. This includes a leaf attached to the body, an intermediate leaf and a leaf attached to the hood. During normal operation the hinge opens and closes using the hood and intermediate leaves. These are attached together by a firing pin. When the actuators are fired the firing pins fail. This allows the hood and intermediate leaves to separate and deploy the hood upwards. When the hood deploys the hood latches act as temporary hinges.



NOTE: The hinges deform during the deployment process and will need to be replaced.

Pedestrian Protection System - Pedestrian Protection System

Diagnosis and Testing

Principles of Operation

For a detailed description of the Pedestrian Protection System, refer to the relevant Description and Operation section in the workshop manual.

REFER to: [Pedestrian Protection System](#) (501-20C Pedestrian Protection System, Description and Operation) / [Pedestrian Protection System](#) (501-20C Pedestrian Protection System, Description and Operation) / [Pedestrian Protection System](#) (501-20C Pedestrian Protection System, Description and Operation).

Inspection and Verification

WARNINGS:



TO AVOID ACCIDENTAL DEPLOYMENT AND POSSIBLE PERSONAL INJURY, THE BACKUP POWER SUPPLY MUST BE DEPLETED BEFORE REPAIRING OR REPLACING ANY PEDESTRIAN PROTECTION SYSTEM COMPONENTS. TO DEplete THE BACKUP POWER SUPPLY ENERGY, DISCONNECT THE BATTERY GROUND CABLE AND WAIT TWO MINUTES. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN PERSONAL INJURY.



Do not use a multimeter to probe the pedestrian protection system actuators. It is possible for the power from the multimeter battery to trigger the activation of the actuator. Failure to follow this instruction may result in personal injury.



CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle.

NOTES:



If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.



When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance always take the resistance of the digital multimeter leads into account.



Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.



It is advisable not to use a cellular phone or to have a cellular phone in close proximity when working on the pedestrian protection system or components



Given the legal implications of a restraints system failure, harness repairs to pedestrian protection system circuits are not acceptable. Where the text refers to "REPAIR the circuit", this will normally mean the replacement of a harness.



After 5 hood deployment events, a new Pedestrian Protection System Control Module (PPSCM) and wiring harness must be installed.

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection




Mechanical	Electrical
<ul style="list-style-type: none"> • Hood • Hood hinge • Hood deployment controls 	<ul style="list-style-type: none"> • Fuses • Wiring harnesses and connectors • Pedestrian Protection System Control Module (PPSCM) • Impact sensors • Hood deployment controls

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for

Diagnostic Trouble Codes (DTCs) and refer to the DTC Index

5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMs which may be valid for the specific customer complaint and carry out the recommendations as required

Symptom Chart

Symptom	Message	Possible Causes	Action
Hood deployed	CHECK PEDESTRIAN SYSTEM	<ul style="list-style-type: none"> • Low speed collision with pedestrian or other object 	 WARNING: The vehicle must not be driven if the hood has been deployed.  NOTE: Repairs due to a collision are not warrantable. <ul style="list-style-type: none"> • Check the vehicle for collision damage. Repair as necessary
Hood not deployed	CHECK PEDESTRIAN SYSTEM	<ul style="list-style-type: none"> • Pedestrian protection system fault 	 NOTE: The vehicle may be driven if a pedestrian protection system fault is present but the hood has not been deployed. <ul style="list-style-type: none"> • Check the vehicle for collision damage. Repair as necessary. Using the manufacturer approved diagnostic system, check the pedestrian protection system control module for related DTCs and refer to the relevant DTC index

DTC Index

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

REFER to: [Diagnostic Trouble Code \(DTC\) Index - DTC: Pedestrian Protection System Control Module \(PPSCM\)](#) (100-00 General Information, Description and Operation).

Pedestrian Protection System - Pedestrian Impact Sensor

Removal and Installation

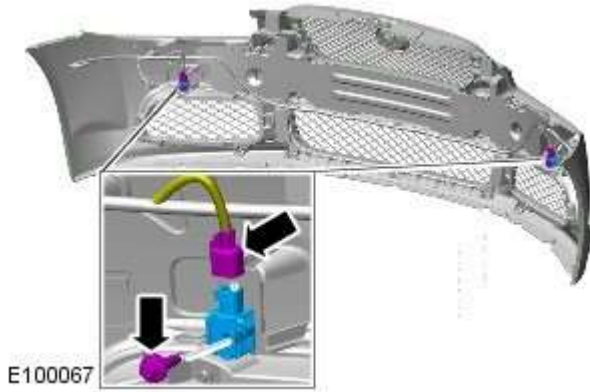
Removal



NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: [Front Bumper Cover](#) (501-19 Bumpers, Removal and Installation).

2. Torque: 3 Nm



Installation

1. To install, reverse the removal procedure.

Pedestrian Protection System - Pedestrian Protection Hood Actuator LH

Removal and Installation

Removal



NOTE: Removal steps in this procedure may contain installation details.

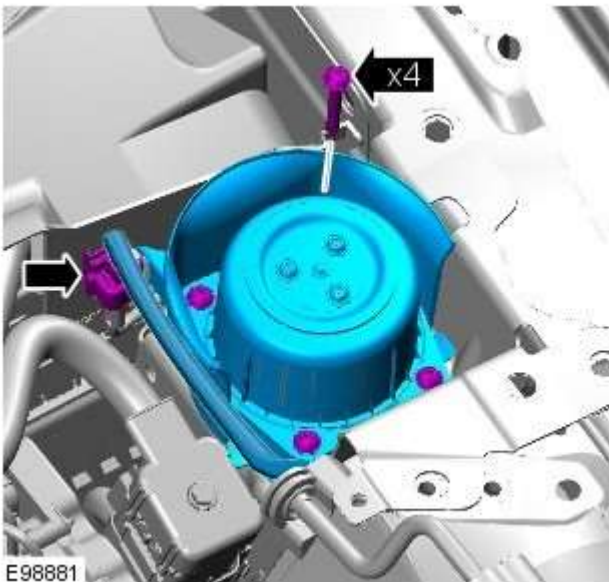
1. Disconnect the battery ground cable.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2. Remove the cowl vent screen.

Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).

3. Torque: 8 Nm



Installation

1. Install is the reverse of removal.

Pedestrian Protection System - Pedestrian Protection Hood Actuator RH

Removal and Installation

Removal



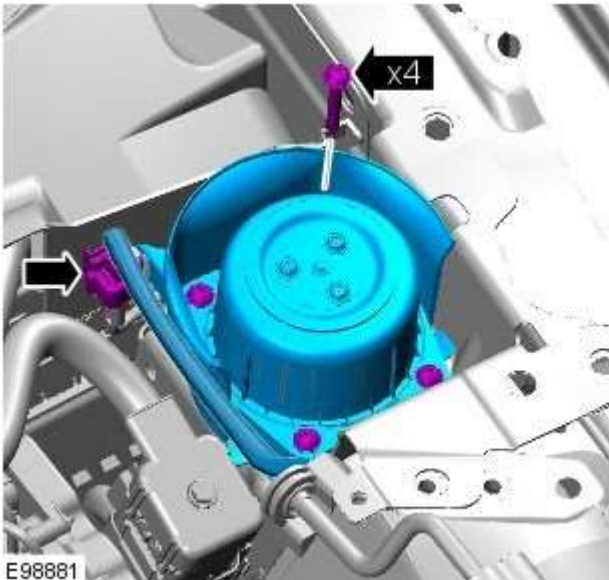
NOTE: Removal steps in this procedure may contain installation details.

1. Disconnect the battery ground cable.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2. Remove the cowl vent screen.

Refer to: [Cowl Vent Screen](#) (501-02 Front End Body Panels, Removal and Installation).



3.  NOTE: Left-hand shown, right-hand similar.

Torque: 8 Nm

Installation

1. Install is the reverse of removal.

Pedestrian Protection System - Pedestrian Protection Module

Removal and Installation

Removal



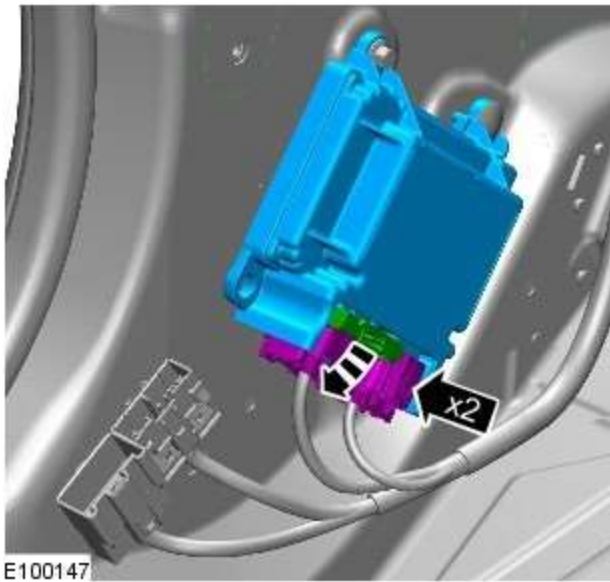
NOTE: Removal steps in this procedure may contain installation details.

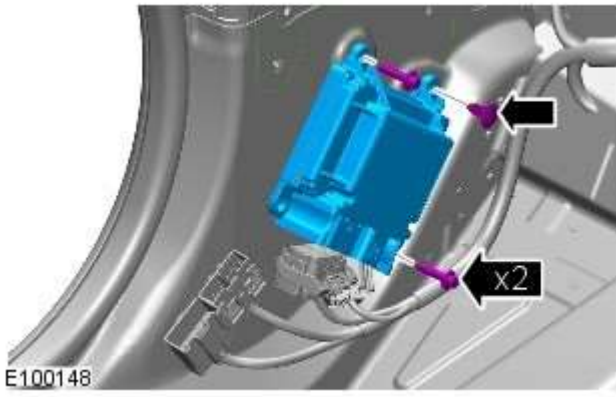
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2.



3.





4. Torque: 10 Nm

Installation

1. To install, reverse the removal procedure.

Body Repairs - General Information - Body Repairs

Description and Operation

General Information

Introduction

The body plays a significant role in the increasing trend of ever more rapidly changing model variants. The different customer groups are strongly influenced by the design and shape of the body. At the same time the stability of the body plays the most important part in ensuring passenger and driver safety. Lightweight construction, alternative materials, composite materials, plastics and appropriate joining processes are all design features that characterise modern Jaguar vehicle bodies.

In terms of manufacturing technology, modern safety cell bodies can be produced almost without any problems. Jaguar guarantee high quality standards by ensuring that mechanical strength properties are tried and tested in numerous computer simulations, crash tests, by testing materials and by employing sophisticated manufacturing technologies. In the event of repairs it is vital that the production quality standards are upheld. This requires a well-equipped workshop, and places particular emphasis on the qualifications of the workshop technicians. Up-to-date knowledge of current manufacturing technologies and continuous training on new repair methods and techniques are vital for high-quality body repairs. The model-specific repair manuals and the general repair techniques provide valuable support when undertaking body repairs.

Always follow the repair instructions published in this manual. Failure to observe this instruction can result in serious impairment of vehicle safety. All specified safety requirements must be met after the work has been carried out.

Vehicle design

The body

The XF adopts the latest generation steels, especially in the upper body – including high carbon steels, dual-phase, hot-formed boron steels, and bake-hardened steels to form a vertical safety 'ring' around the occupant cell. As well as combining strength with lightness, these steels improve corrosion resistance, by making best use of zinc and improving e-coat paint flow – and new thinking means that in spite of their strength, the XF's A and B-pillars are impressively slim, to the benefit of both visibility and accessibility. Similarly, the lower sills are the first component on any Jaguar to use incredibly strong, dual-phase DP600 steel.

The safety of the driver and the passengers is paramount for every body design. There are two key safety aspects in the body:

- Safety passenger cell
- Crumple zones

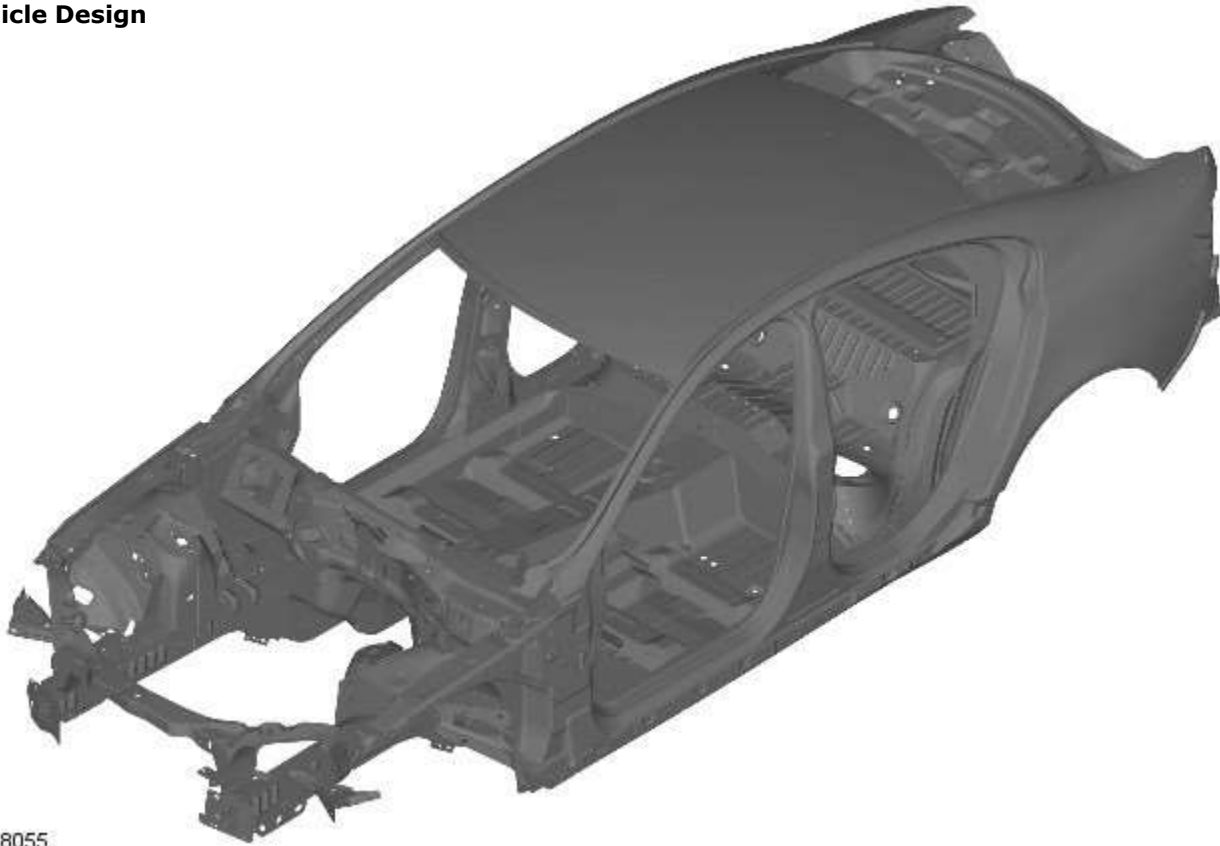
Safety passenger cell

- Stable pillars, rocker panel and door profiles.
- Side impact protection in the doors.
- Doors are designed to open even in the event of extreme deformation.

Crumple zone

- Dynamic absorption of deforming forces.
- Protection of the passenger cell.

Vehicle Design



E128055

Item	Part Number	Description
1		Bodyshell

High Strength Steels

Most modern vehicles are constructed from a number of different steels, partly to obtain an optimised body (collision, safety, rigidity, fuel economy, etc).

Steels are divided into several groups according to their tensile and yield strength, that is to say the force necessary to bring about plastic deformation of the material.

Yield Summary

Yield is the strength at which the metal changes from elastic to plastic in behaviour, the point of no return.

Tensile Summary

Tensile strength is the breaking strength of a material when subjected to a tensile (stretching) force, the point of no return.

Dual Phase (DP) steel falls into both the very high strength steel (VHSS) and extra high strength steel (EHSS) classifications, dependant on grade of DP.

Steel Type	Yield Strength
Mild steel (MS)	Maximum yield point up to 180 MPa
High strength steel (HSS)	Steel with a yield point up to 280 MPa
VHSS	Steel with a yield point up to 380 MPa
EHSS	Steel with a yield point up to 800 MPa
Ultra high strength steel (UHSS)	Steel with a yield point greater than 800 MPa

Welding Ultra High Strength Steel

UHSS requires welding equipment which can achieve the following equipment settings.

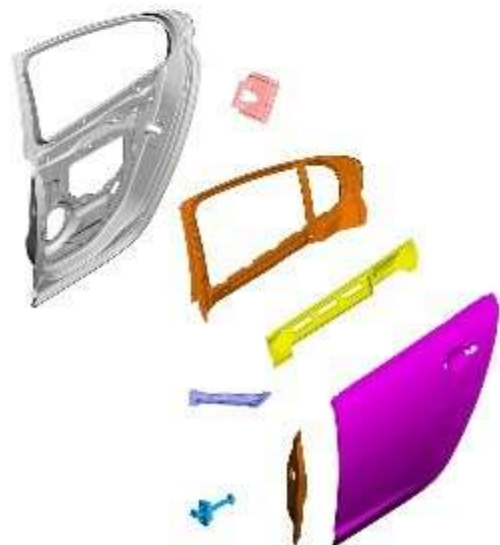
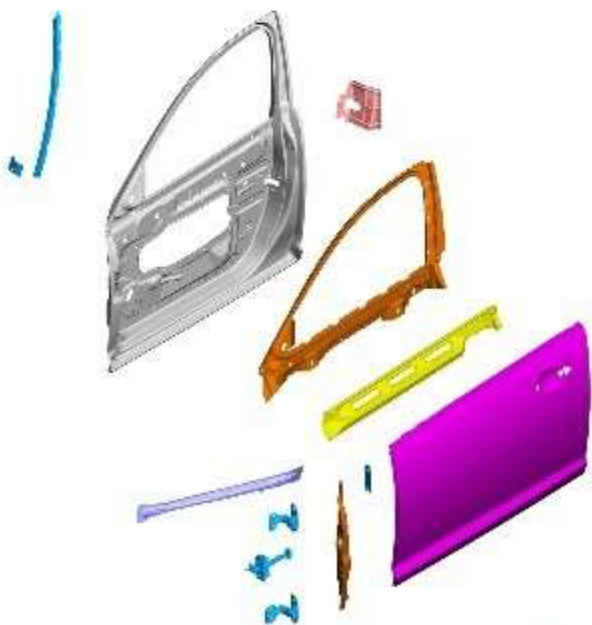
Spot Welding

Information to follow.

MIG Brazing

When mig-brazing use the following type of welder meeting the specifications shown: Fronius Trans Plus Synergic 2700 4 R/Z/AL MIG Welder, with CuSi3 (DIN 1733) 1.0mm filler wire with setting parameters 4, which is 92 Amps, Wire feed 4.6 m/min. Shielding gas L1 = pure Argon (DIN 439).

Steels used in body structure - Body closures



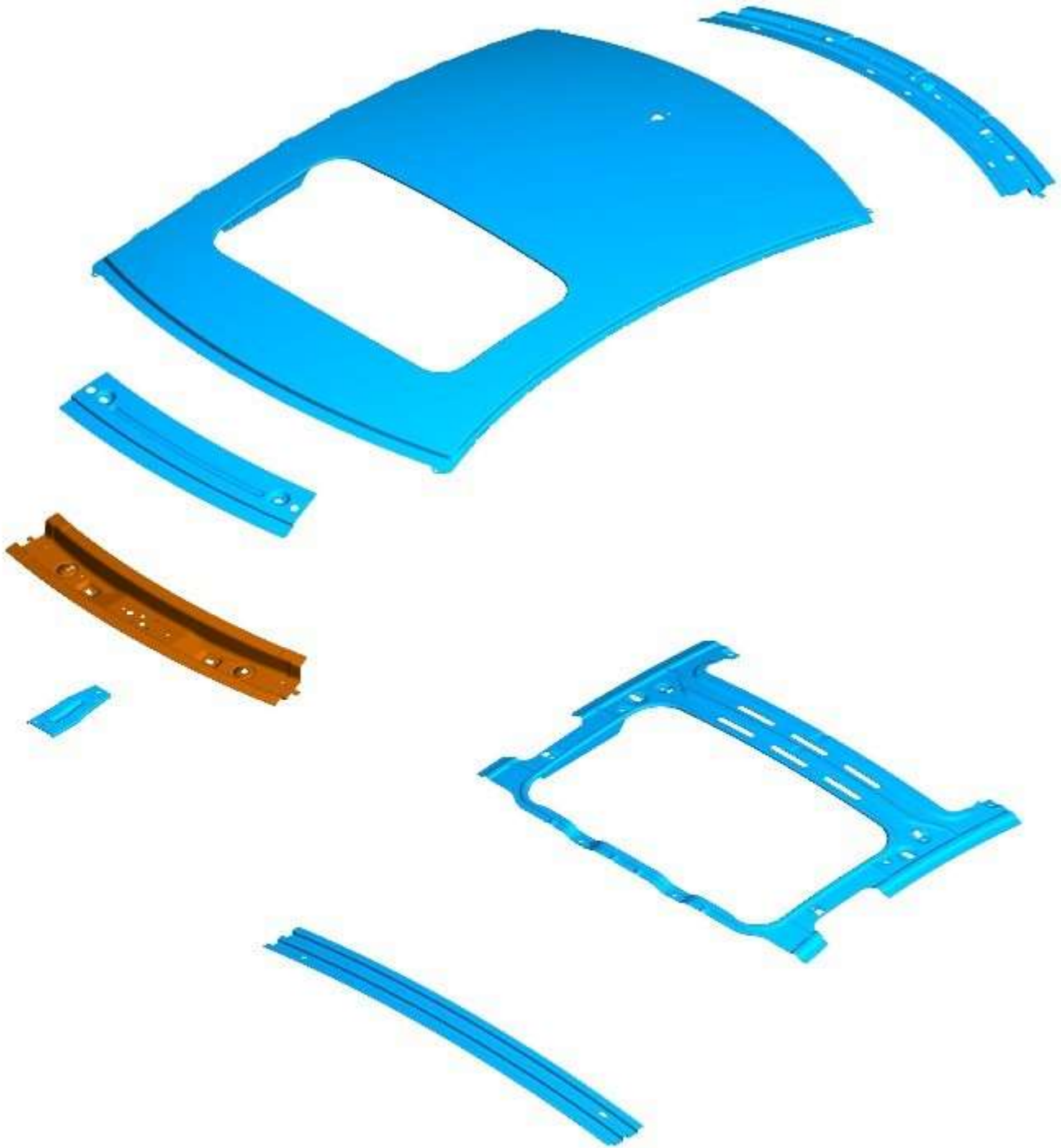
MS1+Z	MS2+Z	MS3+Z	MS4+Z	BH180+Z	BH220+Z
IF220+Z	BORON	5754NG+ALPT+ALS	S182+ALL	6111T4+ALL	

E 128480

Item	Type of Steel
MS1+Z	Mild steel with zinc
IF220+Z	Interstitial free steel - 220 MPa with zinc
MS2+Z	Mild steel with zinc

Item	Type of Steel
Boron	Boron steel
MS3+Z	Mild steel with zinc
5754NG+ALPT+ALS	5000 Series aluminium alloy
MS4+Z	Mild steel with zinc
5182+ALL	5000 Series aluminium alloy
BH180+Z	Bake hardened steel - 180 MPa with zinc
6111 T4+ALL	6000 Series aluminium alloy
BH220+Z	Bake hardened steel - 220 MPa with zinc

Steels used in body structure - Roof panels



MS1-4 BH300

E128477

Item	Type of Steel
MS1-4	Mild steel
BH300	Bake hardened steel - 300 MPa

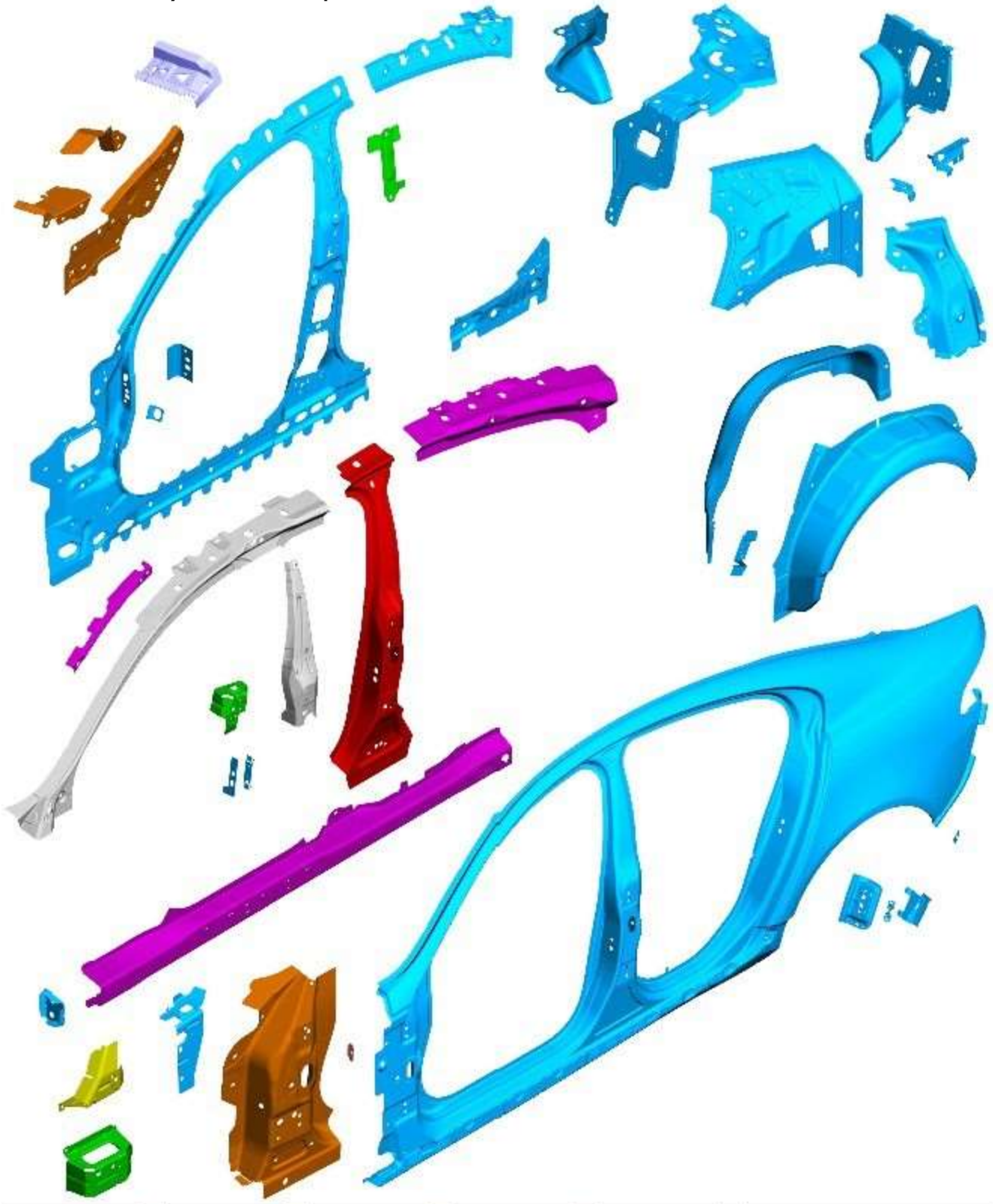
Steels used in body structure - Front end panels



E128475

Item	Type of Steel
MS1+4	Mild steel
HSLA340	High strength low alloy steel - 340 MPa
HSLA350	High strength low alloy steel - 350 MPa
HI ST BAR	High strength steel bar

Steels used in body structure - Side panels



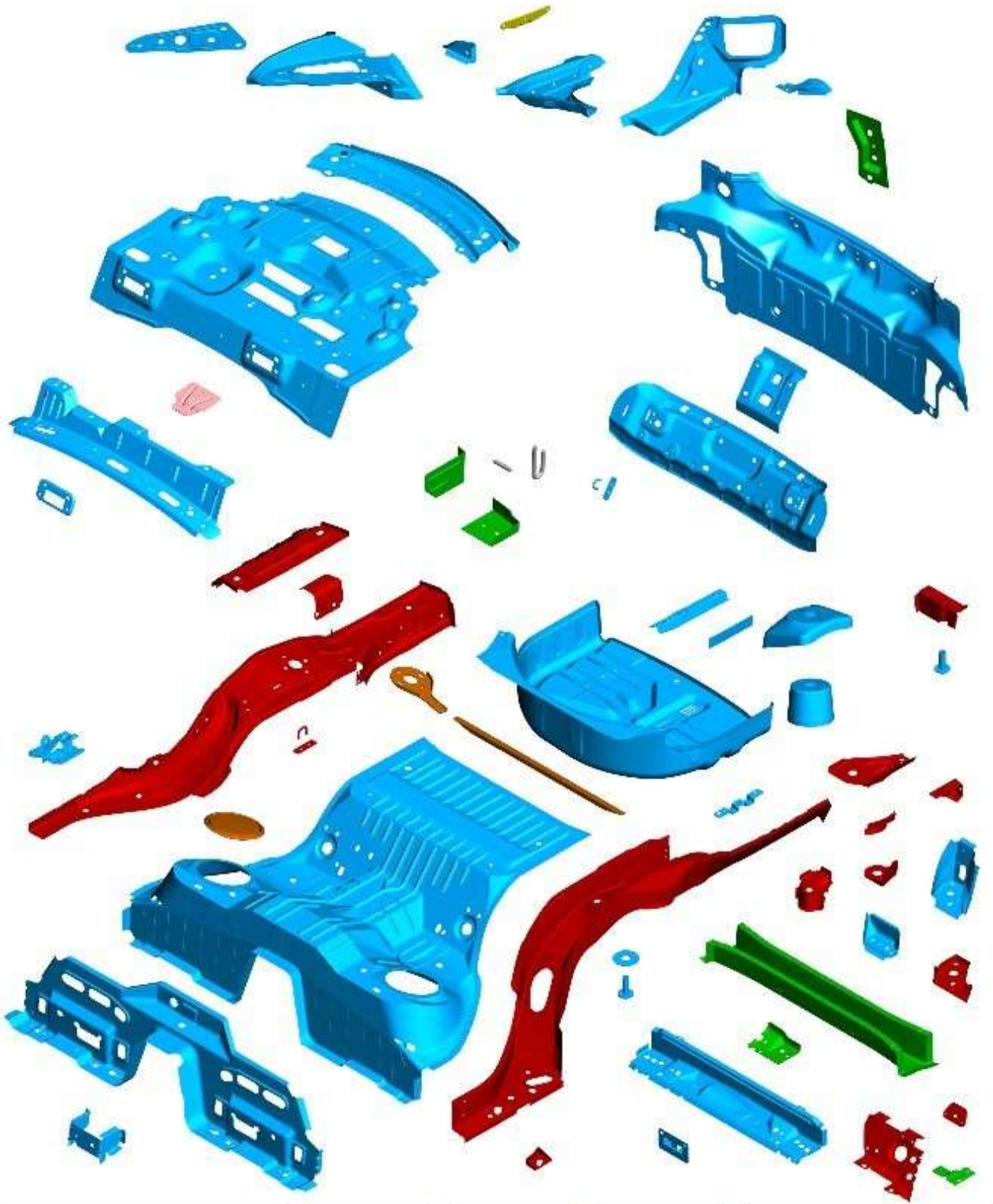
E 128478

 MS1-4	 HSLA300	 HSLA340	 HSLA380	 BH220
 BH300	 DP450	 DP600	 BORON	

Item	Type of Steel
MS1-4	Mild steel
BH300	Bake hardened steel - 300 MPa
HSLA300	High strength low alloy steel - 300 MPa
DP450	Dual phase steel - 600 MPa
HSLA340	High strength low alloy steel - 340 MPa

Item	Type of Steel
DP600	Dual phase steel - 600 MPa
HSLA380	High strength low alloy steel - 380 MPa
Boron	Boron
BH220	Bake hardened steel - 220 MPa

Steels used in body structure - Rear end panels

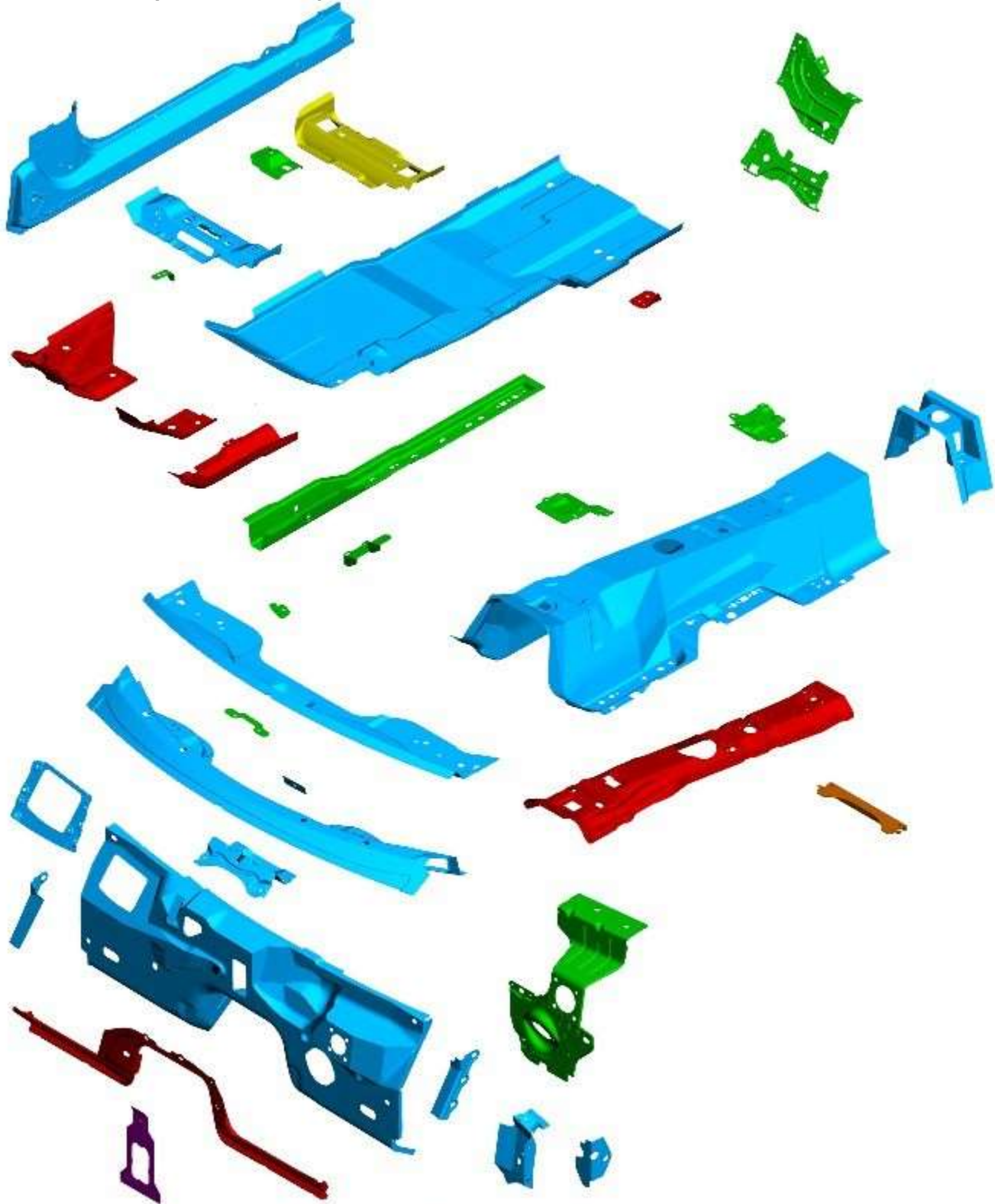


E 128479

- MS14
- HSLA300
- HSLA340
- HSLA350
- HSLA380
- HI ST BAR
- OTHER

Item	Type of Steel
MS1-4	Mild steel
HSLA380	High strength low alloy steel - 380 MPa
HSLA300	High strength low alloy steel - 300 MPa
HI ST BAR	High strength steel bar
HSLA340	High strength low alloy steel - 340 MPa
Other	Other
HSLA350	High strength low alloy steel - 350 MPa

Steels used in body structure - Floor panels



E 128476

 MS1-4	 HSLA340	 HSLA350
 HSLA380	 BH260	 OTHER

Item	Type of Steel
MS1-4	Mild steel
HSLA380	High strength low alloy steel - 380 MPa
HSLA340	High strength low alloy steel - 340 MPa
BH260	Bake hardened steel - 260 MPa
HSLA350	High strength low alloy steel - 350 MPa

Item	Type of Steel
Other	Other

NOTES:

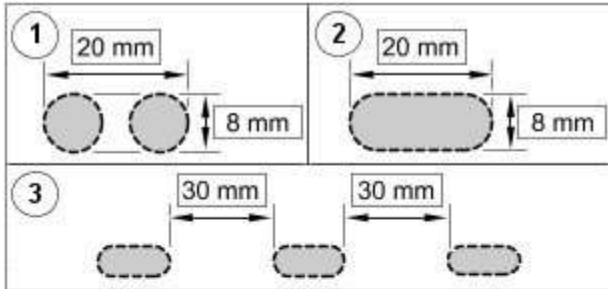


When installing the A-pillar outer panel, the rocker panel and B-pillar outer panel, or the roof panel, they must be slot brazed where they adjoin the A-pillar reinforcement upper.



The size of the slots are to be 20mm x 8mm and 30mm apart. Slots should be installed in accordance with this spacing. Where this is not possible, due to the indents in the panel, the slot should be made in the location of the original spot weld.

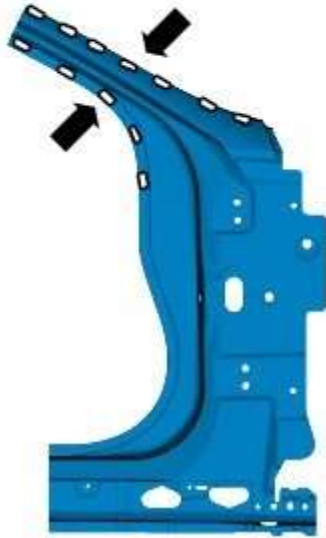
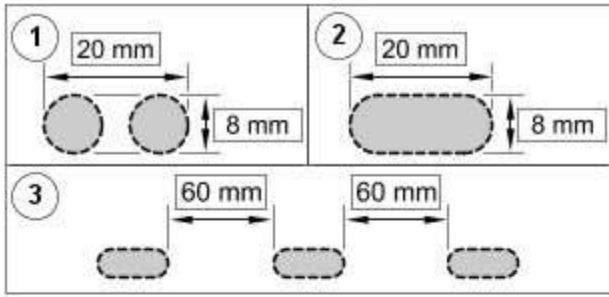
Rocker panel and b-pillar outer panel



E104791

Item	Description
1	Drill 2 x 8mm holes to form basis of slot
2	Mill out to form 20mm x 8mm slot
3	Slots spaced at 30mm intervals

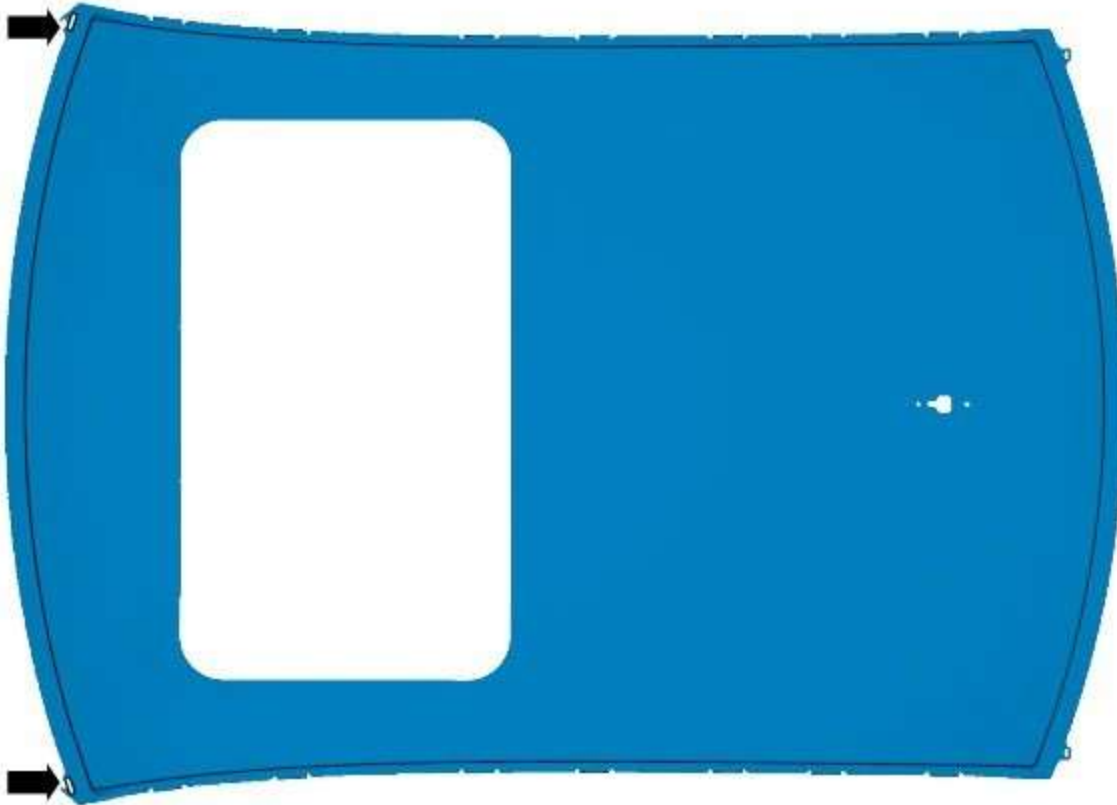
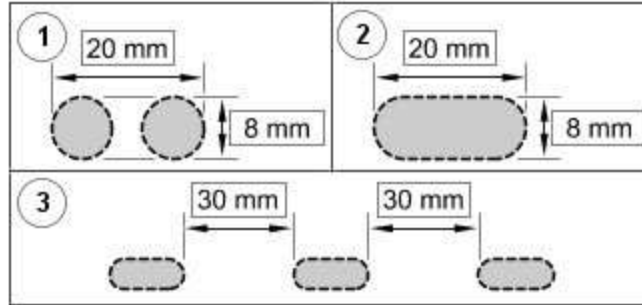
A-pillar outer panel



E108460

Item	Description
1	Drill 2 x 8mm holes to form basis of slot
2	Mill out to form 20mm x 8mm slot
3	Slots spaced at 30mm intervals

Roof panel



E102826

Item	Description
1	Drill 2 x 8mm holes to form basis of slot
2	Mill out to form 20mm x 8mm slot
3	Slots spaced at 30mm intervals



NOTE: Mig brazing is carried out at a temperature of 650°C to 950°C. To avoid degradation of the ultra high strength steel material properties, the temperature must be below 950°C.

Mig braze the slot(s) using a Fronius Trans Plus Synergic 2700 4 R/Z/AL MIG Welder, with CuSi3 (DIN 1733) 1.0mm filler wire with setting parameters 4, which is 92 Amps, Wire feed 4.6 m/min. Shielding gas L1 = pure Argon (DIN 439).

Dress the surface of the weld cap (brazed slot) with 60/80 grit belt sanders.

Accident damage and diagnosis

General notes

Exact diagnosis of the extent of the damage enables proper repair planning.

All body repairs must be carried out in accordance with the guidelines in this Body Repair Manual.

The stability and strength properties of the body must be taken into account during body repairs. The body has exact defined deformation patterns that must not be affected by any repair work.

For instance, the crumple zones absorb the bulk of the impact energy. If any unprofessional repair techniques or methods are used in these areas then this can pose a fundamental threat to vehicle safety.

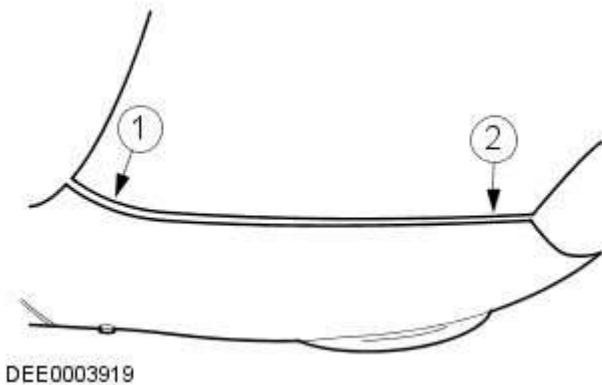
Hidden damage

As well as looking at external indicators like flaked off paint, it is vital to check for hidden body damage or deformation that is not visible from the outside. Large attached parts like bumpers and inner fenders often need to be removed to allow accurate assessment of damage to underlying body parts.

Gap dimensions

Gap dimensions offer another alternative for diagnosis by visual inspection. If any changes or misaligned edges are apparent, then this usually indicates that the dimensions of the affected part are incorrect.

Changes in gap dimension



Item	Description
1	Gap too wide
2	Gap too small

Impact effects on the body



NOTE: Vehicle components like drive shafts and trailer attachments transfer forces. If a vehicle is subjected to a rear impact then all connected body parts and mechanical components (e.g. transmission mountings) should be thoroughly checked. Electronic components should be checked to make sure that they still operate correctly.

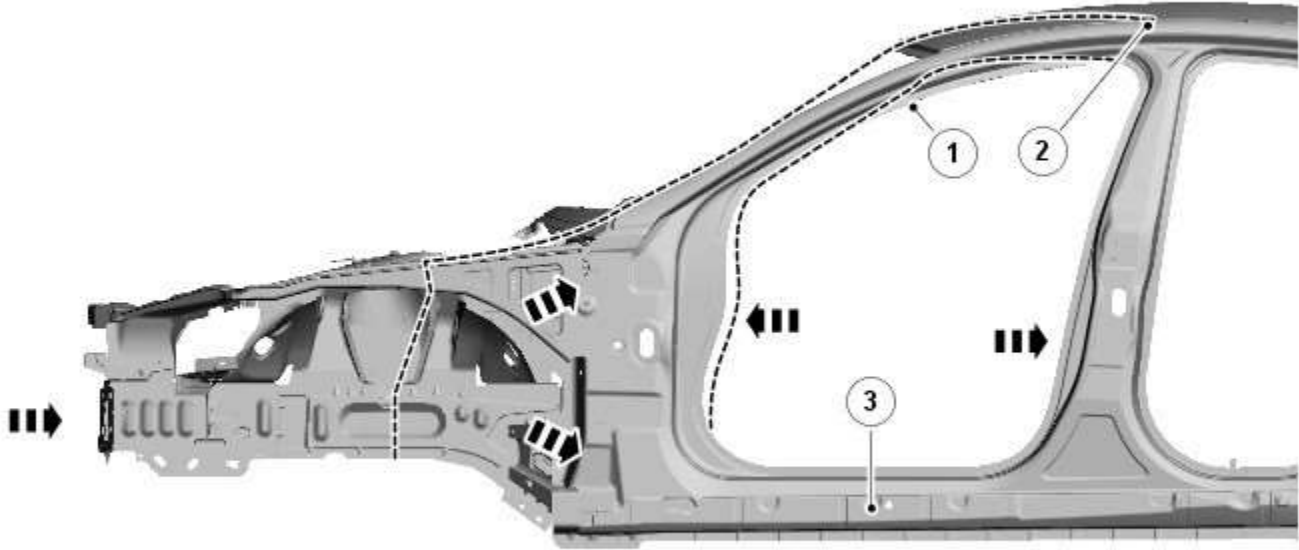
Furthermore it is possible to deduce the overall extent of damage from the direction and magnitude of the impact forces. This does however require extensive body-specific knowledge.

If, for instance, an impact occurs at the front left-hand side member, then the right-hand side member is usually also affected as a result of the rigid body-shell design (crossmember). Often the length of this side member will not have changed, but because of the rigid body-shell design it may have moved from its original position (often only by a very small amount). If any deviations are present this can usually be detected by checking the gap dimensions between door and fender or by checking for changes in dimension.

In the case of more severe impacts, the front part of the body cannot absorb all of the impact energy, and the passenger cell is also deformed. Here the impact energy is transferred via the side member to the A-pillar (see diagram). This results in deformations in the area of the roof and the door rocker panel.

The body reacts quite differently to side impacts where there is hardly any crumple zone. As the passenger cell is extremely stable, there are comparatively few local deformations at the site of the impact. However, the impact forces are transferred to the entire vehicle floor, which often results in so-called "banana damage", where the vehicle is bent into a banana shape.

Impact energy is transferred via the side member to the A-pillar



E128762

Item	Description
1	Deformation area - roof rail
2	Deformation area - roof
3	Deformation area - door rocker panel

Body measurements

Measuring options

- Comparison measurements can also be made on the outside of the body. Depending on the damage, comparison measurements and diagonal measurements can be carried out using compass, telescopic rod, tape measure or ruler.



- **NOTE:** The same reference points must be chosen on both sides when checking for changed dimensions (e.g. bores, edges, beads/swage lines etc).

All of the important external body dimensions are listed in Tolerance Checks.

For additional information, refer to: [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

- Measurements with a measuring/straightening jig.
- A measuring/straightening jig is required for accurate measurements of the body. The measuring systems are categorised by their means of operation:
 - Mechanical measuring system.
 - Optical measuring system.

Quick and accurate measuring results can be obtained using computerised measuring systems.

A minimum of three intact measuring points on the body are required for measurements of length, width and height dimensions.

In some cases this may mean making the measuring points accessible. All of these measuring systems can be used to make body measurements, provided all the equipment is available.

Planning a repair

The following decisions have to be made before the repairs are started:

- Does the vehicle need to be put on a straightening jig, or can it be straightened by other means?
- Does the body need to be measured?
- Do aggregates like engine or axles need to be removed?



- **NOTE:** It is preferable to repair body parts rather than to renew them, as this keeps the complete body-shell intact.
- Which body parts need to be renewed?
- Which body parts can be repaired?

Obtaining spare parts

The availability of spare parts often determines how easily the body repairs can be carried out. The following procedure is recommended:

- Obtain all the data for the vehicle, including type, vehicle identification number, trim code, engine identification letters, initial registration etc.
- Establish all of the metal parts that need to be renewed.
- Establish all of the attached parts that need to be renewed, including small parts like rivets, clips etc.

Straightening repairs



WARNING: The use of heat when pulling to straighten body panels, (such as side members), is not recommended. Longitudinal pulling, (hot or cold), is also not recommended. A small amount of side to side pull is permissible, (cold).

When any type of pulling or straightening operation is performed it is important to observe for any movement in adjacent panels.

A panel must retain its strength and integrity, if there is any doubt the panel must be renewed.

Straightening repairs are often required to restore the body to its original shape after an accident. This can be done with:

- Alignment jigs.
- Universal straightening and measuring jigs.
- Welding jig system.

The following points must be followed to Make sure that the repairs are carried out professionally and that all the dimensions are correct after the repairs have been carried out.

- Structure:
 - The repair sequence depends on the individual repair plan (taking any necessary disassembly work into account).
 - Clean the attachment areas.
 - Anchor the vehicle free of stress on the relevant system.
 - Support the aggregates to take strain off the body.
 - Decide on at least three measuring/mounting points that are undamaged and as far apart as possible (for basic adjustment).
 - Check the dimensions of the measuring/mounting points.
- Straightening:



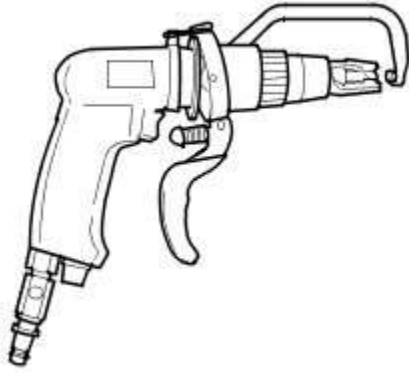
NOTE: Check dimensions and gaps continuously during straightening.

- A body is always straightened in the opposite direction to that of the impact. Always carry out straightening repairs with the complete body shell assembled (do not cut out any parts beforehand). Carry out the straightening work in several stages. This prevents the risk of over stretching or of welded joints tearing out. During the individual straightening steps, relieve tension by striking with an aluminium hammer while the part is subjected to a tensile load (in the area of pre-determined folding points, dents, welded joints etc.).
- Special features:
 - Ultra high strength steel cannot be straightened due to its brittleness and must always be replaced.

Cutting out body parts

Depending on how the parts are joined/connected, different tools are suitable for cutting/separating body parts.

Spot-weld mill



DEE0003924

NOTES:

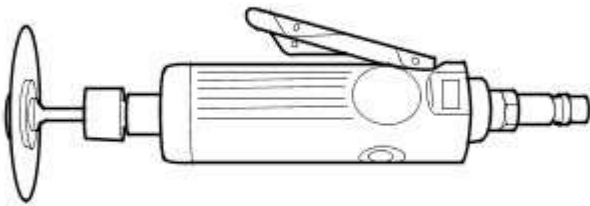


All other parts like interior equipment, window glass etc. must be protected against flying sparks.



Make sure that the milling depth is set correctly to prevent the remaining flange from being weakened.

Rod sander



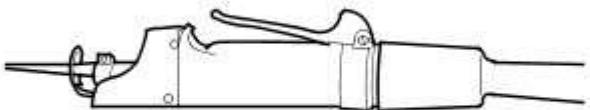
DEE0003925



NOTE: Wear protective clothing. Protect any vulnerable body or glass areas against flying sparks. Remove explosive materials from the vicinity.

Any spot welds that are inaccessible for the spot-weld mill (diameter > 8 mm) should be ground out using a rod sander. The same applies to MIG spot welds or seams.

Short stroke saw



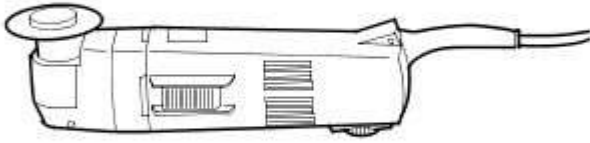
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NOTE: Underlying metal parts, wiring harnesses, hoses etc. must not be damaged - remove them beforehand if necessary.

Body saws are particularly versatile and are therefore very suitable for making severance cuts on body parts.

Reciprocating saw

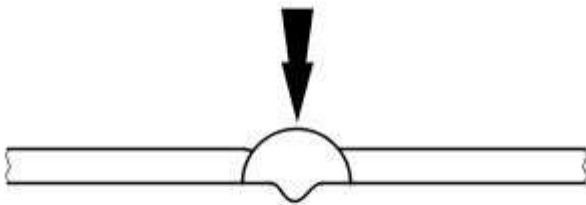


DEE0003927

In addition to the short stroke saw, the reciprocating saw can be used. With this, it is possible to make narrow and straight cuts to an exact depth.

Carrying out the repairs

Butt joint



DEE0003929



NOTE: The severance cut should always be kept as short as possible on sectional replacement. Only cut at the severance lines shown in the repair chapters.

Do not make any cuts near reinforcements or pre-determined folding lines.

- Prepare parts remaining on the vehicle/new parts.



NOTE: Do not use a welding torch to remove paint residue (the heat could cause the metal to deform).

- Reshape the adjoining surface of any dented body parts that are to remain on the vehicle using a hammer and a counterhold (Make sure that the old part matches the shape of the new part). Grind off left over spot welds or seams with an angle grinder.
- Cut the new parts to shape.
- If necessary punch or drill holes for mig plug welding.
- Grind all joining flanges to bare metal on both sides. Do not use an angle grinder for this purpose (this could weaken the metal and damage the zinc layer). Suitable tools: rotating wire brush, belt sander or plastic disc.
- Apply welding primer liberally to all weld flanges.
- The primer must be well stirred before use.



NOTE: When using aerosols, take care not to contaminate adjacent parts with spray mist.

Fit the new part.

It must be Make sured that the new part fits exactly to the specified dimensions. Suitable equipment:

- Alignment jig.
- Universal measuring system.
- Jig system.
- Ruler or tape measure.
- Compass.
- Frame dimensions can be found in the model-specific repair manuals.



NOTE: Any attached body parts that require accurate alignment and fitting must be incorporated in this step; for instance bumpers, seals, headlamps, rear lamps and lock assembly components. If this is not done carefully it may result in water leaks, wind noises and substantial follow-on work.

Make sure that edges line up with adjacent parts and check that gaps are consistent (compare left and right-hand sides). Make sure that the shape of the vehicle is retained.

Secure the new part



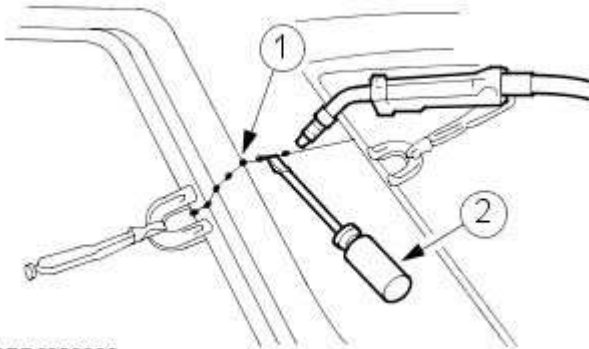
NOTE: The need for subsequent follow-on work can be significantly reduced if aligning and tack-welding are carried out with due care.

Depending on accessibility the following methods for securing are available:

- Grip pliers (set of).
- Screw clamp (set of).
- Self-tapping screws.
- Tack welds.

Use a staking tool or a screwdriver to Make sure that the edges of sectional replacements of profiled parts line up. The edge is then tack welded to Make sure that it lines up.

Aligning and tack weld



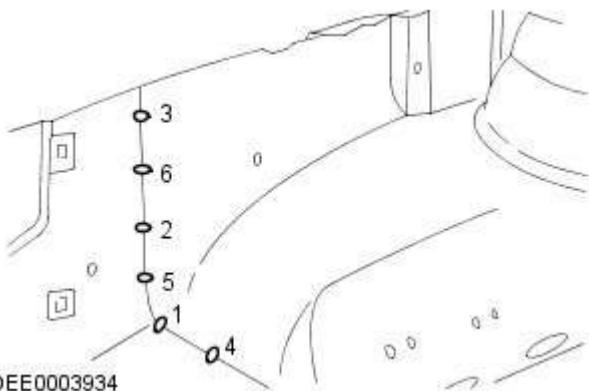
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Item	Description
1	Tack welds
2	Using a screwdriver to align

Longer joints are usually tack welded to prevent the panel from warping. It is important to carry out the tack welds in the correct sequence (see diagram).

Weld in the new part following the instructions in the repair manual.

Correct tack welding sequence



DEE0003934

Follow on repairs/corrosion protection

- This step basically covers the following work:



NOTE: See corrosion protection section for cavity wax application areas.

- Grinding welded seams.
- Priming any bare metal.

- Sealing welded seams.
- Applying underbody protection.
- Sticking damping matting in place.
- Filling cavities with cavity wax.
- Cavity wax (after painting).

Panel Beating

Fundamentals of panel beating

Before carrying out any sectional replacements or complete replacements of body panels, always check carefully whether the damaged panel(s) can be rectified by panel beating.

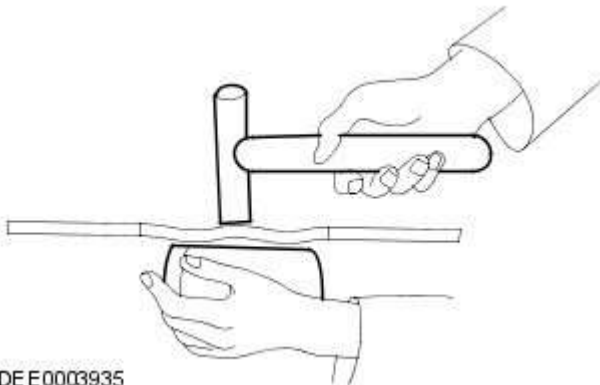
Panel beating is usually the easiest and most economical method of repairing a damaged panel.

Examples of applications of different panel beating techniques:

Aluminium hammer and mallet.

- Advantage: Low risk of over-stretching the panel.
- Used for repairs of small dents on panels that are accessible from both sides.
- These two panel beating tools are usually used for "finishing repairs".

Fine straightening with an aluminium hammer and a universal dolly



Sliding hammer

- If the damaged panel is only accessible from the outside, use a sliding hammer to pull it back into shape. The discs or studs needed to mount the sliding hammer are welded onto the bare surface. Dents in the panel can be flattened out using controlled application of the sliding hammer.

Heat-treatment of panels

It is usually inevitable that some parts of the body panels show excess material as a result of mechanical strain. If there are any areas of excess material this will cause localised instabilities due to differences in tension. These localised instabilities can be stabilised by applying heat-treatment techniques.



NOTE: This does not apply to high-strength low alloy steel, ultra high strength steel and aluminium.

Rule: Flattening panels by heat-treatment reduces the amount of excess material by more than they were originally stretched.

Different heat-treatment techniques.



NOTE: Different heat-treatment techniques are used depending on the amount of excess material.

Flattening using a flame.

- A welding torch is used if the material excess extends over a larger area (torch size 0.5 - 1.0 mm). Use a soft flame.
- The surface of the metal is briefly spot-heated and then immediately cooled with a wet sponge.
- Requirement: Ability to handle a welding torch safely and knowledge of annealing colours of steel.
- Advantage: No damage to the surface of the metal.

Flattening using a flame, supported by hammer and counterhold.



NOTE: The flattening effect is increased by speeding up the heating and cooling stages.

- If the material excess is concentrated, then the flattening effect can be increased after heating by carefully using an aluminium or wooden hammer.
- Requirement: Ability to recognise material tension by feeling the surface that is to be flattened.

Flattening using a carbon electrode.

- If panel areas are only accessible from one side, or the panel is only slightly destabilised, then the preferred method is flattening using a carbon electrode.
- Requirement: Bare metal surface.

- Disadvantage: Scarring and hardening of the surface.
- Flattening using a copper electrode.
- Small, sharp dents that face outwards can be worked on with a copper electrode.
- Flattening using a flame and body files.



NOTE: When applied correctly, this method can be used with all the attached parts still in place (roof headlining, wiring harnesses etc.).

- Small, soft dents (only slight stretching): Working at the edges of the dent in an inward spiral pattern, the dent is heated with an oxyacetylene torch (torch size 1 - 2 mm, excess gas flame) to approx. 250° C.
- Working rapidly with a body file extracts heat from the edge area until the dent is flattened. Preferably alternate between two files. This increases the amount of heat that can be extracted.

Safety measures

The electronic control modules (ECM) fitted to vehicles make it advisable to follow suitable precautions prior to carrying out welding repair operations. Harsh conditions of heat and vibration may be generated during these operations which could cause damage to the modules. In particular, it is essential to follow the appropriate precautions when disconnecting or removing the airbag RCM.

Do not allow electronic modules or lines to come into contact with the ground connection or the welding electrode. Seat belt anchorages are a safety critical. When making repairs in these areas, it is essential to follow design specifications. Note that extra strength low alloy steel may be used for seat belt anchorages. Where possible, the original production assembly should be used, complete with its seat belt anchorages, or the cut line should be so arranged that the original seat belt anchorage is not disturbed.

All welds within 250mm (9.842) of seat belt anchorages must be carefully checked for weld quality, including spacing of spot welds.

Remove the battery before carrying out welding work in its vicinity.

Utmost care must be taken when welding near the fuel tank or other components that contain fuel. If the tank filler neck or a fuel line must be detached to allow access for welding work, then the fuel tank must be drained and removed. Never weld, on components of a filled air conditioning system. The same applies if there is a risk of the air conditioning system heating up.

Connect the ground connection of the electrical welder directly to the part that is to be welded. Make sure that there are no electrically insulating parts between the ground connection and the welding point.

Adjacent vehicle parts and adjacent vehicles must be shielded against flying sparks and heat.

Pedestrian protection system

The pedestrian protection system is designed to mitigate injuries in a pedestrian collision with the vehicle. It does this by utilizing a pair of pyrotechnic actuators to lift the hood away from the engine, creating a cushioned impact between the pedestrian and the vehicle. It is essential that any repair or replacement operations do not affect the safe working of the system.

For additional information, refer to: [Pedestrian Protection System](#) (501-20C Pedestrian Protection System, Description and Operation).

Resistance spot welding

Where resistance spot welds have been used in production, they must be reproduced with new spot welds in replacement where possible. All such reproduction spot welds should be spaced 25 to 30mm apart.

Setting up the equipment and co-ordinating the welding parameters.

Equipment:

- Follow the equipment manufacturer's instructions for the equipment settings.
- Select the correct electrode arms (as short as possible).
- Align the electrode arms and tips exactly.
- Electrode tips should be convex (rough shaping with a file, fine shaping with a sanding block).

Body:

- Make sure that the flanges to be joined lie perfectly flat to one another.
- Prepare a bare metal joint surface (inside and outside).

Notes on technique/method:

- Carry out a test weld on a sample piece of the material coated in welding paste.
- If any metal parts are located between the electrode arms then there will be a loss of induction and therefore power (adjust current setting).
- The power needs to be adjusted for high-strength low alloy steel.
- Repeated welding on old welding points often leads to poor quality welds.
- Keep the electrode tips as near as possible to an angle of 90° to the contact surface.
- Keep the pressure on the electrodes for a short period after finishing the weld.
- The electrodes work best if their shape is convex. Clean the contact surface of the electrodes regularly.

Resistance spot welding panels where the total thickness is 3 mm or more

For all repairs to modern Jaguar vehicles, spot-welding equipment should be suitable for reliable welding of zinc-plated, high-strength and high-tensile steels in three or more layers, up to 5 mm total thickness. If these requirements are not fulfilled, plug welding must be used for safety reasons. The electrical specifications (current, resistance, heat) of the spot-welding equipment have different validity, depending upon the type of equipment. Therefore, it is essential that the manufacturer's instructions are observed with regard to the actual welding performance.

MIG/MAG welding

Setting up the equipment and co-ordinating the welding parameters.

Any joints that are MIG/MAG welded in production must also be MIG/MAG welded during repairs. Also during repairs, some resistance spot welds need to be replaced by plug welds.

If access is difficult, or if a suitably powerful spot welder (see above) for total panel thicknesses of 3 mm or more is not available, resistance spot welding must be partially replaced by plug welding during repairs. In this case, the increased time needed and the correspondingly more demanding corrosion protection requirements, must be taken into account.

Welding repairs can only be carried out properly if the equipment is set up correctly and all the welding parameters are co-ordinated.

Equipment:

- Set up the equipment as directed by the manufacturer.
- The hoses must be untwisted.
- The core must be free of abraded rod particles.
- The gas and current nozzles must be free of slag and scale residue.
- Pay attention to the quality of the welding rod and the throughput of gas.

Body:

- Make sure that the joint surface is perfect.
- Prepare a bare metal joint surface.
- Maintain the correct gaps (formation of roots).

Notes on technique/method:

NOTES:



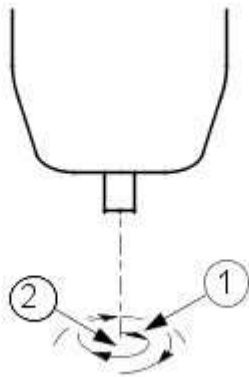
The increased application of heat during MIG welding destroys the welding primer/zinc layer over a much larger area than during resistance spot welding, as a result of which much more care needs to be taken when applying anti-corrosion protection afterwards.



A test weld should always be carried out to make sure that the welded joint is not just a surface connection.

- Attach the ground cable right next to the welding point (Make sure that good contact is made).
- During plug welding start welding on the lower panel to Make sure adequate penetration.

Plug welding



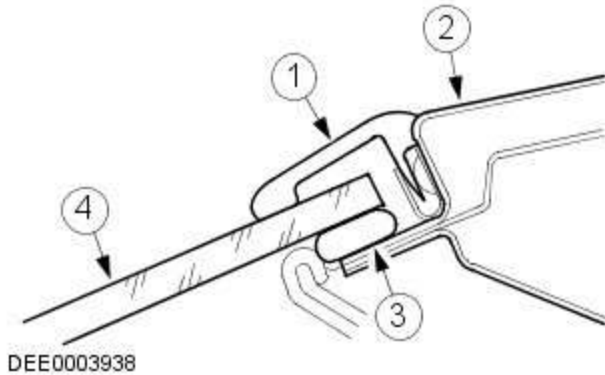
DEE0003936

Item	Description
1	Welding direction: circular pattern working from the inside outwards
2	Welding starting point: centre of hole on lower panel

Bonded glazing

- The windscreen, side and rear windows are bonded directly onto the window frames on the body and liftgate.
- The windows are bonded primarily for reasons of adhesive strength. Bonded glazing provides additional torsional stiffness to the body.

Adhesive bonding of bonded windows



Item	Description
1	Rubber strip
2	Window frame
3	Adhesive
4	Window glass

Removing and installing bonded windows

Safety measures

The following safety measures must always be followed to prevent personal injury:

- Wear protective gloves and arm protection.
- Wear protective goggles.

Preparations

Before cutting out a bonded window, undo and remove any attached parts in the cutting area that are at risk, e.g. trim panels and decorative strips, as well as all electrical connections.

Mask any painted areas that are adjacent to the window.

Cut off any surplus adhesive, as this makes it easier to cut out the window.

Secure vertical windows against dropping out.

Cutting out the window

Cut into the adhesive bead at easily accessible points using the cutting tool.

Carefully guide the cutting tool around the window, cutting through the adhesive bead.

Avoid touching the window frame and the body flange.

Use cup suction tools to lift the cut-out window out of the window aperture.

General preparations for bonding

Follow the manufacturer's instructions.

Cut back the remaining adhesive bead on the metal flange to a residual height of about 1mm. Do not touch or clean the cut surface afterwards.

Carefully rectify any paint damage (apply primer and top coat).

Renew the window stops as necessary.

Bonding the window glass

Apply an even bead of adhesive to the window or to the body flange.

Insert the window glass into the window aperture and centre it (2 technicians required).

Check the gaps.



NOTE: Open the windows and doors while the window is left to dry and do not move the vehicle (slamming doors creates excess pressure which could cause the window to become loose).

Use adhesive tape to prevent the window from falling out or slipping.

Finishing operations

Reconnect all electrical connections and check that the components operate correctly.

Install the attached parts and check that the fit is accurate and secure.

- Carry out a visual inspection to Make sure that the gaps and joints are even.

Thoroughly clean the window glass.

Protective equipment and safety at work

Various safety measures and legal requirements must be met when carrying out repairs. All regulations relating to health and safety at work must be followed.

Welding safety precautions

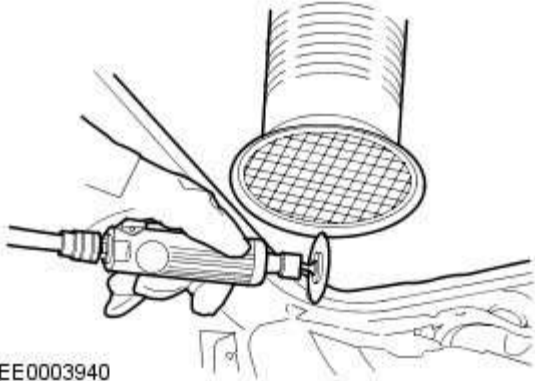
The following safety precautions must be observed to prevent the risk of personal injury:

- Protective overalls
- Safety hood (face protection).
- Welding shield.
- Safety gloves.
- Safety shoes.
- Extraction unit for welding fumes.

Welding should always be carried out in well ventilated areas. A fire extinguisher must also always be within reach.

General body repair safety measures

Extraction unit



Sealing compound, underbody protection etc. must not be burned off with a naked flame. This would produce toxic gases. If for instance PVC is burned, then gases containing hydrochloric acid are produced. For this reason a suitable extraction unit should always be used when performing grinding, welding or soldering work.

Always Make sure good ventilation when working with materials that contain solvents, wear breathing equipment and use an extraction unit.

Ear defenders should always be worn when cutting, grinding or straightening metal, as the noise levels can reach or even exceed 85 - 90 dB(A).

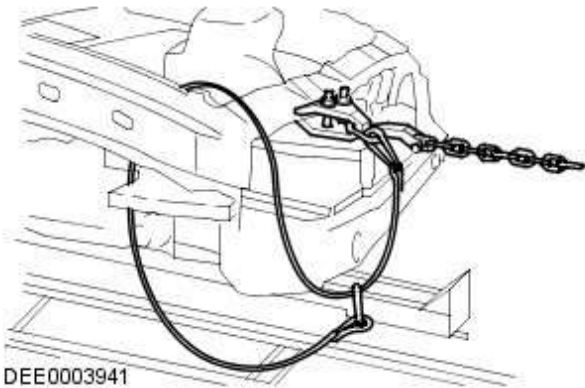
Take care not to look directly into any laser measuring systems, for instance used to measure the under body.

When removing components from a vehicle mounted on a lifting ramp, watch out for a shift in its centre-of-gravity.

When first placing the vehicle on the ramp, take into account that it may need to be secured against tipping over.

Chains and chain clamps must be secured with safety ropes during straightening work.

Safety rope



Body Repairs - Corrosion Protection - Corrosion Protection

Description and Operation

General

The corrosion protection provided in production must be carefully maintained and/or reproduced during and after body repair work. It is only then that the long-term warranty against penetrative corrosion damage can be assured.

Only Jaguar original bodywork components and Jaguar approved repair materials, (sealer, paint etc.), are to be used for bodywork repairs.

Jaguar Original Parts



E 117239

All Jaguar bodywork components have a cathodic base coating. Individual bodywork components are zinc plated on one or both sides, (in different areas depending on vehicle model).

Together with elastic paint coating, this guarantees an optimum, highly resistant protection against corrosion caused by the impact of small objects such as gravel.



NOTE: If possible, the individual protective layers, (zinc, cathodic base coat), on Jaguar bodywork components must not be damaged or destroyed by sanding or other mechanical operations.

If hairline cracks at "bodywork connection areas" appear after reshaping work, (e.g. at door hinges), it must be ensured that the corrosion protection provided in production is recreated. The complete paint covering must be re-created if necessary. The same applies to reshaping work on heavily profiled bodywork components, (e.g. floor pan). Renew or touch-up the paint coating, sealing beads and underbody protection as necessary.

After repair, any interior surfaces which are no longer visible or accessible must be primed before cavity wax is applied. To be certain of an even coating on inner surfaces, careful application of spray, (twice, with drying time in-between), must be carried out throughout the whole cavity.

If bodywork panels are strongly heated during repair work, this will invariably result in damage to or even destruction of the applied corrosion protection material. The effectiveness of the cavity protection material is reduced if heating occurs. Reworking of the affected areas is therefore vital.

Welded areas should be made good before corrosion protection is applied.

The corrosion protection measures to be taken when bodywork components are renewed are described on the following pages.

Corrosion Protection of New Components

All new components must be inspected for transport or storage damage such as scratches or dents. The following operations may be necessary, depending on the extent of damage:

Undamaged New Component

- Do not grind the cathodic primer.
- Thoroughly clean with silicone remover and rub dry.

Slightly Damaged New Component

- Sand out scratches.
- Finely sand the surrounding surface.
- Thoroughly clean with silicone remover and rub dry.
- Apply corrosion protection primer to bare areas.

Damaged New Components (bumps and dents)

- Beat out the dented area and sand down to bare metal.

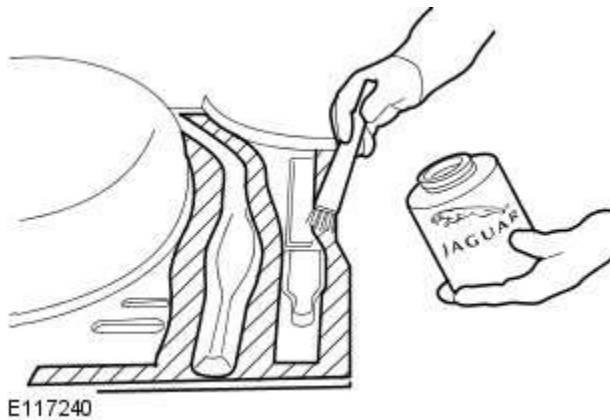
- Apply polyester filler (only onto bare metal).
- Apply filler.
- Lightly sand the whole component.
- Thoroughly clean with silicone remover and rub dry.
- Apply corrosion protection primer to bare areas.

The clinched flanges on the hood, doors, tailgate and liftgate must be sealed with clinched flange sealer, if this is not already applied.

Weld Components

Use a stripping disc to remove the cathodic primer on the inside and outside of the area to be welded. The stripped area should be kept as small as possible, retaining as much of the cathodic primer as possible, taking care not to damage the zinc coating.

Apply Welding Primer



NOTE: The welding primer must be stirred well or shaken before application.

Clean the repair area thoroughly, (silicone remover).

Apply welding primer evenly to all weld flanges, (old and new components).



NOTE: The welding primer must be allowed to dry before welding is carried out.

All weld beads must be ground down after all welding is completed, taking care not to weaken the material.

Any unevenness at the joint must be made good.

If necessary, spot weld missing weld studs into position.

The vehicle must be completely cleaned of sanding dust and metal swarf because of the danger of corrosion.

Clean and prime all internal areas and those to be sealed.



NOTE: The primer must be dry before sealing mastic or underbody protection is applied. Do not use thinners when applying sealing mastic, (the mastic will not dry).

Partial Renewal

The procedure to follow when partially renewing components is the same as described in the section "Welded Components".

The main difference when components are partially, rather than completely renewed, concerns the preparation of butt or lap joints.

When bodywork components are cut through, attention must be paid to the adequate removal of the paint and zinc coatings on inner areas. This specially applies to areas which are difficult to access internally.

It is important for the weld quality that the inner area is bare metal. Zinc and paint residues in the weld area burn and cause serious hole formation during welding.

If the zinc layer and the paint coating are not removed, the zinc and paint will burn during welding. The soot produced prevents satisfactory cavity protection.

Procedure

The paint layer must be removed for a width of 30 mm from the line of the weld using a rotating tress wire brush.

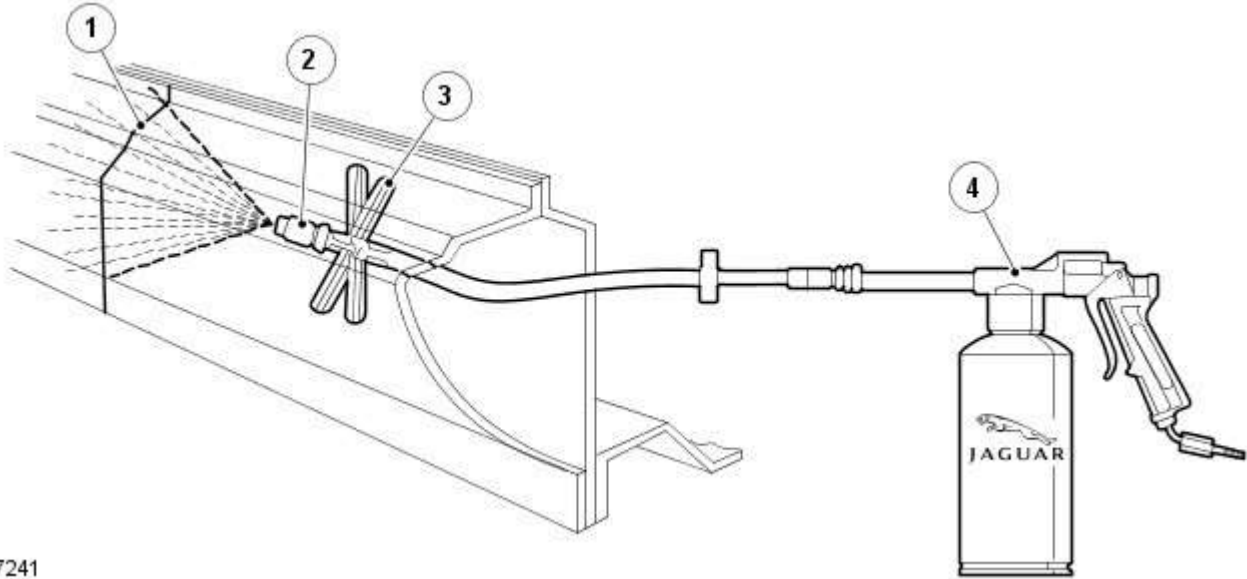
This operation must be carried out on both the new and the old parts of the bodywork.

Depending on the bodywork component, a 10 mm width of the underlying zinc layer must also be removed along the weld line.



NOTE: A flat scraper or a wire brush can be used instead of the rotating brush if the cavity is small. Do not use an angle grinder, which would weaken the structure.

Application of Cavity Wax Protection on a Rocker Panel After Partial Repair



E117241

Item	Description
1	Weld bead
2	Spray head
3	Distance maintainer
4	Spray gun

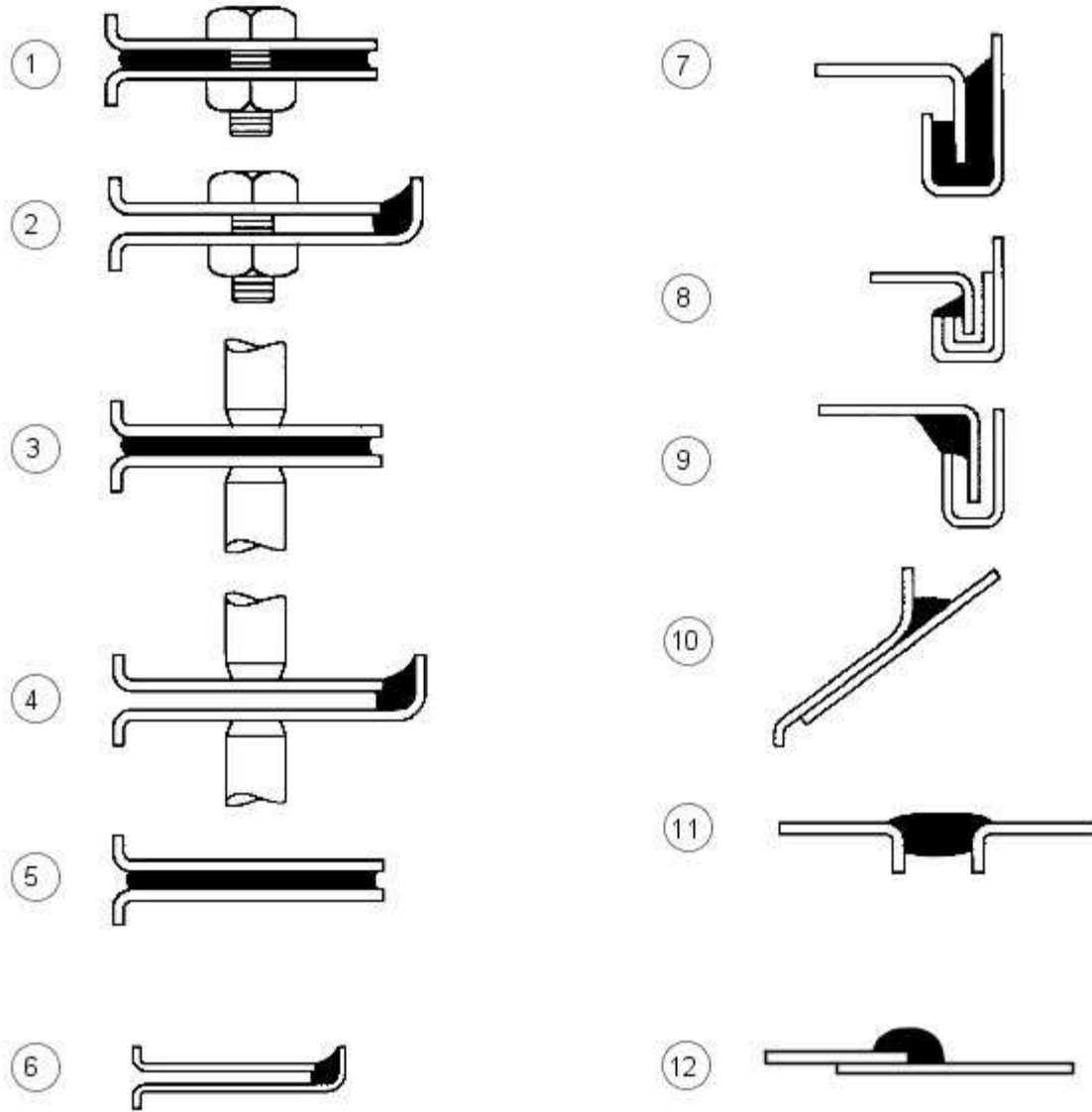
Classification of the different corrosion protection measures for dent removal

Corrosion Protection Method	Exterior Surfaces	Accessible Inner Surfaces	Inaccessible Inner Surfaces
Painting	X	X	
Cavity protection			X

Classification of Different Corrosion Protection Measures for Installation of New Components

Corrosion Protection Method	Weld Flanges Before Welding in Place (contact surfaces)	All Bare Sanded Areas	Weld Flange Area Accessible	Weld Flange Area Not Accessible
Welding primer	X			
Painting		X	X	
Clinched flange protection			X	
Cavity protection				X

Body Sealing Materials



E56018

Item	Description
1	Between Panels - Bolted
2	Panel Edge Bolted
3	Between Panels - spot welded
4	Panel edges - spot welded
5	Between panels - bonded
6	Panel edges - bonded
7	Clinch joints - type A
8	Clinch joints - type B
9	Clinch joints - type C
10	Gaps between panels - type A
11	Gaps between panels - type B
12	Lap joint

Approved Service Materials For Repair

Description - Usage	Supplier	Product Number
Sealing	-	-
Polyurethane cartridge extruded seam sealer - grey - this is not a weld through product	3M	08684
Polyurethane cartridge extruded seam sealer - white - this is not a weld through product	3M	08689
Polyurethane cartridge extruded seam sealer - black - this is not a weld through product	3M	08694
Polyurethane sachet 310ml - grey - this is not a weld through product	3M	08782
Polyurethane sachet 310ml - white - this is not a weld through product	3M	08787
Polyurethane sachet 310ml - black - this is not a weld through product	3M	08789
Polyurethane sachet 600ml - grey - this is not a weld through product	3M	08783
Polyurethane sachet 600ml - white - this is not a weld through product	3M	08788
Polyurethane sachet 600ml - black - this is not a weld through product	3M	08793
Sprayable seam sealer 2K polyurethane 150ml - grey	3M	08823
Sprayable seam sealer 2K polyurethane 250ml - grey	3M	08800
Sprayable seam sealer MS polymer grey	3M	08851
Super seam sealer can - grey	3M	08537
Super seam sealer - brush	3M	08540
Butyl cartridge highly flexible for joints greater than 3mm - grey	3M	08645
Terostat 9100 (1K PUR) adhesive sealant	Teroson	153.65B
Terostat 9100 (1K PUR) adhesive sealant	Teroson	112.72C
Terostat 9100 (1K PUR) adhesive sealant	Teroson	129.19S
Terostat 9200 (1K PUR) adhesive sealant - black	Teroson	120.20Q
Terostat 9200 (1K PUR) adhesive sealant - black	Teroson	120.25W
Terolan light vehicle body sealant	Teroson	128.60D
Terostat 9320 sprayable seam sealant - grey	Teroson	139.15A
Terostat 9320 sprayable seam sealant - black	Teroson	139.16B
Terostat 9320 sprayable seam sealant - ochre	Teroson	139.17C
Terolan special sealant brushable	Teroson	179.70H
Terostat II sprayable sealant band	Teroson	193.00D
Terostat VII round profile plastic sealing band	Teroson	112.46Z
Terostat IX putty	Teroson	157.86J
MS Polymer Sealing	-	-
MS Polymer caulkable sealer - white	3M	0855
Terostat 9120 (MS Polymer) adhesive sealant - white	Teroson	102.78X
Terostat 9120 (MS Polymer) adhesive sealant - black	Teroson	113.23H
Terostat 9120 (MS Polymer) adhesive sealant - black	Teroson	104.41R
Seam Sealing Light	-	-
Drip Chek clear	3M	08401
Drip Chek heavy	3M	08531
Silicone Sealant	-	-
Terostat 9140 silicone sealant - transparent	Teroson	140.08B
Terostat 9140 silicone sealant - black	Teroson	140.04X
Body Caulking	-	-
Body caulking	3M	08568
Structural Adhesive	-	-
Two component epoxy adhesive	3M	08122
Manual applicator gun	3M	08190
Panel Bonding Adhesive	-	-
Panel bonding adhesive + (nozzle 08193)	3M	08115
Requires manual applicator gun + nozzle	3M	08117
Tape and Film	-	-
Acrylic tape PT1100 double sided - 6mm x 40m	3M	80318
Acrylic tape PT1100 double sided -9mm x 20m	3M	80319
Acrylic tape PT1100 double sided 12mm x 20m	3M	80320
Acrylic tape PT1100 double sided 19mm x 20m	3M	80322
Acrylic tape PT1100 double sided 25mm x 20m	3M	80323
Polyolefin adhesion promoter	3M	05917
Abrasion resistance film	3M	08210
Abrasion resistance film	3M	08219
Sealing Tape and Primer	-	-
Terotape seam sealing tape 8mm x 6mm	Teroson	8164590
Terotape seam sealing tape 10mm x 16mm	Teroson	8164600
Terotape primer 420ml	Teroson	8164610
Cavity Wax	-	-
Body shultz coatings - black - 1L can	3M	08861
Body shultz coatings - black - 500ml aerosol	3M	08877
Inner cavity wax aerosol (transparent)	3M	08909
Inner cavity wax aerosol (amber)	3M	08901
Inner cavity wax 1L can (amber)	3M	08911
Inner cavity wax 1L can (transparent)	3M	08919
Inner cavity wax 10L drum (amber)	3M	08921
Inner cavity wax 10L drum (transparent)	3M	08929

Description - Usage	Supplier	Product Number
Terotex HV 200 extra spray - 1L can	Teroson	176.48
Terotex HV 200 extra spray - 10L tin	Teroson	179.40A
Terotex HV 200 extra spray - 60L barrel	Teroson	170.96J
Terotex HV 400 1L can	Teroson	169.65Q
Terotex HV 400 10L tin	Teroson	169.76C
Terotex HV 400 60L barrel	Teroson	169.85M
Teroson cavity spray 500ml aerosol	Teroson	155.71A
Underbody Wax	-	-
Terotex wax black 1L can	Teroson	114.59F
Protective wax	Teroson	122.73Q
Underbody Coating	-	-
Bodyguard stonechip coating (textured) can - black	3M	08868
Bodyguard stonechip coating (textured) can - white	3M	08878
Bodyguard stonechip coating (textured) can - grey	3M	08879
Bodyguard stonechip coating (flat) can - black	3M	08158
Bodyguard stonechip coating (flat) can - grey	3M	08159
Anti chip coating smooth - grey	3M	08886
Terotex record black 1L can	Teroson	122.48N
Terotex record light 1L can	Teroson	165.53S
Terotex anti chip compound light (UBC) 1L can	Teroson	191.08V
Terotex anti chip compound black (UBC) 1L can	Teroson	191.32V
Trim Adhesive	-	-
Auto adhesive - aerosol - clear (trim)	3M	08080
Auto adhesive - brushable - clear (trim)	3M	08150
Contact adhesive - aerosol - amber	3M	08090
Corrosion Protection	-	-
Zinc spray	3M	09113
Zinc spray	Teroson	158.18T
Anti Corrosive Agent	-	-
Terotex HV 350 1L can	Teroson	141.78L
Terotex HV 350 10L can	Teroson	160.02T
Terotex HV 350 60L barrel	Teroson	160.01S
Sound Deadening	-	-
Sound deadening sheets	3M	08840
Terodem SP 100 alu	Teroson	190.33
Terodem SP 200	Teroson	190.55M
Terodem SP 300 50 x 50	Teroson	145.28R
Terodem SP 300 100 x 50	Teroson	134.29X
Flexible Part Repair	-	-
Flexible part repair material (FPRM)	3M	05900
Adhesives / Thread Locking	-	-
Lock N Seal 243 thread locking	Loctite	13701
Lock N Seal 243 thread locking	Loctite	14131
Lock N Seal 243 thread locking	Loctite	25684
Stud N Bearing fit 271	Loctite	13704
Stud N Bearing fit 271	Loctite	14130
Stud N Bearing fit 271	Loctite	25685
Pipe sealant 577	Loctite	16604
Pipe sealant 577	Loctite	25689
Pipe sealant 55	Loctite	31899
Gasket	-	-
Multi gasket	Loctite	25688
Silicone copper	Loctite	19245
Silicone copper	Loctite	82046
Silicone 596 black	Loctite	19242
Silicone 596 black	Loctite	59875
3020 gasket adhesive	Loctite	31458
NVH Baffle	-	-
Sikabaffle 278	SIKA	

Approved Service Material Supplier - Contact Details

3M

- 3M United Kingdom PLC
- 3M Centre
- Cain Road
- Bracknell
- Berkshire
- RG12 8HT
- Telephone (01344) 858000
- www.3m.com

Cooper Pegler

- Burgess Hill
- Sussex
- RH 15 9LA
- Telephone (014446) 42526

Sika Ltd

- Watchmead
- Welwyn Garden City
- Hertfordshire
- AL7 1BQ
- Telephone (01707) 394444
- www.sika.co.uk

SATA Spray Equipment

- Minden Industrial equipment
- 16 Greyfriars Road
- Moreton Hall
- Bury St Edmunds
- Suffolk
- IP32 7DX
- Telephone (01284) 760791
- www.sata.com

Henkel Loctite Adhesives Limited

- Technologies House
- Wood Lane End
- Hemel Hempstead
- Hertfordshire
- HP2 4RQ
- Telephone (01442) 278000
- www.loctite.co.uk

Teroson

- Henkel Ltd
- Apollo Court
- 2 Bishops Square Business Park
- Hatfield
- Hertfordshire
- AL10 9EY
- Telephone (01707) 635000
- www.henkel.co.uk

Underbody sealer

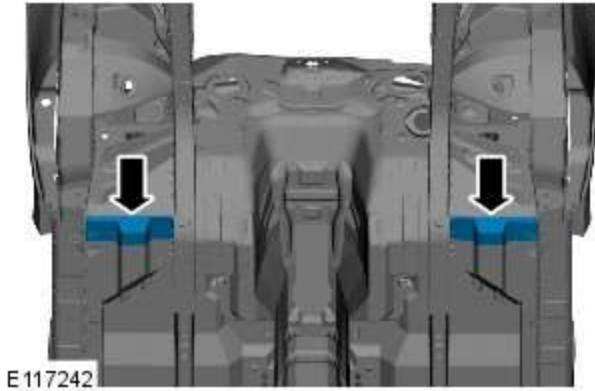
Under floor areas and the front part of the spare wheel well are treated with a plastisol PVC underbody sealer. This material is not suitable for re-treatment. When repairing areas of underbody sealer, strip the factory-applied underbody sealer back to a suitable break point. Ensure that a clean metal surface is exposed and that the edge of the existing adheres soundly to the panel.

Apply new underbody sealer between primer and surface paint operations. Apply seam sealer as necessary before application of underbody sealer. Ensure that blanking plugs and grommets in the floor pan (except those used for wax injection) are fitted before underbody sealer application. Refit any heat-fusible plugs which have been disturbed in repair with the aid of a hot air blower, or replace with rubber grommets

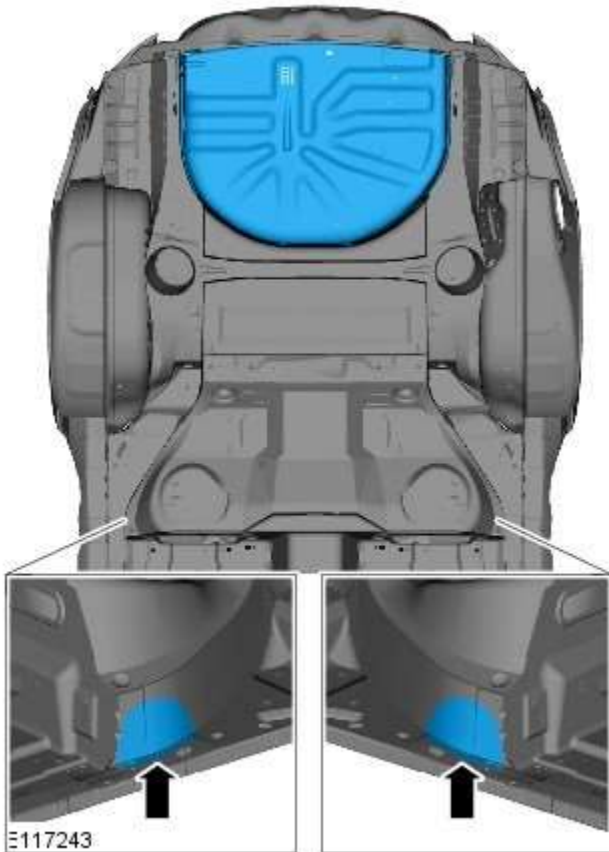


CAUTION: Ensure that suspension units, wheels, tires, power unit, drive shafts, exhaust and brakes, (including all mounting points), are shielded prior to application of fresh underbody sealer.

Area of Underbody Sealer Application - Floor Pan (Front)



Area of Underbody Sealer Application - Spare Wheel Well and Rear Side Member



Precautions During Body Repairs and Handling

Take care when handling the vehicle in the workshop. Underbody sealers, seam sealers, underbody wax and body panels may be damaged if the vehicle is carelessly lifted.

Proprietary Anti-corrosion Treatments

The application of proprietary anti corrosion treatments in addition to the factory-applied treatment could invalidate the corrosion warranty and should be discouraged. This does not apply to approved, compatible, preservative waxes which may be applied on top of existing coatings.

Fitting Approved Accessories

When fitting accessories ensure that the vehicle corrosion protection is not affected, either by breaking the protective coating or by introducing a moisture trap.

Do not screw self-tapping screws directly into body panels. Fit suitable plastic inserts to the panel beforehand. Always ensure that the edges of holes drilled into panels, chassis members and other body parts are protected with a suitable zinc rich or acid etch primer, and follow with a protective wax coating brushed onto the surrounding area.

Do not attach painted metal surfaces of any accessory directly to the vehicle's bodywork unless suitably protected. Where

metal surfaces are bolted together always interpose a suitable interface material such as weldable zinc rich primer, extruded strip, or zinc tape.

Steam Cleaning

Due to the high pressure/temperature generated by steam cleaning equipment, there is a risk that certain adhesives and corrosion prevention material may become softened or liquified.

Take care not to allow the steam jet to dwell on one area, and keep the nozzle at least 300mm from the panel surface.



CAUTION: Do not remove wax or lacquer from underbody areas during repairs.

Inspection During Maintenance Servicing

It is a requirement of the corrosion warranty that the vehicle is inspected for corrosion by a Jaguar Authorised Repairer during a routine service, to ensure that the factory-applied protection remains effective.

Rectify any bodywork damage or evidence of corrosion found during inspection as soon as is practicable, both to minimise the extent of the damage and to ensure the long term effectiveness of the factory-applied corrosion prevention treatment.

Underbody Protection Repairs

Whenever body repairs have been carried out, ensure that full sealing and corrosion protection treatments are reinstated. This applies both to the damaged areas and also to areas where protection has been indirectly impaired, as a result either of accident damage or repair operations.

Remove corrosion protection from the damaged areas before straightening or panel beating. This applies in particular to panels coated with wax, PVC underbody sealer, sound deadening pads etc.



CAUTION: Do not use oxy-acetylene to remove corrosion prevention material. Large volumes of fumes and gases are liberated by these materials when they burn.

The most common method of removal is by means of a hot air blower with an integral scraper. High temperatures can be generated with this equipment which may cause fumes. Take care during its use.

Structural Adhesive



CAUTION: When separating a joint with metal to metal adhesive, it is important to avoid distortion. Heat gradually until the bond weakens sufficiently to permit panel separation - do not apply excessive heat.



NOTE: When spot welding through metal to metal adhesive, take particular care to adjust the equipment setting to ensure a suitable weld.

Metal to metal adhesive is applied to critical joint areas during factory assembly. The material used is a high temperature, heat cured, nitrile phenolic which serves to bond two metal surfaces and also to seal the joint against ingress of dust, moisture and fumes. This material is not suitable for service use and, during repair, should be substituted by an approved structural adhesive. For panel specific information and to identify the areas of structural adhesive application in repair, refer to the relevant sheet metal removal and installation procedure.

Expanding Foam Acoustic Seals

Expanding foam acoustic seals are used in various closed-sections of the body to improve vehicle refinement. The seals are installed during the vehicle body manufacture and expand during the paint process up to ten times original size, thus locking them into position. They are located such that they prevent noise accentuation along a section and reflect air borne noise away from the cabin.

The seals have spilt functionality depending on location. The seals located at the base of the body pillars have a primary function of preventing water ingress when wading. Their secondary function is to prevent noise and dust ingress.

The seal around the fuel filler has a primary function of preventing both fuel and water ingress. With a secondary function of preventing noise and dust ingress.

The remaining seals primary function is to prevent noise accentuation along a section and reflect air borne noise away from the cabin.

Another advantage of the seals is that they marginally increase the overall stiffness of the body and its structural performance in case of a crash.

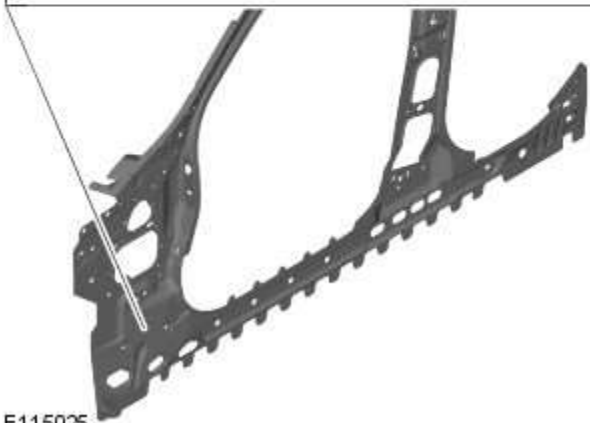
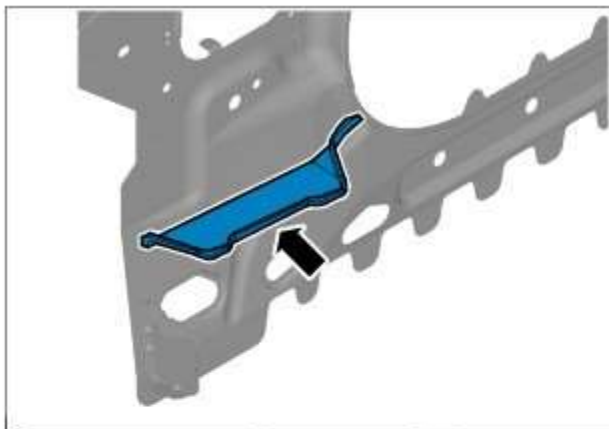
The seals are manufactured from an expandible polymer.

Replacing Expanding Foam Acoustic Seals

As paint oven temperatures used in a repair workshop are significantly lower than those that are used during manufacture of the vehicle, (the temperatures are not sufficient to expand the foam), a different process is required to replicate the foam in repair.

If a repair disturbs the expanding foam acoustic seal it must be reinstated. If access allows, (whether a new seal is fitted or the original is reused), acoustic foam should be injected after paint refinishing. If access is not possible, or it is not practical to apply expanding foam due to the nature of the repair, a suitable flexible PU sealer should be applied around the seal and the corresponding body panel/s prior to assembly. In all cases the application of foam / sealer should form a seal between the expanding foam acoustic seal and any adjacent panelwork.

Expanding Foam Acoustic Seals - A-pillar, (inner panel)



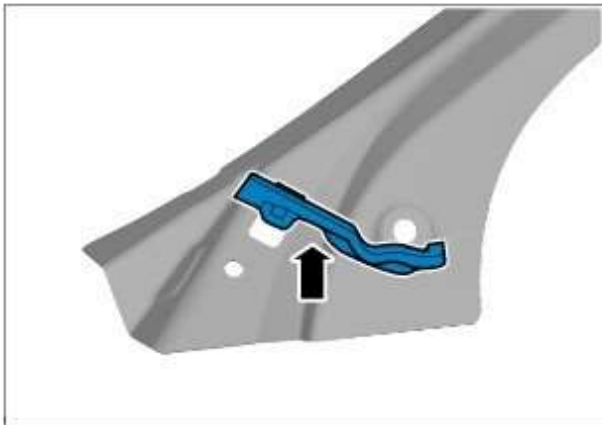
E115025

Expanding Foam Acoustic Seals - A-pillar, (reinforcement)



E115026

Expanding Foam Acoustic Seals - A-pillar, (upper)



E115027

Expanding Foam Acoustic Seals - B-pillar, (reinforcement)



E115028

Expanding Foam Acoustic Seals - Quarter Panel, (fuel filler)



E 115031

Expanding Foam Acoustic Seals - Quarter Panel, (inner reinforcement)



E 115031

Expanding Foam Acoustic Seals - Quarter Panel, (fuel filler)



E 115031

Expanding Foam Acoustic Seals - Quarter Panel, (fuel filler)



E 115031

Seam Sealer

A heat cured, PVC based sealant is applied to specific joint seams during factory assembly. This material is not suitable for service use and during repair and should be substituted by an approved seam sealer.



NOTE: Where seams are inaccessible following the reassembly or fitting of components, ensure that a paste-type seam sealer is applied to such seams. Certain seams also become inaccessible after the completion of panel repairs. In such instances apply seam sealer and paint before final assembly.

Apply seam sealers after the application of primer and before the application of top coat. The sealer must form a continuous bead, with the profile of the bead dependent on the type of seam. If the seam sealer is applied with a brush take particular care to maintain the required coverage of the seam.

Ensure that all accessible repair seams are sealed following a repair. Damage to a vehicle often flexes areas of the body remote from the impact. As a result the seam sealer in these areas may be disturbed by subsequent straightening and repair operations. Check all seams in the vicinity of the area undergoing repair for evidence of cracked seam sealer, then clean out as required and apply fresh seam sealer using the following procedure:

- Clean the affected seam and re-treat any exposed metal areas with a suitable etch phosphate primer.
- Treat affected area with an etch-acid primer.
- Apply appropriate seam sealer as necessary.
- apply appropriate colour coat (and under body sealer as applicable).

Provided access is adequate, apply seam sealer to both sides of a repair joint. Where access is limited to one side only, (e.g. box section), treat the affected box member with cavity wax.

Cavity Wax

After repairs, always re-treat these areas with an approved cavity wax. In addition, treat all interior surfaces which have been disturbed during repairs whether they have been treated in production or not. This includes all box members, cavities and door interiors.

Before wax injection, ensure that the cavity to be treated is free from any contamination or foreign matter. Where necessary, clear out any debris.

Ensure that cavity wax is applied after the final paint process and before refitting any trim components.

During application ensure that the wax covers all flanges and seam areas and that it is adequately applied to all repaired areas of both new and existing panels.

It should be noted that new panel assemblies and complete body shells are supplied without wax injection treatment. Ensure that such treatment is carried out after repairs.

Effective cavity wax protection is vital. Always observe the following points:

- Complete all paint refinish operations before wax application.
- Check the spray pattern of injection equipment.
- Mask all areas not to be waxed.
- Remove body fixings, such as seat belt retractors, if contamination is at all likely.
- Move door glasses to fully closed position before treating door interiors.
- Treat body areas normally covered by trim before refitting items.
- Check that body and door drain holes are clear after the protective wax has dried.
- Keep all equipment clean, especially wax injection nozzles.

Body Repairs - Water Leaks - Water Leaks

Description and Operation

General

If water leaks occur after bodywork repairs, the cause can be established using the checks described below. A systematic and logical procedure is required to locate water leaks. Before beginning extensive checks, a thorough visual inspection must be carried out.

Visual Inspection

- The following characteristics may indicate existing leaks:
- Check the clearance and accurate fit of ancillary components such as the hood, tailgate, liftgate, doors, and so on.
- Check for correct fit and possible damage to sealing elements such as blanking plugs, rubber door seals, and so on.
- Check water drain holes for unhindered flow.

Various tests can be used to provide further information on possible leaks:

- Water test
- Washer test
- Road test
- Chalk (powder) test

Practical execution of tests and checks

Water test



NOTE: Never aim a jet of water directly at a rubber seal.

Carry out the water test with a second person present (in the passenger compartment). Use variable washer nozzles (concentrated water jet to fine spray mist). Start in the lower section and spray the whole area, working upwards in stages.

Washer test

Further tests can be carried out in the washer system. Some leaks originate here, or only occur here. The relevant passenger compartment should be checked using a torch during the wash procedure.

Road test

If no leaks are located during the tests above, road tests should be carried out on wet roads.

Road tests under various conditions:

- At various speeds.
- On various road surfaces (asphalt to cobbles).
- With loaded or unloaded vehicle.
- Driving through puddles (splash water).

Chalk test (powder test)

In this test, the clamping load and the bearing surface of the seal are checked.

Performing the test:

- Dust the door seal with powder or coat with chalk.
- Coat the bearing surface of the seal with a thin film of Vaseline.
- Slowly close the door and open it again.
- Check the width and continuity of the imprint on the door seal.

Other test equipment

Other equipment such as stethoscopes, UV lamps, special mirrors or ultrasound measuring instruments can be used to locate leaks.

Rectifying the leak using recommended tools, auxiliary equipment and materials

Tools and auxiliary equipment:

- Dry, absorbent cloths
- Variable washer nozzle
- Torch, fluorescent tube
- Mirror
- Compressed air
- Seal lip installer
- Wet/dry vacuum cleaner
- Sealing compound compressor
- Remover for interior trim
- Cutter blade or pocket knife
- Wedge (wood or plastic)
- Hot air blower
- Special mirror for concealed leaks

- Air flow checker
- Sealing compound (tape and plastic compound)
- Multi-purpose sticker
- Clinched flange sealer
- Window sealing compound
- Water shield (PVC)
- Double-sided adhesive tape for water shield
- Methylated spirit (available from trade outlets)
- PU adhesive
- Silicone remover
- Tar remover

Water leaks according to mileage or running time

Increasing mileage has an effect on the problem of leaks in a vehicle. Possible influencing factors are:

 Servicing and maintenance of seals:

- No maintenance, lack of maintenance or incorrect maintenance
- Using an incorrect agent

 Damaged seals:

- As a result of aging, wear or incorrect handling/assembly.

 Heavy soiling of the vehicle:

- Heavy soiling of a vehicle can seriously impair the function of water drainage channels in particular, and also of rubber seals.

 Age-related factors:

- Environmental factors
- UV radiation
- Extreme climatic conditions

 Corrosion can have a serious impact on bodywork, in particular as a result of:

- Lightly or heavily rusted seal carriers
- Rusted body seal welds
- Perforation corrosion

Water leaks after body repairs

If a vehicle develops a leak after body repairs, the following points must be taken into consideration in particular:

 The correct seating of ancillary components and their seals must be checked.

 The correct alignment of doors/tailgate and liftgate must be checked. The associated seals must not be damaged and must be installed correctly.

 Check that panel seams are correctly sealed.

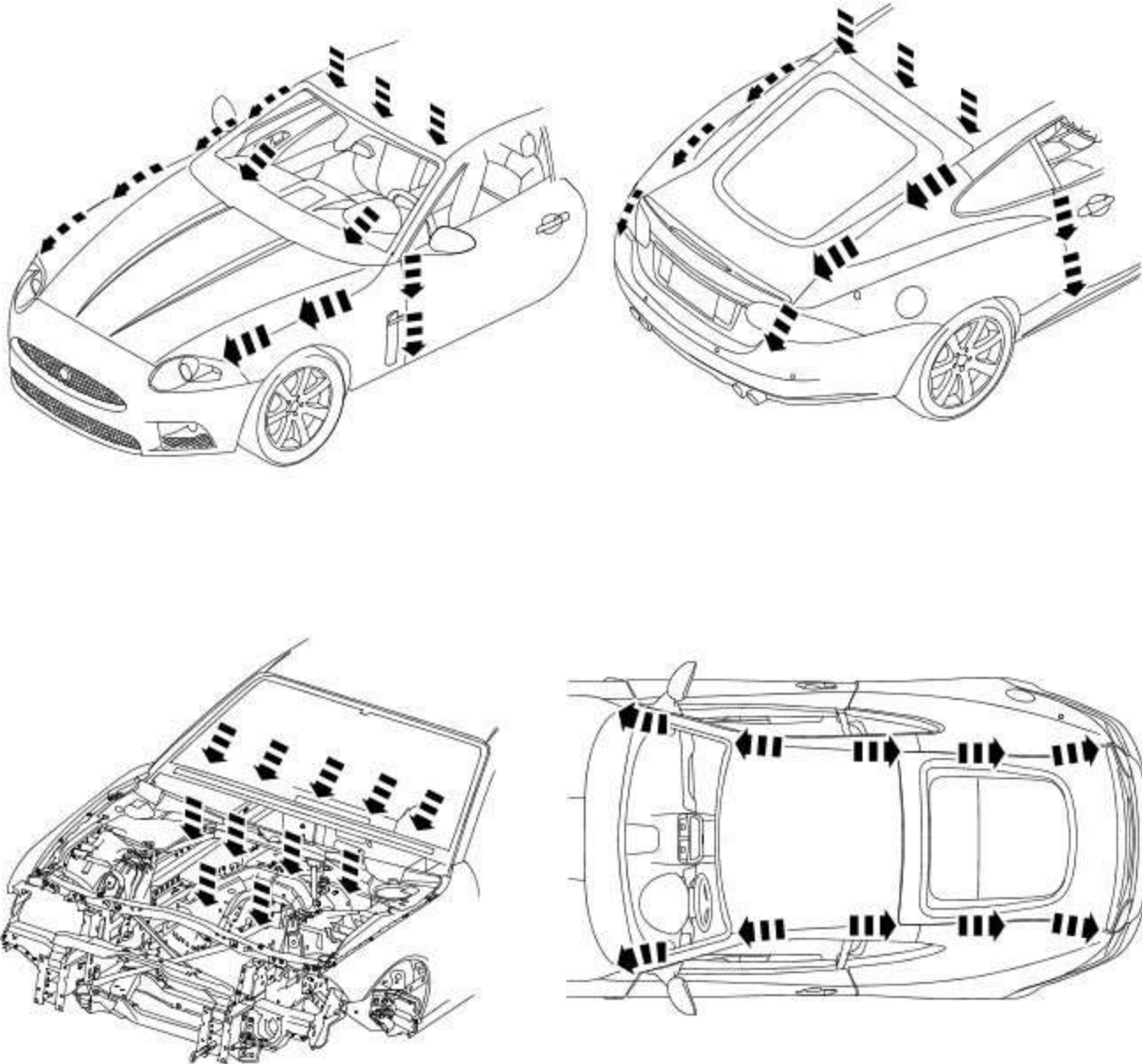
 The correct seating of rubber grommets must be checked.

 Directly-glazed windows must have correct and complete bonding.

Water drainage system

If a vehicle develops water leaks, then areas into which water is routed or drained should be checked first.

Water drainage system (illustration for reference only)



E102719

Item	Description
1	Water drainage, front
2	Water drainage, side and rear
3	Roof drainage
4	Engine compartment drainage

Water leaks, diagnosis and corrective action: Front passenger compartment

Windscreen

Diagnosis:

- Ingress of water into A-pillar area or instrument cluster area and rocker panel area.

Cause:

- Breaks in adhesive beads

Corrective action:

- The breaks in adhesive beads can be located from inside by using compressed air. The leak can be identified from outside by the escaping air.
- The second test method is by means of a water test. The outer trims must be raised carefully using a plastic wedge. The leak should be located from inside by a second assistant.

Side windows

In the case of side windows, the same problems can arise as for a windscreen. The same corrective actions must therefore be used.

Door seal

Diagnosis:

- Water ingress in the lower part of the interior door trim or in the rocker panel area.

Cause:

- The water shield fitted behind the interior door trim exists to drain off water that has entered the door via the drainage holes, either downwards or outwards. If the water shield seal is damaged or has been fitted incorrectly, then water can get into the passenger compartment.
- In addition to this, the drainage holes can become clogged with leaves, dirt or excess cavity protection agents. Water gathers in the door and ingresses into the passenger compartment.
- Check water shield for damage or correct fitting.
- If the water shield needs to be re-bonded, then approved seam sealer should be used.
- Before the water shield is installed, the drainage holes must be checked for unhindered flow.

Door seals

Diagnosis:

- Ingress of water into the rocker panel area

Cause:

- Insufficient clamping load between seal and door.

Corrective action:



NOTE: When adjusting the clamping load, the profile alignment of the relevant components must always be taken into consideration.



NOTE: Do not realign the flange too far in the direction of the door, as this can reduce the bearing surface of the seal to the door.

- Check clamping load:
- The easiest way to check the clamping load of a seal to the respective bearing surface is by means of a paper strip test. This consists of trapping strips of paper at various points between the door and the seal, and fully closing the door. If it is possible to pull out the paper with no great resistance, then the clamping load is too low.
- Adjust the clamping load:
- The clamping load is normally adjusted using the striker. When doing so, the edge alignment from the door to the side panel, or from the front door to the rear door must be taken into account.
- Another setting method is to realign the panel flange for the seal mounting. The clamping load is increased by moving the flange towards the door.
- Check the bearing surface:
- Apply chalk evenly to the surface of the seal. Evenly coat the bearing surface of the door with Vaseline.
- Close the door fully, the lock must engage. Open the door. The imprint of the chalk (bearing surface) can be identified in the film of Vaseline.
- The bearing surface should be at least 5mm across at all points.

Other causes:

- The door seal must completely seal the door where it meets the bodywork.
- Water can ingress directly or indirectly into the interior of the vehicle if the seal is damaged at any point.

Corrective action:

- A damaged or worn door seal must always be renewed in full.
- When renewing the seal, the following must be taken into account:
- Always fit the seal first in the area of the narrow radii (corner points).
- Next, secure the seal to the flange evenly by tapping lightly with a rubber hammer. The installed seal must not be kinked at any point.



NOTE: The prescribed length of a seal must not be shortened.

Other cause:

- The door seal is attached to the welded flange all the way round. If this welded flange is uneven or damaged at any point (usually in areas with small radii) then this point could be subject to leaks.
- A stretched seal carrier can also cause a leak.
- In both cases, water gets into the vehicle interior under the seal carrier.

Corrective action:

- Align the deformed welded flange using a hammer and anvil block, prevent and, if necessary, repair any paint damage.

Sliding roof/tilting roof

Diagnosis:

- Ingress of water at sliding roof aperture

Cause:

- The sliding roof/tilting roof is installed in a water trap. The water drains off via the water trap, water drain holes and drain hoses. The drain hoses lead downwards on both sides via the A-pillar and B-pillar.
- The drain holes or drain hoses can become clogged with leaves, dirt, underbody protection and so on.

Corrective action:



NOTE: In the case of a sliding or tilting roof, the external rubber seal and the lock actuator or latch mechanism must be checked first of all.

- Check the water trap for leaks.
- Check the drain hoses for leaks and for correct connection to the water trap.
- Check the drainage system for unimpeded flow, and blow out with compressed air if necessary.
- Check the external seal and the correct adjustment of the sliding roof.

Liftgate

Diagnosis:

- Ingress of water into rear headlining area and luggage area.

Cause:

- The leak problems of the tailgate and liftgate correspond to those of the doors.
- In addition to this, the area to be sealed is much bigger. The routing holes for cables and hoses must also be sealed.
- The rubber grommets for the routing holes must be checked for damage and correct seating (fully unhooked).
- The mounting points of the liftgate hinges may leak.

Corrective action:

- Check the rubber grommets and renew if necessary.
- Check the hinge mounting points, and re-seal with sealing compound if necessary.

Forced air extraction

Diagnosis:

- Ingress of water into side luggage compartment area

Cause:

- The forced air extraction for the vehicle interior is located in the quarter panel lower extension.
- The rubber flap of the forced air extraction must be able to move freely.

Corrective action:

- Remove the forced air extraction.
- Check the seal area between the bodywork and housing, as well as the rubber flap.
- Renew seal if necessary.

Rear window

Diagnosis:

- Ingress of water into the luggage compartment area

Cause:

- Rear window leaking.
- Check for leak in the same way as for leaking windscreen.

Body Repairs - Vehicle Specific Information and Tolerance Checks - Body and Frame

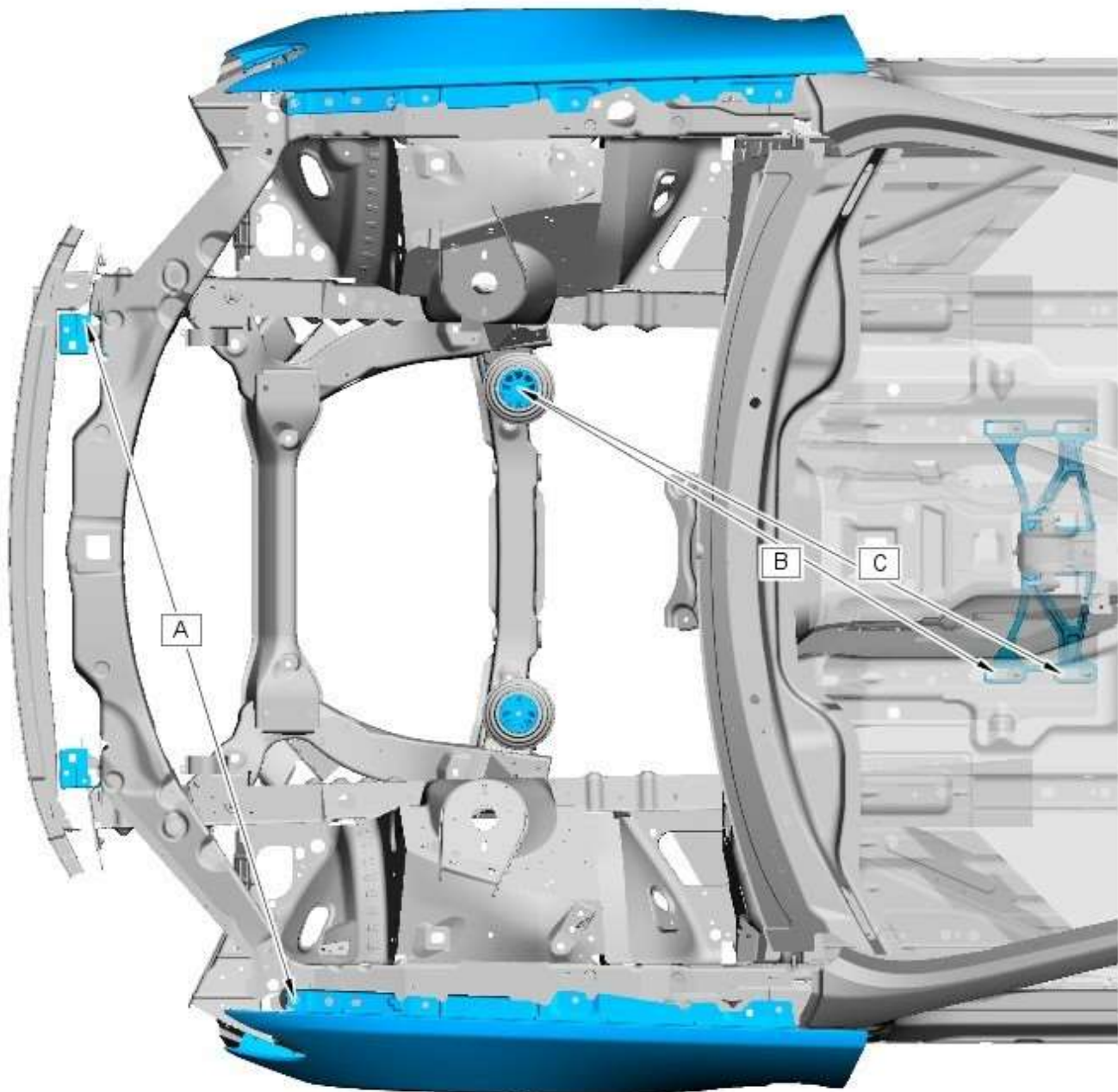
Description and Operation

Front End Body Dimensions

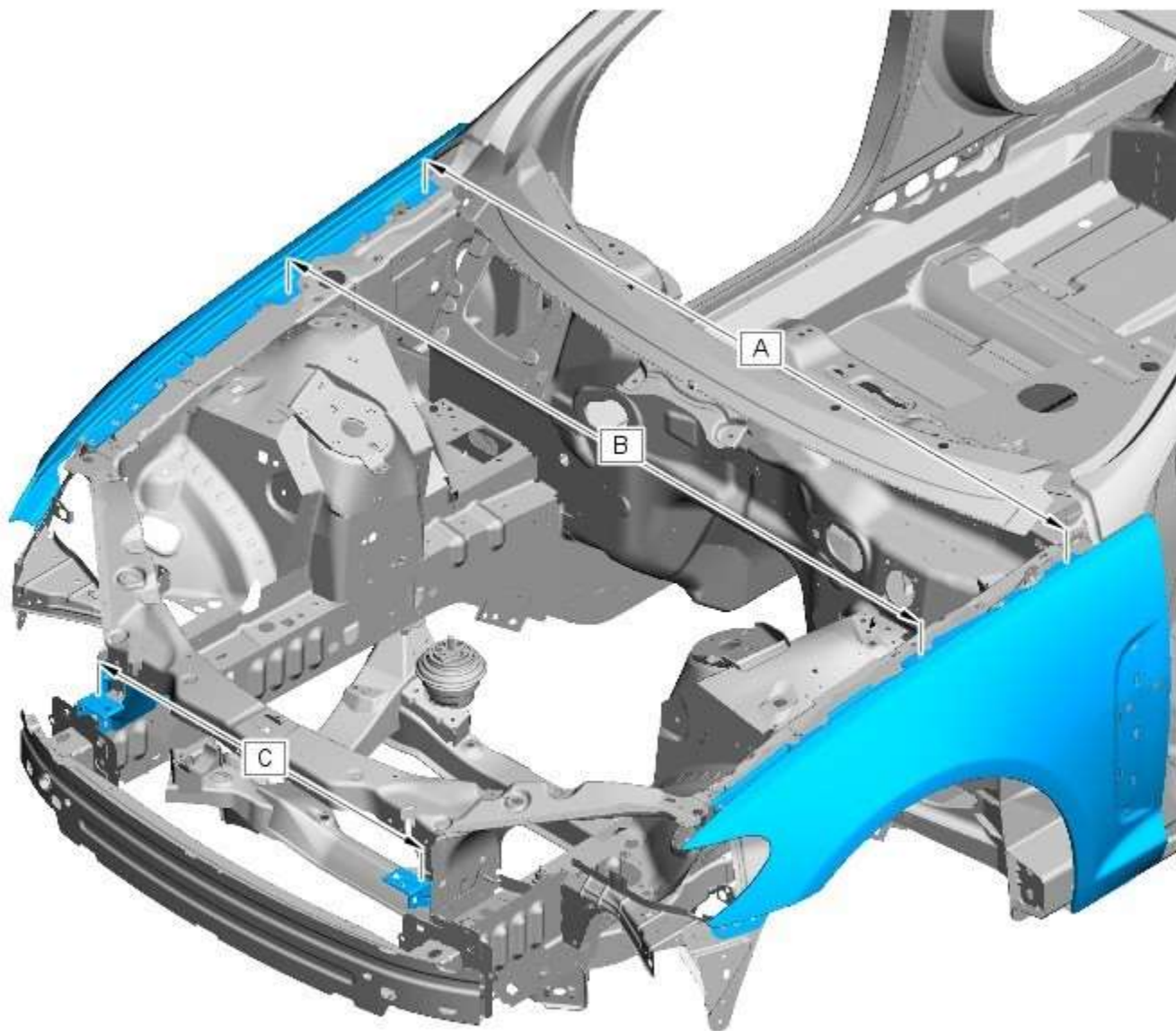
NOTES:

 All dimensions shown are in millimetres (mm).

 Dimensions shown to holes, are always taken from/to the hole centre. They are also always to the body panel surface, not to the top of bolts or components.

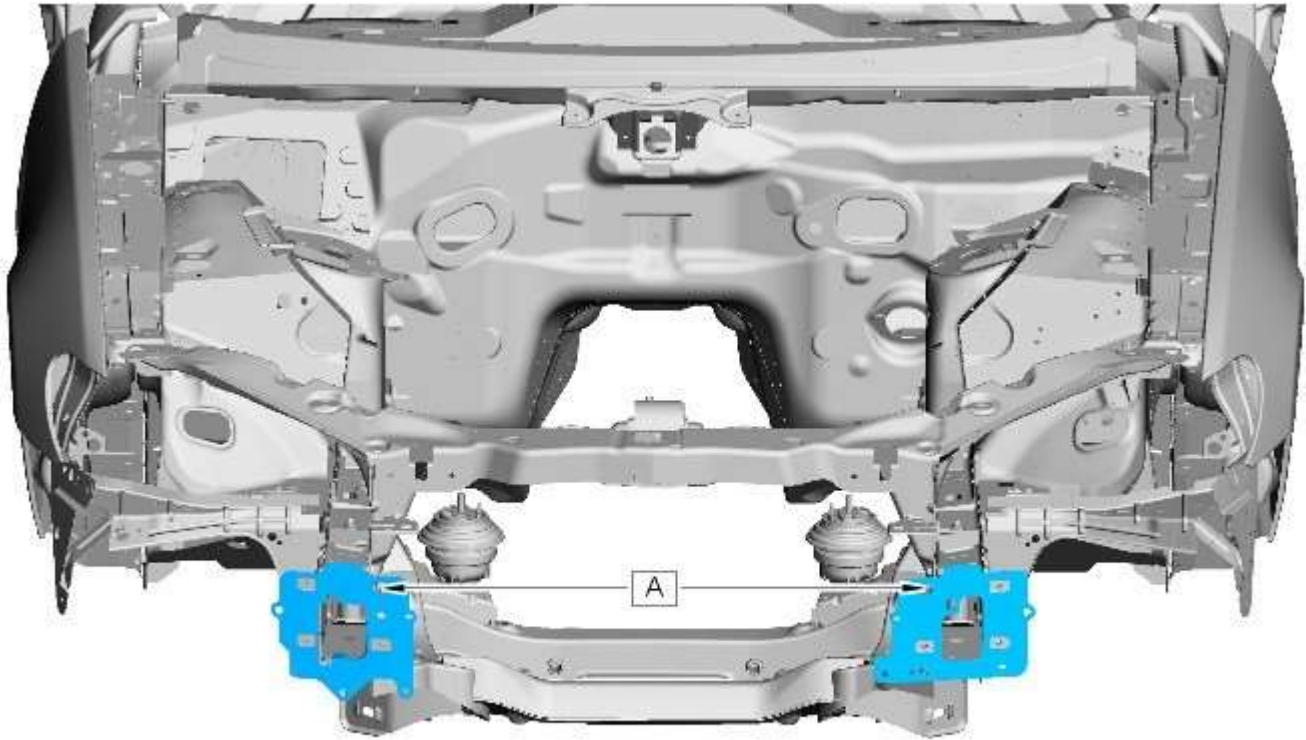


Item	From	To	Dimension
A	Headlamp RH inboard fixing hole	Front fender LH forward fixing hole	510.5
B	Transmission LH mounting, forward stud	Engine RH mounting, forward fixing hole	987.2
C	Transmission LH mounting, rear stud	Engine RH mounting, forward fixing hole	1091



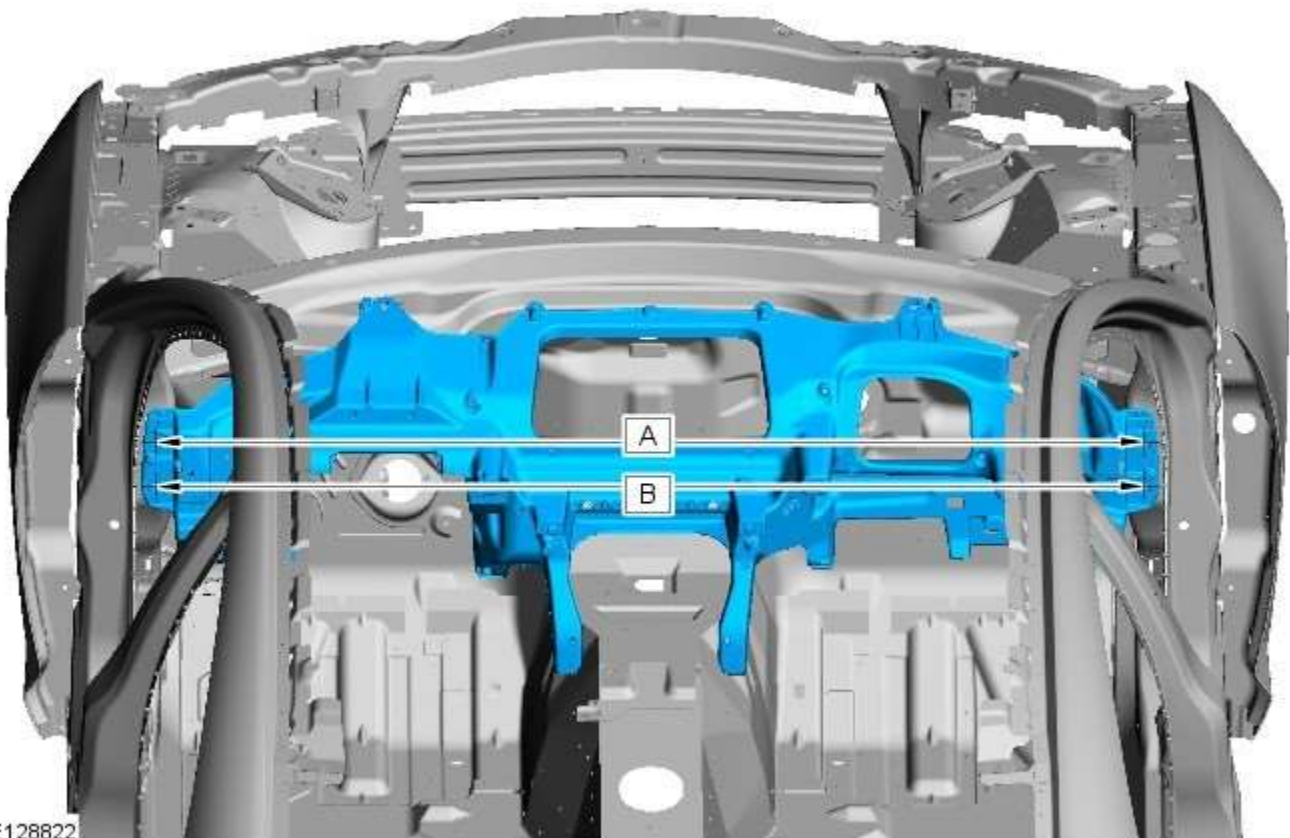
E 128817

Item	From	To	Dimension
A	Front fender RH, rear fixing hole	Front fender LH, rear fixing hole	1549.6
B	Front fender RH, centre fixing hole	Front fender LH, centre fixing hole	1518.1
C	RH Headlamp top inboard fixing hole	LH Headlamp top inboard fixing hole	771



E128818

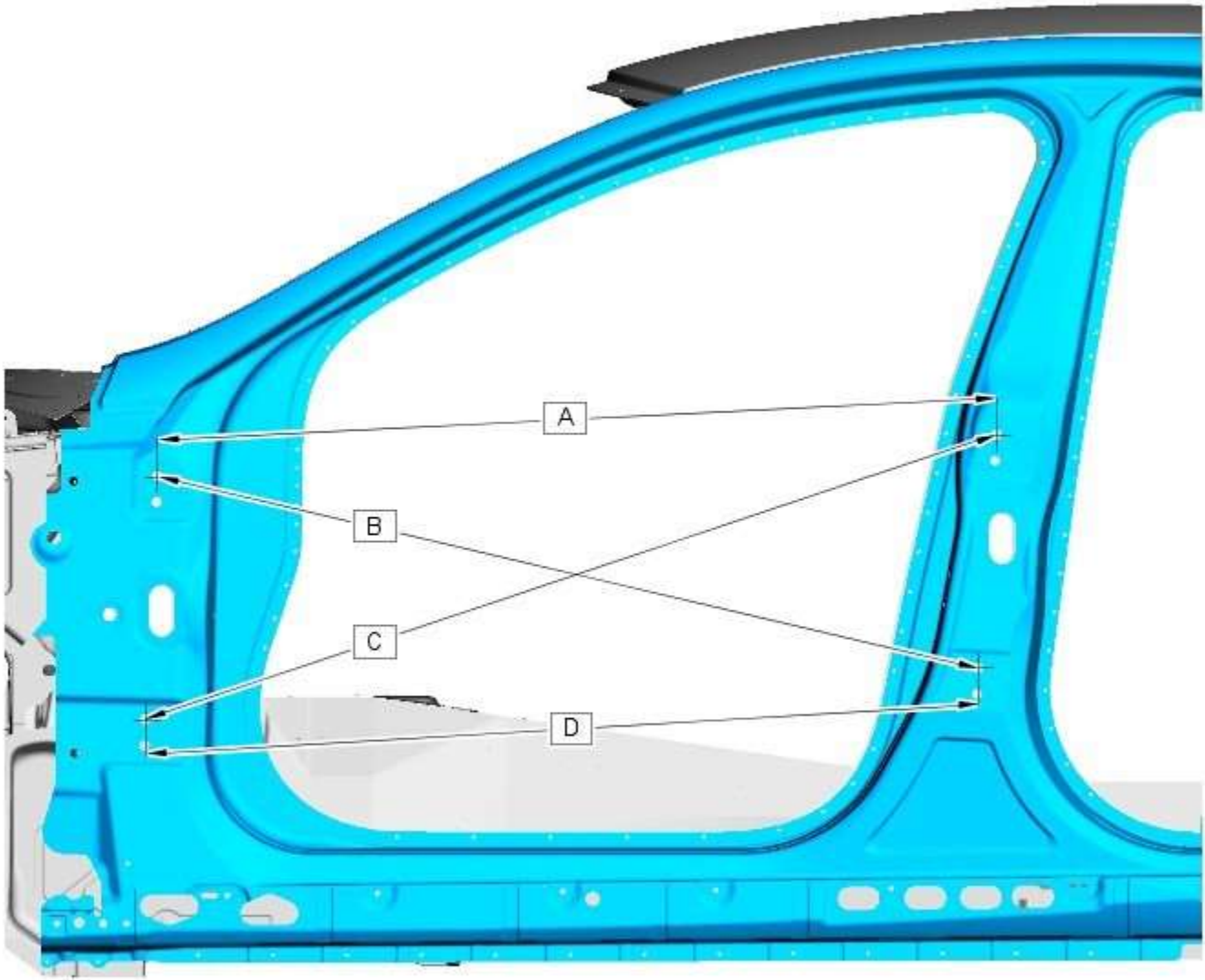
Item	From	To	Dimension
A	Front bumper RH top inboard fixing hole	Front bumper LH top inboard fixing hole	770.9



E128822

Item	From	To	Dimension
A	Instrument panel carrier RH top fixing hole	Instrument panel carrier LH top fixing hole	1416
B	Instrument panel carrier RH bottom fixing hole	Instrument panel carrier LH bottom fixing hole	1416

Side Panel Dimensions



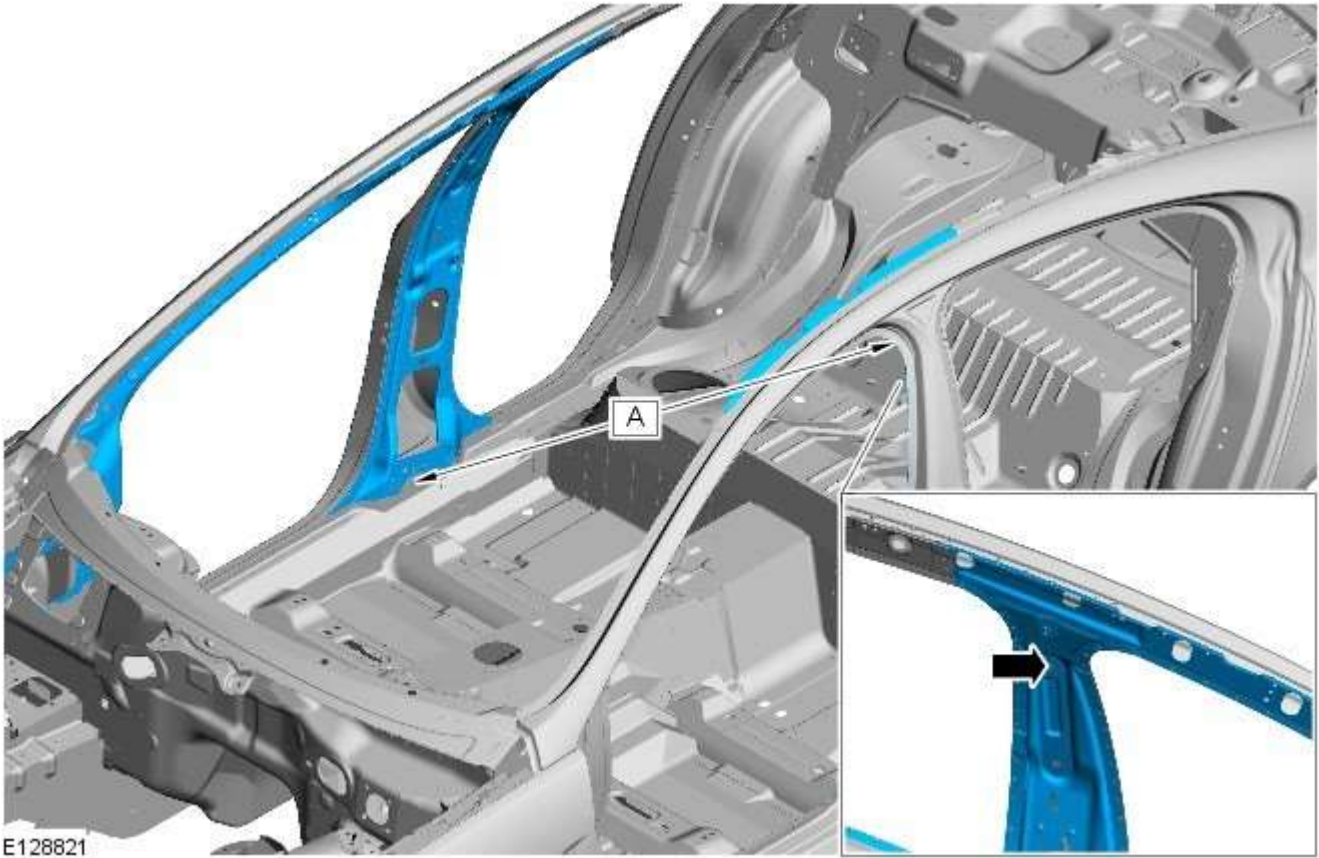
E 128819

Item	From	To	Dimension
A	Front door top hinge, top fixing hole	Rear door top hinge, top fixing hole	1129.4
B	Front door top hinge, top fixing hole	Rear door bottom hinge, top fixing hole	1133.8
C	Front door bottom hinge, top fixing hole	Rear door top hinge, top fixing hole	1206.7
D	Front door bottom hinge, top fixing hole	Rear door bottom hinge, top fixing hole	1122.4



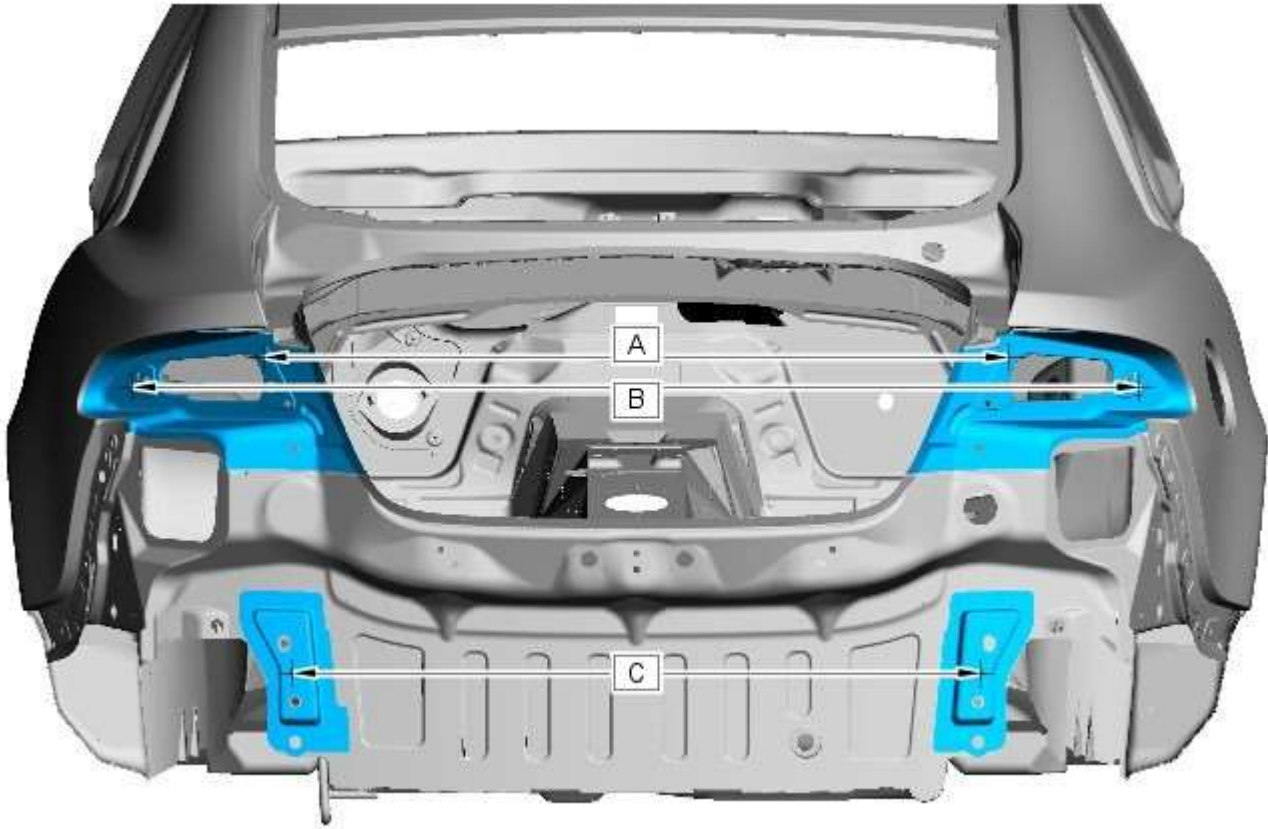
E 128820

Item	From	To	Dimension
E	Rear door top hinge, top fixing hole	Rear door striker, top fixing hole	844.4
F	Rear door bottom hinge, top fixing hole	Rear door striker, top fixing hole	884.7



Item	From	To	Dimension
A	Front seat belt retractor fixing hole	Front seat belt anchorage fixing hole	1684.37

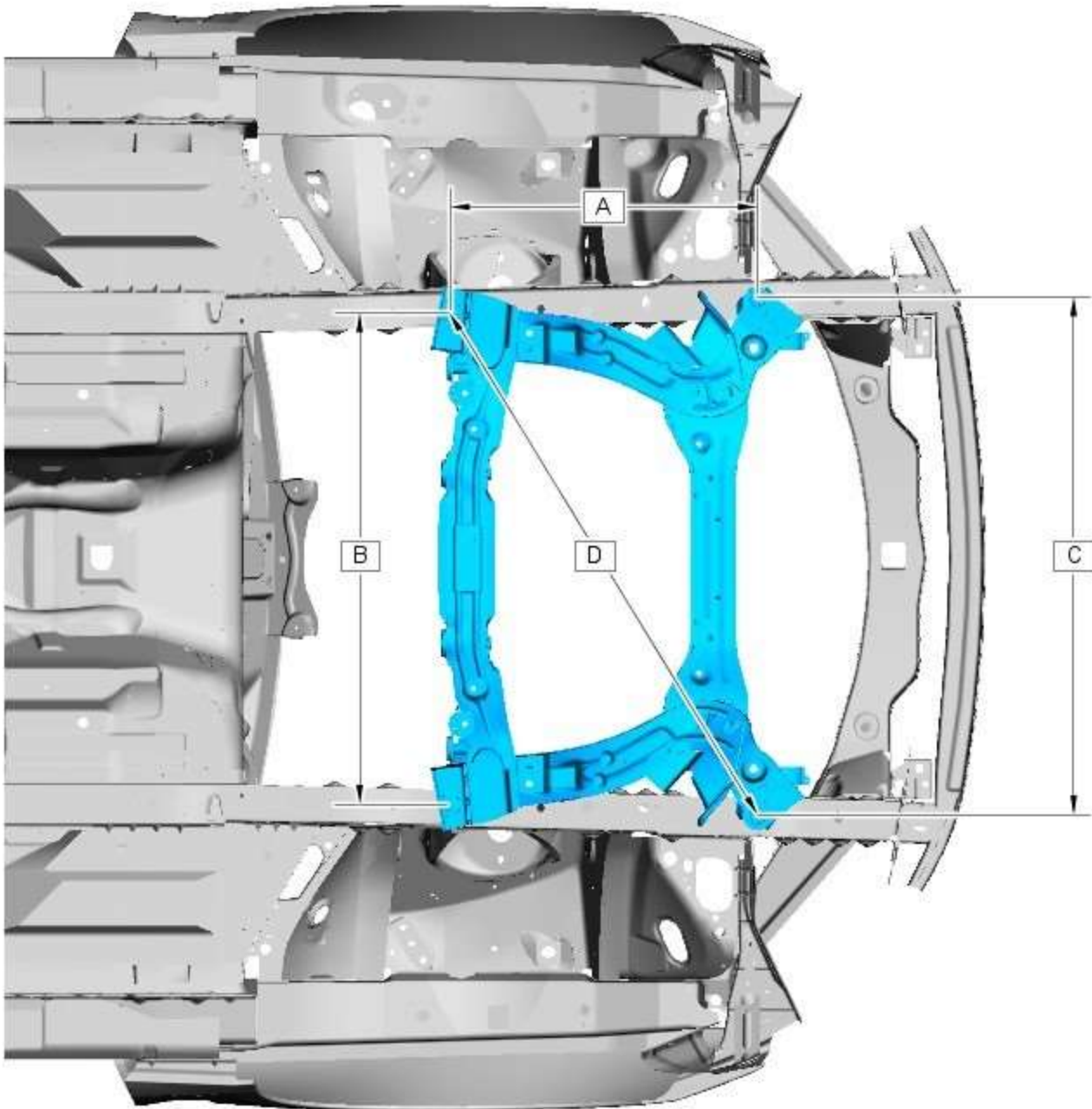
Rear End Body Dimensions



E128823

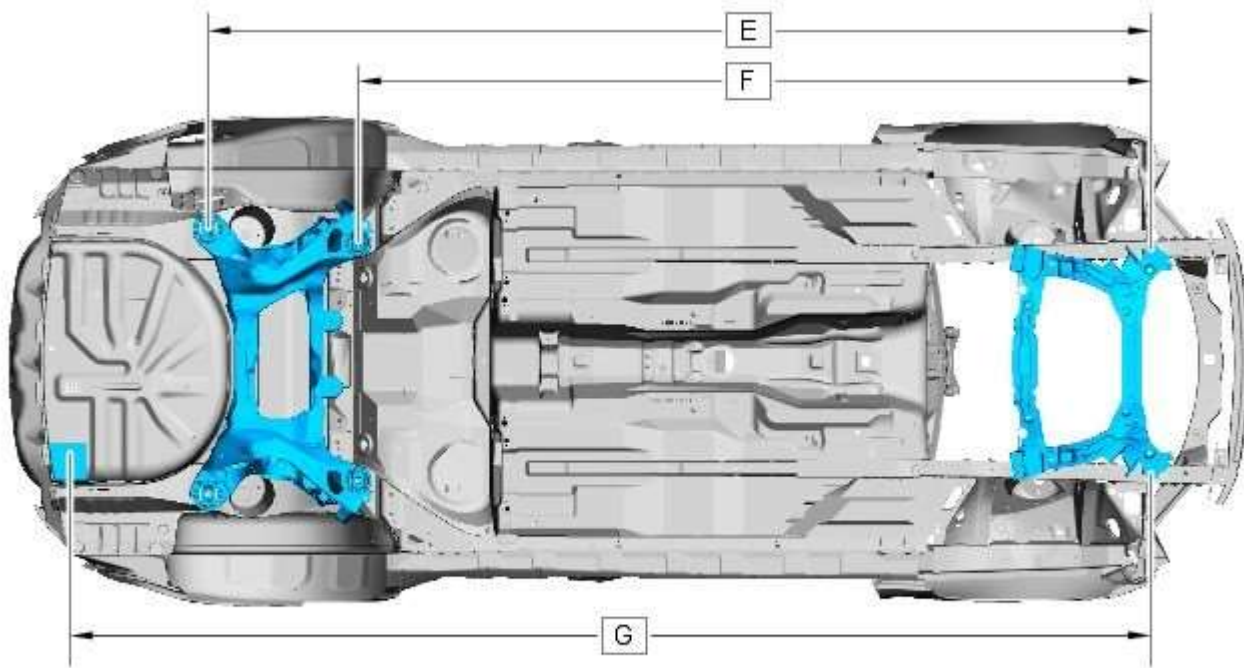
Item	From	To	Dimension
A	RH Rear lamp location hole	LH Rear lamp location hole	1501.8
B	RH Rear lamp top fixing hole	LH Rear lamp top fixing hole	1109.6
C	Rear bumper RH outboard top fixing stud	Rear bumper LH outboard top fixing stud	1024.7

Under Body Dimensions



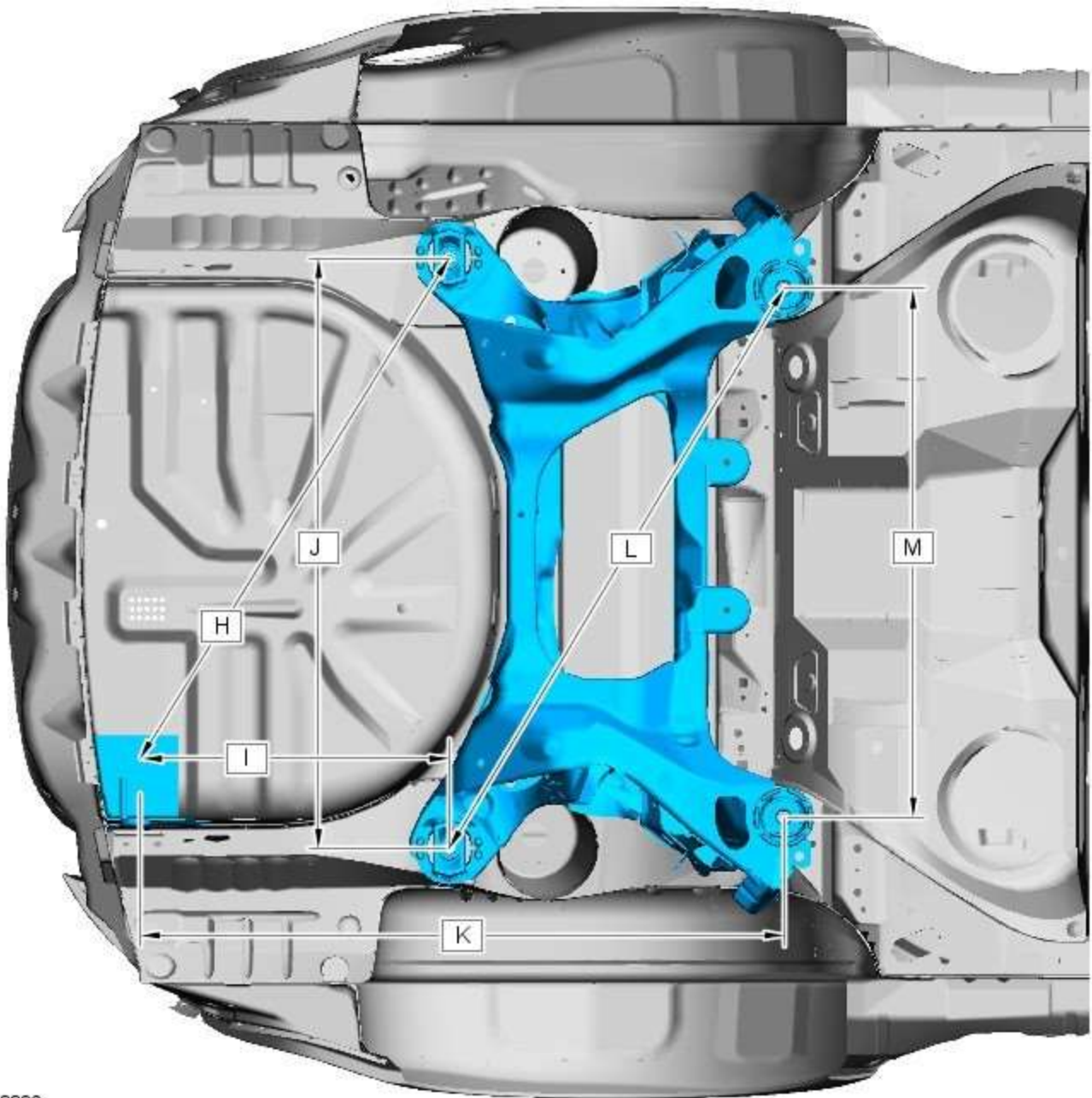
E 128824

Item	From	To	Dimension
A	Front subframe front fixing hole	Front subframe rear fixing hole	510.5
B	Front subframe RH rear fixing hole	Front subframe LH rear fixing hole	821
C	Front subframe RH front fixing hole	Front subframe LH front fixing hole	860
D	Front subframe front fixing hole	Front subframe rear fixing hole	983.4



E128825

Item	From	To	Dimension
E	Front subframe front fixing hole	Rear subframe rear fixing hole	3608.5
F	Front subframe front fixing hole	Rear subframe front fixing hole	3035.8
G	Front subframe front fixing hole	Rear towing eye rear fixing hole	4138.1



E128826

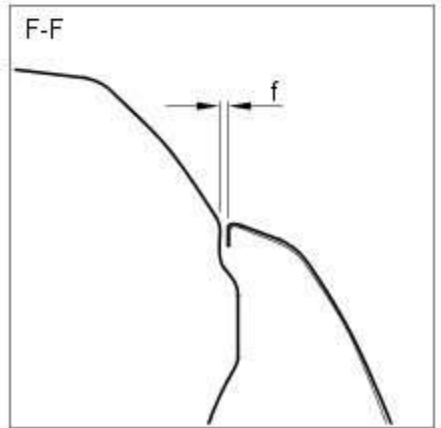
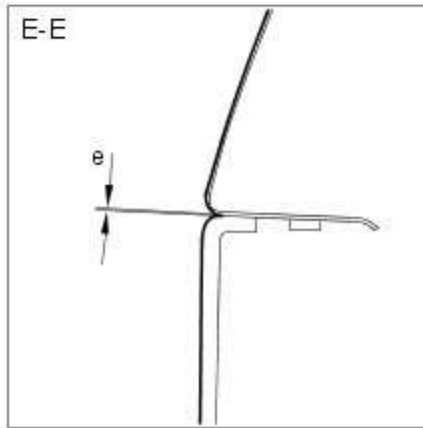
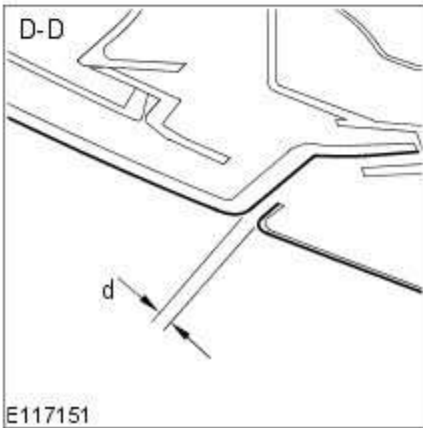
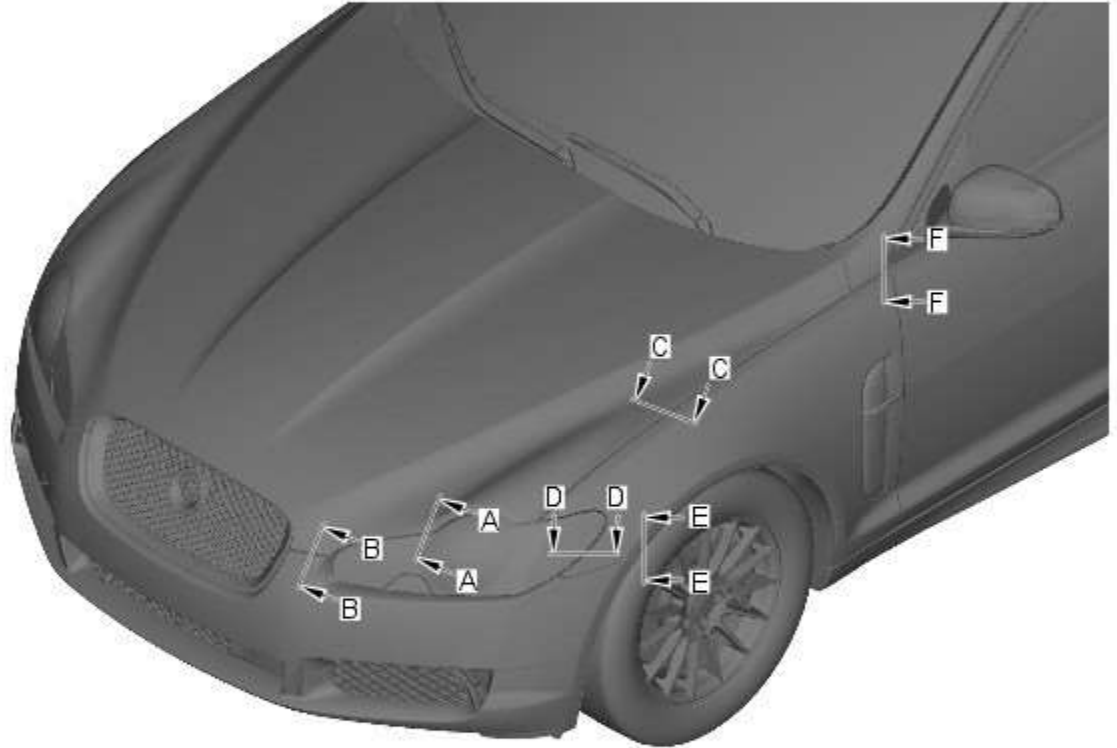
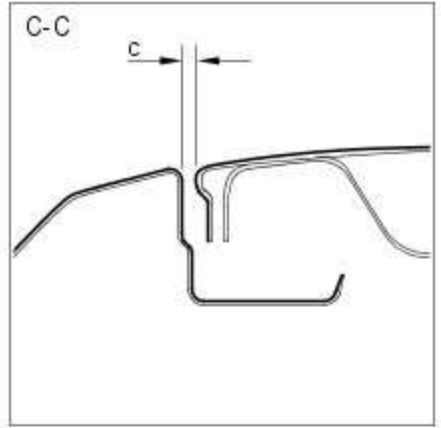
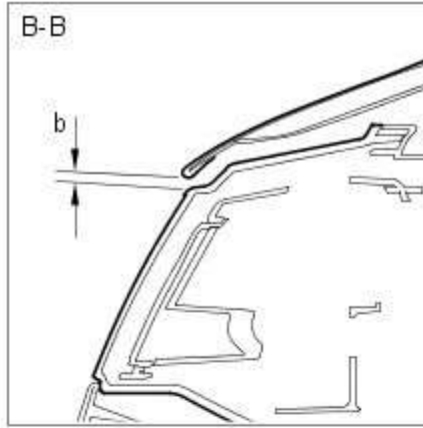
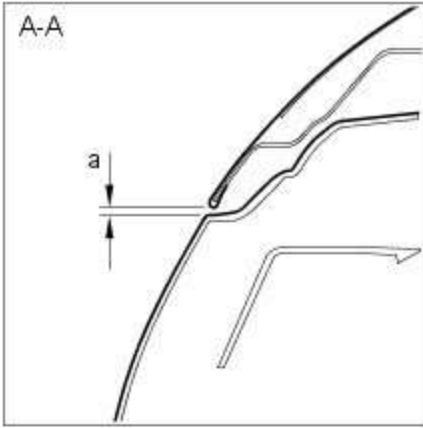
Item	From	To	Dimension
H	Rear subframe LH rear fixing hole	Rear towing eye rear fixing hole	1011.8
I	Rear subframe RH rear fixing hole	Rear towing eye rear fixing hole	560.8
J	Front subframe front fixing hole	Rear towing eye rear fixing hole	1015.3
K	Rear subframe front fixing hole	Rear towing eye rear fixing hole	1103.6
L	Rear subframe RH rear fixing hole	Rear subframe LH front fixing hole	1139
M	Rear subframe RH front fixing hole	Rear subframe LH front fixing hole	908.9

Gap and Profile measurements

The following information is to be used as a guide to assist the technician in installing exterior body panels and trim items so as to achieve a correctly aligned and cosmetically acceptable vehicle.

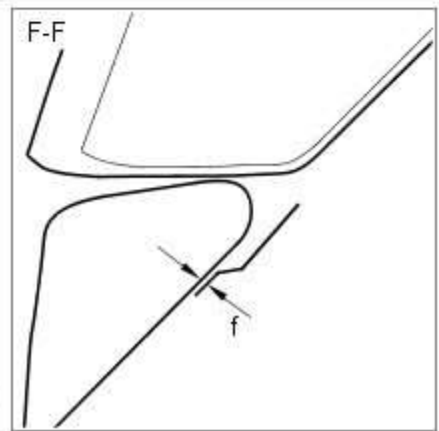
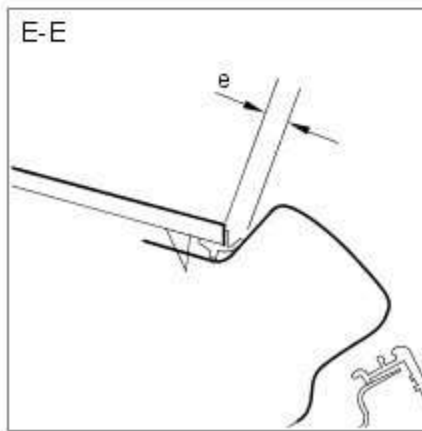
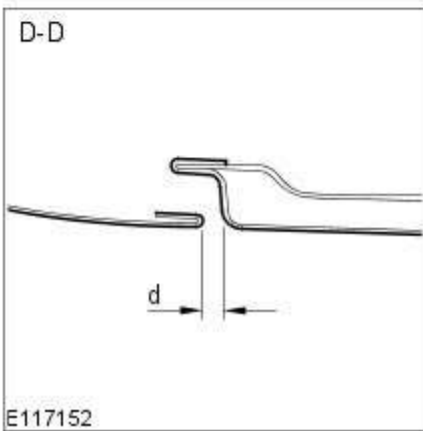
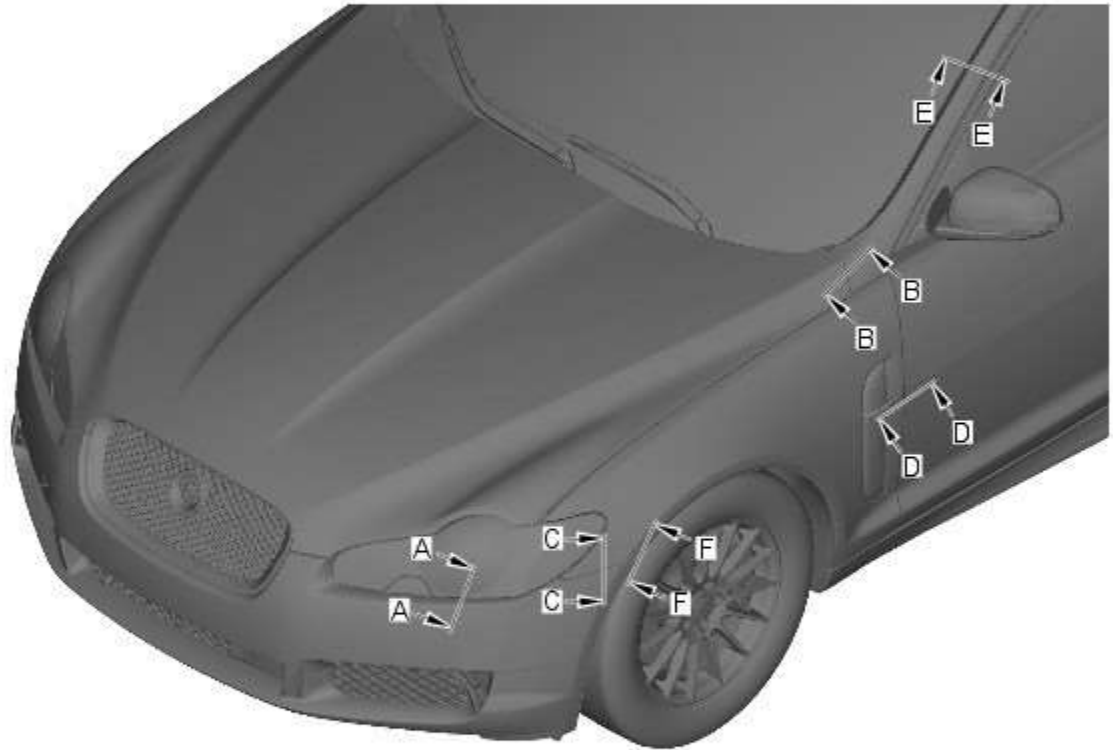
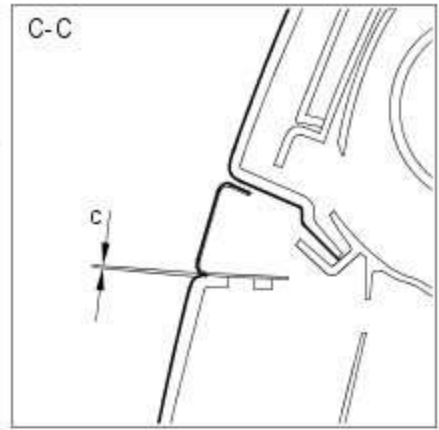
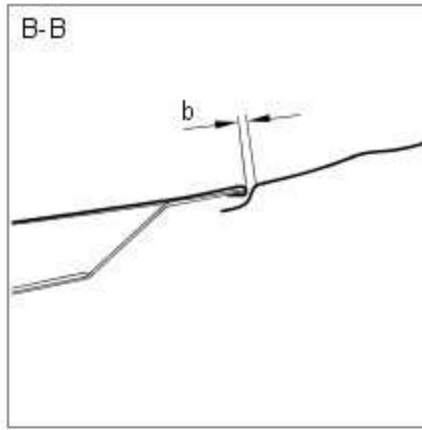
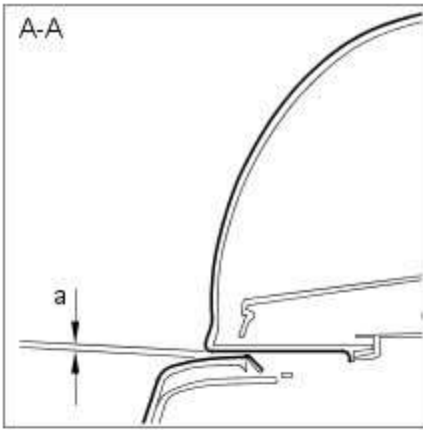


NOTE: All dimensions shown are in millimetres, (mm).



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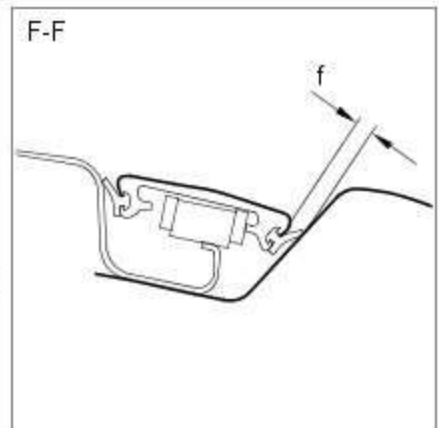
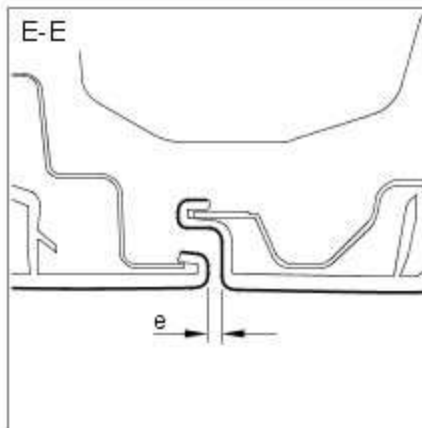
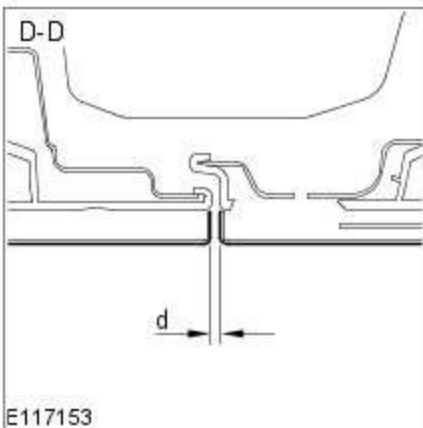
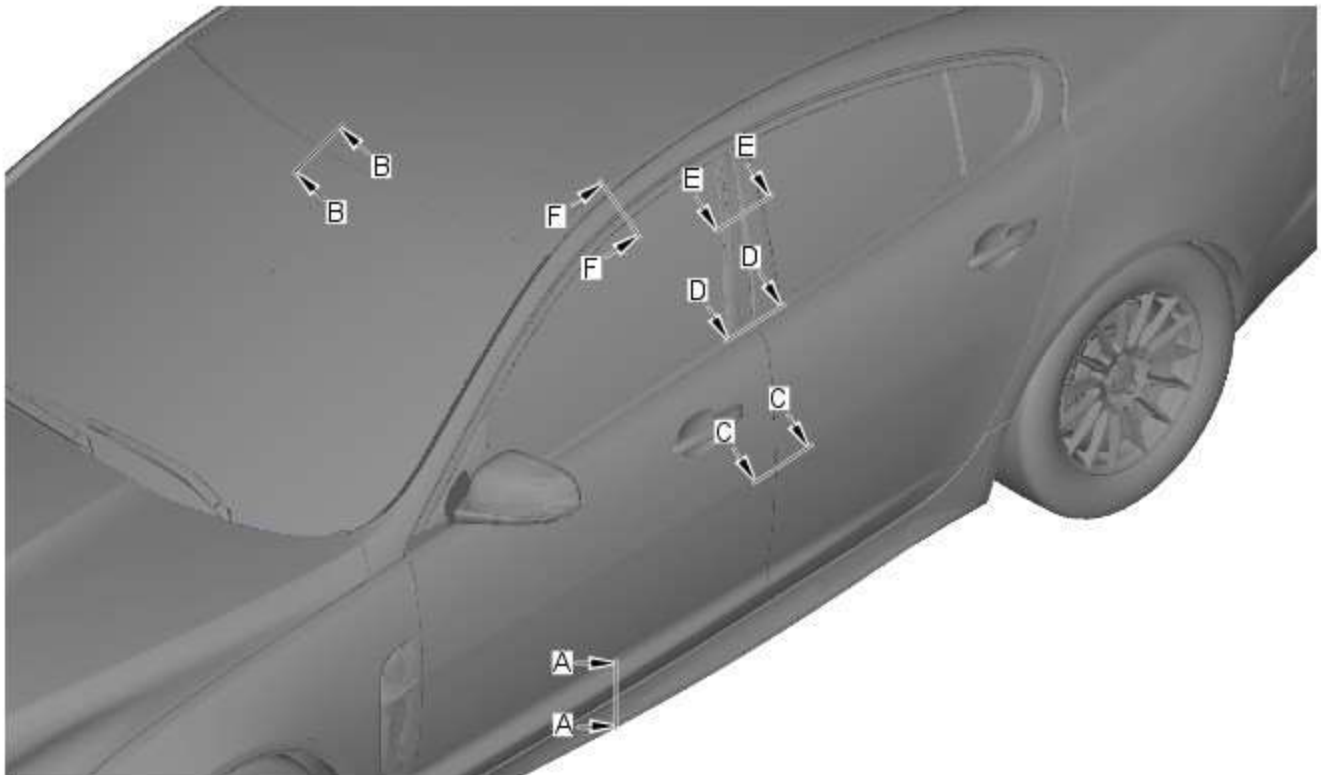
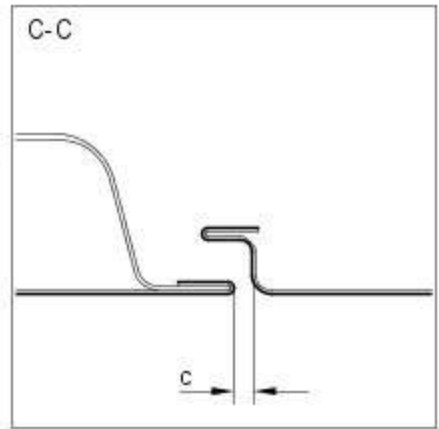
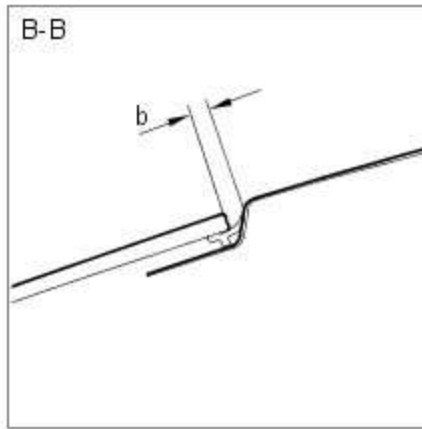
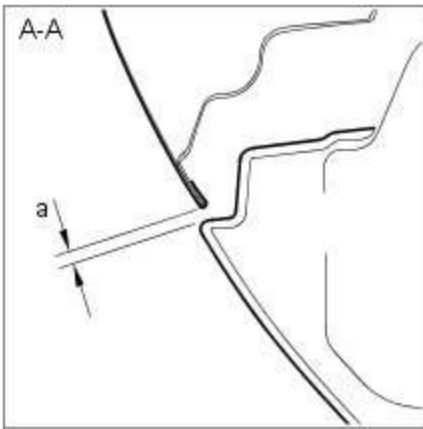
Section	Description	Gap	Profile
A-A	Hood to front bumper cover	4.0 ± 2.0	N/A
B-B	Hood to headlamp	4.0 ± 2.0	2.0 ± 2.0
C-C	Hood to front fender	3.5 ± 1.0	0.5 ± 0.5
D-D	Front fender to headlamp	2.0 ± 1.0	N/A
E-E	Front fender to front bumper cover	0.0 ± 0.5	0.5 ± 0.7



E117152

Section	Description	Gap	Profile
A-A	Front bumper cover to headlamp	3.0 ± 2.0	N/A
B-B	A-pillar to hood	3.0 ± 1.3	-1.0 ± 0.9
C-C	Front fender to front bumper cover	0.0 ± 0.5	0.5 ± 0.7
D-D	Front door to front fender	3.65 ± 1.0	-0.5 ± 1.0
E-E	A-pillar to windshield	4.0 ± 1.0	N/A

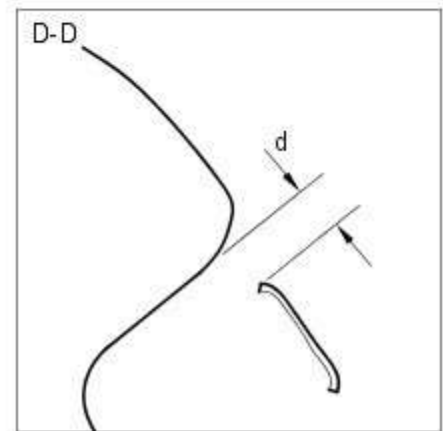
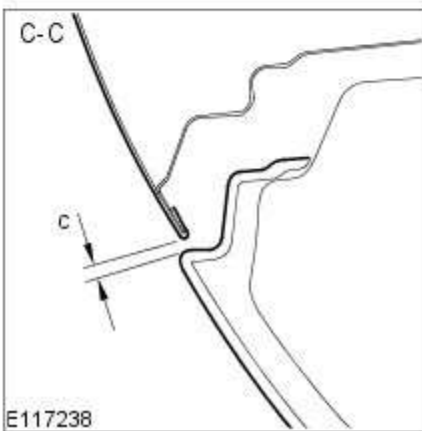
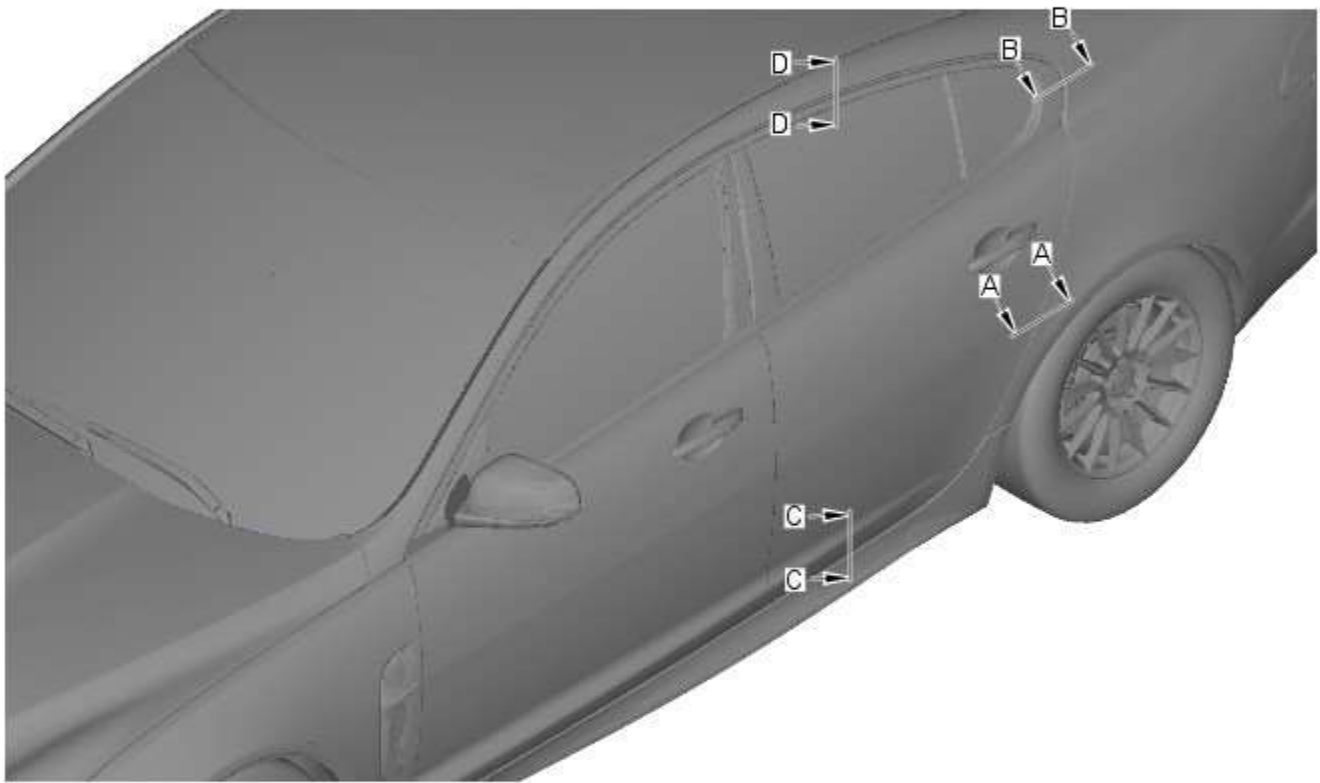
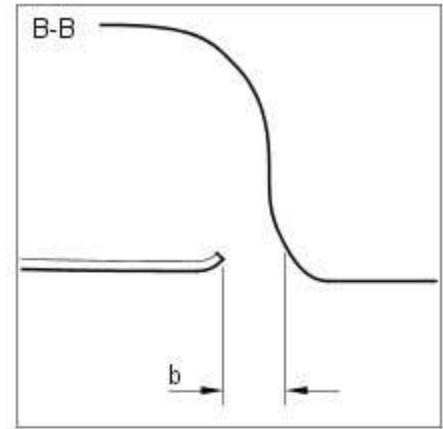
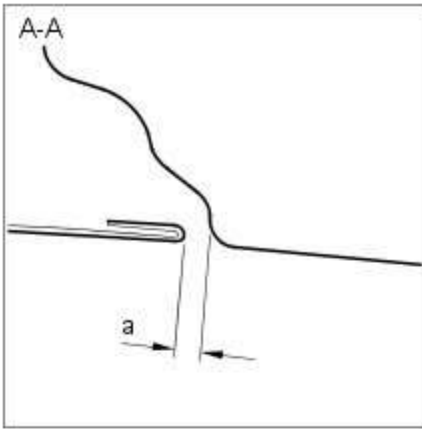
Section	Description	Gap	Profile
F-F	Front bumper cover to front fender (inner sweep)	N/A	0.5 ± 1.3



E117153

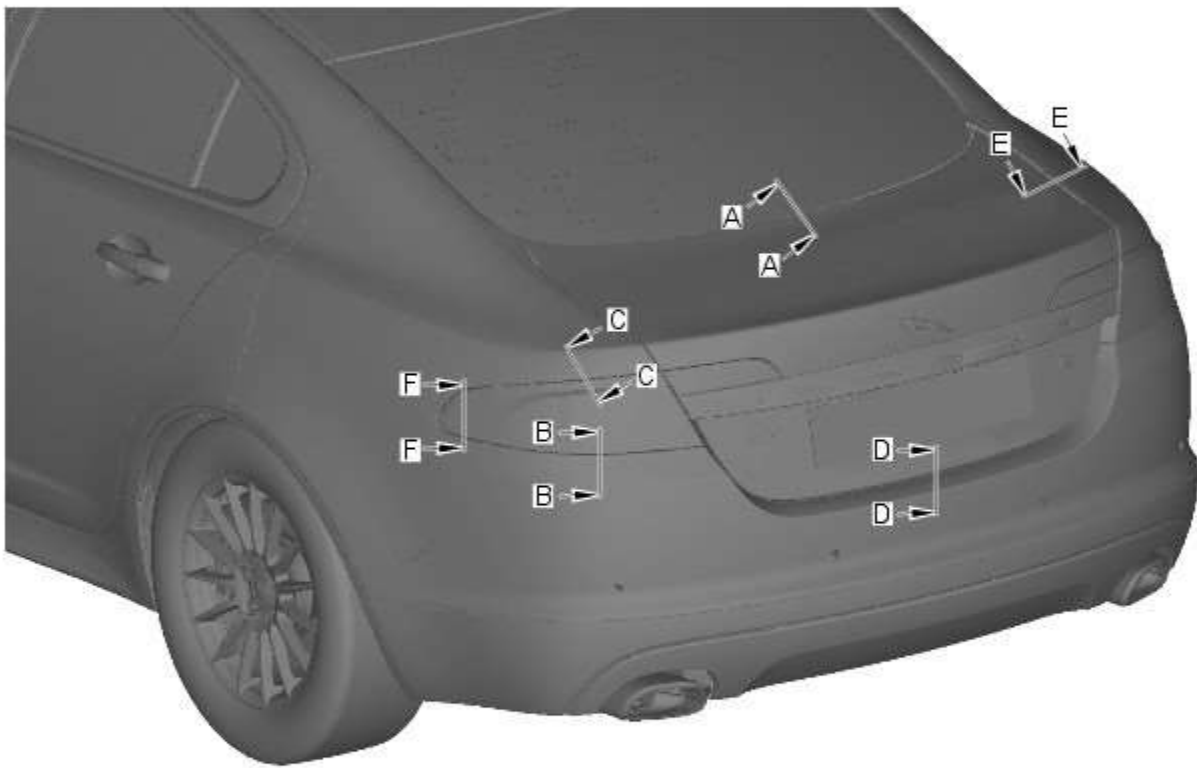
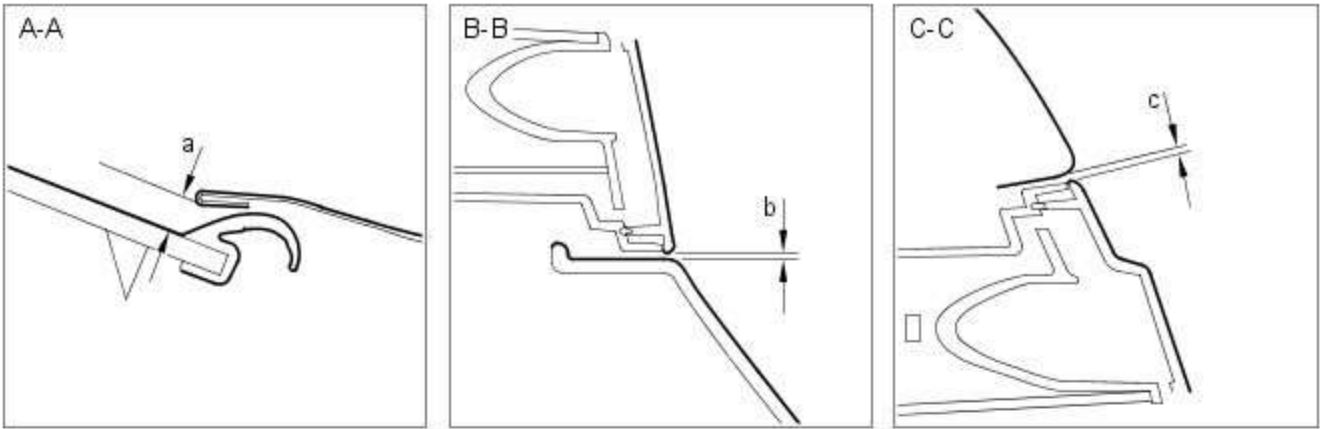
Section	Description	Gap	Profile
A-A	Rocker panel finisher to front door	4.0 ± 1.5	N/A
B-B	Windshield to roof panel	4.0 ± 1.1	N/A
C-C	Front door to rear door	3.65 ± 1.0	-0.5 ± 1.0

Section	Description	Gap	Profile
D-D	Front door to rear door at waist	3.65 ± 1.0	0.0 ± 1.0
E-E	Front door to rear door upper	3.65 ± 1.0	0.0 ± 1.0
F-F	Front door to roof	11.7 ± 1.6	N/A



Section	Description	Gap	Profile
A-A	Rear door to quarter panel	3.65 ± 1.0	0.00 ± 1.0

Section	Description	Gap	Profile
B-B	Rear door to quarter panel upper	7.9 ± 1.5	N/A
C-C	Rocker panel finisher to rear door	4.0 ± 1.5	N/A
D-D	Rear door to roof panel	7.9 ± 1.5	N/A



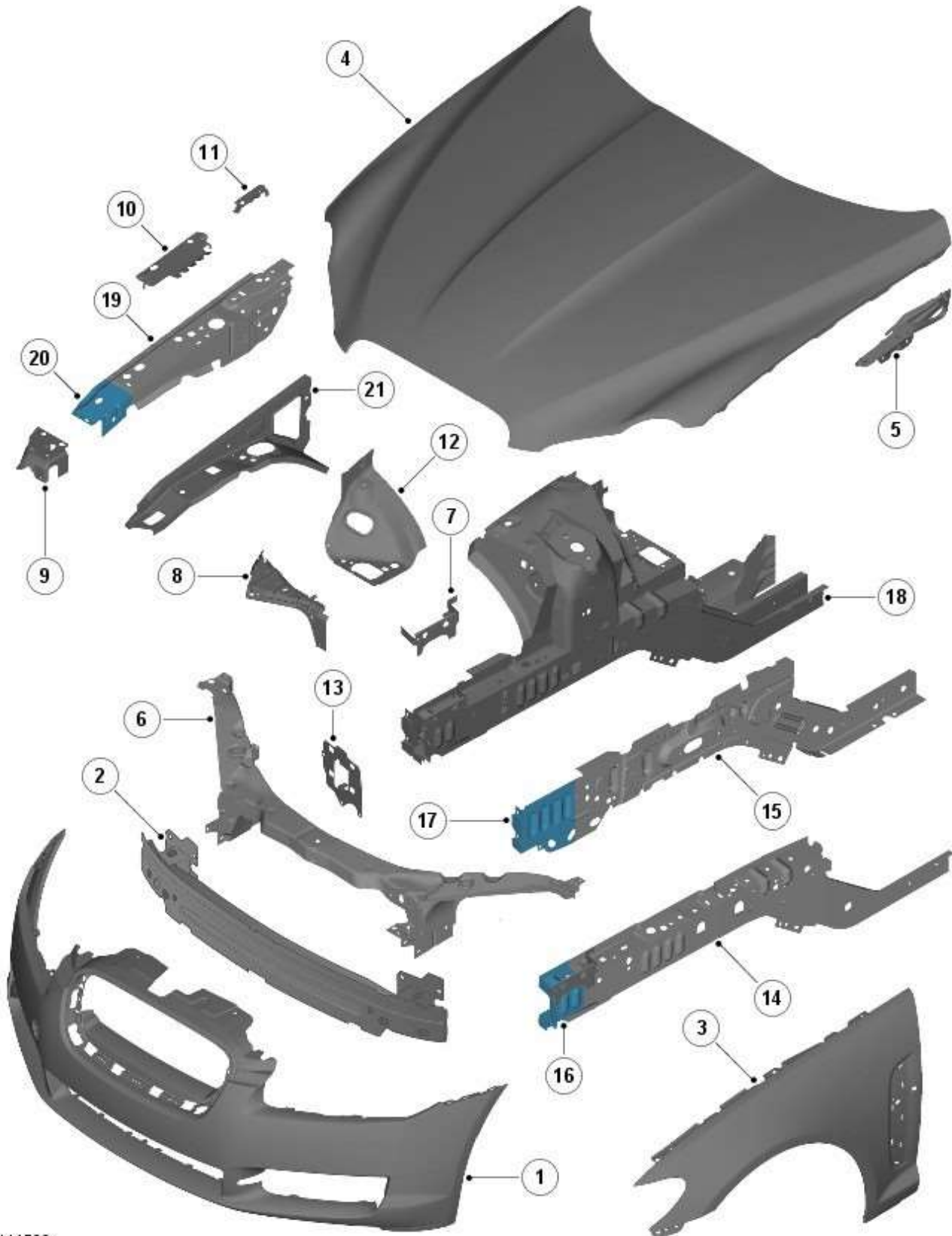
Section	Description	Gap	Profile
A-A	Luggage compartment lid to rear window glass	6.0 ± 1.5	N/A

Section	Description	Gap	Profile
B-B	Rear lamp to rear bumper cover	2.0 ± 0.9	-2.0 ± 1.5
C-C	Rear lamp to rear quarter upper	2.0 ± 0.9	-2.0 ± 1.5
D-D	Luggage compartment lid to rear bumper cover	6.0 ± 1.7	N/A
E-E	Luggage compartment lid to quarter panel	3.5 ± 1.1	0.5 ± 0.5
F-F	Rear lamp to rear bumper cover	2.0 ± 0.8	-2.0 ± 1.8

Front End Sheet Metal Repairs - Front End Sheet Metal

Description and Operation

Front end service panels





NOTE: The illustration may indicate either hand of the service panel, the opposite hand will be similar.

Item	Description
1	Front bumper cover
2	Front bumper
3	Front fender
4	Hood
5	Hood hinge
6	Hood latch panel
7	Hood latch panel mounting bracket
8	Front fender support bracket
9	Fender apron panel front extension
10	Fender mounting plate
11	Hood strut mounting bracket
12	Front wheelhouse section
13	Front bumper mounting
14	Front side member
15	Front side member section
16	Front side member closing panel
17	Front side member closing panel section
18	Front side member & suspension top mount assembly
19	Fender apron panel
20	Fender apron panel front section
21	Fender apron panel closing panel

Time schedules, front end

The following information shows the total time taken to replace single panels and complete assemblies. This time includes removal of Mechanical, Electrical and Trim, (MET), items, plus paint times based on Metallic Clear Over Base Paint, (blends to adjacent panels are not included).

The times shown were generated by Thatcham, (the Motor Insurance Repair Research Centre), and are to be used as a guide only.

Single panel times

Panel Description	Hours
Hood	7.4
Front bumper cover	7.8
Front fender L/H	8.9
Front Fender R/H	9.1
Hood latch panel	6.6
Instrument panel console remove and install	5.3
Engine and suspension assembly remove and install	9.3

Combination panel replacement times

The following panel combination times show the total time to remove/install body panels, MET items and paint times based on Metallic Clear Over Base Paint process, (blends to adjacent panels are not included).

Combination panel times

Panel Description	Hours
Hood	
Hood hinge L/H and R/H	
Front bumper cover	
Front bumper	
Front fender	
Hood latch panel	
Hood latch panel mounting bracket	
Front fender support bracket	
Total Time	L/H 23.5 R/H 23.6

Combination panel times

Panel Description	Hours
Hood	
Hood hinge L/H and R/H	
Front bumper cover	
Front bumper	
Front fender L/H and R/H	
Hood latch panel	
Hood latch panel mounting bracket L/H and R/H	
Front fender support bracket L/H and R/H	
Total Time	26.8

Combination panel times

Panel Description	Hours
Hood	
Hood hinge L/H and R/H	
Front bumper cover	
Front bumper	
Front fender	
Hood latch panel	
Front fender support bracket	
Fender apron panel	
Fender apron panel closing panel	
Front side member & suspension top mount assembly	
Fender mounting plate	
Front fender lower mounting	
Engine and suspension assembly remove and install	
Instrument panel console remove and install	
Total Time	L/H 44.3 R/H 44.5

Combination panel times

Panel Description	Hours
Hood	
Hood hinge L/H and R/H	
Front bumper cover	
Front bumper	
Front fender L/H and R/H	
Hood latch panel	
Front fender support bracket L/H and R/H	
Fender apron panel L/H and R/H	
Fender apron panel closing panel L/H and R/H	
Front side member & suspension top mount assembly L/H and R/H	
Fender mounting plate L/H and R/H	
Front fender lower mounting L/H and R/H	
Engine and suspension assembly remove and install	
Instrument panel console remove and install	
Total Time	57.6

Combination panel times

Panel Description	Hours
Hood	
Hood hinge L/H and R/H	
Front bumper cover	
Front bumper	
Front fender	
Hood latch panel	
Front fender support bracket	
Front bumper mounting	
Front side member section	
Front side member closing panel section	
Total Time	L/H 28.0 R/H 28.1

Combination panel times

Panel Description	Hours
Hood	
Hood hinge L/H and R/H	
Front bumper cover	
Front bumper	
Front fender	
Hood latch panel	
Front fender support bracket	
Front fender support bracket mounting	
Front fender lower mounting	
Front bumper mounting	
Front side member	
Front side member closing panel	
Front wheelhouse section	
Engine and suspension assembly remove and install	
Total Time	L/H 37.6 R/H 37.4

Front End Sheet Metal Repairs - Fender Apron Closing Panel Front Section

Removal and Installation

Removal



1. **NOTE:** The fender apron closing panel front section is manufactured from mild steel.

The fender apron closing panel front section is cut from the fender apron panel closing service panel.



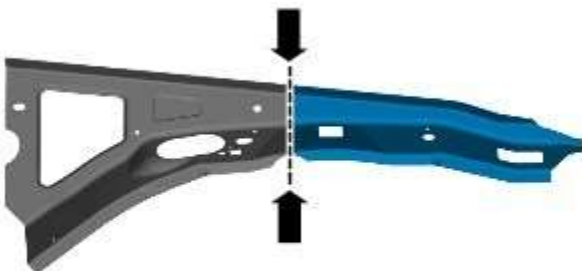
E 107765

2. The fender apron closing panel front section is replaced in conjunction with:
 - Front bumper cover
 - Hood
 - Front fender
 - Hood latch panel
 - Fender apron panel front extension
 - Fender apron panel front section
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the fender apron panel front section.
For additional information, refer to: [Fender Apron Panel Front Section](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
5. Disconnect the generator electrical connectors.



6. **NOTE:** Make sure the section is cut to cater for the extent of damage and to allow a minimum 50mm staggered joint with the fender apron panel front section.

Cut the front section from the fender apron panel closing service panel.



E 107766



7. **CAUTION:** Care should be taken not to cut through into adjacent panels.

Using the new panel for reference and allowing for an overlap, cut the old panel at the points indicated.

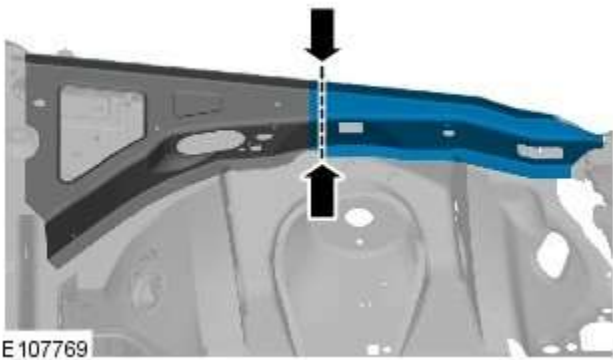


8. **NOTE:** To avoid unnecessary MAG plug welding on installation, spot welds must be drilled from underneath where this is possible.

Drill out the spot welds.

9. Separate the joints and remove the old panel.

Installation



1. **CAUTION:** Care should be taken not to cut through into adjacent panels.

Offer up, align and clamp the new panel into position, overlapping the old panel remnant. Cut through the new panel, partially cutting the old panel, at the points where the MAG butt joint is to be made.

2. Remove the new panel.
3. Cut and remove the old panel remnants.

Prepare the old and new panel joint surfaces.

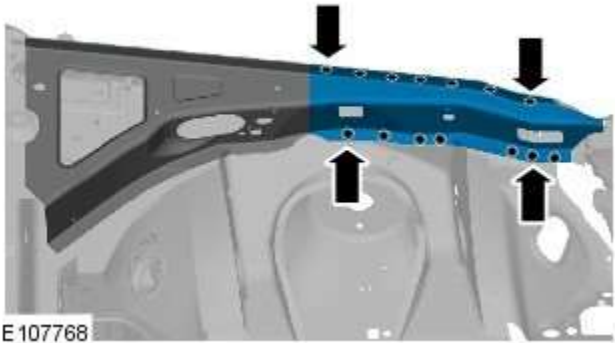
4. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

5. Tack weld the butt joint.



6. NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original.

Spot weld.



E 107768

7. Dress the tack welds.

8. MAG weld the butt joint.



E 107770

9. Dress all welded joints.

1. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Fender Apron Panel

Removal and Installation

Removal



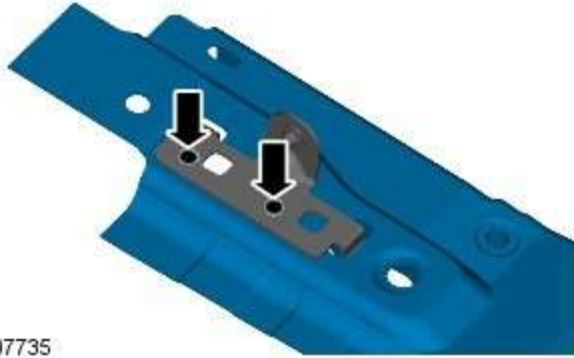
1. **NOTE:** The fender apron panel is manufactured from mild steel.

The fender apron panel is serviced as a separate weld-on panel.




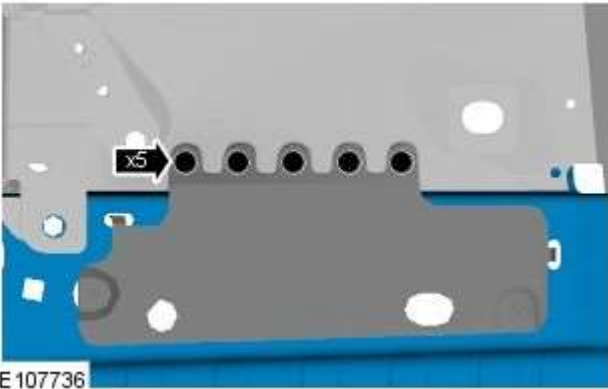
E 107734

2. The fender apron panel is replaced in conjunction with:
 - Front bumper cover
 - Front fender
 - Fender apron panel closing panel
 - Hood
 - Hood hinge
 - Hood strut mounting bracket
 - Fender mounting plate
3. For additional information relating to this repair procedure please see the following:
 For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the hood.
 For additional information, refer to: [Hood](#) (501-02 Front End Body Panels, Removal and Installation).
5. Remove the hood hinge.
6. Remove the fender apron panel closing panel.
 For additional information, refer to: [Fender Apron Panel Closing Panel](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
7. Disconnect the generator electrical connectors.
8. Remove the windshield wiper motor and linkage.
 For additional information, refer to: [Windshield Wiper Motor](#) (501-16 Wipers and Washers, Removal and Installation).
9. Remove the ECM (engine control module).
 For additional information, refer to: [Engine Control Module \(ECM\)](#) (303-14A, Removal and Installation) / [Engine Control Module \(ECM\)](#) (303-14B Electronic Engine Controls - V6 3.0L Petrol, Removal and Installation) / [Engine Control Module \(ECM\)](#) (303-14C, Removal and Installation).




E 107735

10.  NOTE: If the hood strut mounting bracket is to be replaced, it is not necessary to remove it.
- Drill out the spot welds to remove the hood strut mounting bracket.




E 107736

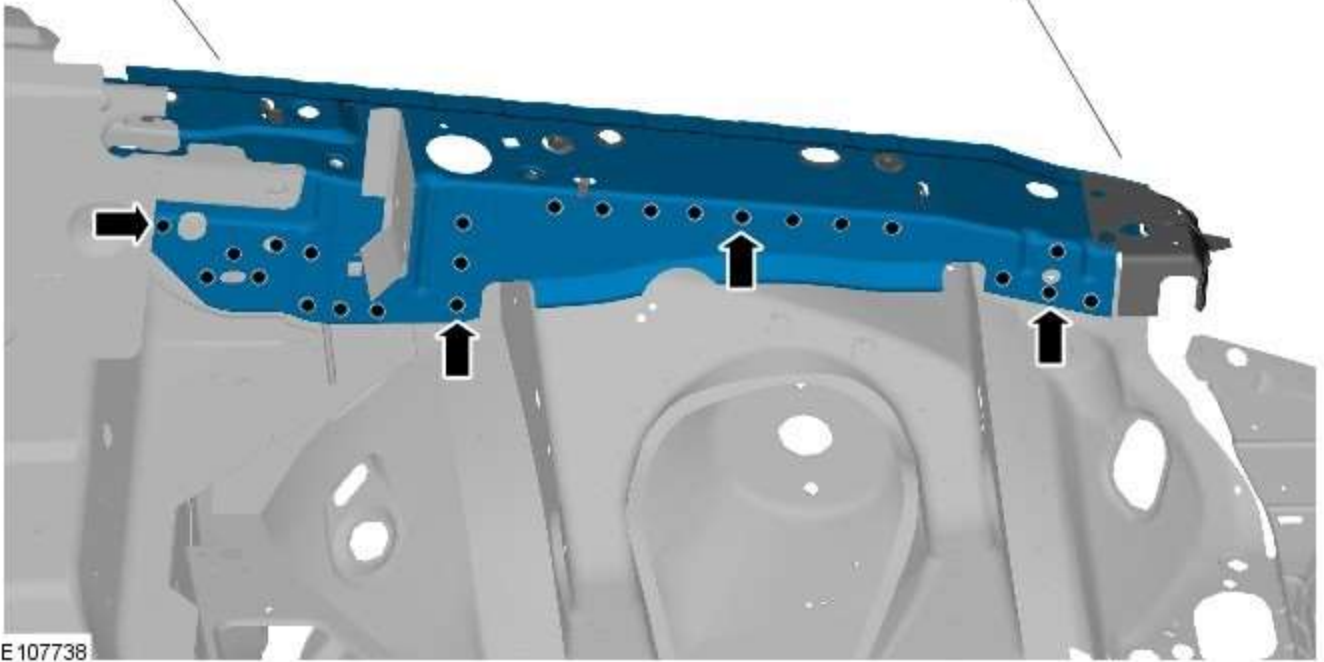
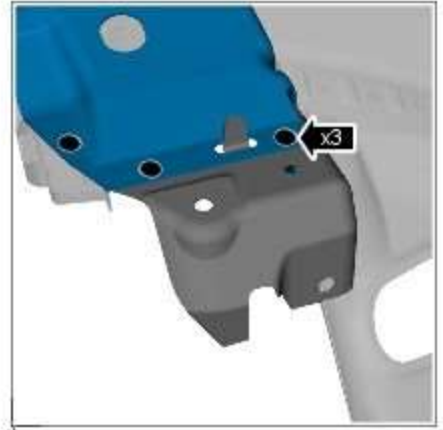
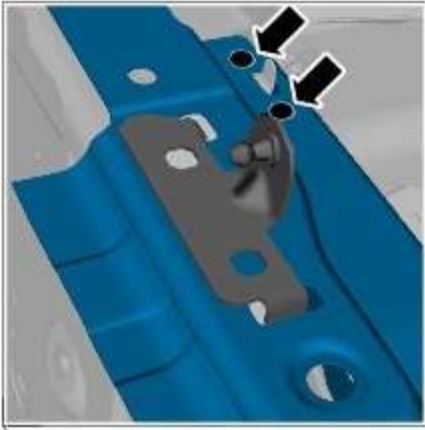
11.  NOTE: If the fender mounting plate is damaged it is not necessary to remove it from the fender apron panel.
- Drill out the spot welds to release the fender mounting plate.



E 107737

12.  NOTE: If the fender mounting plate is undamaged it can be reused by releasing it from the fender apron panel, leaving it attached to the suspension top mount. Drill out from underneath to allow spot welds to be used in installation.
- Drill out the spot welds, from underneath, to release the fender mounting plate.

13.  NOTE: Use a belt sander where there is no access to drill.
- Drill out the spot welds.

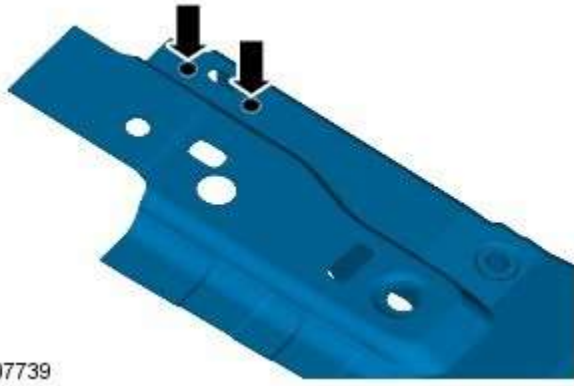


E107738

14. Separate the joints and remove the old panel.

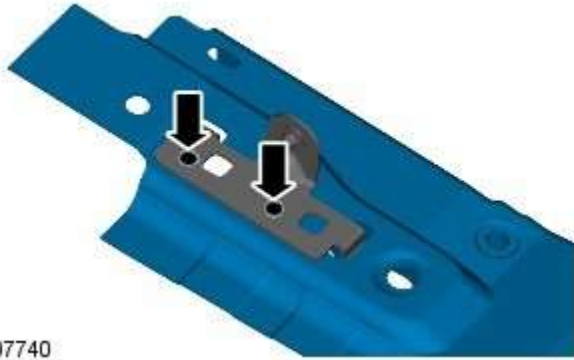
Installation

1. Drill holes in the new panel ready for MAG plug welding.




E 107739

2. Prepare the old and new panel joint surfaces.



E 107740

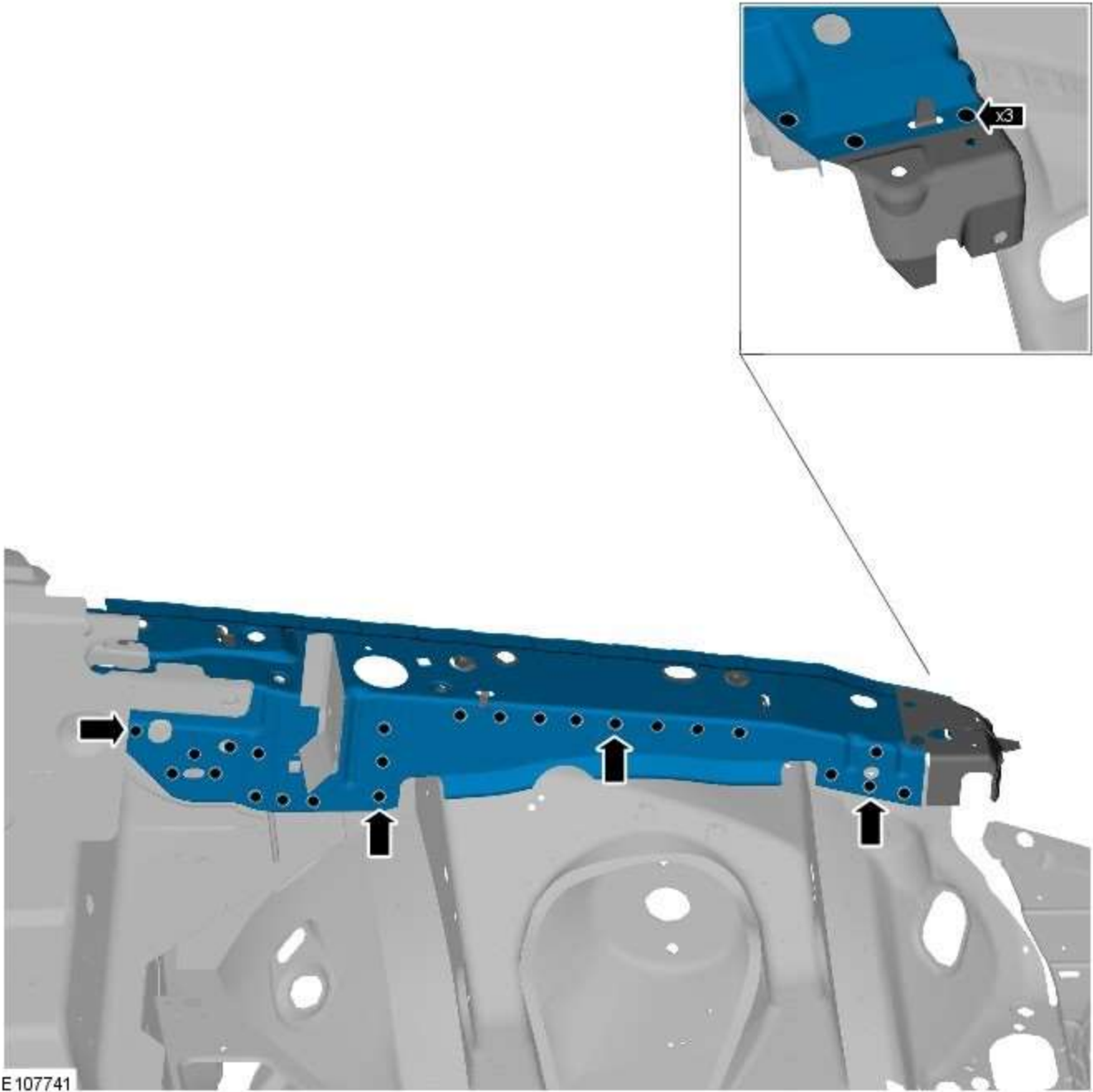
3.  NOTE: If the hood strut mounting bracket is to be replaced, it must be spot welded to the fender apron panel prior to installation. If it is to be reused it should be MAG plug welded to the fender apron panel after installation.

Install the new hood strut mounting bracket.

4. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

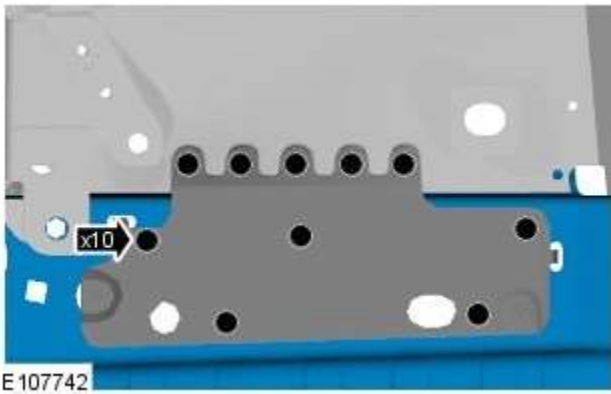
5.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original.

Spot weld.



E107741

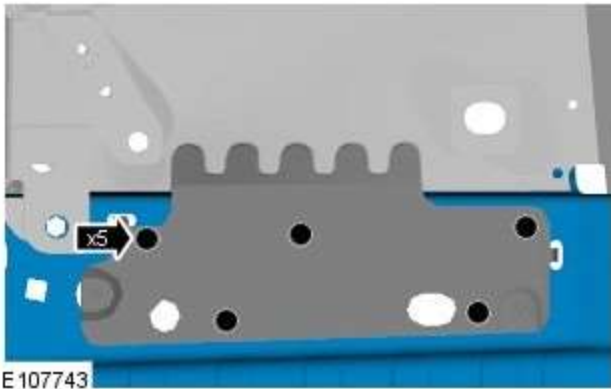
6. Offer up, align and clamp the new fender mounting plate into position, if correct, proceed to next step, if not rectify and recheck before proceeding.



E 107742

7.

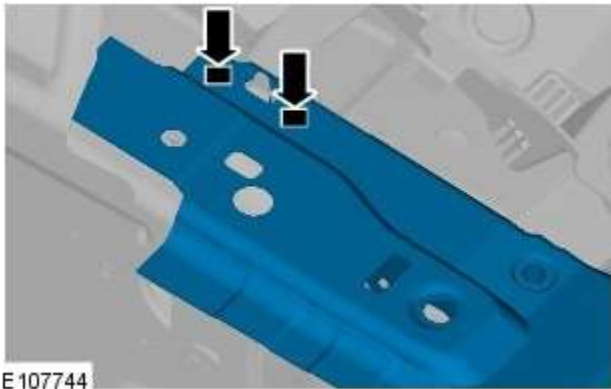
Spot weld the new fender mounting plate into position.



E 107743

8.

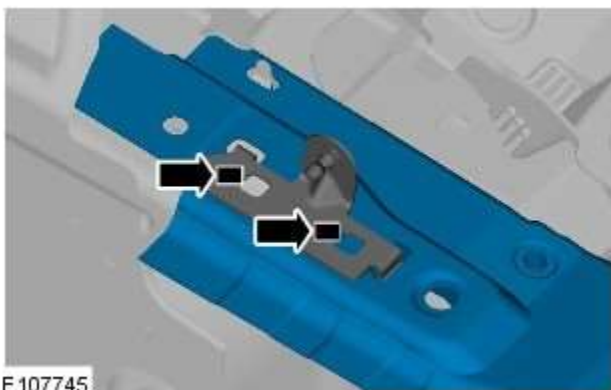
If the original fender mounting plate is being reused, spot weld as indicated.



E 107744

9.

MAG Plug weld.



E 107745

10.

Offer up, align and clamp the hood strut mounting bracket into position and MAG plug weld.

11. Dress all welded joints.
12. The installation of associated panels and components is the reversal of removal procedure.
 - Tighten the hood hinge to 25 Nm.

Front End Sheet Metal Repairs - Fender Apron Panel Closing Panel

Removal and Installation

Removal



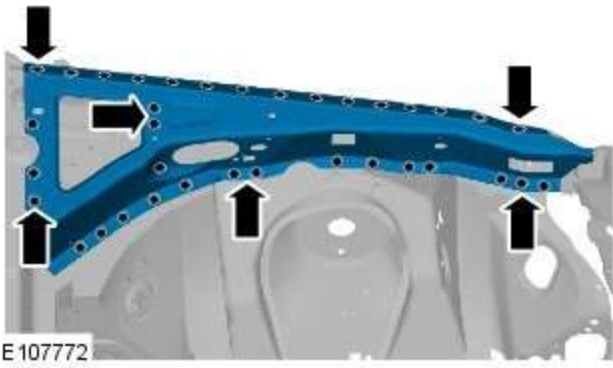
1. **NOTE:** The fender apron panel closing panel is manufactured from mild steel.


The fender apron panel closing panel is serviced as a separate weld-on panel.



E107771

2. The fender apron panel closing panel is replaced in conjunction with:
 - Front bumper cover
 - Front fender
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the front fender.
For additional information, refer to: [Front Fender](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
5. Disconnect the generator electrical connectors.
6. Remove the pedestrian protection hood actuator.
For additional information, refer to: [Pedestrian Protection Hood Actuator LH](#) (501-20C Pedestrian Protection System, Removal and Installation) / [Pedestrian Protection Hood Actuator RH](#) (501-20C Pedestrian Protection System, Removal and Installation).
7. Remove the secondary bulkhead panel.
For additional information, refer to: [Secondary Bulkhead Panel LH - 3.0L NA V6 - AJ27](#) (501-02 Front End Body Panels, Removal and Installation) / [Secondary Bulkhead Panel RH - 3.0L NA V6 - AJ27](#) (501-02 Front End Body Panels, Removal and Installation).
8. Remove the pedestrian protection actuator bracket.
9. Release and position the fuse box to one side.
10. Release and position the wiring harness to one side.



11.  NOTE: Spot welds must be drilled from underneath, this will make sure the new panel can be spot welded on installation. Use a belt sander where there is no access to drill.

Drill out the spot welds.

12. Separate the joints and remove the old panel.

Installation


1. Drill holes in the new panel ready for MAG plug welding.



2. Prepare the old and new panel joint surfaces.

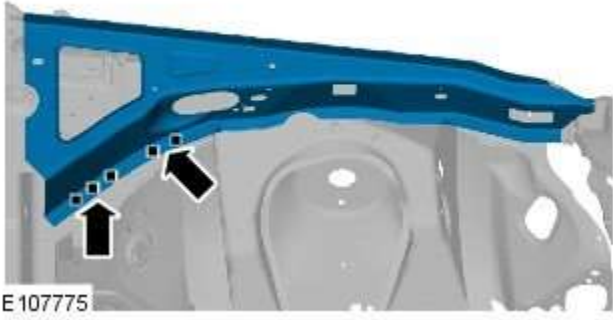
3. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



4.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original.

Spot weld.

5. MAG Plug weld.



6. Dress all welded joints.

7. The installation of associated panels and components is the reversal of removal procedure.

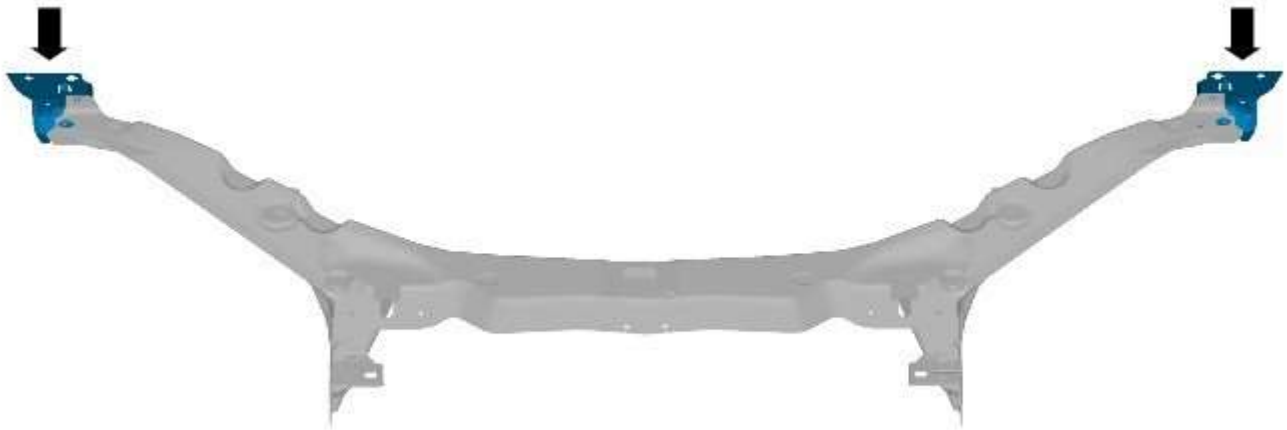
Front End Sheet Metal Repairs - Fender Apron Panel Front Extension

Removal and Installation

Removal

1. **NOTE:** The fender apron panel front extensions are manufactured from mild steel.

The right-hand and left-hand fender apron panel front extensions are serviced bolted on the hood latch panel. On the vehicle they are welded to the fender apron panels and inner wheelhouse.

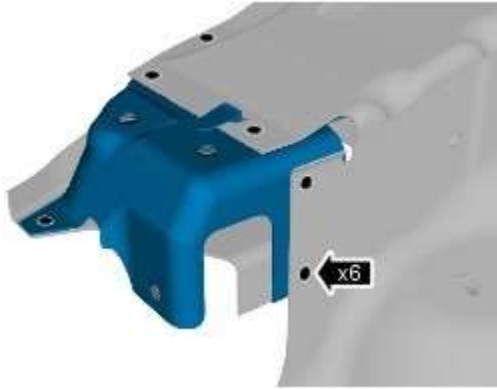


E 103204

2. The fender apron panel front extension is replaced in conjunction with:
 1. Front bumper cover
 2. Front bumper
 3. Hood latch panel
 4. Front fender
3. For additional information relating to this repair procedure please see the following:
 For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the hood latch panel.
 For additional information, refer to: [Hood Latch Panel](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
5. Remove the front fender.
 For additional information, refer to: [Front Fender](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
6. Disconnect the generator electrical connectors.
7. If the left-hand fender apron panel front extension is to be repaired,

remove the air conditioning (A/C) pipe.

8. Drill out the spot welds.



E 103205

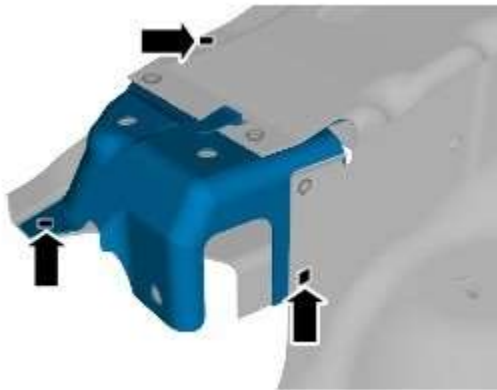
9. Separate the joints and remove the old panel.

Installation

1. **NOTE: If only one new fender apron panel front extension is to be fitted, remove the other side from the service panel and discard.**

Offer up the new hood latch service panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

2. With the new panel offered up and aligned, drill 3 holes, in the areas indicated, ready for MAG plug welding.



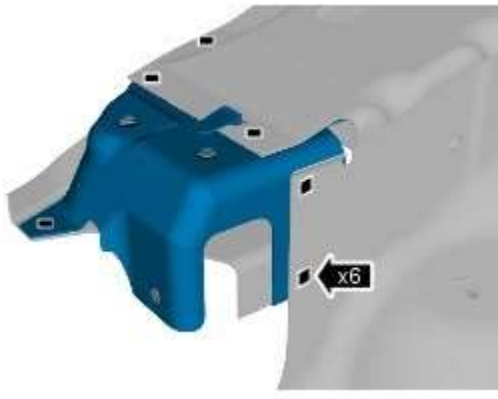
E 104699

3. Remove the new hood latch service panel.

4. Prepare the old and new panel joint surfaces.

5. Offer up the new hood latch service panel, align and clamp into position.

6. MAG Plug weld.



E 103206

7. Remove the hood latch panel in readiness for the paint refinishing process.

8. Dress all welded joints.

9. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Fender Apron Panel Front Section

Removal and Installation

Removal

1. **NOTE:** The fender apron panel front section is manufactured from mild steel.

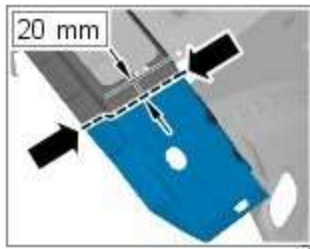
The fender apron panel front section is cut from the fender apron service panel.



E 107776

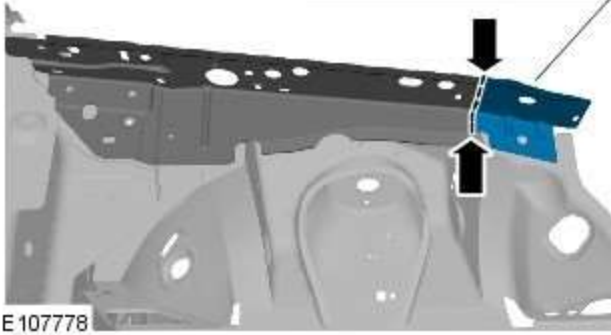
2. The fender apron panel front section is replaced in conjunction with:
 - Front bumper cover
 - Hood
 - Front fender
 - Hood latch panel
 - Fender apron panel front extension
 - Fender apron closing panel front section
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. **NOTE:** Make sure the fender apron closing panel front section is cut to allow a minimum 50mm staggered joint with the fender apron panel front section.

Remove the fender apron closing panel front section.
For additional information, refer to: [Fender Apron Closing Panel Front Section](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
5. Disconnect the generator electrical connectors.

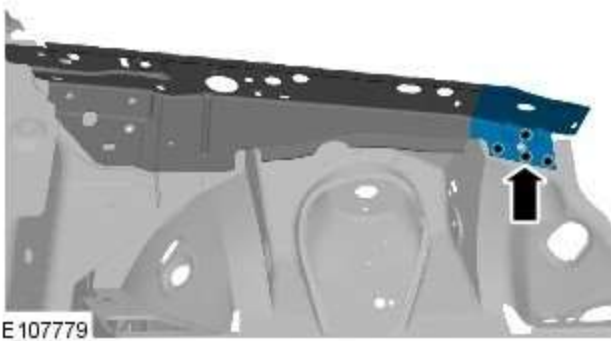


6. NOTE: The section is cut as indicated to allow access to dress the MAG butt weld.

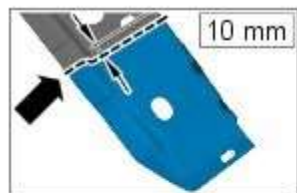
Cut the old panel at the point indicated.



7. Drill out spot welds.



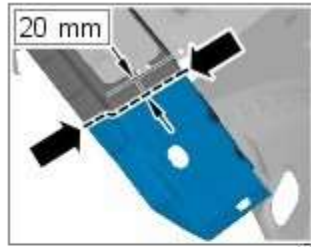
8. Separate the joints and remove the old panel.



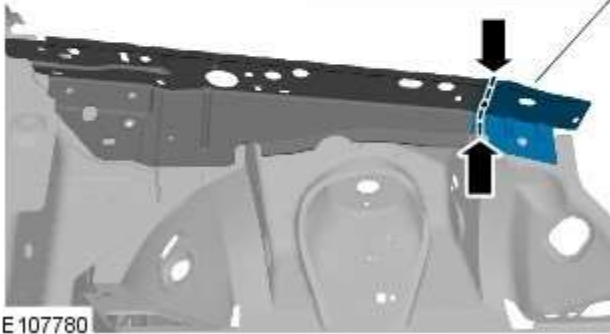
9. Cut the new front section from the fender apron panel service panel at the point indicated.



Installation



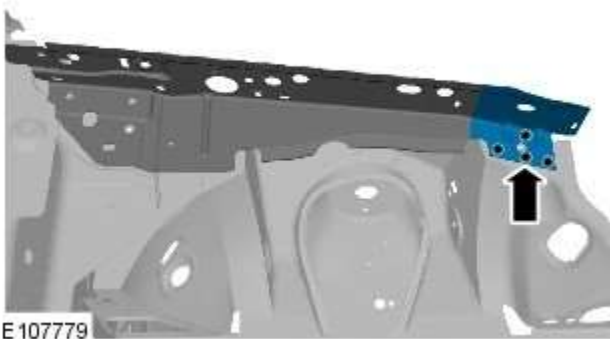
1. Offer up, align and clamp the new panel into position overlapping the old panel remnant. Cut along the edge of the old panel, through the new panel where the MAG butt joint is to be made.



2. Remove the new panel.
3. Prepare the old and new panel joint surfaces.
4. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
5. Tack weld the butt joint.

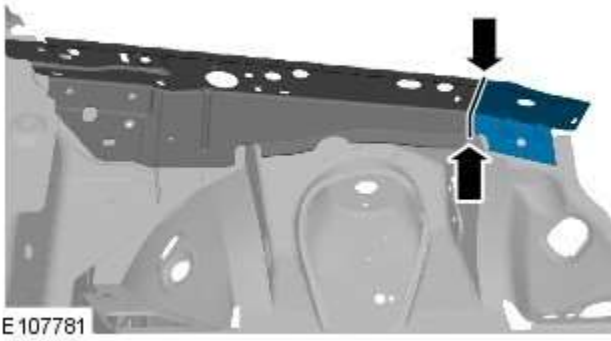
6. **NOTE:** Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original.

Spot weld.



7. Dress the tack welds.

8. MAG weld the butt joint.



9. Dress all welded joints.

10. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Front Bumper Mounting

Removal and Installation

Removal



E 108360

1. **NOTE:** The front bumper mounting is manufactured from High Strength Low Alloy steel, 350MPa, (HSLA350).

The front bumper mounting is serviced as a separate weld-on panel, it is also serviced on the front side member & suspension top mount assembly.

2. The front bumper mounting is replaced in conjunction with:
 - Front bumper cover
 - Front bumper
 - Hood latch panel
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the hood latch panel.
For additional information, refer to: [Hood Latch Panel](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
5. Disconnect the generator electrical connectors.
6. Drill out the spot welds.



E 108361

7. Separate the joints and remove the old panel.

Installation

1. NOTE: Remove the caged nuts for the front bumper fixings, to allow for preparation.

Prepare the old and new panel joint surfaces.

2. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



3. NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original.

Spot weld.

E 108361

4. Dress all welded joints.

5. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Front Fender

Removal and Installation

Removal

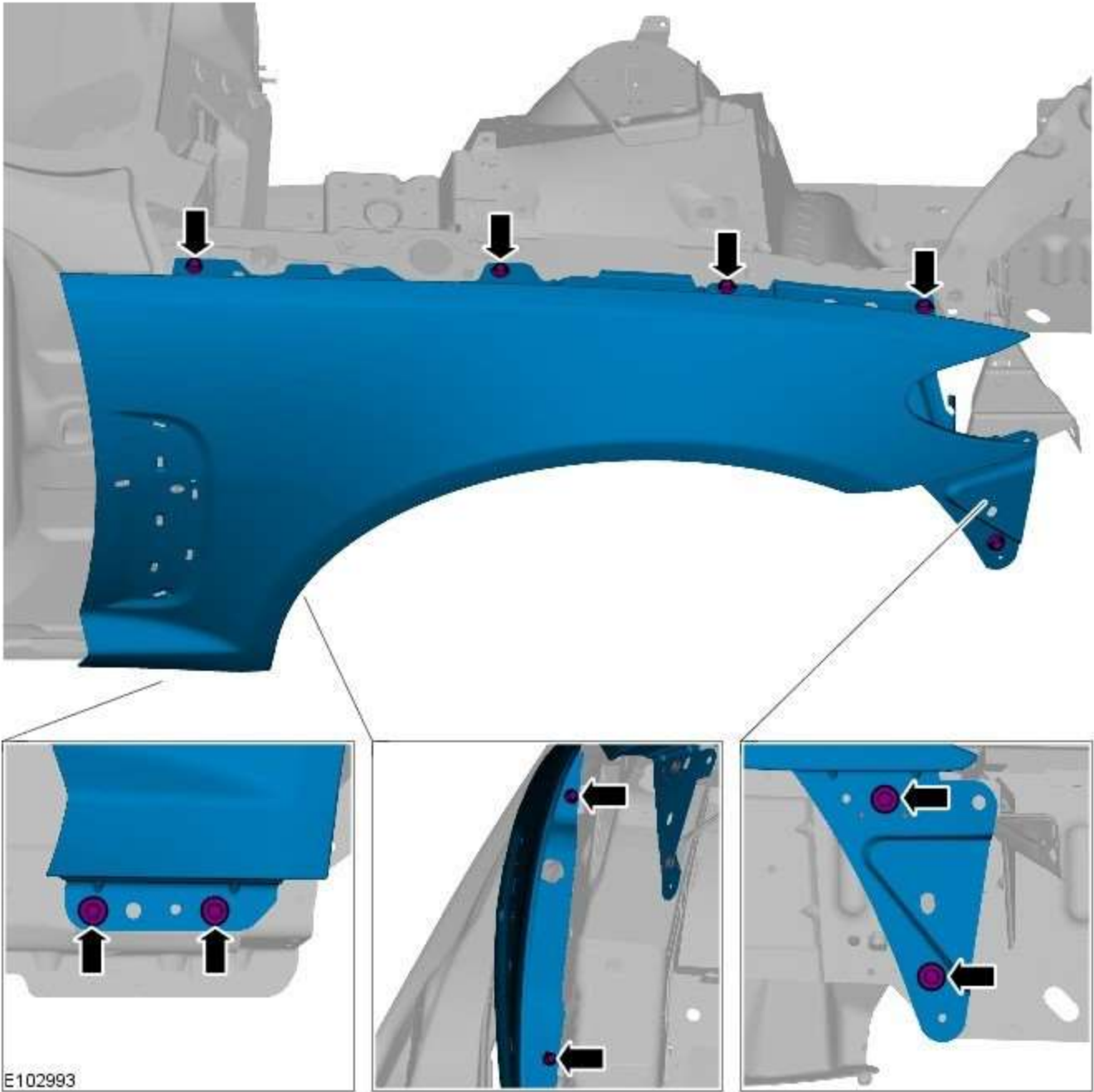



E102992

1. **NOTE:** The front fender is manufactured from mild steel.

The front fender is serviced as a separate bolt-on panel.

2. The front fender is replaced in conjunction with:
 1. Front bumper cover
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
5. Remove the front bumper cover.
For additional information, refer to: [Front Bumper Cover](#) (501-19 Bumpers, Removal and Installation).
6. Remove the fender splash shield.
For additional information, refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).
7. If the right-hand front fender is to be repaired, remove the windshield washer reservoir.
For additional information, refer to: [Windshield Washer Reservoir](#) (501-16 Wipers and Washers, Removal and Installation).
8. Remove the headlamp assembly.
For additional information, refer to: [Headlamp Assembly](#) (417-01 Exterior Lighting, Removal and Installation).
9. Remove the rocker panel outer moulding.
10. Remove the front fender.

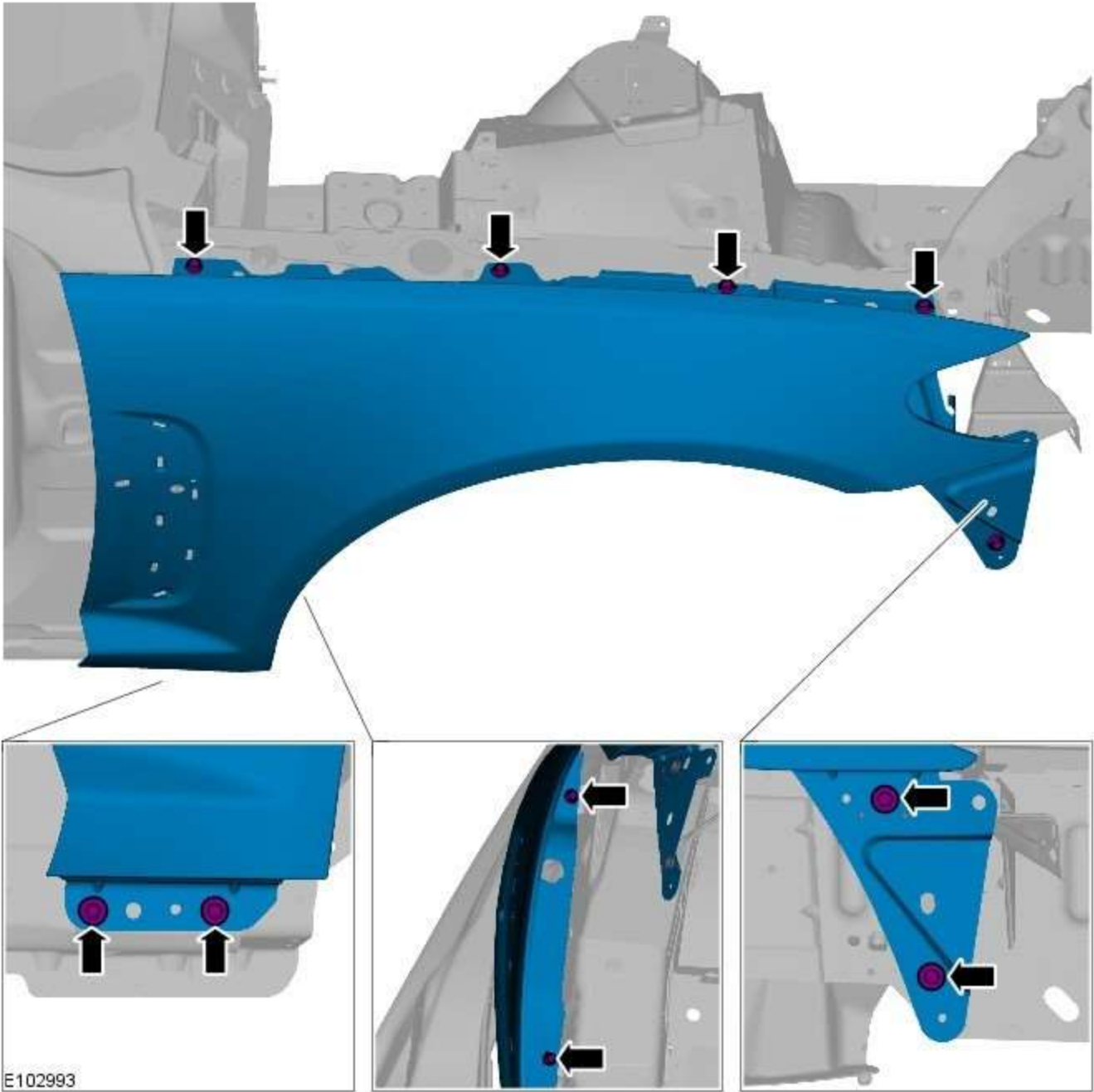


11.  **NOTE:** Do not disassemble further if the component is removed for access only.

Remove the front fender moulding.

Installation

1. Offer up the new panel. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
2. Install the front fender.
 - Tighten to 10 Nm.



3. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Front Fender Support Bracket

Removal and Installation

Removal

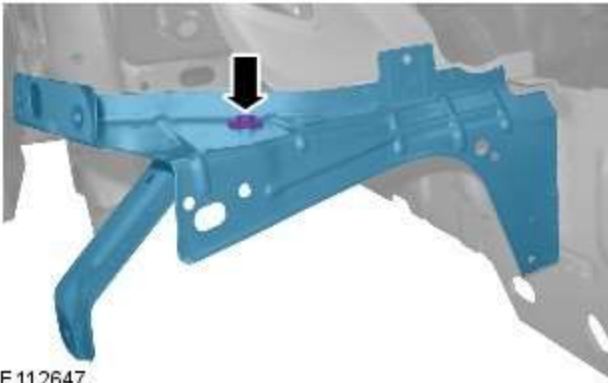


E 112646

1. **NOTE:** The front fender support bracket is manufactured from mild steel.

The front fender support bracket is serviced as a separate weld-on panel.

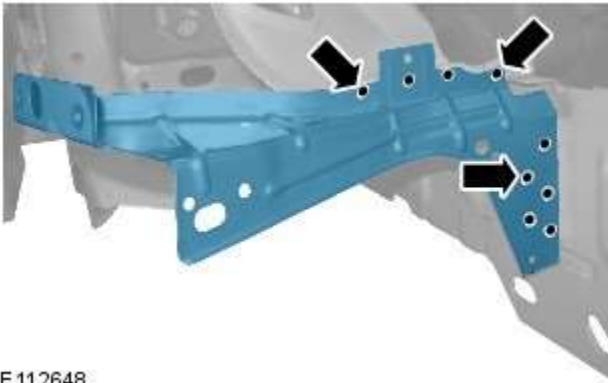
2. The front fender support bracket is replaced in conjunction with:
 - Front bumper cover
 - Front fender
 - Hood latch panel
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the hood latch panel.
For additional information, refer to: [Hood Latch Panel](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
5. Disconnect the generator electrical connectors.
6. If the left-hand front fender support bracket is to be repaired, remove the air conditioning (A/C) pipe.
7. Release and position the front fender support bracket wiring harness to one side.



E 112647

- NOTE: If the front fender lower mounting is undamaged it should be retained for reuse.

Remove the front fender lower mounting retaining bolt.



E 112648

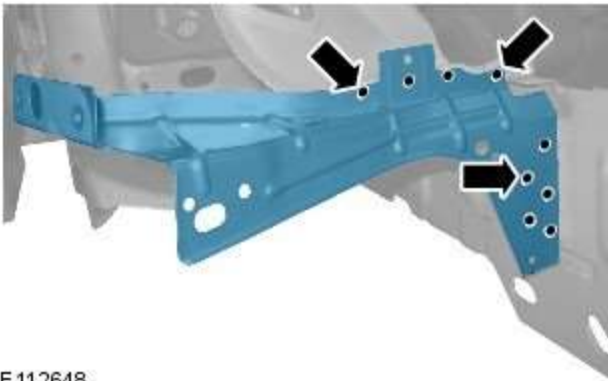
-  NOTE: Use a belt sander where there is no access to drill.

Drill out the spot welds.

- Separate the joints and remove the old panel.

Installation

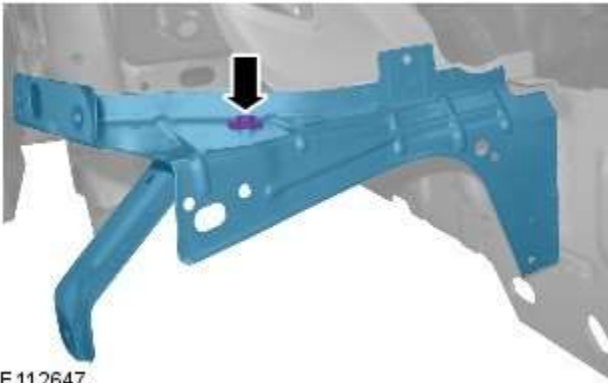
- Prepare the old and new panel joint surfaces.
- Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



E 112648

- NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible spot welds should be installed adjacent to the original.

Spot weld.



E112647

4. Offer up the front fender lower mounting and loosely install its fixing bolt. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

5. Tighten the front fender lower mounting fixing bolt.
 - Tighten to 10 Nm.

6. Dress all welded joints.

7. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Front Side Member

Removal and Installation

Removal

1. **NOTE:** The front side member is manufactured from High Strength Low Alloy Steel, 350MPa, (HSLA350).

The front side member is serviced as a separate weld-on panel, which includes the hood latch panel mounting bracket. This method is to install a "long" section of the service panel.

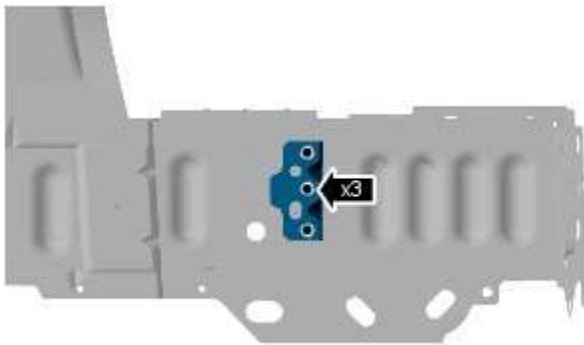


E111823


2. In this procedure, make sure that the vehicle is correctly aligned, it must be placed on an approved alignment jig.
3. The front side member is replaced in conjunction with:
 - Front bumper cover
 - Front bumper
 - Front bumper mounting
 - Hood
 - Hood latch panel
 - Front fender support bracket
 - Front fender support bracket mounting
 - Front wheelhouse section
 - Front side member closing panel
 - Engine, transmission / transaxle, front subframe and front suspension, as an assembly
4. For additional information relating to this repair procedure please see the following:
 For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
5. Remove the hood.
 For additional information, refer to: [Hood](#) (501-02 Front End Body Panels, Removal and Installation).
6. Remove the front wheelhouse section.
 For additional information, refer to: [Front Wheelhouse Section](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
7. Remove the engine, transmission / transaxle, front subframe and front suspension, as an assembly.
 For additional information, refer to: Engine (303-01A, Removal) / [Engine](#) (303-01B Engine - V6 3.0L Petrol, Removal) / Engine (303-01D, Removal) / Engine (303-01E, Removal) / Transmission - 2.7L Diesel (307-01, Removal) / [Transmission - TDV6 3.0L Diesel](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal) /

[Transmission](#) (307-01A Automatic Transmission/Transaxle - V6 3.0L Petrol, Removal) /
Transmission - 4.2L (307-01, Removal) /
[Transmission - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal) /
[Front Shock Absorber](#) (204-01 Front Suspension, Removal and Installation) /
Front Subframe - 2.7L Diesel (502-00, Removal and Installation) /
[Front Subframe - V6 3.0L Petrol](#) (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation) /
Front Subframe - 4.2L, Vehicles Without: Supercharger (502-00, Removal and Installation) /
Front Subframe - 4.2L, Vehicles With: Supercharger (502-00, Removal and Installation).

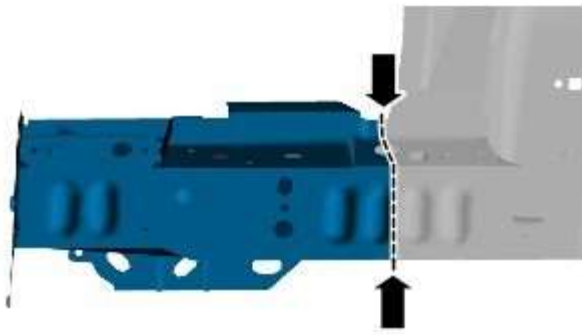
8. Remove the pedestrian protection hood actuator.
For additional information, refer to: [Pedestrian Protection Hood Actuator LH](#) (501-20C Pedestrian Protection System, Removal and Installation) / [Pedestrian Protection Hood Actuator RH](#) (501-20C Pedestrian Protection System, Removal and Installation).
9. If the drivers side front side member and suspension top mount is to be repaired, remove the brake master cylinder and reservoir.
For additional information, refer to: [Brake Master Cylinder](#) (206-06 Hydraulic Brake Actuation, Removal and Installation) / [Brake Fluid Reservoir](#) (206-06 Hydraulic Brake Actuation, Removal and Installation).
10. If the left-hand front side member and suspension top mount assembly is to be repaired, remove the fuel supply and return lines.
11. Release and position the front side member wiring harness to one side.
12. Remove any remaining miscellaneous components from the repair area.



E117044

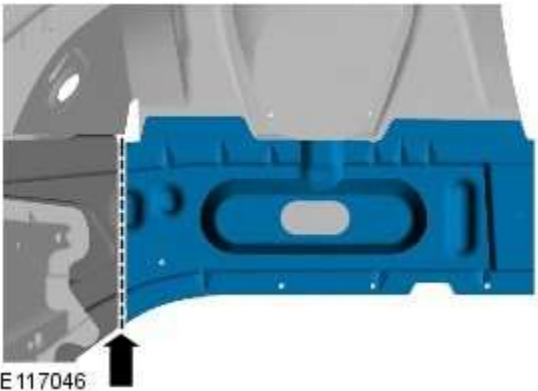
13.  **NOTE:** Retain the front fender support bracket mounting if it is to be reused. If the front fender support bracket mounting is to be renewed, it is not necessary to remove or retain it.

Drill out the spot welds to remove the front fender support bracket mounting.




E117045

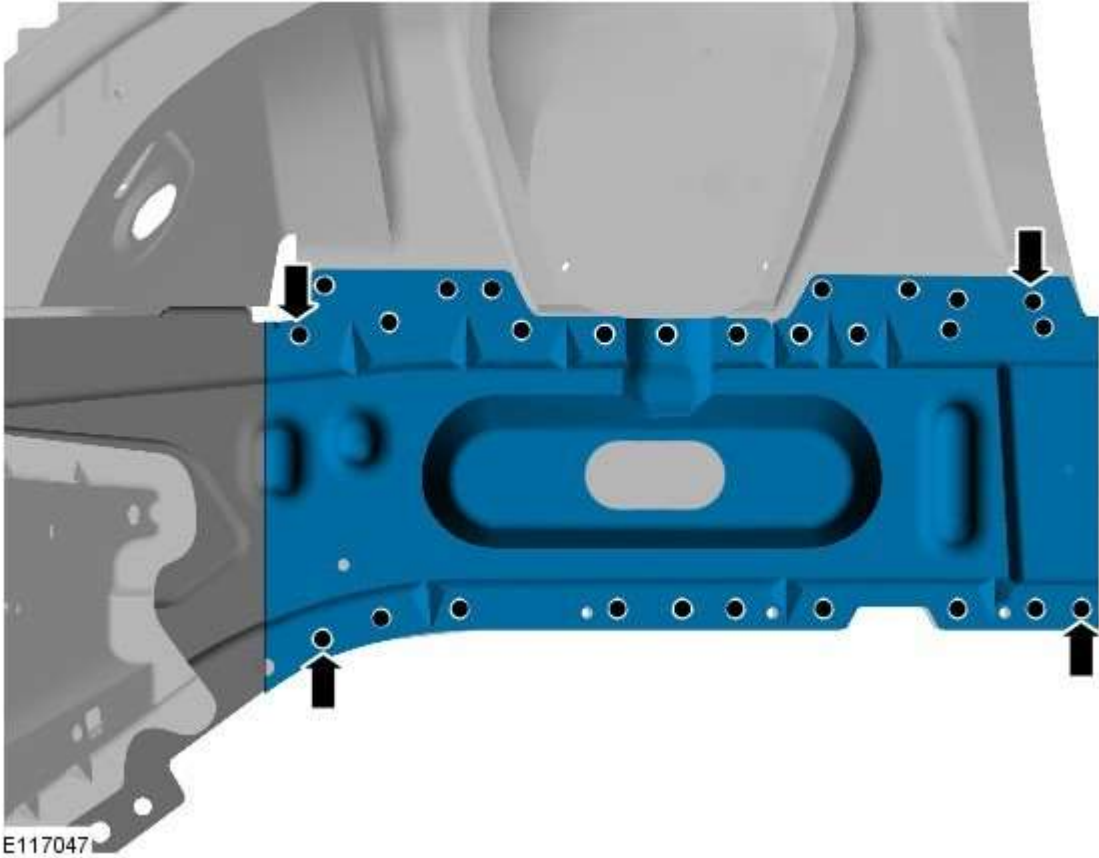
14. Remove the bulk of the damaged panels by cutting through the front side member and the front side member closing panel as indicated.




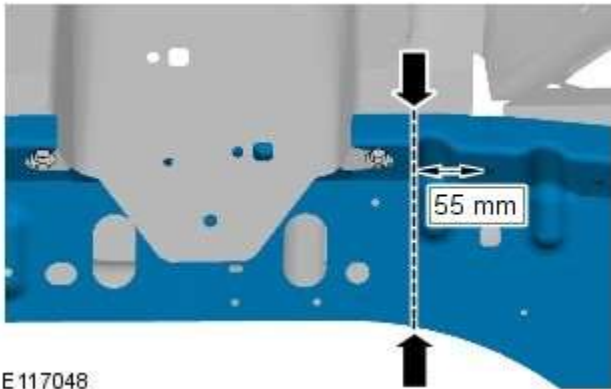
E 117046


15.  **CAUTION:** Care should be taken not to cut through into the front side member or its inner lower reinforcement.
Cut the front side member closing panel as indicated.


16. Drill out the spot welds from the front side member closing panel as indicated.

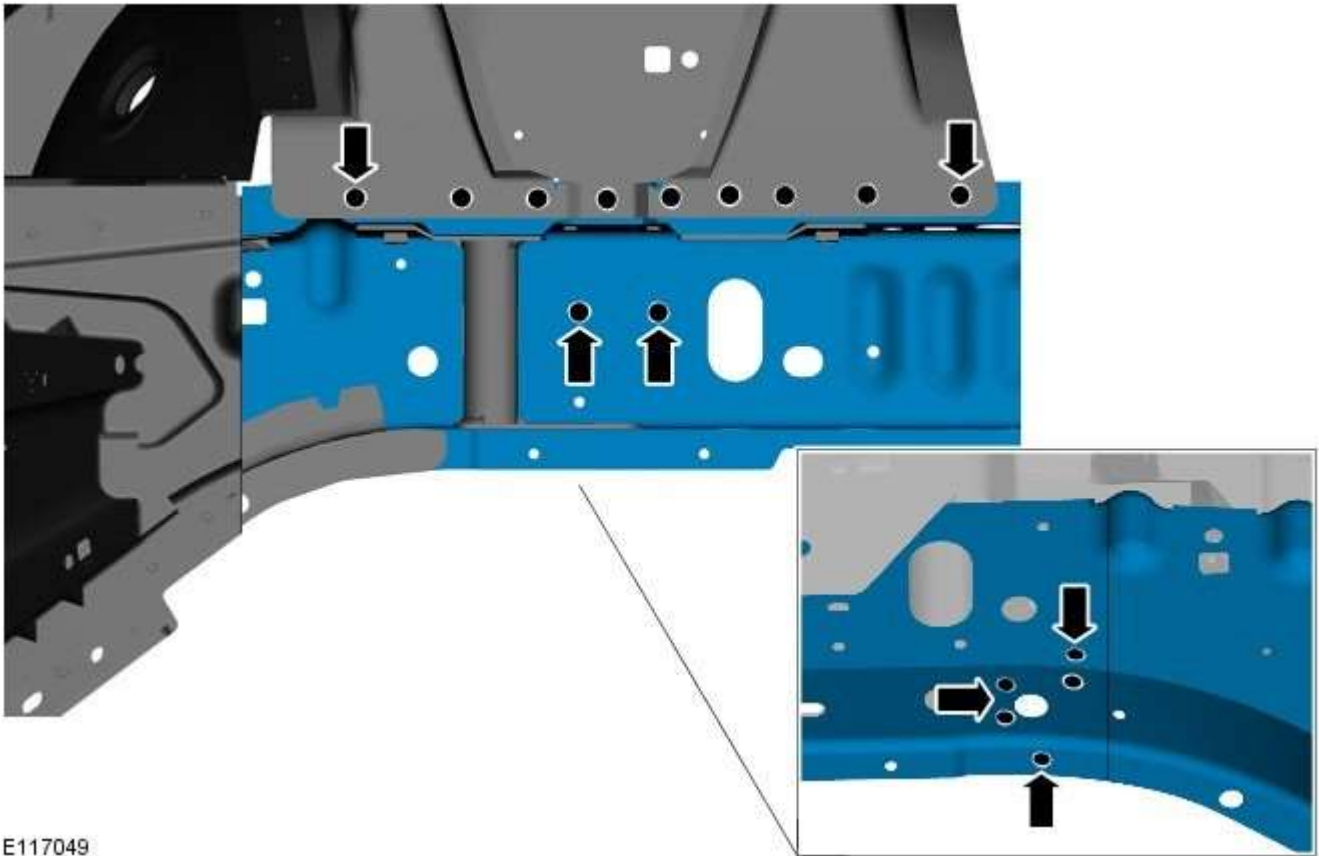


17.  NOTE: Retain the front side member closing panel remnant as it will be used as a template.
- Separate the joints and remove the front side member closing panel remnant.

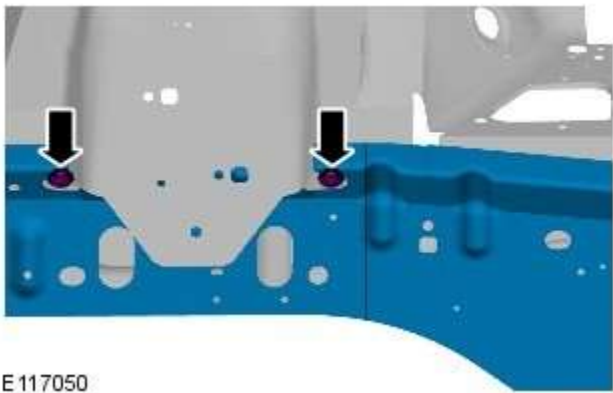


18.  NOTE: Care should be taken not to cut through into the front side member inner lower reinforcement.
- Mark out the position where the front side member MAG butt joint is to be made and cut through the panel at this point as indicated.


19.  NOTE: Where possible spot welds must be drilled out as indicated, to allow the new panel to be spot welded on installation.
- Drill out the spot welds as indicated.




E117049



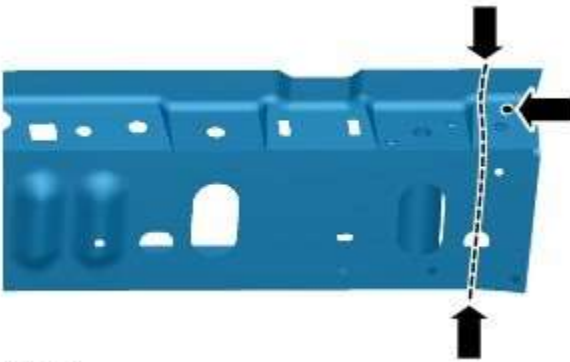
E117050

20.  NOTE: Retain the bolts for refitment on installation.
Remove the retaining bolts as indicated.

21.  NOTE: Retain the front side member remnant as it will be used as a template.
Separate the joints and remove the front side member remnant.

Installation

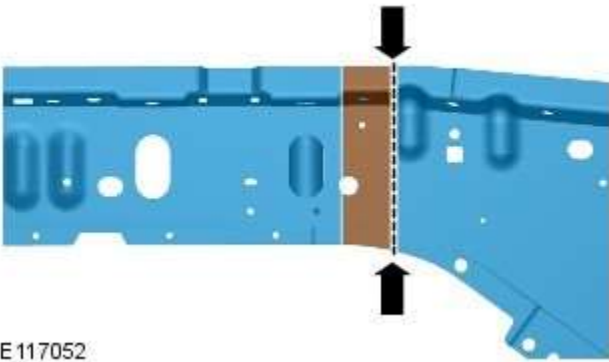
1. Drill out one spot weld, separate and cut a template from the rear of the front side member remnant as indicated.



E 117051

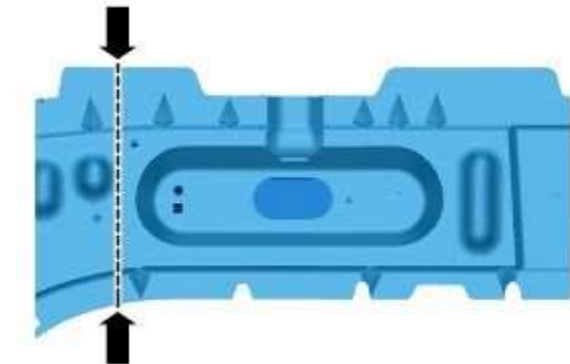
2.  NOTE: Dress the panel joint surfaces of the template to allow a good fit.

Offer up, align and clamp the template into position on the new side member service panel. Cut along the edge of the template, through the new panel, as indicated, where the MAG butt joint is to be made.



E 117052

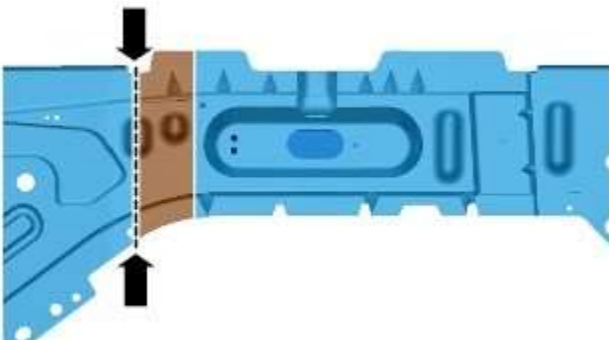
3. Cut a template from the rear of the front side member closing panel remnant as indicated.



E 117053

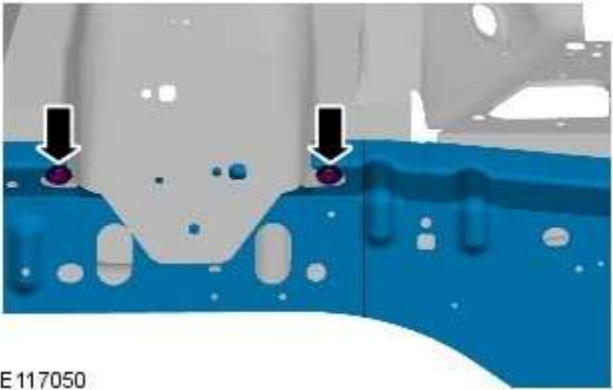
4.  NOTE: Dress the panel joint surfaces of the template to allow a good fit.

Offer up, align and clamp the front side member closing panel remnant into position on the new side member closing panel service panel. Cut along the edge of the template, through the new panel, as indicated, where the MAG butt joint is to be made.



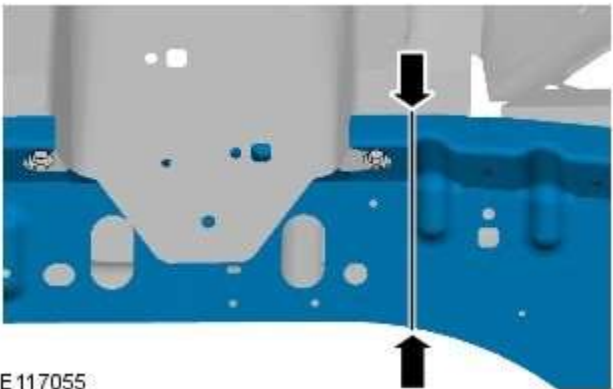
E 117054

5. Prepare the panel joint surfaces of the old and new front side member.
6. Offer up the new front side member and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



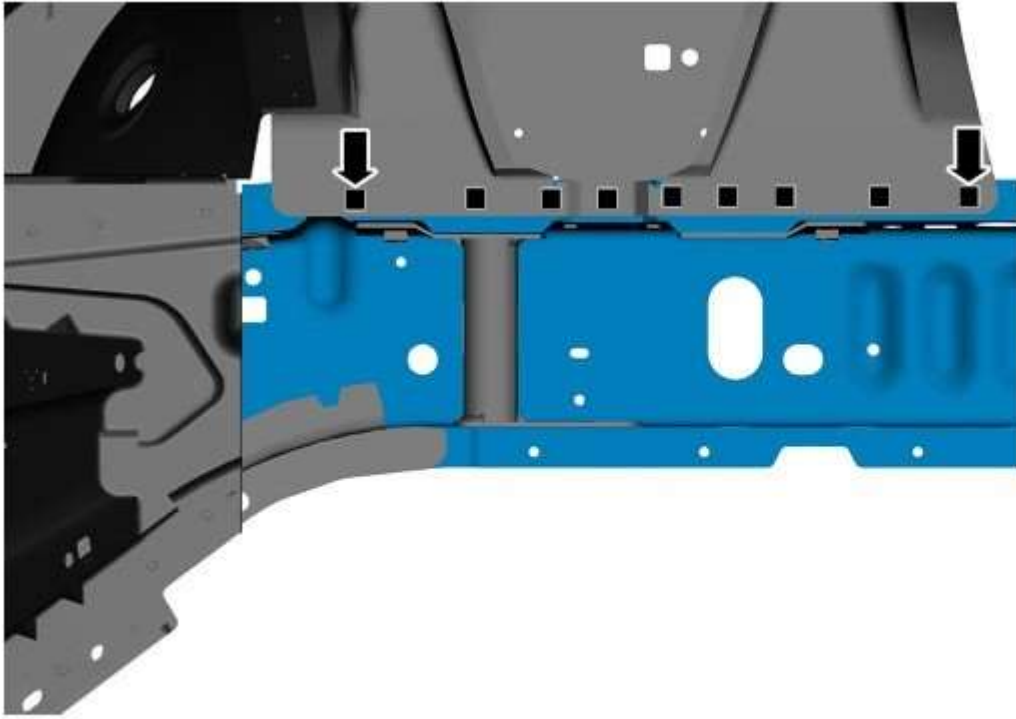
7. Install the retaining bolts.
 - **Tighten to XXNm.**

8. Tack MAG weld the front side member butt joint.
9. Dress the front side member MAG tack welds.




10. MAG weld the front side member butt joint.

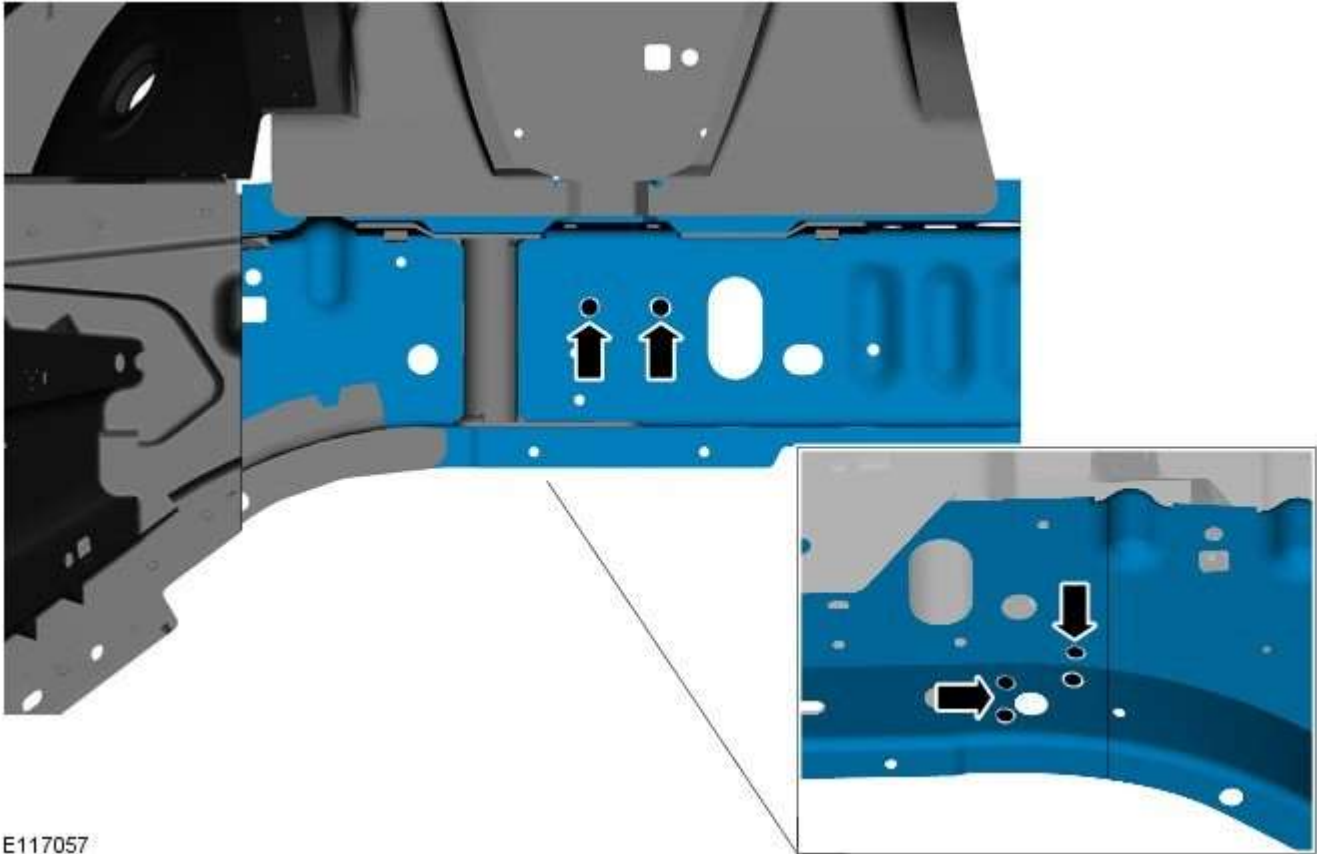
11. MAG plug weld.



E117056

12.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.

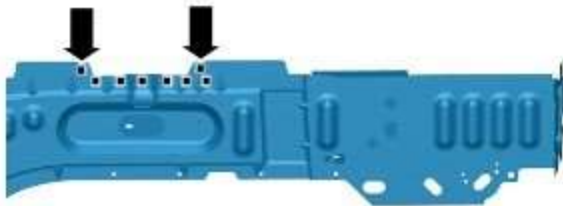


E117057

13. Dress all welded joints.

14. Apply a zinc rich primer to any bare metal surfaces at this stage.

15. Drill holes in the new side member closing panel ready for MAG plug welding.



E 117058

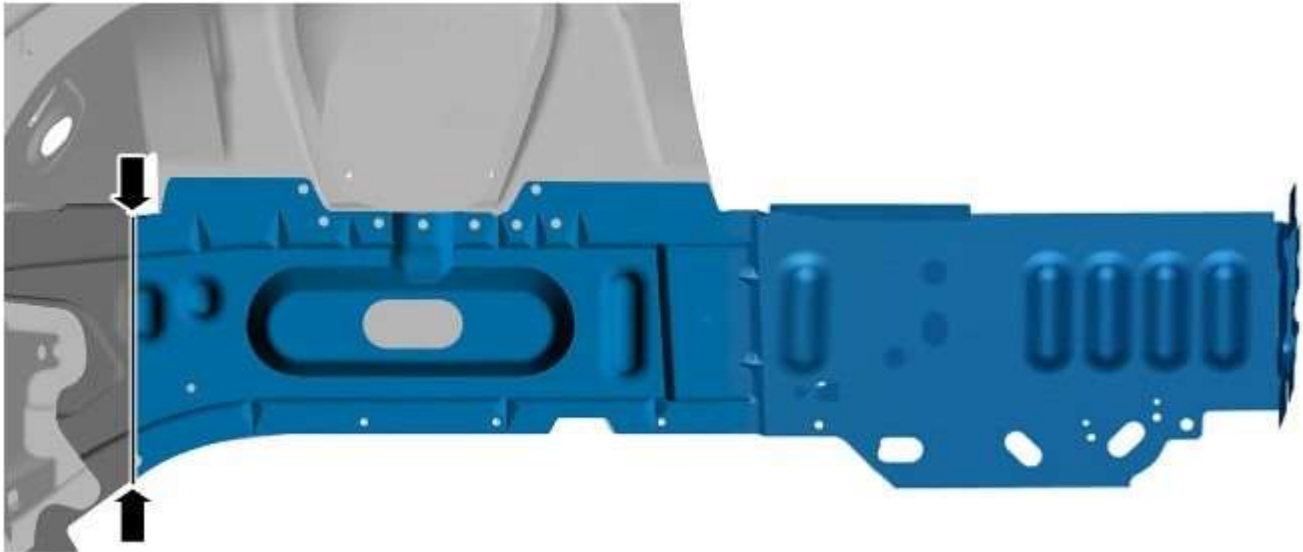
16. Prepare the panel joint surfaces of the old and new front side member closing panel.

17. Offer up the new front side member closing panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

18. Tack MAG weld the front side member closing panel butt joint.

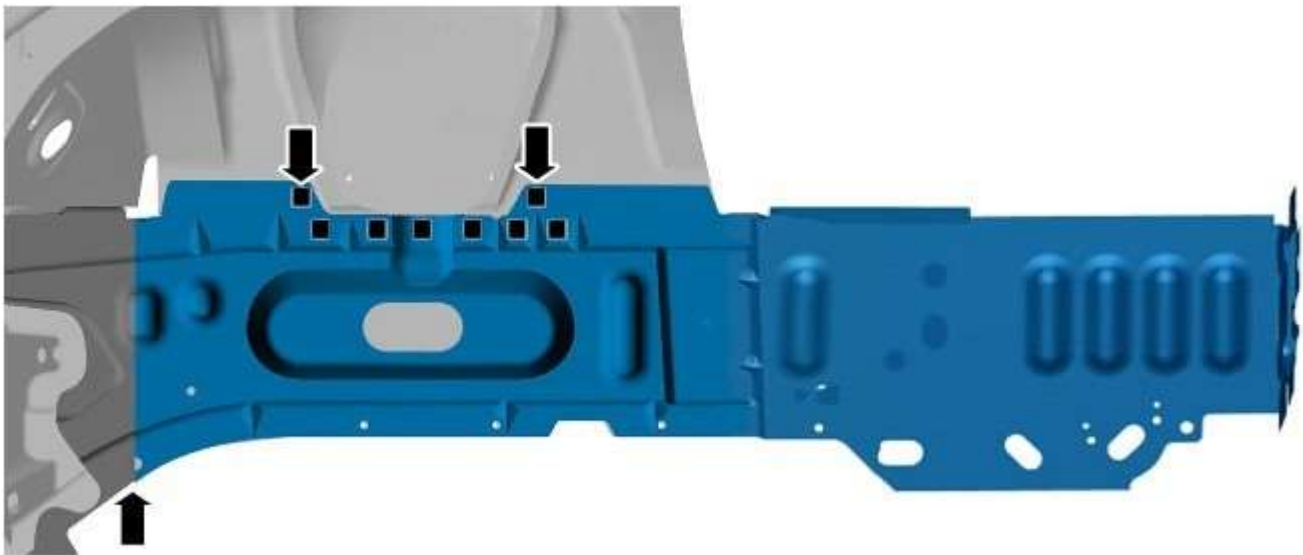
19. Dress the front side member closing panel MAG tack welds.

20. MAG weld the front side member closing panel butt joint.




E 117059

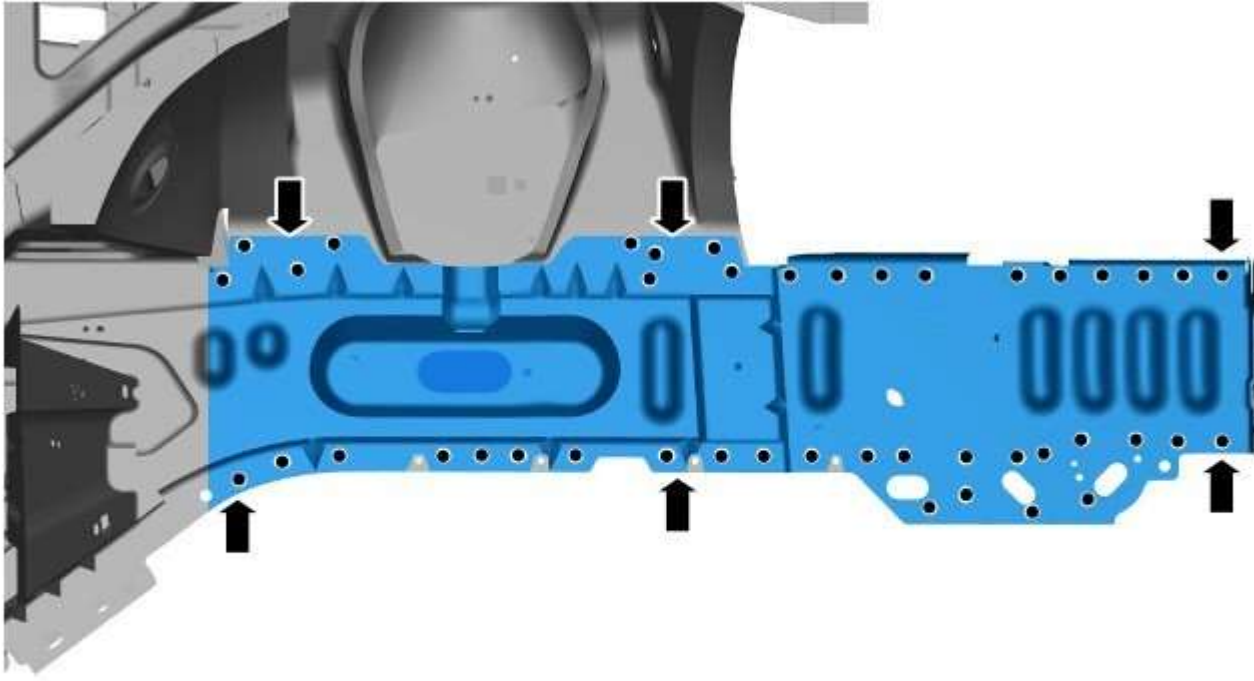
21. MAG plug weld.



E 117060

22.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.



E117061

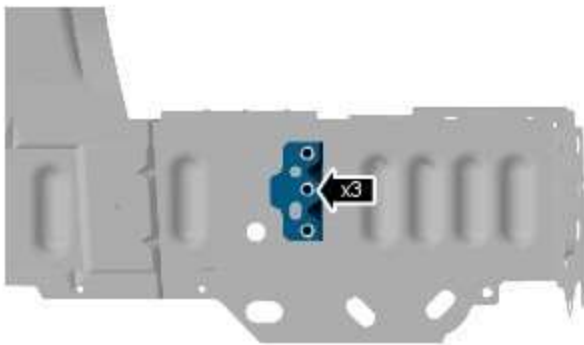
23. Dress all welded joints.

24.  **NOTE:** If a new front fender support bracket mounting is to be installed, drill 3 holes ready for MAG plug welding.

Prepare the panel joint surfaces of the front fender support bracket mounting and the front side member closing panel.

25. Offer up the front fender support bracket mounting and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

26. MAG plug weld.



E117044

27. Dress the MAG plug welds.

28. Install the front bumper mounting.
For additional information, refer to: [Front Bumper Mounting](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
29. Make sure any remaining areas of bare metal created during this procedure are treated with a zinc primer prior to the installation of outer panels.
30. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Front Side Member and Suspension Top Mount Assembly

Removal and Installation

Removal

1. NOTE: The front side member and suspension top mount assembly is, an assembly of panels, manufactured from High Strength Low Alloy Steel, 350MPa, (HSLA350) and mild steel.

The front side member and suspension top mount assembly is serviced as a separate weld-on panel. The assembly includes, the front bumper mounting, hood latch support panel, front side member, front side member closing panel, front wheelhouse section, front fender support bracket mounting, suspension top mount and the inner apron and wheelhouse panels



E112841

2. In this procedure, to make sure that the vehicle is correctly aligned, it must be placed on an approved alignment jig.
3. The front side member and suspension top mount assembly is replaced in conjunction with:
 - Front bumper cover
 - Front bumper
 - Front fender
 - Hood
 - Hood hinge
 - Hood latch panel
 - Front fender support bracket
 - Fender apron panel front extension
 - Fender apron panel closing panel
 - Fender apron panel
 - Hood strut mounting bracket

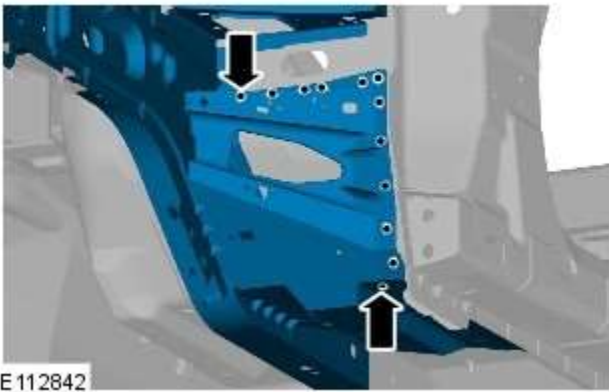
- Fender mounting plate
 - Instrument panel console
 - Engine, transmission / transaxle, front subframe and front suspension, as an assembly
4. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
 5. Remove the fender apron panel front extension.
For additional information, refer to: [Fender Apron Panel Front Extension](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
 6. Remove the front fender support bracket.
For additional information, refer to: [Front Fender Support Bracket](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
 7. Remove the fender apron panel.
For additional information, refer to: [Fender Apron Panel](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
 8. Remove the engine, transmission / transaxle, front subframe and front suspension, as an assembly.
For additional information, refer to: Engine (303-01A, Removal) / [Engine](#) (303-01B Engine - V6 3.0L Petrol, Removal) / Engine (303-01D, Removal) / Engine (303-01E, Removal) / Transmission - 2.7L Diesel (307-01, Removal) / [Transmission - TDV6 3.0L Diesel](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal) / [Transmission](#) (307-01A Automatic Transmission/Transaxle - V6 3.0L Petrol, Removal) / Transmission - 4.2L (307-01, Removal) / [Transmission - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (307-01B Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal) / [Front Shock Absorber](#) (204-01 Front Suspension, Removal and Installation) / Front Subframe - 2.7L Diesel (502-00, Removal and Installation) / [Front Subframe - V6 3.0L Petrol](#) (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation) / Front Subframe - 4.2L, Vehicles Without: Supercharger (502-00, Removal and Installation) / Front Subframe - 4.2L, Vehicles With: Supercharger (502-00, Removal and Installation).
 9. Remove the pedestrian protection hood actuator.
For additional information, refer to: [Pedestrian Protection Hood Actuator LH](#) (501-20C Pedestrian Protection System, Removal and Installation) / [Pedestrian Protection Hood Actuator RH](#) (501-20C Pedestrian Protection System, Removal and Installation).
 10. If the drivers side front side member and suspension top mount is to be repaired, remove the brake master cylinder and reservoir.
For additional information, refer to: [Brake Master Cylinder](#) (206-06 Hydraulic Brake Actuation, Removal and Installation) / [Brake Fluid Reservoir](#) (206-06 Hydraulic Brake Actuation, Removal and Installation).
 11. If the drivers side front side member and suspension top mount is to be repaired, remove the brake booster.


For additional information, refer to: [Brake Booster](#) (206-07 Power Brake Actuation, Removal and Installation).

12. Remove the left-hand and right-hand front seats.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
13. Remove the heater core and evaporator core housing.
For additional information, refer to: [Heater Core and Evaporator Core Housing](#) (412-01 Climate Control, Removal and Installation).
14. Remove the front safety belt retractor.
For additional information, refer to: [Front Safety Belt Retractor](#) (501-20A Safety Belt System, Removal and Installation).
15. Remove the B-pillar side impact sensor.
For additional information, refer to: [B-Pillar Side Impact Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
16. Remove the left-hand and right-hand front floor covering.
17. Remove the rear floor covering.
18. If the left-hand front side member and suspension top mount assembly is to be repaired, remove the left-hand rear foot well duct.
19. If the right-hand front side member and suspension top mount assembly is to be repaired, remove the right-hand rear foot well duct.
20. If the drivers side front side member and suspension top mount is being repaired, remove the pedal box.
21. Release and position the insulating material at the inner bulkhead to one side.
22. Release and position the inner bulkhead and floor panel wiring harness to one side.
23. Drain the fuel tank.
For additional information, refer to: [Fuel Tank Draining](#) (310-00 Fuel System - General Information, General Procedures).
24. If the left-hand front side member and suspension top mount assembly is to be repaired, remove the left-hand under shield.
25. If the right-hand front side member and suspension top mount assembly is to be repaired, remove the right-hand under shield.
26. If the left-hand front side member and suspension top mount assembly is to be repaired, remove the fuel supply and return pipes.
27. For diesel engine vehicles only, if the left-hand front side member and suspension top mount assembly is to be repaired, remove the fuel cooler.
28. If the right-hand front side member and suspension top mount assembly is to be repaired, release and position the underfloor wiring harness to


one side.


29. If the right-hand front side member and suspension top mount assembly is to be repaired, remove the front to rear brake pipes.
30. Remove the exhaust heat shields.
31. Release and position the front side member and suspension top mount wiring harness to one side.
32. Remove any remaining miscellaneous components from the repair area as necessary.



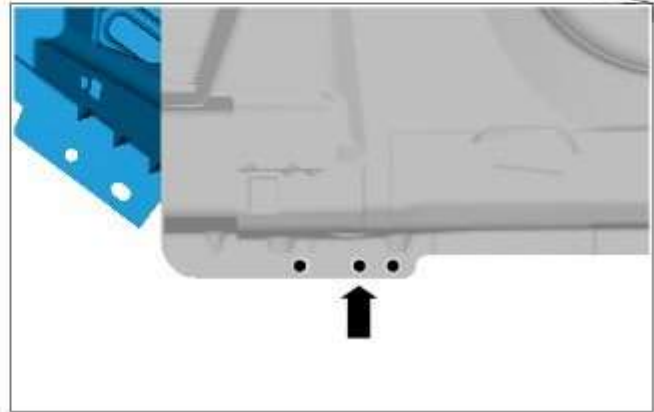
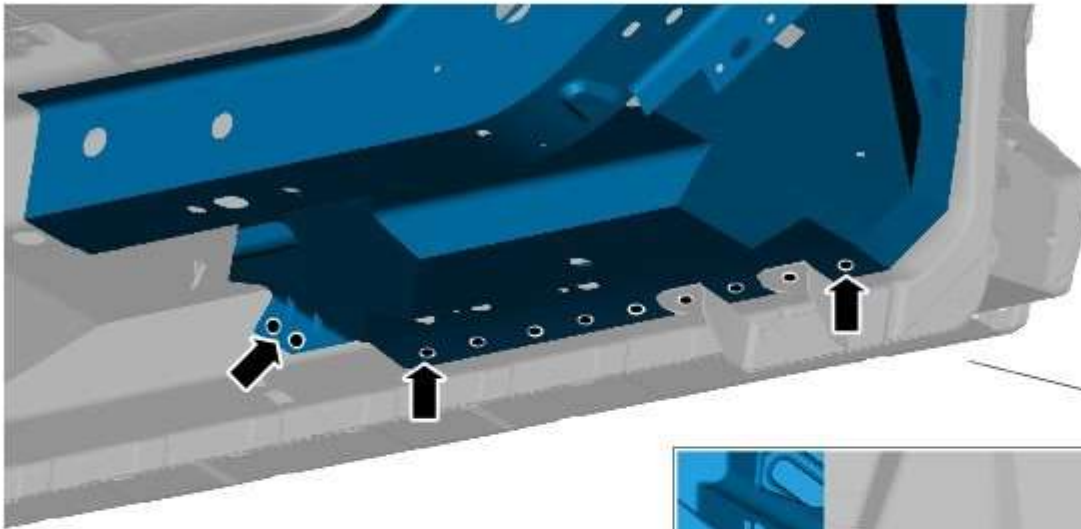
33.  NOTE: Remove the sealer to expose the spot welds.
Drill out the spot welds as indicated.

34. NOTES:

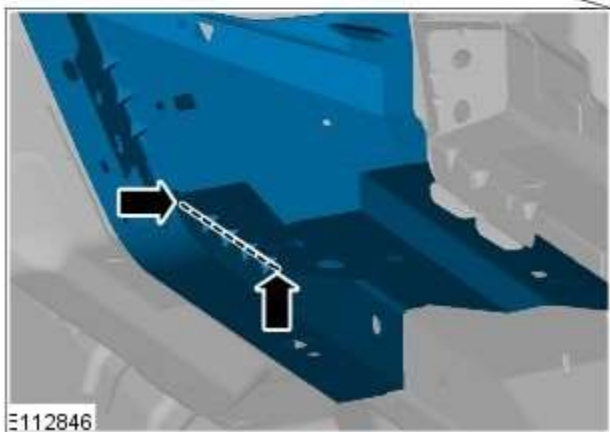
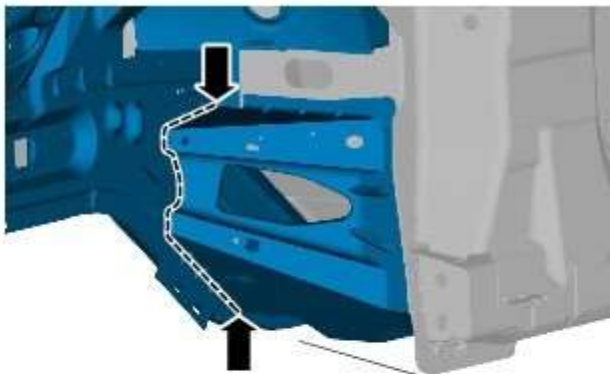
 Remove the sealer to expose the spot welds.

 Use a belt sander where there is no access to drill. The three spot welds at the rocker panel should be drilled from outside and right through, to allow MAG plug welding on installation


Drill out the spot welds as indicated.



E112844

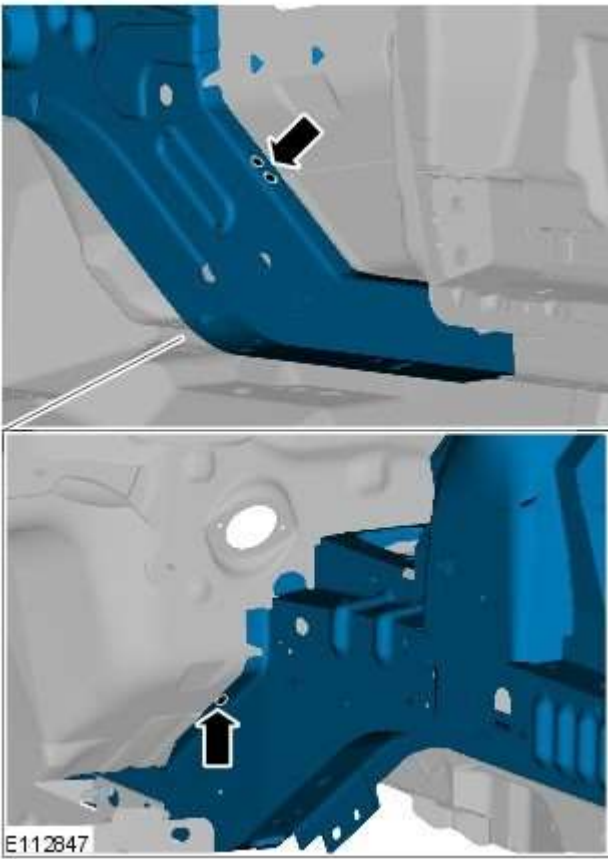


E112846

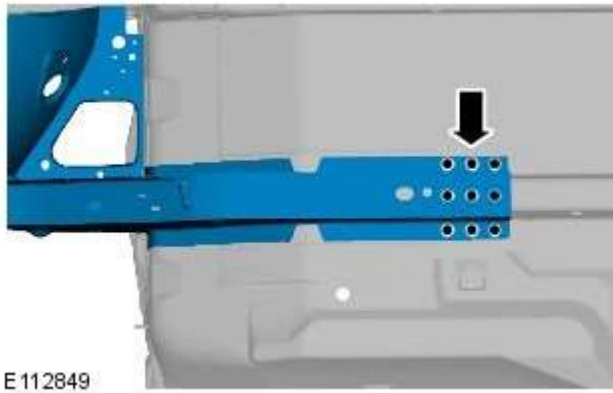
35.  NOTE: The removal of the bulkhead reinforcement is required to gain access to drill out two spot welds.
Remove the bulkhead reinforcement panel, by performing a saw cut at the points as indicated.


36. Separate the joints and remove the bulkhead reinforcement panel.

37. Drill out the spot welds as indicated.

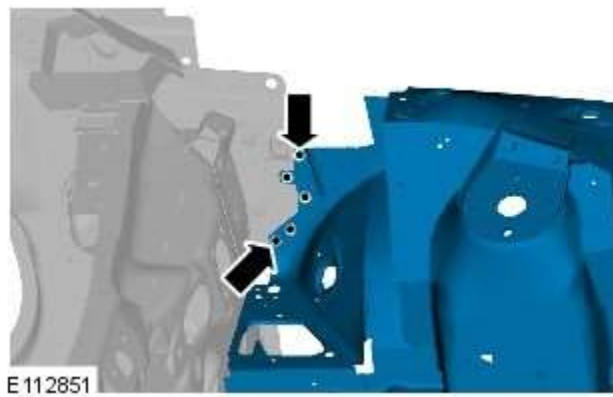


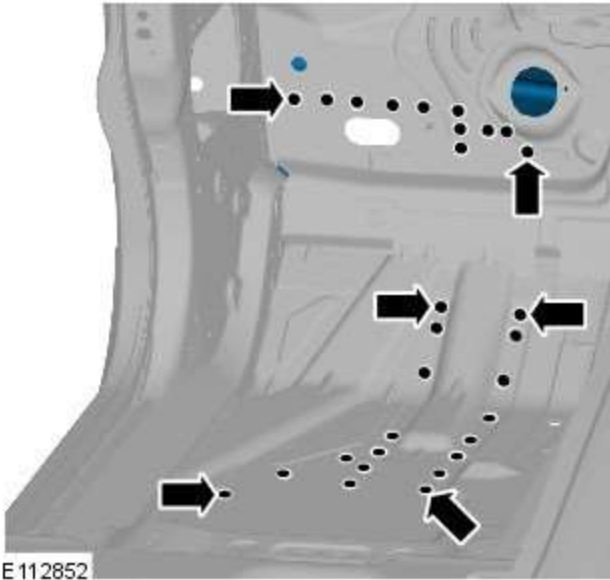
38. Drill out the spot welds as indicated.




39.  NOTE: The spot welds indicated should be drilled from inside the engine compartment, to allow spot welding on installation.

Drill out the spot welds as indicated.






40. NOTES:

 Remove the NVH (noise, vibration and harshness) sound deadening material to expose the spot welds.

 The spot welds indicated should be drilled from inside and right through, to allow MAG plug welding on installation.

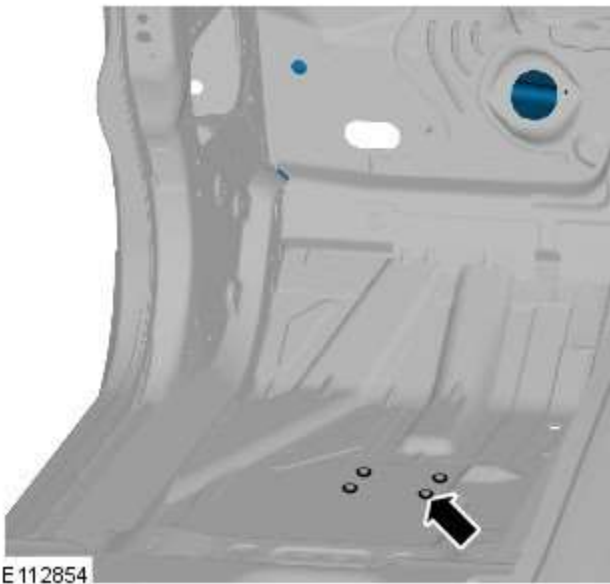
Drill out the spot welds as indicated.

41.  CAUTION: This step requires the aid of another technician as the removed panel will be heavy.

Separate the joints and remove the old panel.

Installation

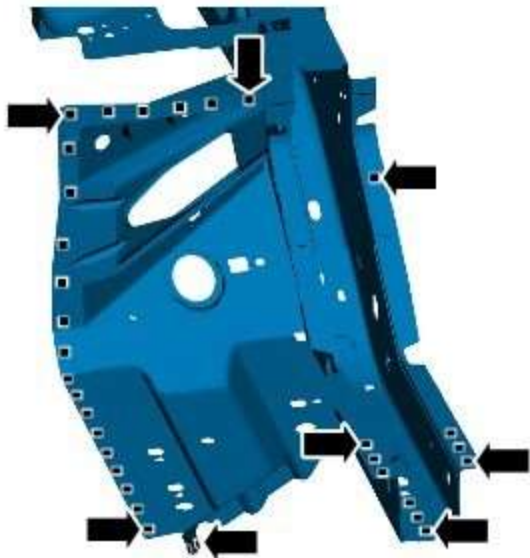
1. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



2. NOTE: To avoid overlapping MAG plug welds, the original removal holes must be marked so that they can be avoided when drilling the adjacent MAG plug holes.

Mark the position of the drilled holes as indicated, on the new panel.

3. Remove the new panel.

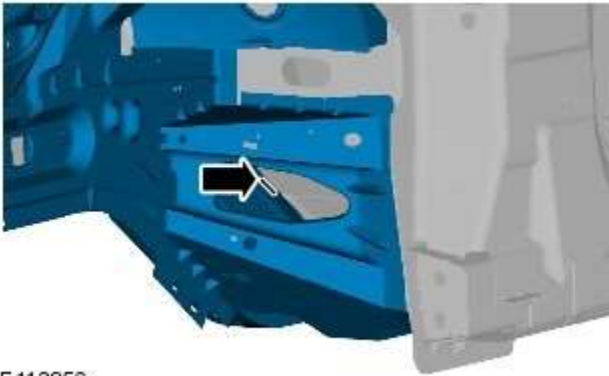


E 112855

- NOTE: Holes should be drilled avoiding the areas previously marked.

Drill holes in the new panel ready for MAG plug welding.

- Prepare the old and new panel joint surfaces.

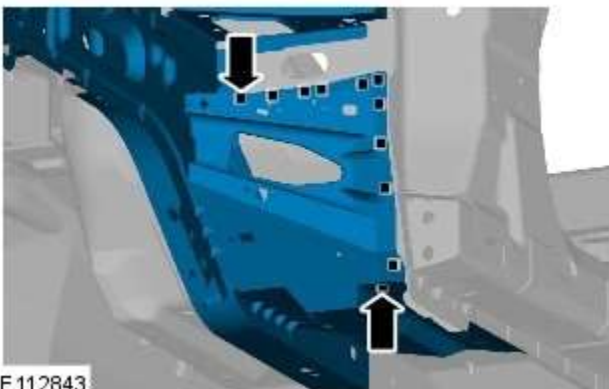


E 112856

- NOTE: On installation, a MAG run replaces two spot welds which cannot be MAG plugged due to restricted access.

Prepare the old and new panel joint surfaces at the point indicated, where the MAG run is to be performed.

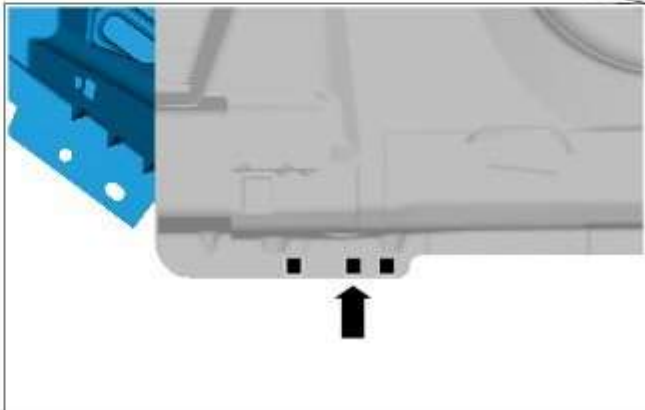
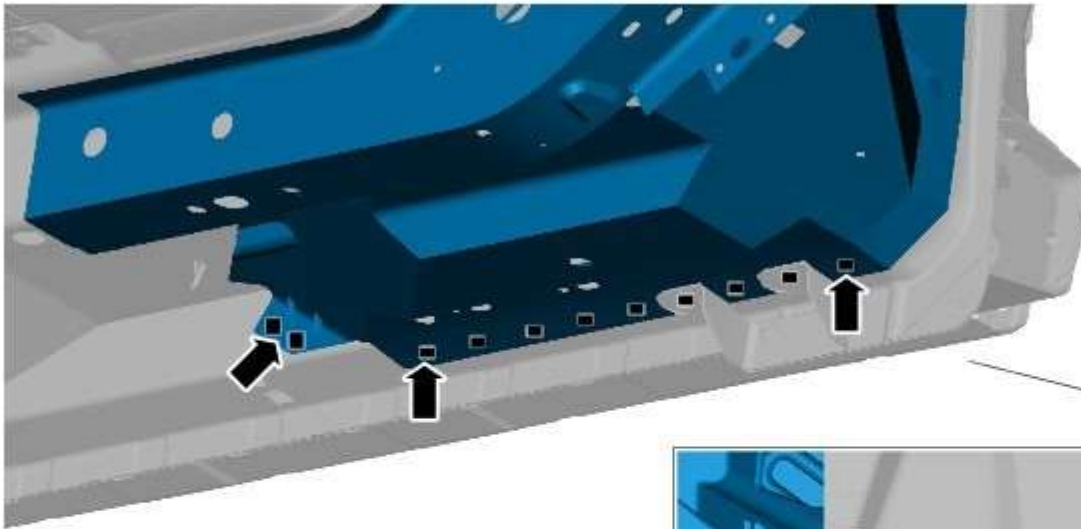
- Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



E 112843

- MAG plug weld at the points indicated.

- MAG plug weld at the points indicated.



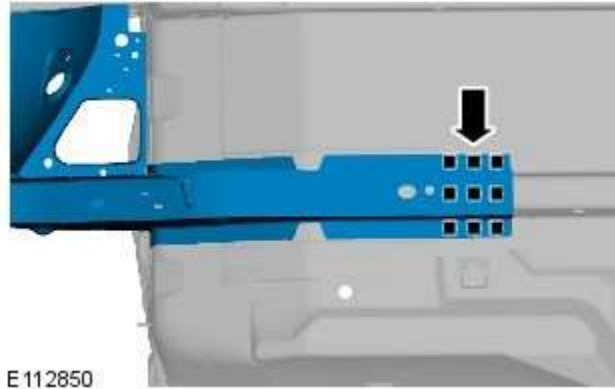
E112845

10. MAG plug weld at the points indicated.

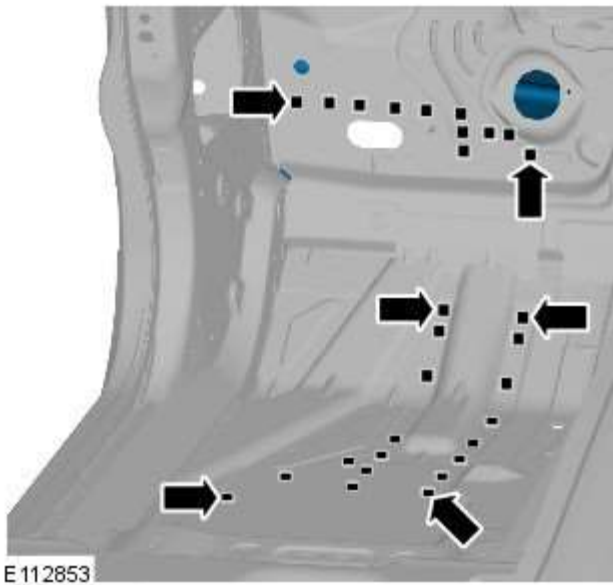


E112848

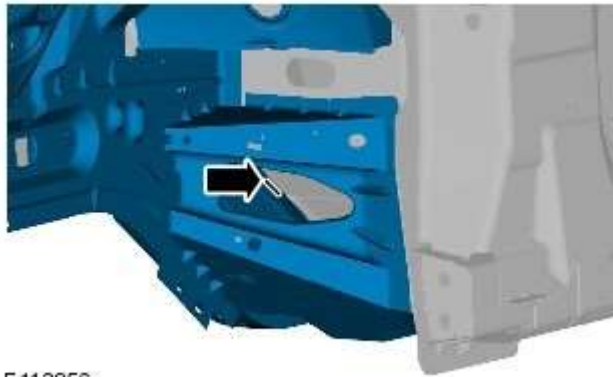
11. MAG plug weld at the points indicated.




E112850

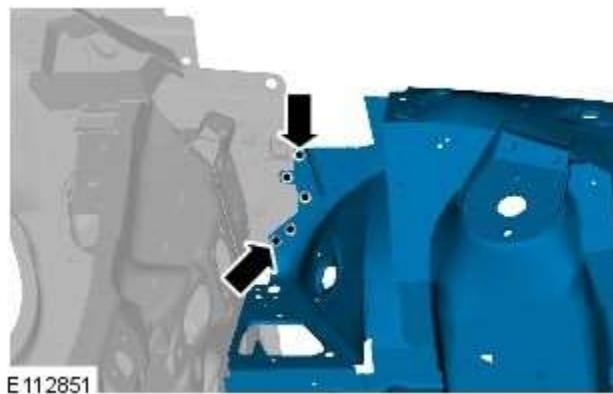



12. MAG plug weld at the points indicated.



13.  NOTE: A MAG weld run replaces the original two spot welds as there is no access to install spot welds or MAG plug welds in this area. The MAG weld run should be performed avoiding the area of adhesive.

Perform a MAG weld run, of approx 30mm as indicated.



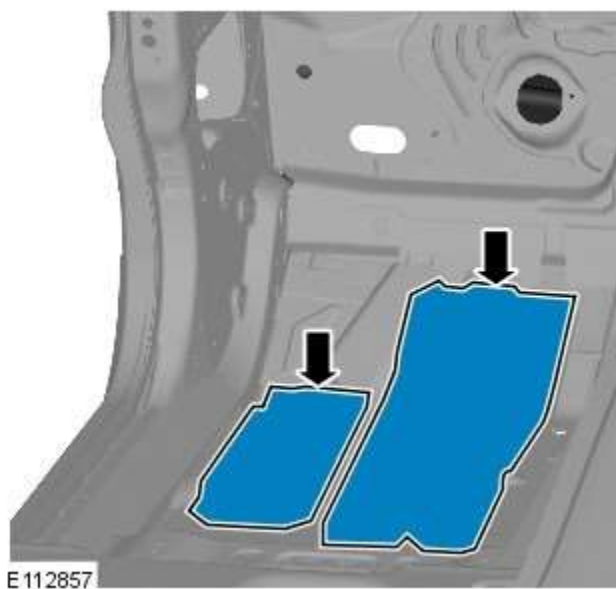
14.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.

15. Dress all welded joints.

16. Make sure any remaining areas of bare metal created during this procedure are treated with a zinc primer prior to the installation of outer panels.

17. Install the NVH sound deadening material in the areas indicated.



E 112857

18.  NOTE: Make sure all underbody joints are fully sealed following this repair procedure.

The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Front Side Member Closing Panel

Removal and Installation

Removal

1. **NOTE:** The front side member closing panel is manufactured from High Strength Low Alloy Steel, 350MPa, (HSLA350).

The front side member closing panel is serviced as a separate weld-on panel.



E111830

2. In this procedure, to ensure the vehicle is correctly aligned, it must be placed on an approved alignment jig.
3. The front side member closing panel is replaced in conjunction with:
 - Front bumper cover
 - Front bumper
 - Front bumper mounting
 - Hood
 - Hood latch panel
 - Front fender support bracket
 - Front fender support bracket mounting
 - Front wheelhouse section
 - Front side member
 - Engine, transmission / transaxle, front subframe and front suspension, as an assembly
4. For additional information relating to this repair procedure please see the following:
 For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
5. **NOTE:** This procedure assumes that if the front side member closing panel is damaged, the front side member will also be damaged. Therefore, the replacement procedure for the front side member closing panel is combined within the front side member procedure.

 Remove the front side member.
 For additional information, refer to: [Front Side Member](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).

Installation

1. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Front Side Member Closing Panel Section

Removal and Installation

Removal

1. **NOTE:** The front side member closing panel section is manufactured from High Strength Low Alloy Steel, 350MPa, (HSLA350).

The front side member closing panel section is cut from the front side member closing panel service panel.



E111830

2. In this procedure, to make sure that the vehicle is correctly aligned, it must be placed on an approved alignment jig.
3. The front side member closing panel section is replaced in conjunction with:
 - Front bumper cover
 - Front bumper
 - Front bumper mounting
 - Hood
 - Hood latch panel
 - Front side member section
4. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
5. **NOTE:** This procedure assumes that if the front side member closing panel section is damaged, the front side member section will also be damaged. Therefore the removal procedure for the front side member closing panel section is combined within the front side member section procedure.

Remove the front side member section.

For additional information, refer to: [Front Side Member Section](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).

Installation

1. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Front Side Member Section

Removal and Installation

Removal

1. **NOTE:** The front side member section is manufactured from High Strength Low Alloy Steel, 350MPa, (HSLA350).

The front side member section is cut from the front side member service panel, which includes the hood latch panel mounting bracket.



E111823

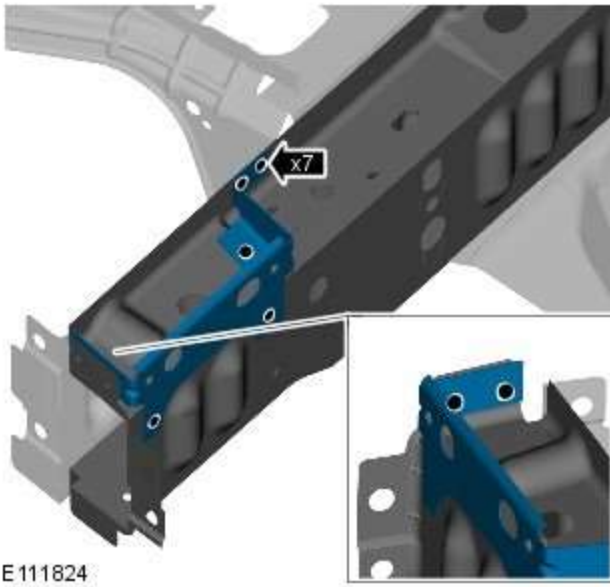
2. In this procedure, to make sure that the vehicle is correctly aligned, it must be placed on an approved alignment jig.
3. **NOTE:** This procedure assumes that the front side member closing panel section is damaged. Therefore, the procedure combines the repair of the front side member section and the front side member closing panel section.

The front side member section is replaced in conjunction with:

- Front bumper cover
- Front bumper
- Front bumper mounting
- Hood
- Hood latch panel
- Front side member closing panel section

For additional information, refer to: [Front Side Member Closing Panel Section](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).

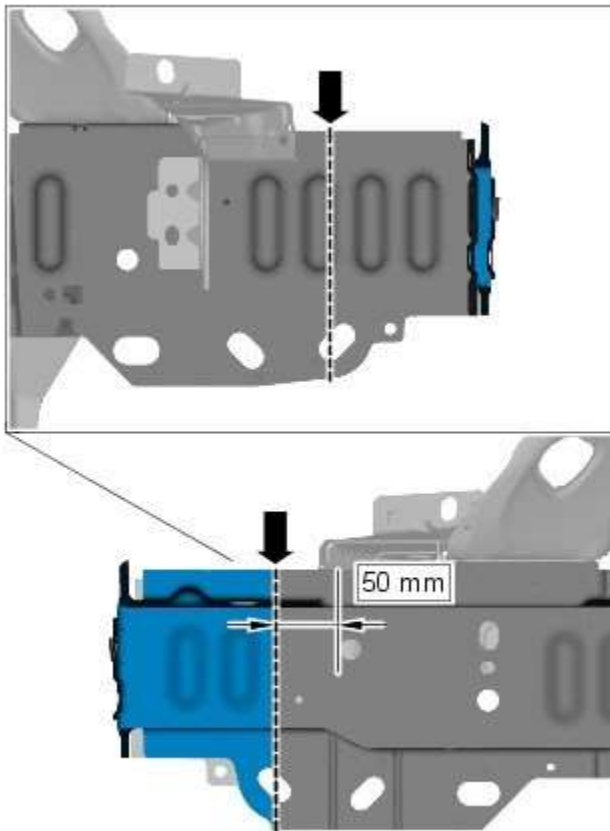
4. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
5. Remove the hood.
For additional information, refer to: [Hood](#) (501-02 Front End Body Panels, Removal and Installation).
6. Remove the front bumper mounting.
For additional information, refer to: [Front Bumper Mounting](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
7. Disconnect the generator electrical connectors.




E111824

8. NOTE: Removal of the hood latch panel mounting bracket is required to enable the section cut line to be marked out and performed on the front side member.

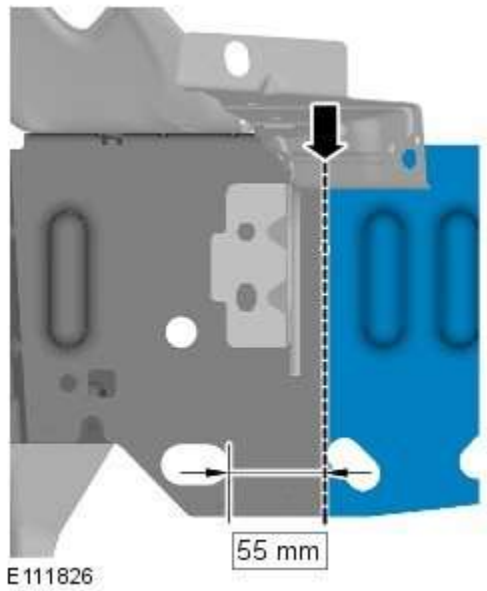
Drill out the spot welds and remove the hood latch panel mounting bracket.




E111825

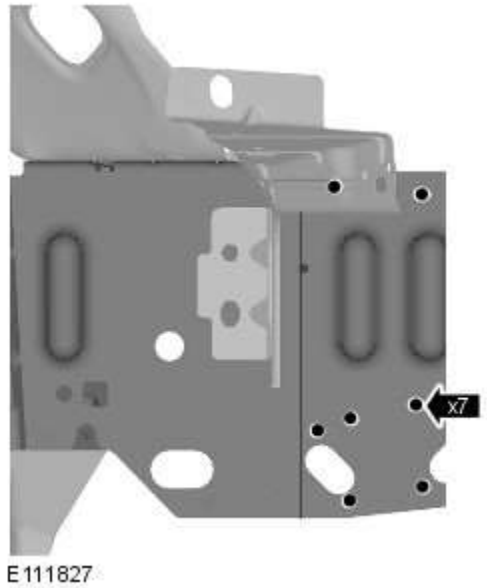
9.  NOTE: The measurements shown allow the section to be performed, avoiding the inner reinforcements and allowing for a minimum 50mm staggered joint with the front side member closing panel section.

Mark out the position where the front side member section MAG butt joint is to be made. Cut through the front side member at this point, also cutting through the front side member closing panel as indicated.



10.  **CAUTION:** Care should be taken not to cut through into the front side member.

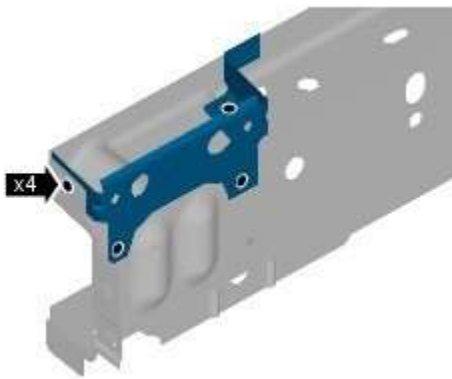
Mark out the position where the front side member closing panel section MAG butt joint is to be made. Cut through the front side member closing panel at this point as indicated.



11. Drill out the spot welds from the front side member closing panel remnant.

12. Separate the joints and remove the front side member closing panel remnant.

Installation

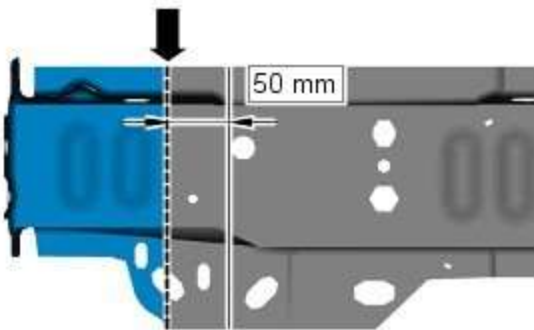


E 111828

1. NOTE: Removal of the hood latch panel mounting bracket is required to enable the section cut line to be marked out and performed on the front side member. Retain the hood latch panel mounting bracket as it will be reused.

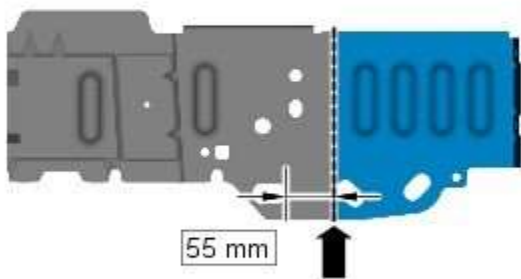
Drill out the spot welds and remove the hood latch panel mounting bracket from the side member service panel.

2. Mark out the position on the front side member service panel, where the section MAG butt joint is to be made and cut the panel at this point as indicated.



E 111829

3. Mark out the position on the front side member closing panel service panel, where the section MAG butt joint is to be made and cut the panel at this point as indicated.

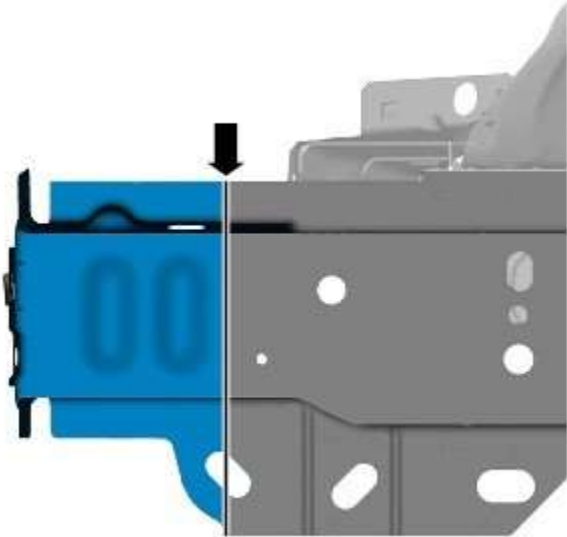


E 111831

4. Prepare the panel joint surfaces of the old and new front side member and front side member closing panel sections.

5. Offer up the new front side member section and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
6. Tack MAG weld the front side member section butt joint.
7. Dress the front side member section MAG tack welds.

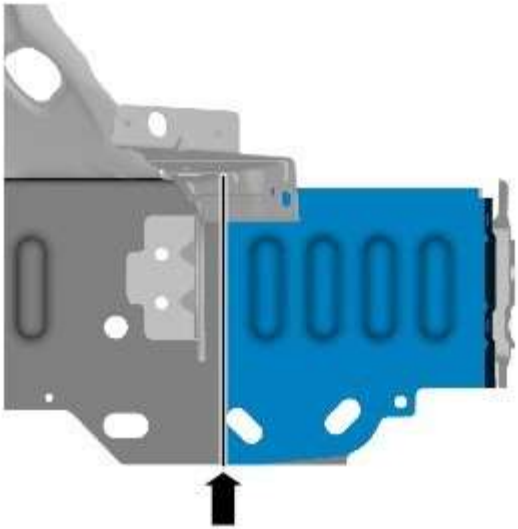
8. MAG weld the front side member section butt joint.




E 111832

9. Dress the front side member section MAG butt joint.
10. Apply a zinc rich primer to any bare metal surfaces at this stage.
11. Offer up the new front side member closing panel section and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
12. Tack MAG weld the front side member closing panel section butt joint.
13. Dress the front side member closing panel section MAG tack welds.

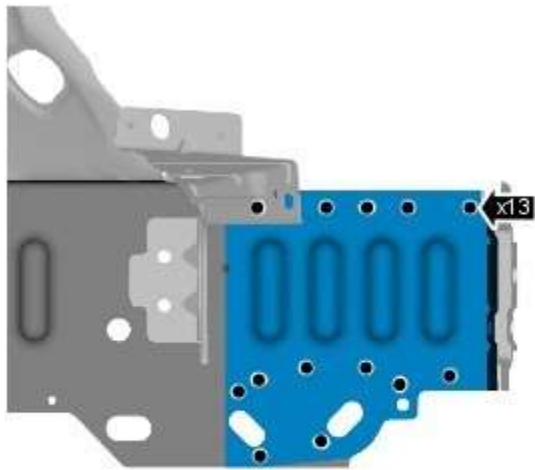
14. MAG weld the front side member closing panel section butt joint.



E111833

15.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld the front side member closing panel section to the front side member.



E111834

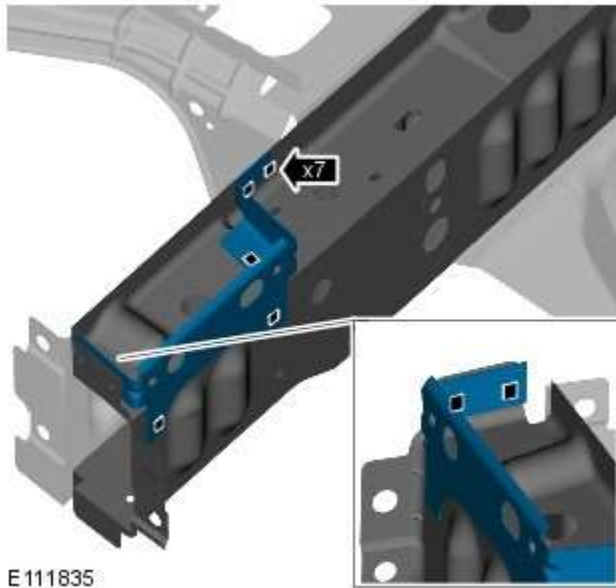
16. Dress the spot welds and the front side member closing panel section MAG butt joint.

17. Drill holes in the new hood latch panel mounting bracket ready for MAG plug welding.



E 111906

18. Prepare the panel joint surfaces of the new hood latch panel mounting bracket and the corresponding joints on the front side member section.



E 111835

19. MAG plug weld the hood latch panel mounting bracket to the front side member section.

20. Dress the hood latch panel mounting bracket MAG plug welds.
21. Make sure any remaining areas of bare metal created during this procedure are treated with a zinc primer prior to the installation of outer panels.
22. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Front Wheelhouse Section

Removal and Installation

Removal



E 111995

1. NOTES:



The left hand service panel is illustrated.



The front wheelhouse section is manufactured from mild steel.

The front wheelhouse section is serviced as a separate weld-on panel, the left-hand is serviced less the weld-on air cleaner mounting bracket. It is also serviced on the front side member and suspension top mount assembly, the left-hand assembly includes the air cleaner mounting bracket.

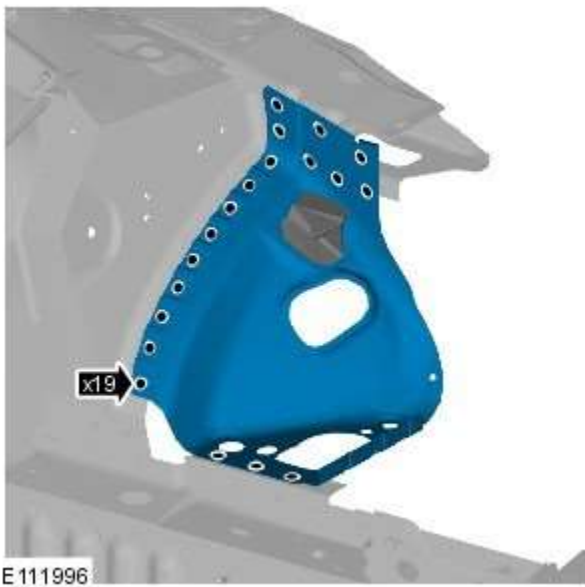
2. The front wheelhouse section is replaced in conjunction with:
 - Front bumper cover
 - Front fender
 - Hood latch panel
 - Front fender support bracket

3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

4. Remove the front fender support bracket.
For additional information, refer to: [Front Fender Support Bracket](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).

5. Disconnect the generator electrical connectors.

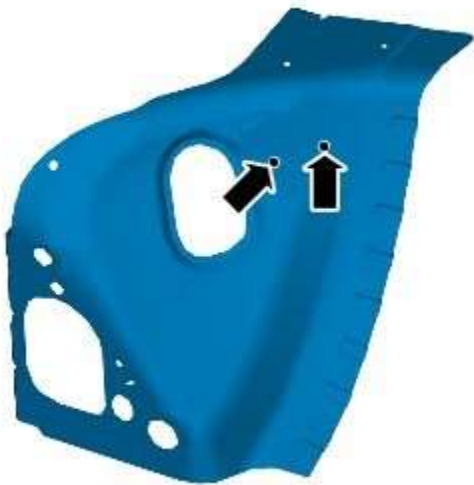
6. Drill out the spot welds.



7. NOTE: If the left-hand front wheelhouse section is to be repaired, retain the old panel if the air cleaner mounting bracket is to be reused.

Separate the joints and remove the old panel.

8. If the left-hand front wheelhouse section is to be repaired, drill out the spot welds for the air cleaner mounting bracket from underneath so that it can be reused.



9. NOTE: If undamaged, the air cleaner mounting bracket should be retained for installation on the new panel.

Separate and remove the air cleaner mounting bracket.

Installation

1. NOTE: If adjacent panels are being repaired and access allows, spot welds should be installed where possible.

Drill holes in the new panel ready for MAG plug welding.



E 111998

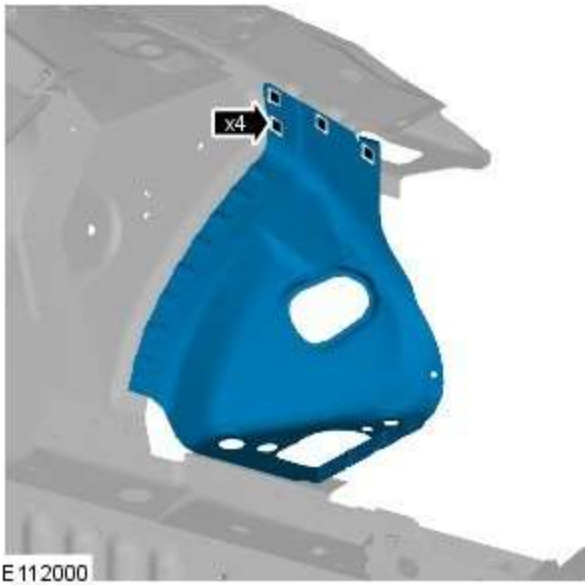
2. Prepare the old and new panel joint surfaces.
3. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



E 111999

4. NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original.

Spot weld.

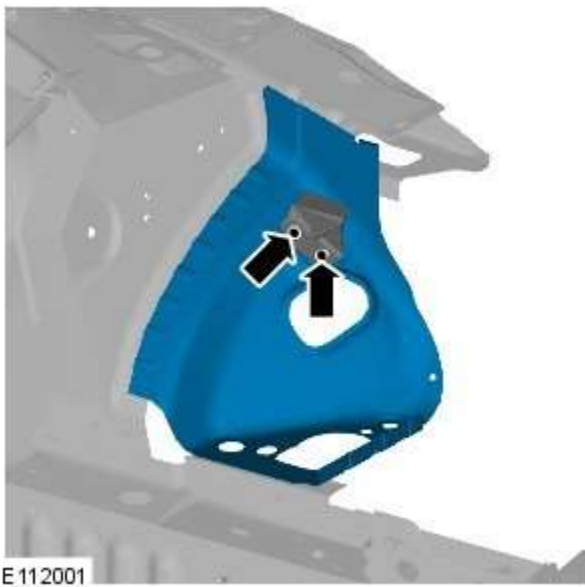


5. NOTE: If adjacent panels are being repaired and access allows, spot welds should be installed where possible.

MAG plug weld.

6. Prepare the panel joint surfaces of the air cleaner mounting bracket.
7. Offer up the air cleaner mounting bracket and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

8. Spot weld the air cleaner mounting bracket.



9. Dress all welded joints.
10. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Hood Latch Panel

Removal and Installation

Removal


1.  **NOTE:** The hood latch panel is manufactured from mild steel.

The hood latch panel is serviced as a separate bolt-on panel and includes the left-hand and right-hand fender apron panel front extensions. These are removed and discarded unless damaged.



E102951

2. The hood latch panel is replaced in conjunction with:
 1. Front bumper cover
 2. Front bumper

3.  **WARNING:** The hood latch panel and its associated components form part of the pedestrian protection system, it is essential that any repair or replacement operations do not affect the safe working of the system.

For additional information relating to the pedestrian safety system please see the following:

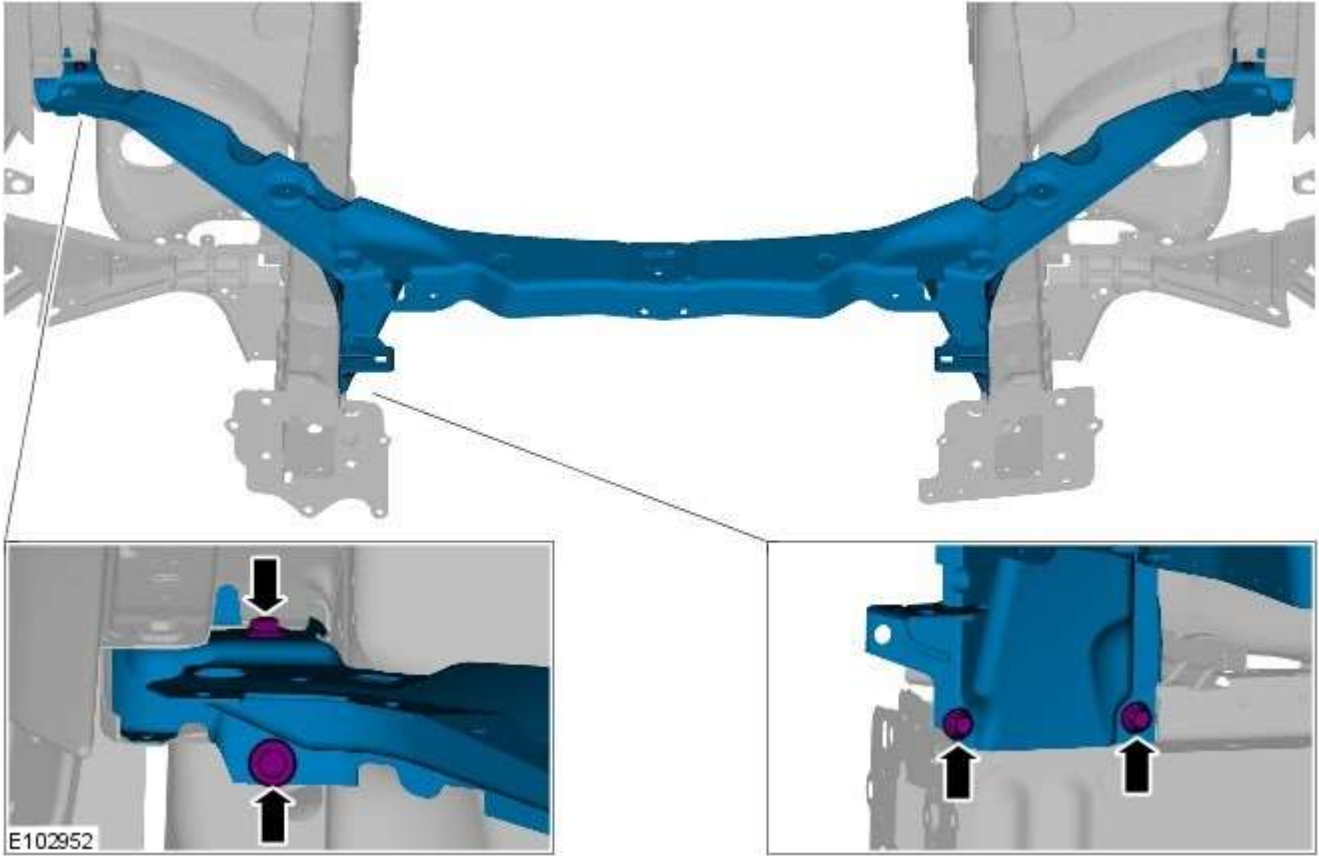
For additional information, refer to: [Pedestrian Protection System](#) (501-20C Pedestrian Protection System, Description and Operation).

4. For additional information relating to this repair procedure please see the following:

For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
5. Remove the front bumper.

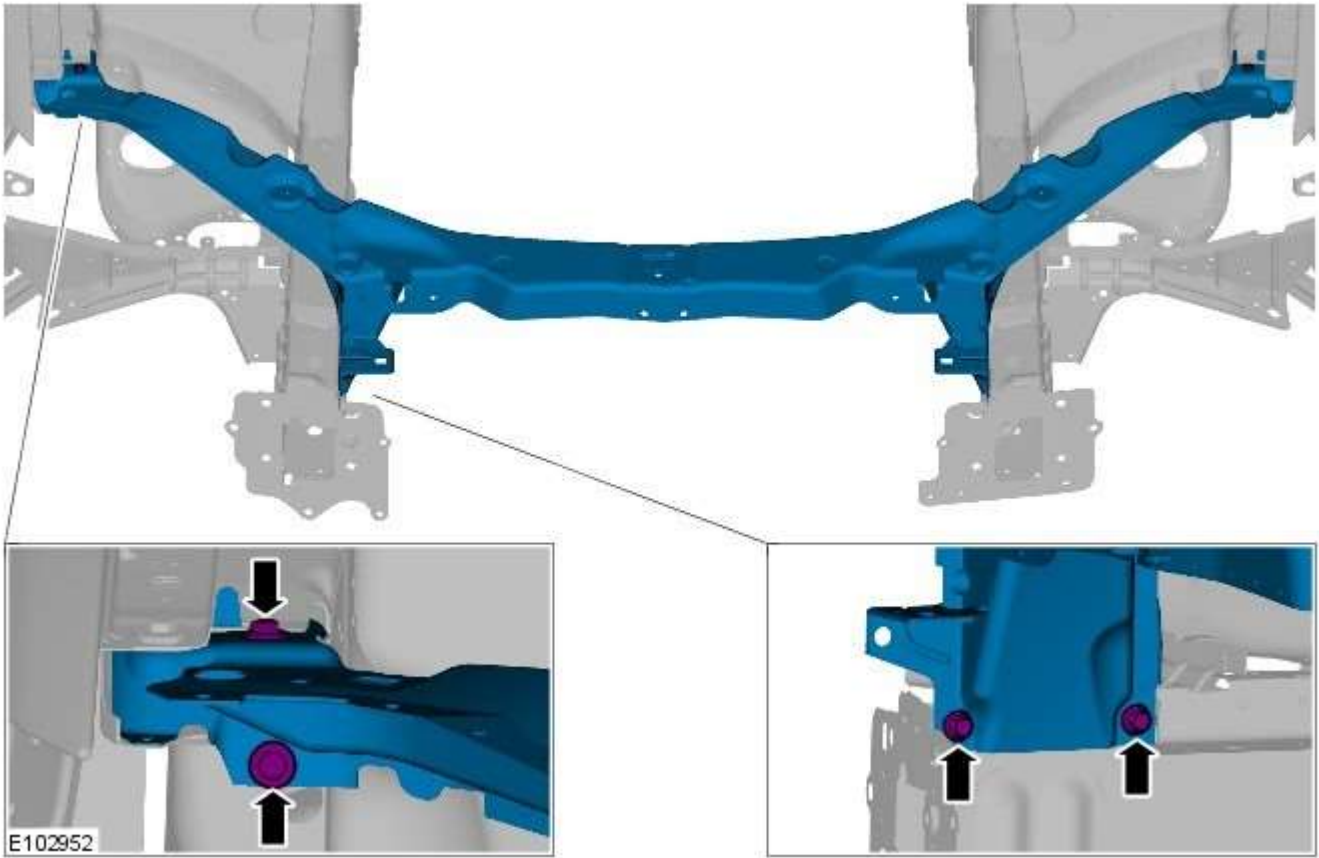
For additional information, refer to: [Front Bumper](#) (501-19 Bumpers, Removal and Installation).

6. Remove both headlamp assemblies.
For additional information, refer to: [Headlamp Assembly](#) (417-01 Exterior Lighting, Removal and Installation).
7. Remove the condenser core.
For additional information, refer to: Condenser Core - 2.7L Diesel (412-03, Removal and Installation) / [Condenser Core - V6 3.0L Petrol](#) (412-03 Air Conditioning, Removal and Installation) /
Condenser Core - 4.2L, Vehicles Without: Supercharger (412-03, Removal and Installation) /
Condenser Core - 4.2L, Vehicles With: Supercharger (412-03, Removal and Installation).
8. Remove the radiator.
For additional information, refer to: Radiator (303-03A, Removal and Installation) / [Radiator](#) (303-03B Engine Cooling - V6 3.0L Petrol, Removal and Installation) /
Radiator - Vehicles With: Supercharger (303-03C, Removal and Installation) /
Radiator - Vehicles Without: Supercharger (303-03C, Removal and Installation).
9. Remove the both hood latch panel braces.
10. Remove the cooling fan upper shroud.
11. Remove both crash sensors.
For additional information, refer to: [Crash Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
12. Remove the both hood latches.
13. Remove the hood safety hook guide.
14. Remove both hood latch panel buffers.
15. Release and lay aside the hood latch panel wiring harness.
16. Remove the old panel.



Installation

1. Offer up the new panel. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
2. Install the hood latch panel.
 - Tighten to 10 Nm.



3. The installation of associated panels and components is the reversal of removal procedure.

Front End Sheet Metal Repairs - Hood Latch Panel Mounting Bracket

Removal and Installation

Removal

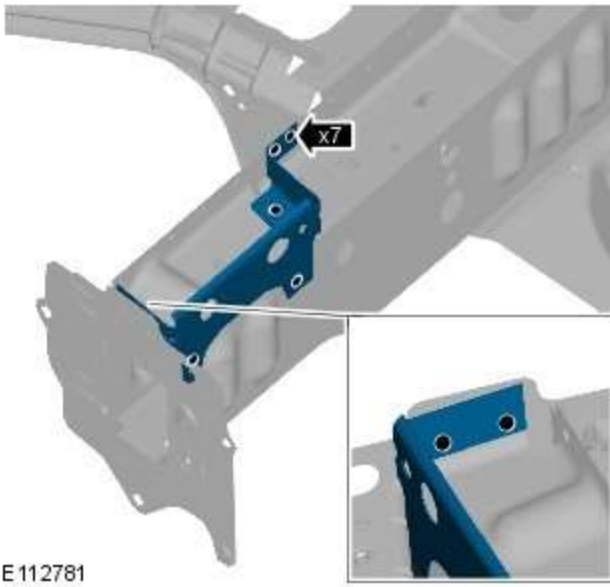



E 112780

1. **NOTE:** The hood latch panel mounting bracket is manufactured from mild steel.

The hood latch panel mounting bracket is serviced as a separate weld-on panel.

2. The hood latch panel mounting bracket is replaced in conjunction with:
 - Front bumper cover
 - Front bumper
 - Hood
 - Hood latch panel
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the hood latch panel.
For additional information, refer to: [Hood Latch Panel](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
5. Remove the hood.
For additional information, refer to: [Hood](#) (501-02 Front End Body Panels, Removal and Installation).



6.  NOTE: Use a belt sander where there is no access to drill.
Drill out the spot welds.

7. Separate the joints and remove the old panel.

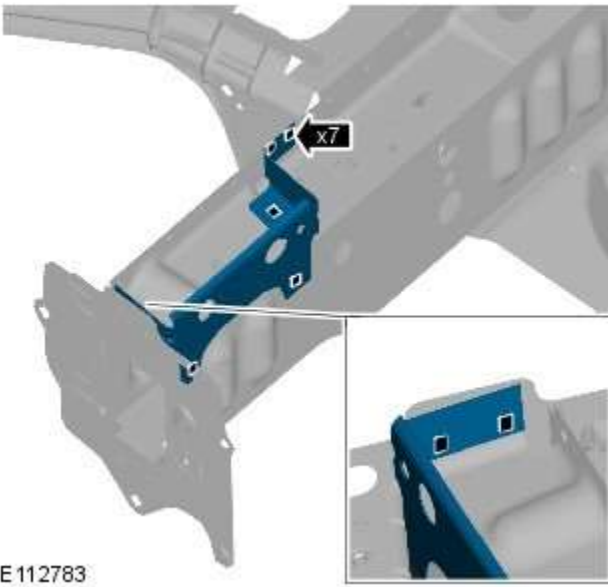
Installation

1. Drill holes in the new panel ready for MAG plug welding.



2. Prepare the old and new panel joint surfaces.
3. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

4. MAG plug weld.



E112783

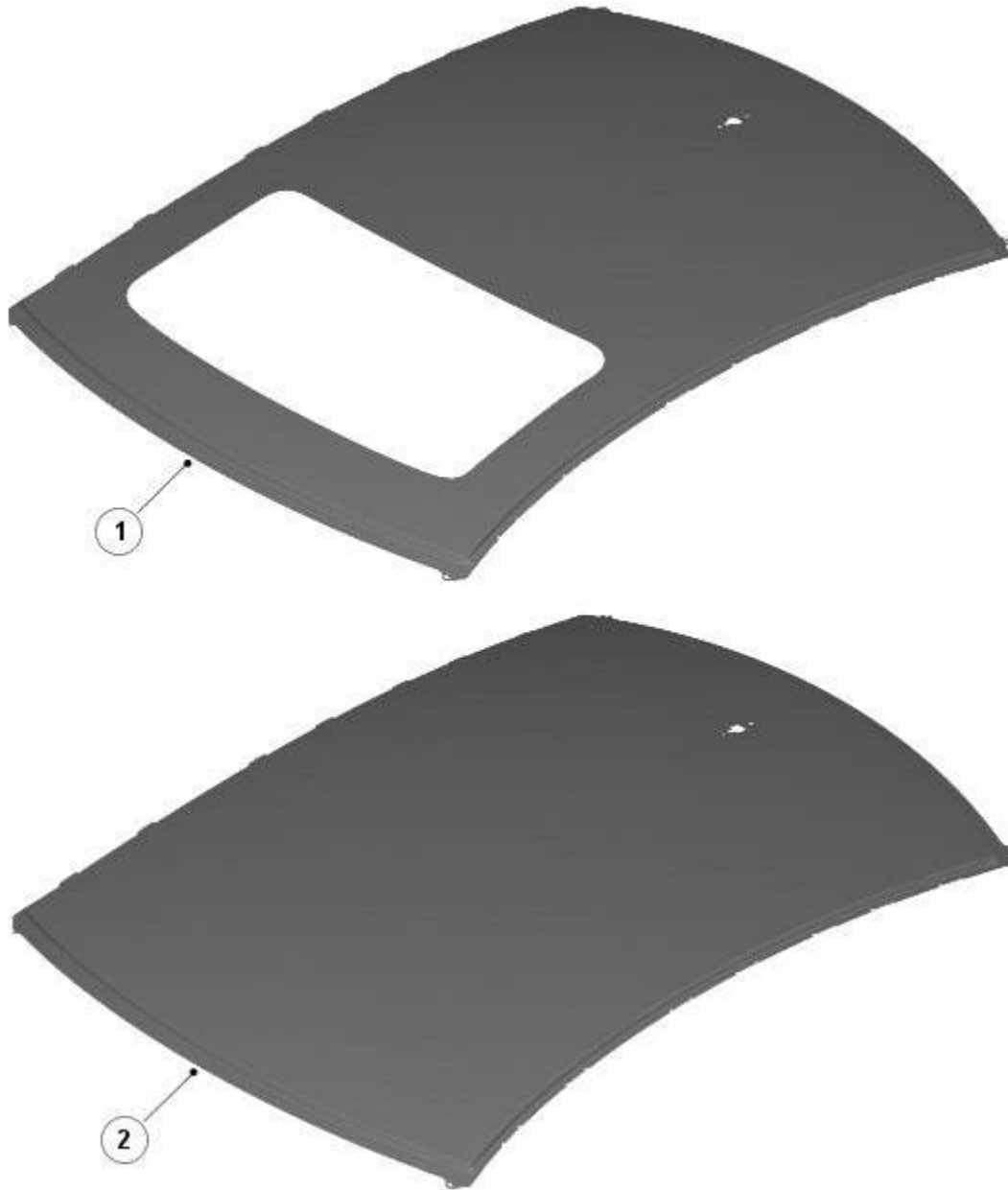
5. Dress all welded joints.

6. The installation of associated panels and components is the reversal of removal procedure.

Roof Sheet Metal Repairs - Roof

Description and Operation

Roof service panels



E 114231

Item	Description
1	Roof panel with sliding roof
2	Roof panel without sliding roof

Time schedules, roof panels

The following information shows the total time taken to install single panels and complete assemblies. This time includes removal of Mechanical, Electrical and Trim, (MET), items, plus paint times based on Metallic Clear Over Base Paint, (blends for adjacent panels are not included).

The times shown were generated by Thatcham, (the Motor Insurance Repair Research Centre), and are to be used as a guide only.

Single panel times

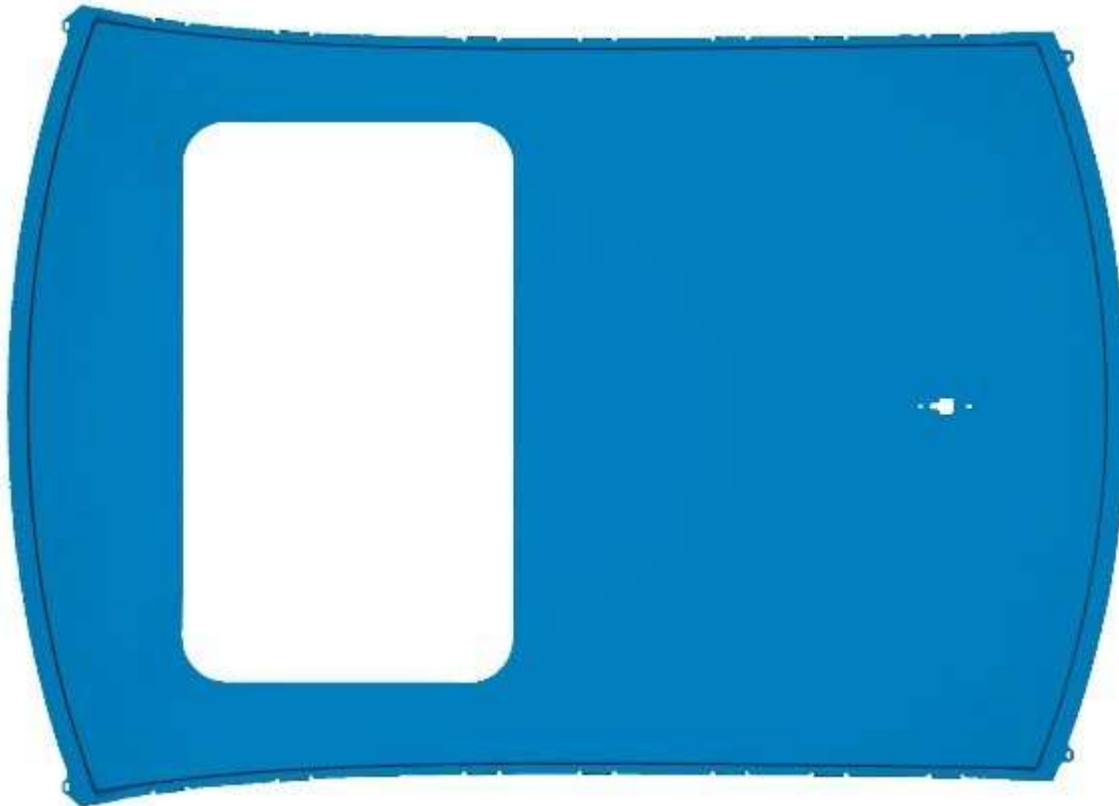
Panel Description	Hours
Roof panel without sliding roof	18.6

Roof Sheet Metal Repairs - Roof Panel Vehicles With: Sliding Roof Opening Panel

Removal and Installation

Removal

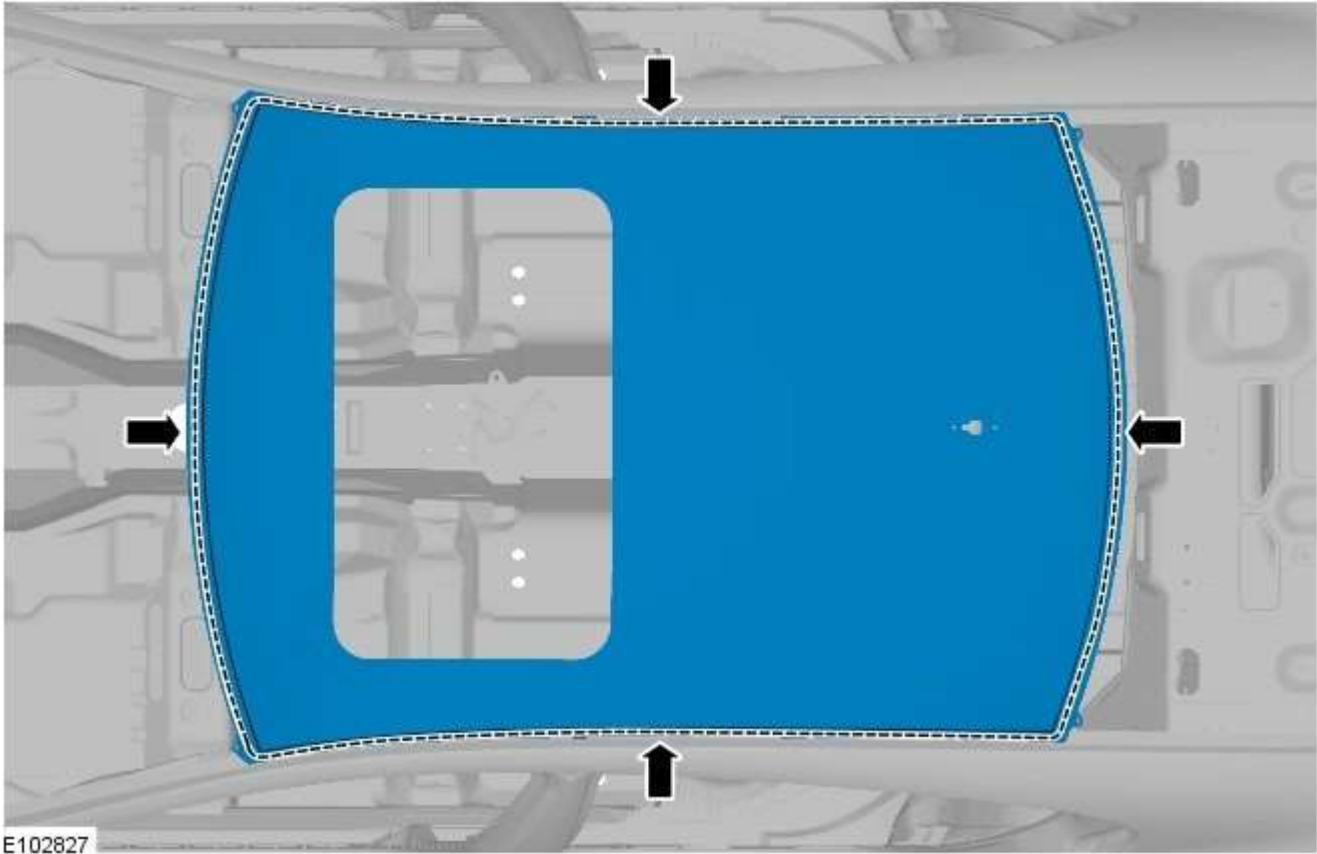
1. **NOTE:** The roof panel is manufactured from mild steel. The roof panel is serviced as a separate weld-on panel.



E102825

2. The roof panel is replaced in conjunction with:
 - Headliner
 - Windshield
 - Rear window glass
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove both front seats.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).

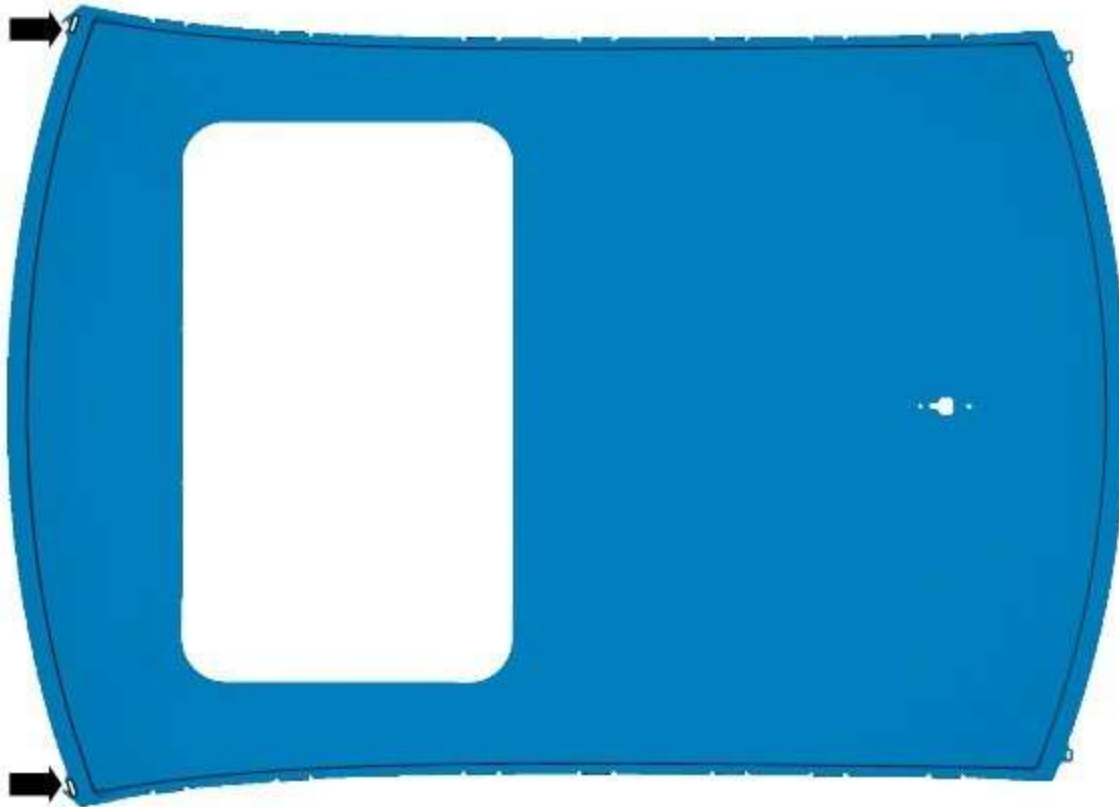
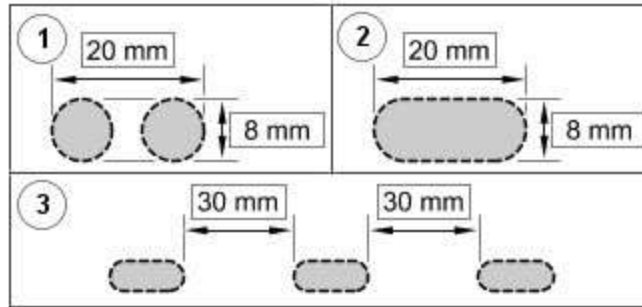
5. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
6. Disconnect the generator electrical connectors.
7. Remove the windshield glass.
For additional information, refer to: [Windshield Glass](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).
8. Remove the rear window glass.
For additional information, refer to: [Rear Window Glass](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).
9. Remove the roof opening panel frame.
For additional information, refer to: [Roof Opening Panel Frame](#) (501-17 Roof Opening Panel, Removal and Installation).
10. Remove the driver and passenger side front scuff plate trim panels.
For additional information, refer to: [Front Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
11. Remove the driver and passenger side rear scuff plate trim panels.
For additional information, refer to: [Rear Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
12. Remove the driver and passenger side air curtain modules.
For additional information, refer to: [Side Air Curtain Module](#) (501-20B Supplemental Restraint System, Removal and Installation).
13. Remove the rear seat backrest.
14. Remove the driver and passenger side rear safety belt retractors.
For additional information, refer to: [Rear Safety Belt Retractor](#) (501-20A Safety Belt System, Removal and Installation).
15. Remove the rear center safety belt retractor.
For additional information, refer to: [Rear Center Safety Belt Retractor](#) (501-20A Safety Belt System, Removal and Installation).
16. Remove the driver and passenger side RF filters.
17. Remove the diversity antenna module.
18. Remove the antenna.
For additional information, refer to: [Navigation System Antenna](#) (419-07 Navigation System, Removal and Installation).
19. Release and position the roof wiring harnesses to one side
20. Position the roof opening panel front and rear drain hoses to one side.
21. Remove the driver and passenger side roof mouldings.
22. Drill out the spot welds.



23. Separate the joints and remove the old panel.

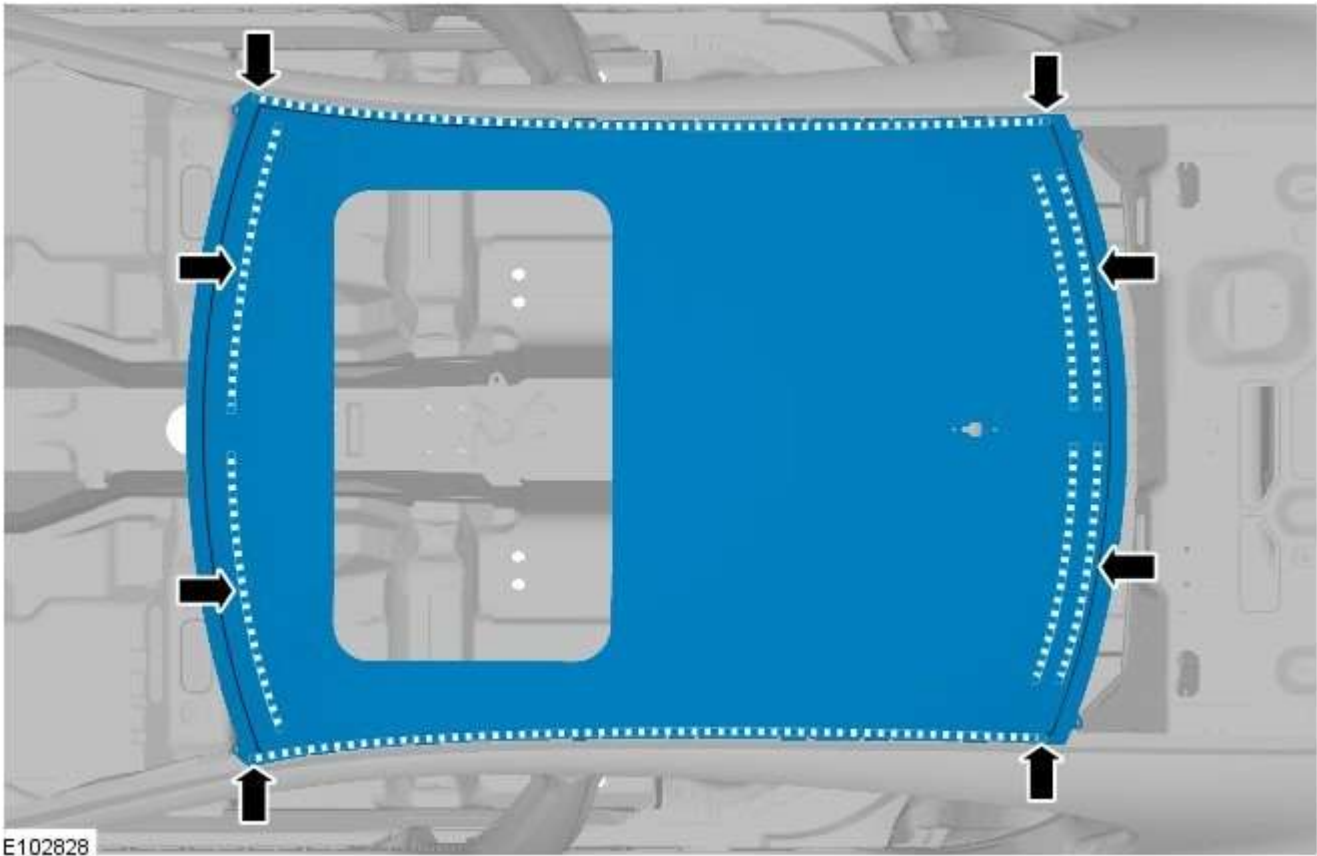
Installation

1. **NOTE:** The slots should be made so that the new roof panel can be brazed to the A-Pillar outer and inner.
Cut 2 slots in the new roof panel.



E102826

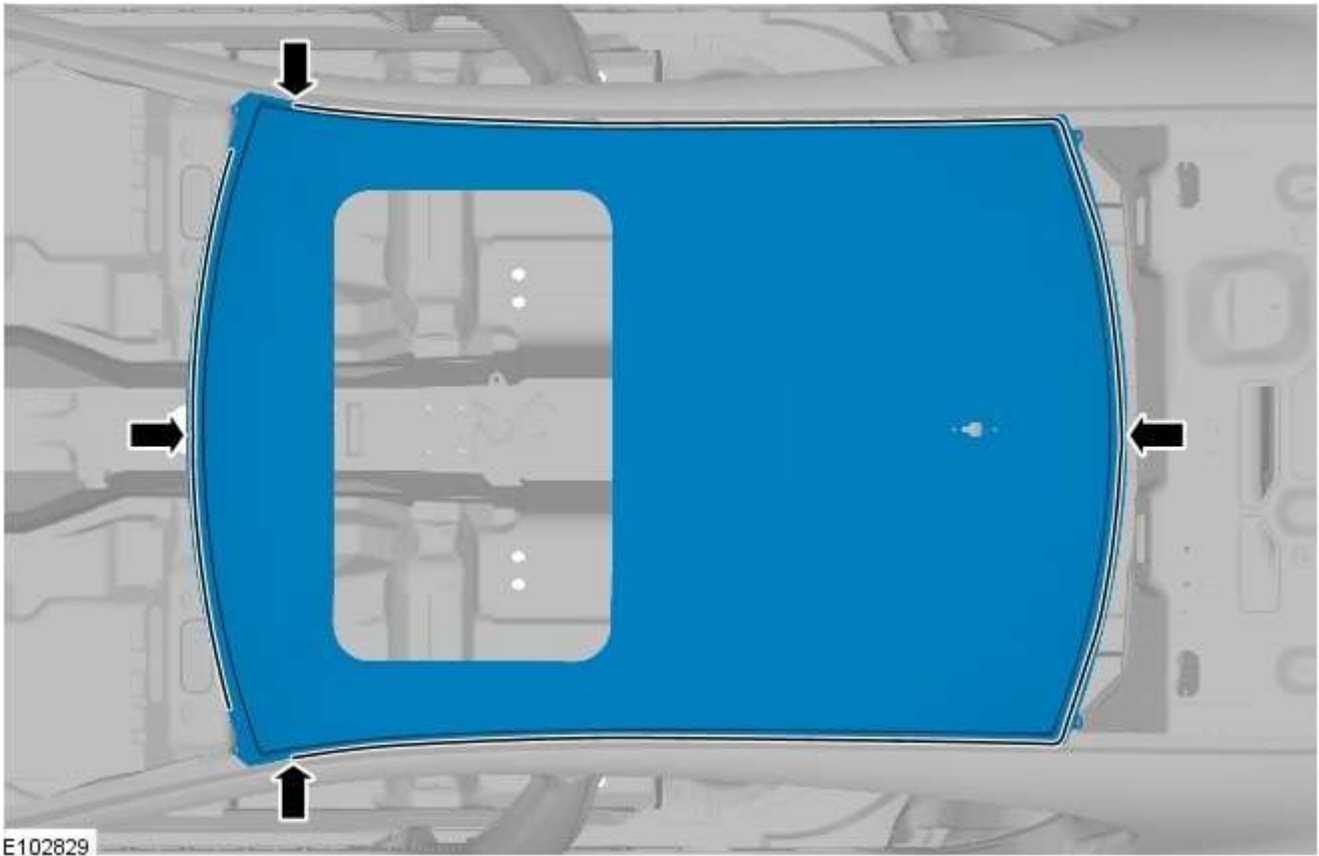
2. Prepare the old and new panel joint surfaces.
3. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
4. Remove the new panel.
5. **NOTE:** Make sure the adhesive is kept away from the area of MIG brazed slots.
Apply adhesive to the areas indicated.



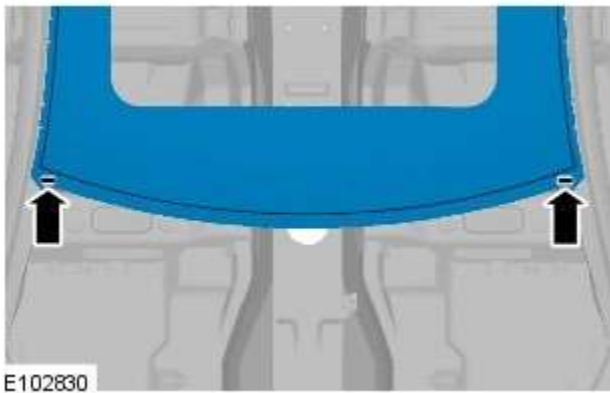
E102828

6. Offer up the new panel and clamp into position.

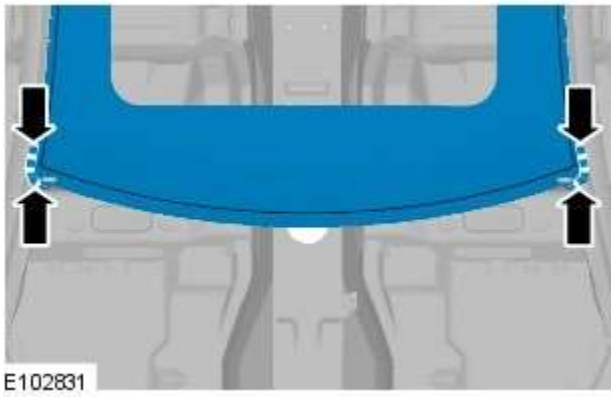
7. Spot weld.



8. MIG braze the slots.

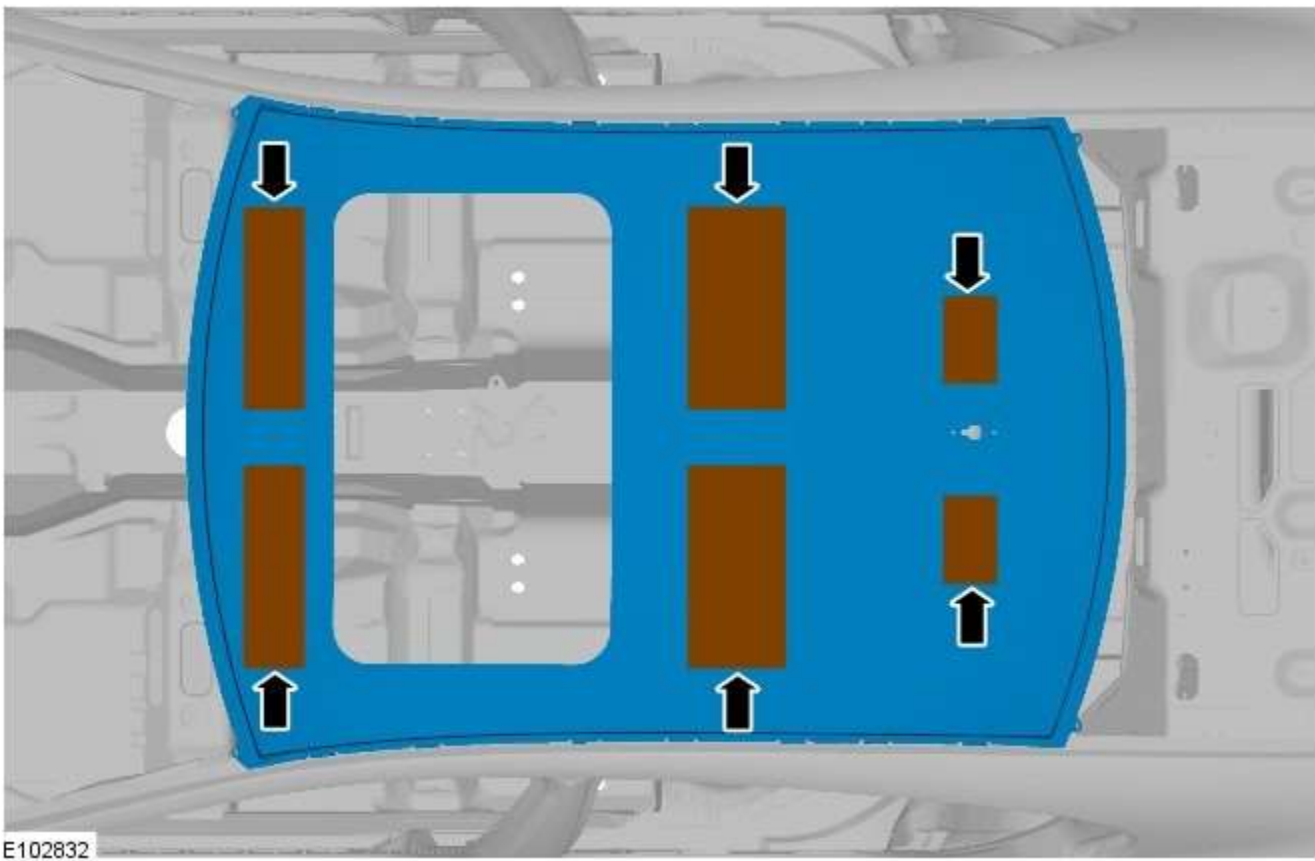


9. Remove any excess adhesive and dress all welded/brazed joints.



10. Make sure the external areas around the MIG brazed slots are sealed as part of the paint preparation process as this cannot be performed satisfactorily during panel replacement.

11. Install NVH (noise, vibration and harshness) sound deadening pads.



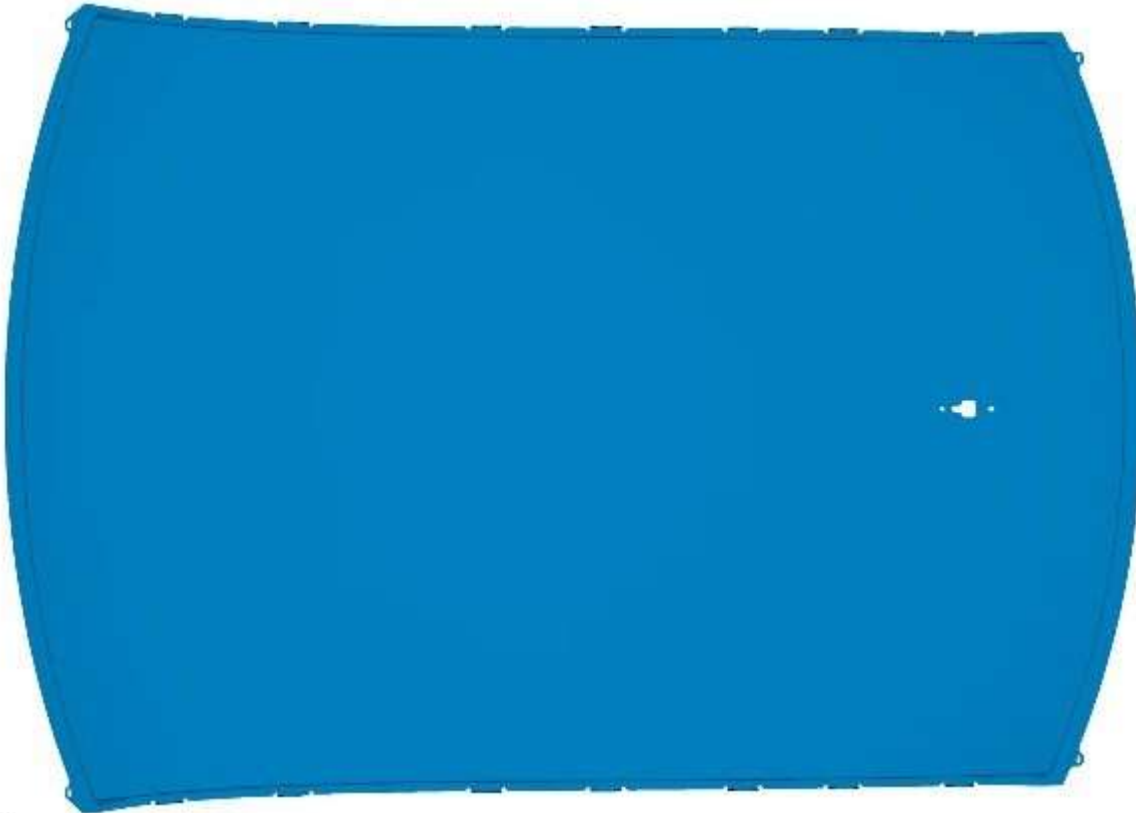
12. The installation of associated panels and components is the reversal of removal procedure.

Roof Sheet Metal Repairs - Roof Panel Vehicles Without: Sliding Roof Opening Panel

Removal and Installation

Removal

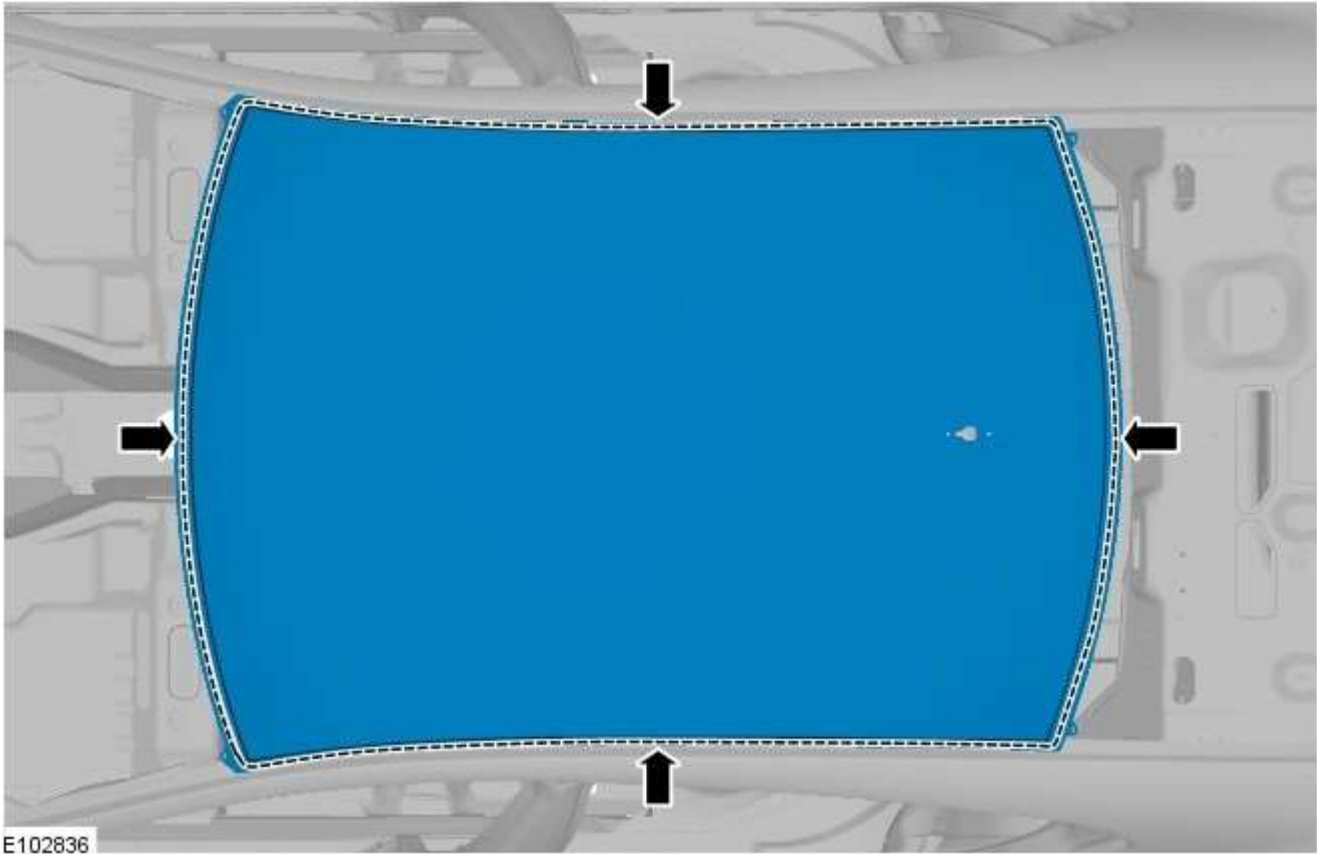
1. **NOTE:** The roof panel is manufactured from mild steel. The roof panel is serviced as a separate weld-on panel.



E102834

2. The roof panel is replaced in conjunction with:
 - Headliner
 - Windshield
 - Rear window glass
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove both front seats.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).

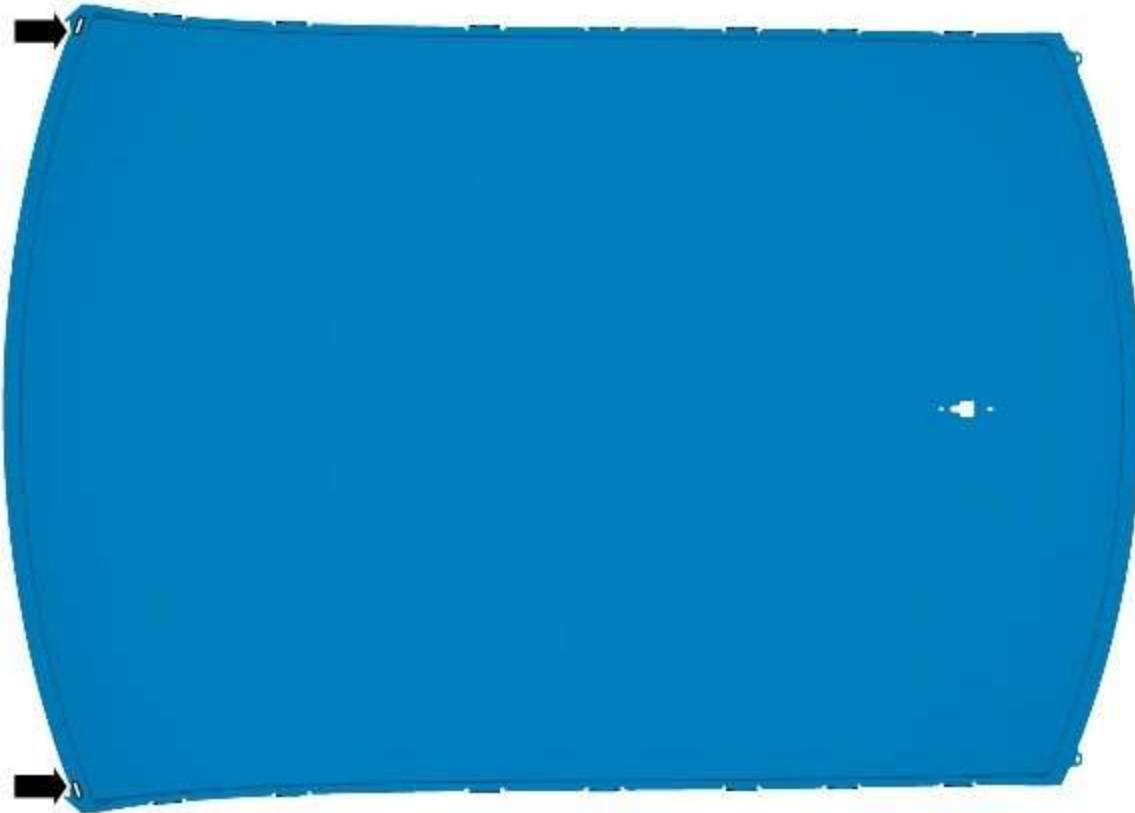
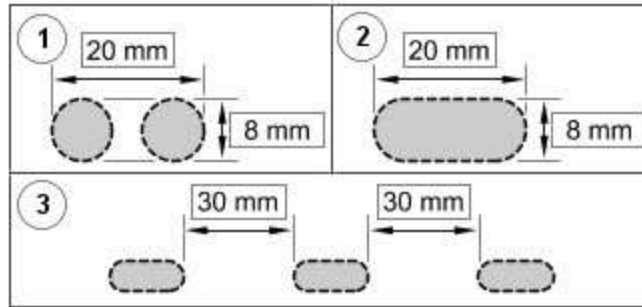
5. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
6. Disconnect the generator electrical connectors.
7. Remove the windshield glass.
For additional information, refer to: [Windshield Glass](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).
8. Remove the rear window glass.
For additional information, refer to: [Rear Window Glass](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).
9. Remove the headliner.
For additional information, refer to: [Headliner](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
10. Remove the driver and passenger side front scuff plate trim panels.
For additional information, refer to: [Front Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
11. Remove the driver and passenger side rear scuff plate trim panels.
For additional information, refer to: [Rear Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
12. Remove the driver and passenger side air curtain modules.
For additional information, refer to: [Side Air Curtain Module](#) (501-20B Supplemental Restraint System, Removal and Installation).
13. Remove the rear seat backrest.
14. Remove the driver and passenger side rear safety belt retractors.
For additional information, refer to: [Rear Safety Belt Retractor](#) (501-20A Safety Belt System, Removal and Installation).
15. Remove the rear center safety belt retractor.
For additional information, refer to: [Rear Center Safety Belt Retractor](#) (501-20A Safety Belt System, Removal and Installation).
16. Remove the driver and passenger side RF filters.
17. Remove the diversity antenna module.
18. Remove the antenna.
For additional information, refer to: [Navigation System Antenna](#) (419-07 Navigation System, Removal and Installation).
19. Release and position the roof wiring harnesses to one side
20. Remove the driver and passenger side roof mouldings.
21. Drill out the spot welds.



22. Separate the joints and remove the old panel.

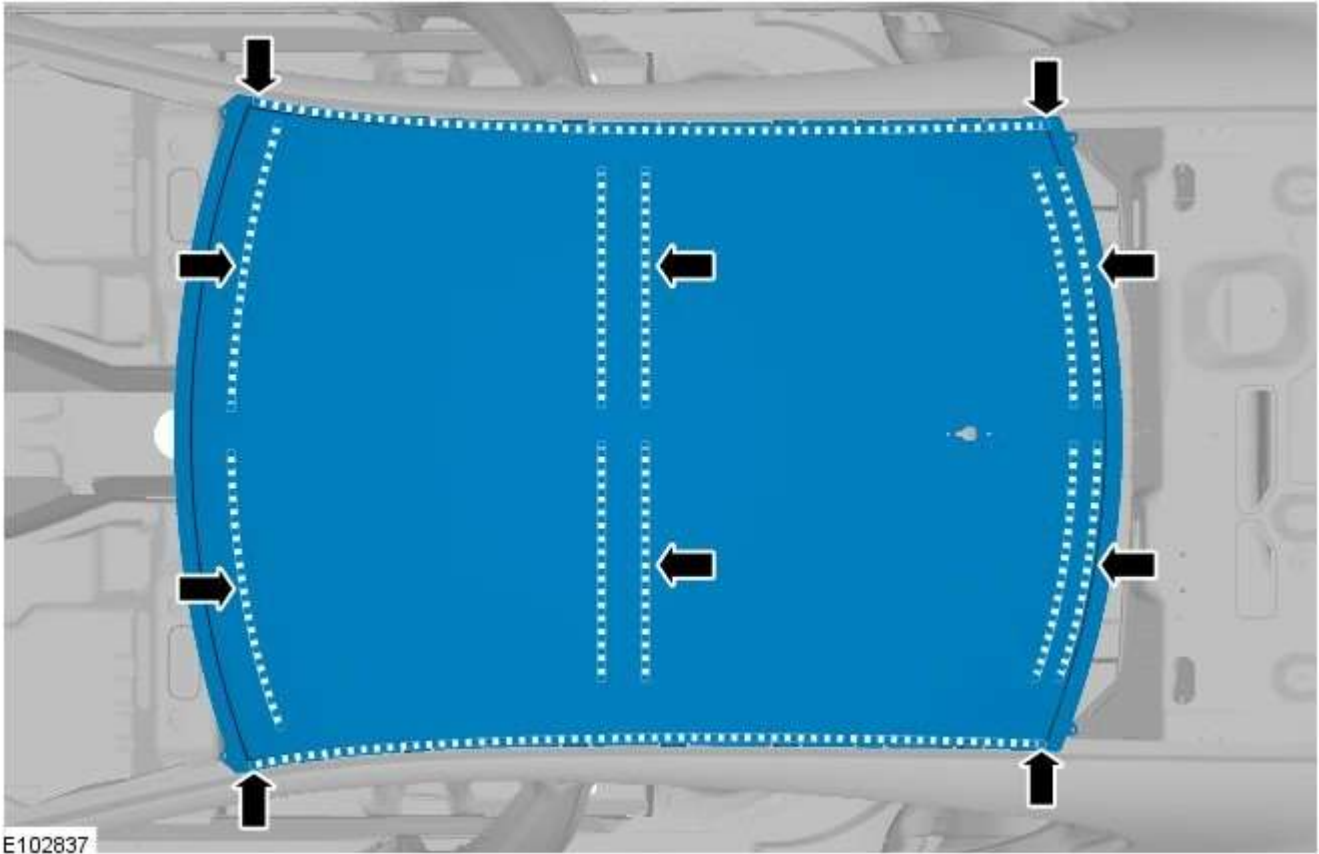
Installation

1. **NOTE:** The slots should be made so that the new roof panel can be brazed to the A-Pillar outer and inner.
Cut 2 slots in the new roof panel.



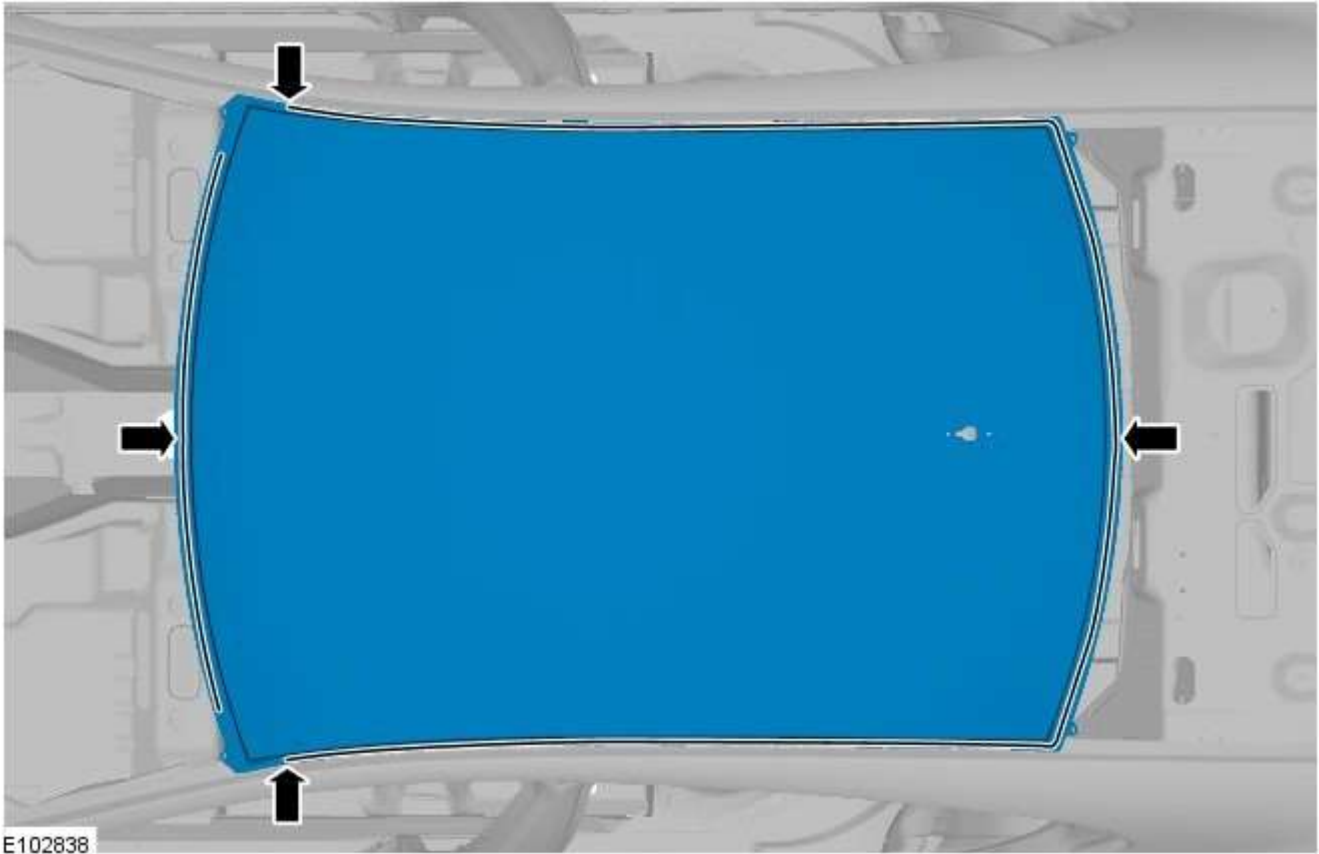
E102835

2. Prepare the old and new panel joint surfaces.
3. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.
4. Remove the new panel.
5. **NOTE:** Make sure the adhesive is kept away from the area of MIG brazed slots.
Apply adhesive to the areas indicated.



6. Offer up the new panel and clamp into position.

7. Spot weld.



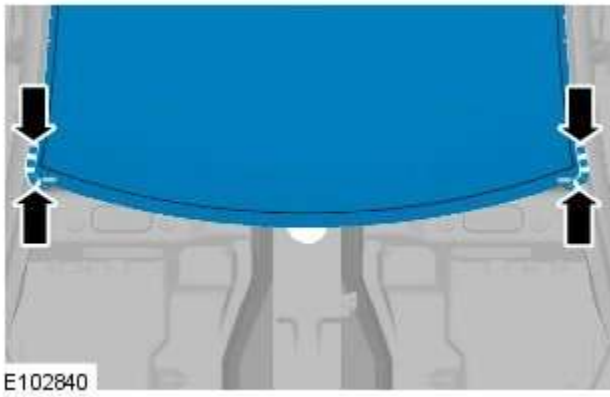
E102838

8. MIG braze the slots.



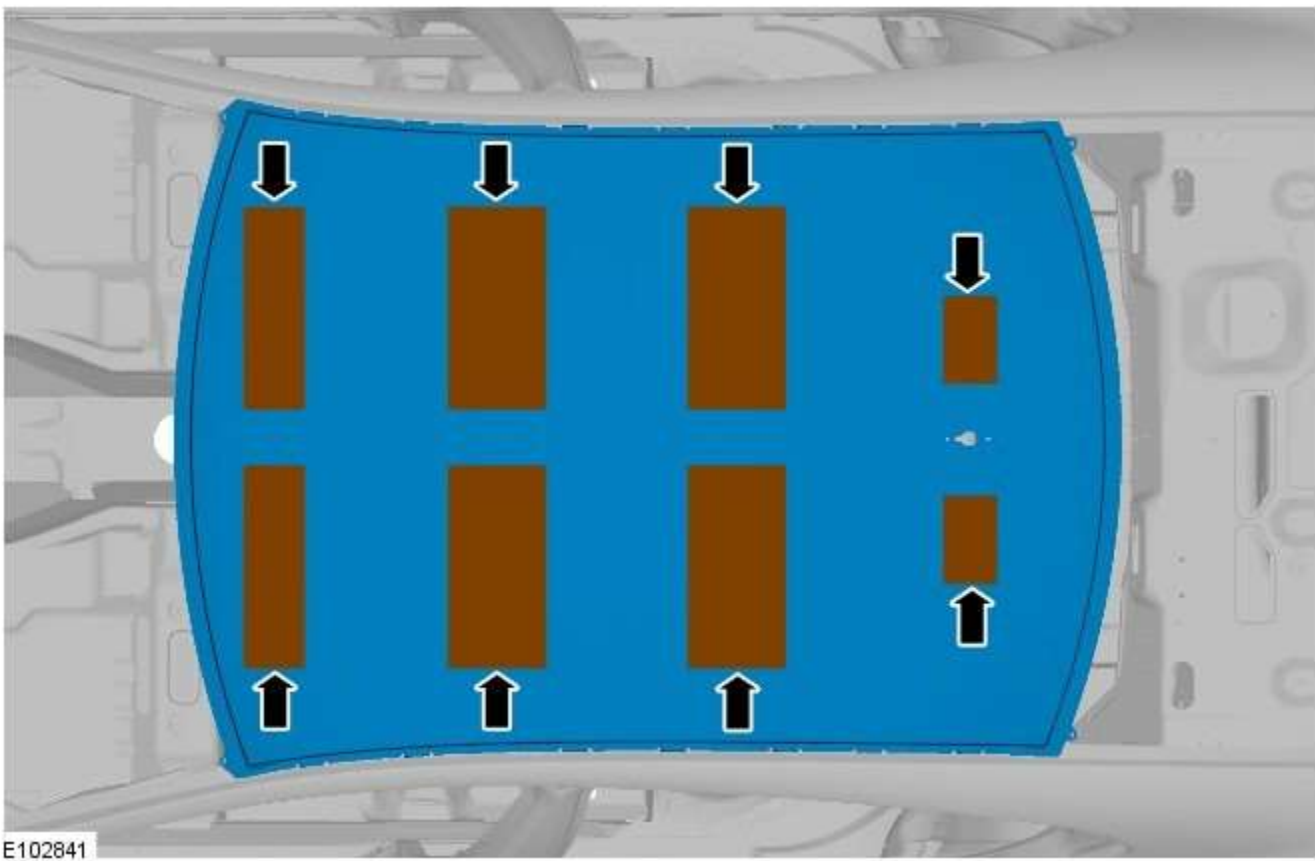
E102839

9. Remove any excess adhesive and dress all welded / brazed joints.



10. Make sure the external areas around the MIG brazed slots are sealed as part of the paint preparation process as this cannot be performed satisfactorily during panel replacement.

11. Install the NVH (noise, vibration and harshness) sound deadening pads.

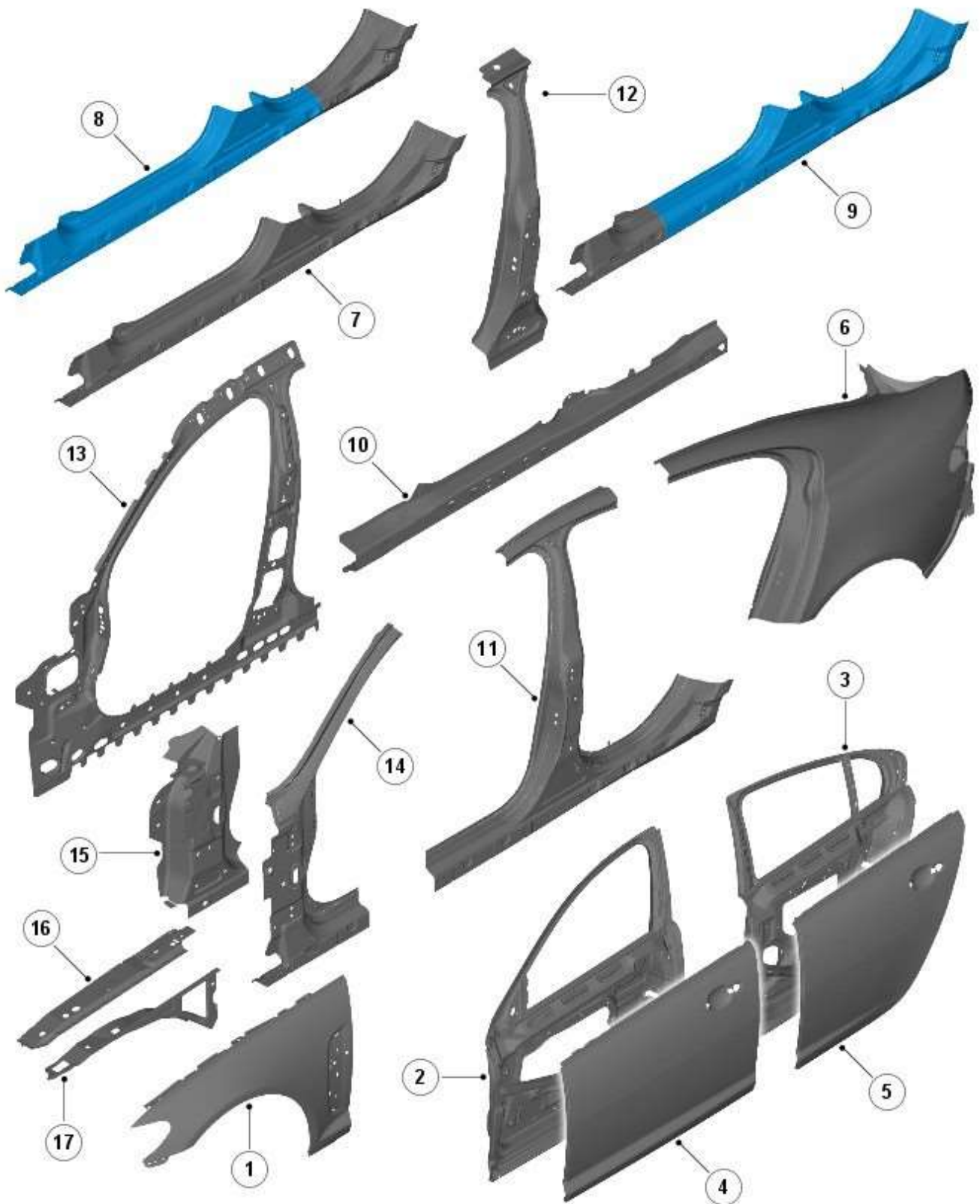


12. The installation of associated panels and components is the reversal of removal procedure.

Side Panel Sheet Metal Repairs - Side Panel Sheet Metal

Description and Operation

Side service panels





NOTE: The illustration may indicate either hand of the service panel, the opposite hand will be similar.

Item	Description
1	Front fender
2	Front door
3	Rear door
4	Front door skin panel
5	Rear door skin panel
6	Quarter panel
7	Rocker panel
8	Rocker panel front section (cut from rocker panel)
9	Rocker panel rear section (cut from rocker panel)
10	Rocker panel inner reinforcement
11	Rocker panel and b-pillar outer panel
12	B-pillar reinforcement
13	B-pillar inner panel
14	A-pillar outer panel
15	A-pillar reinforcement
16	Fender apron panel
17	Fender apron panel closing panel

Time schedules, side panels

The following information shows the total time taken to install single panels and complete assemblies. This time includes removal of Mechanical, Electrical and Trim, (MET), items, plus paint times based on Metallic Clear Over Base Paint, (blends to adjacent panels are not included).

The times shown were generated by Thatcham, (the Motor Insurance Repair Research Centre), and are to be used as a guide only.

Single panel times

Panel Description	Hours
Front fender L/H	8.9
Front fender R/H	9.1
Front door	8.8
Rear door	8.7
Front door skin panel	11.1
Rear door skin panel	10.8
Quarter panel L/H	23.2
Quarter panel R/H	24.2
Rocker panel L/H	19.6
Rocker panel R/H	19.9
Rocker panel front section L/H	18.5
Rocker panel front section R/H	18.8
Rocker panel rear section L/H	16.7
Rocker panel rear section R/H	16.8
Windshield glass remove and install	2.2
Rear window glass remove and install	1.7
Headliner remove and install	3.3
Instrument panel console remove and install	5.3

Combination panel replacement times

The following panel combination times show the total time to remove/install body panels, MET items and paint times based on Metallic Clear Over Base Paint process, (blends to adjacent panels are not included).

Combination panel times

Panel Description	Hours
Front fender	
Front door	
Total Time	L/H 12.7 R/H 12.9

Combination panel times

Panel Description	Hours
Rear door	
Quarter panel	
Rear window glass remove and install	
Headliner remove and install	
Total Time	L/H 29.0 R/H 30.00

Combination panel times

Panel Description	Hours
Front door	
Rear door	
Rocker panel and b-pillar outer panel	
B-pillar reinforcement	
B-pillar inner panel	
Headliner remove and install	
Total Time	L/H 39.0 R/H 39.0

Combination panel times

Panel Description	Hours
Front fender	
Front door	
Rear door	
Quarter panel	
Rear window glass remove and install	
Headliner remove and install	
Total Time	L/H 36.2 R/H 37.4

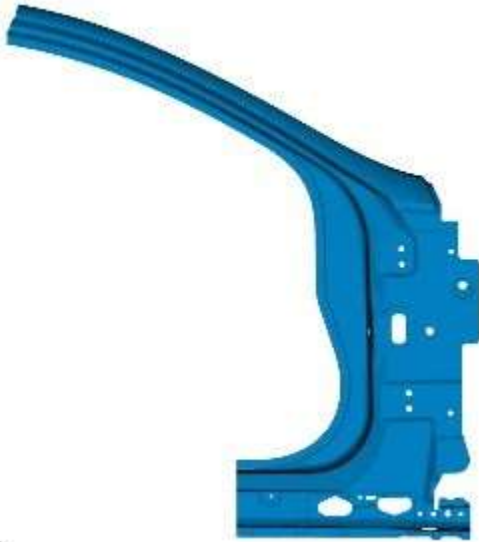
Combination panel times

Panel Description	Hours
Front fender	
Front door	
A-pillar outer panel	
A-pillar reinforcement	
Fender apron panel	
Fender apron panel closing panel	
Windshield glass remove and install	
Instrument panel console remove and install	
Headliner remove and install	
Total Time	L/H 46.4 R/H 46.6

Side Panel Sheet Metal Repairs - A-Pillar Outer Panel

Removal and Installation

Removal



E 108452

1. **NOTE:** The A-pillar outer panel is manufactured from mild steel.

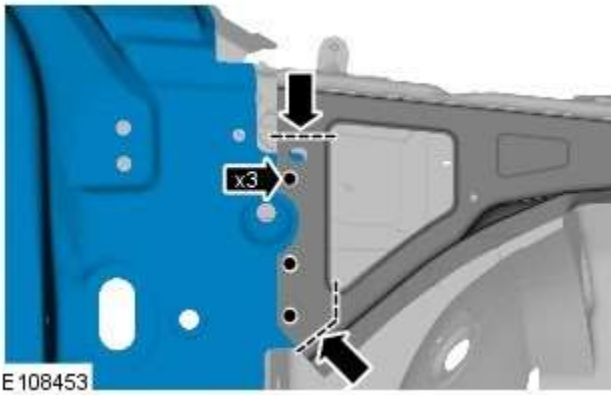
The A-pillar outer panel is serviced as a separate weld-on panel. It is not serviced with its riv-nuts for the fender fixings or NVH (noise, vibration and harshness) components.


2. **NOTE:** The A-pillar outer panel is spot welded to the A-pillar reinforcement upper, which is boron steel. In repair, spot welds are replaced with MIG braze and MIG braze slots in these areas.

In this procedure the upper butt joint is best performed as low as possible due to the work involved in the area of MIG slot braze. If damage dictates, it is permissible to make the section higher up the pillar.

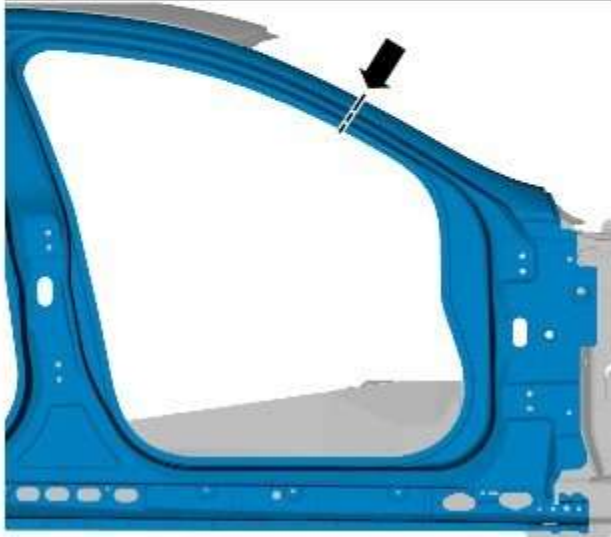
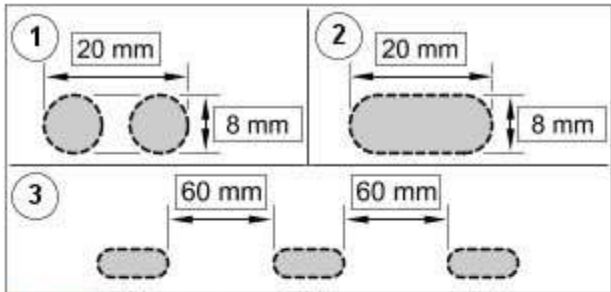
3. The A-pillar outer panel is replaced in conjunction with:
 1. Front bumper cover
 2. Front fender
 3. Hood
 4. Front door
 5. Headliner
 6. Instrument panel console
 7. Windshield glass
4. For additional information relating to this repair procedure please see the following:
 For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
5. Disconnect the generator electrical connectors.
6. Remove the instrument panel console.
 For additional information, refer to: [Instrument Panel Console](#) (501-12 Instrument Panel and Console, Removal and Installation).


7. Remove the headliner.
For additional information, refer to: [Headliner](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
8. Remove the windshield glass.
For additional information, refer to: [Windshield Glass](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).
9. Remove the pedestrian protection hood actuator.
For additional information, refer to: [Pedestrian Protection Hood Actuator LH](#) (501-20C Pedestrian Protection System, Removal and Installation) / [Pedestrian Protection Hood Actuator RH](#) (501-20C Pedestrian Protection System, Removal and Installation).
10. Release and position the floor covering to one side.
11. Release and position the bulkhead insulating material to one side.
12. Release and position the inner rocker panel wiring harness to one side.
13. Remove the wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
14. Remove the underfloor splash shield.
15. If the right-hand A-pillar outer panel is to be repaired, release and position the underfloor wiring harness to one side.
16. Remove the front fender.
For additional information, refer to: [Front Fender](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
17. Remove the front door.
For additional information, refer to: [Front Door](#) (501-03 Body Closures, Removal and Installation).
18. Remove the upper and lower front door hinges.
19. Remove the hood.
For additional information, refer to: [Hood](#) (501-02 Front End Body Panels, Removal and Installation).
20. Remove the hood hinge.




21.  NOTE: If a new fender apron panel closing panel is to be fitted the section will not be required.

Drill out the spot welds and cut a section from the fender apron panel closing panel, to allow access to the A-pillar joints as indicated.



22.  CAUTION: Care should be taken not to cut through into the inner panels.

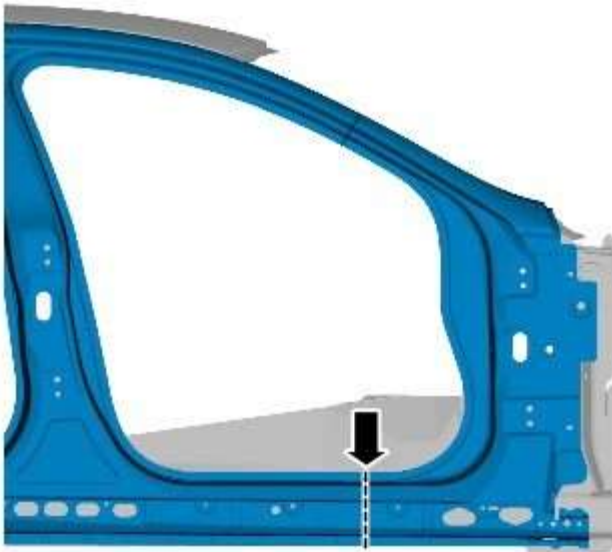
NOTES:

 In this procedure the upper butt joint is best performed as low as possible due to the work involved in the area of MIG braze slots. If damage dictates, it is permissible to perform the butt joint higher up the pillar.


 Observe the increased pitch required for the MIG braze slots in this area.

Using the new panel for reference and allowing for an overlap, cut the old panel at the point indicated. Make sure that the location of the upper butt joint is calculated to allow for the installation of the MIG braze slots.

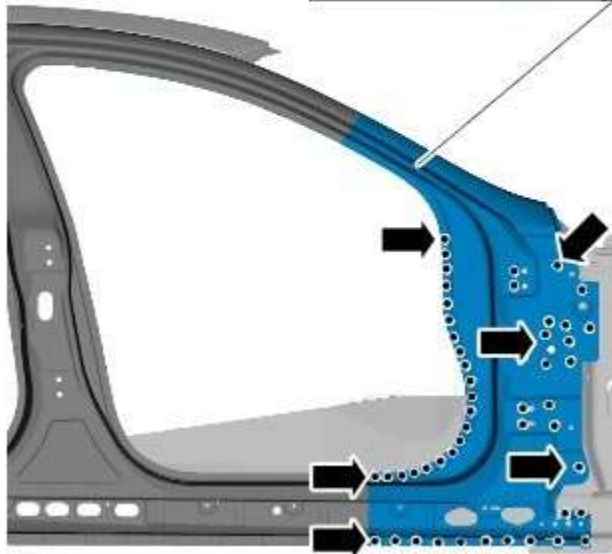
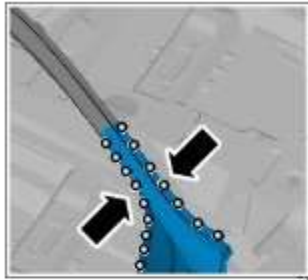
23. Using the new panel for reference and allowing for an overlap, cut the old panel at the point indicated, where the lower butt joint is to be made.



E108455

24.  NOTE: A drill bit suitable for drilling boron should be used on the upper spot welds, as indicated.

Drill out the spot welds.

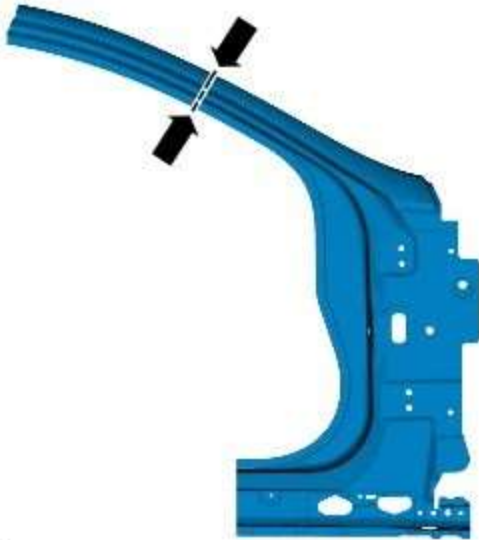


E108456

25. Separate the joints and remove the old panel, also releasing the NVH components.

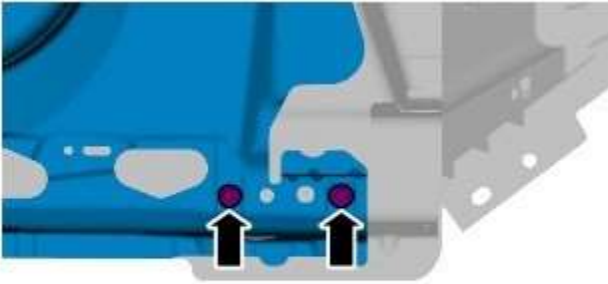
Installation

1. Trim the excess from the upper part of the service panel.




E108457

2. Install the riv-nuts into the new rocker panel front section as indicated.



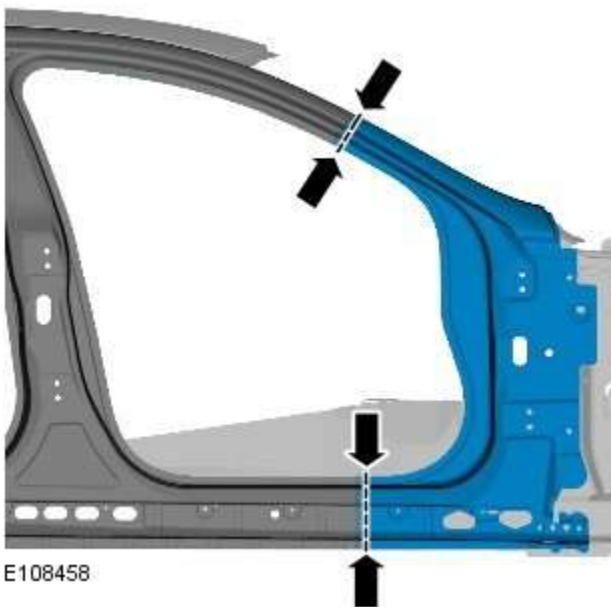
E102807

3.  **CAUTION:** Care should be taken not to cut through into the inner panels.



NOTE: Temporarily install the front door and hinges to aid alignment.

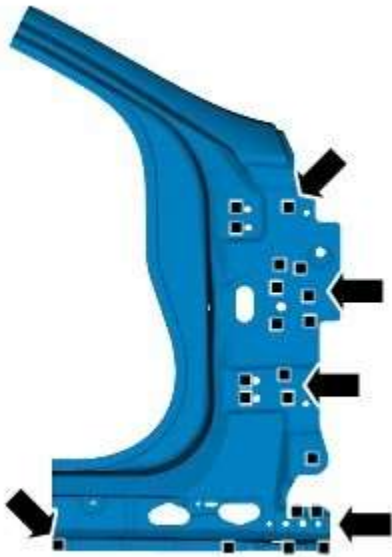
Offer up, align and clamp the new panel into position, overlapping the old panel remnant. Cut through the new panel, partially cutting the old panel at the points where the butt joints are to be made.



E108458

4. Remove the front door and hinges and the new A-pillar outer panel.

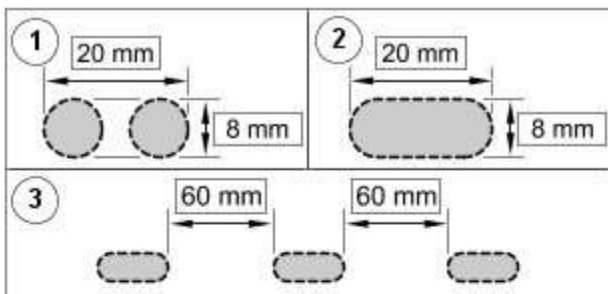
5. Cut and remove the old panel remnants.




E 108459

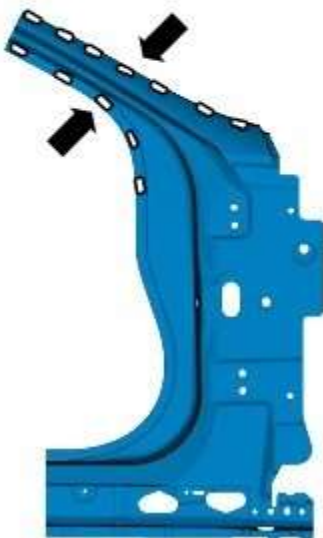
6. NOTE: Ensure the MAG plug holes are performed away from the adhesive bond path.

Drill holes in the new panel ready for MAG plug welding.



7.  NOTE: Observe the increased pitch required for the MIG braze slots in this area.

Cut slots in the new panel ready for MIG braze slots.



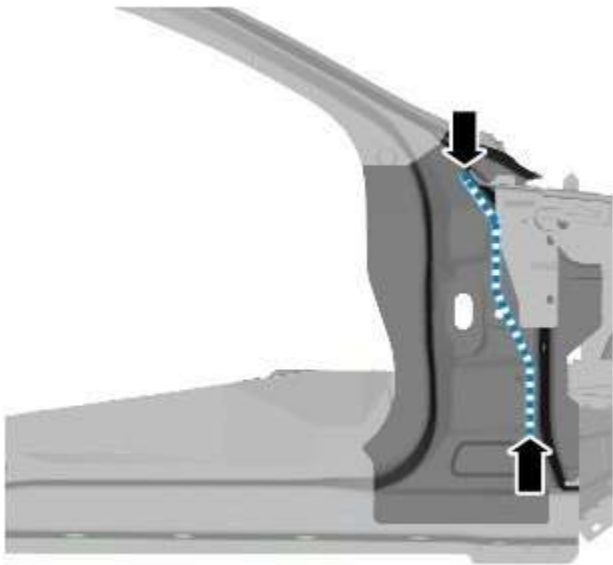
E108460

8. NOTE: If necessary, renew the NVH components.


Prepare the old and new panel joint surfaces, including the NVH components.

9. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

10. Remove the new A-pillar outer panel.

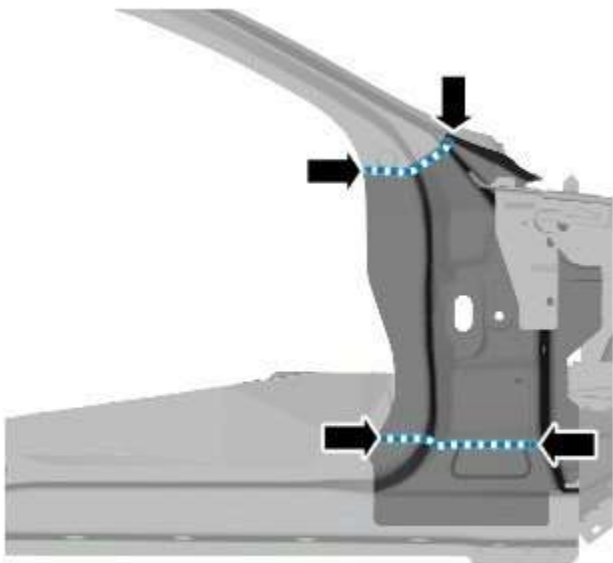


E 108461

11.  NOTE: Make sure the adhesive does not encroach into the area of the MAG plug welds as it will contaminate the weld (any unsealed areas must be sealed following the repair).

Apply adhesive to the area as indicated.

12. Apply sealer adhesive to the NVH components as indicated.

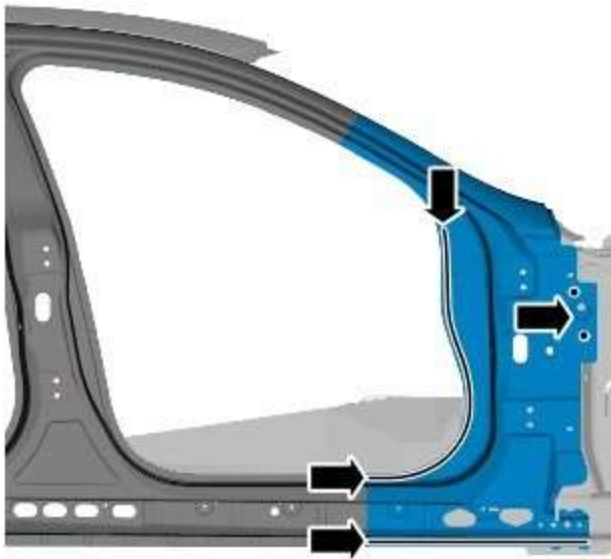


E 108462


13. Offer up the new A-pillar outer panel, align and clamp into position.

14. Tack MIG braze the upper butt joint.

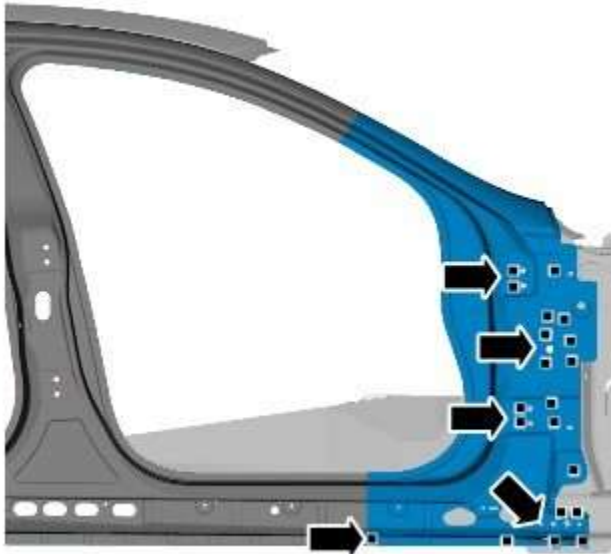
15. Tack MAG weld the lower butt joint.



E 108463

16.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

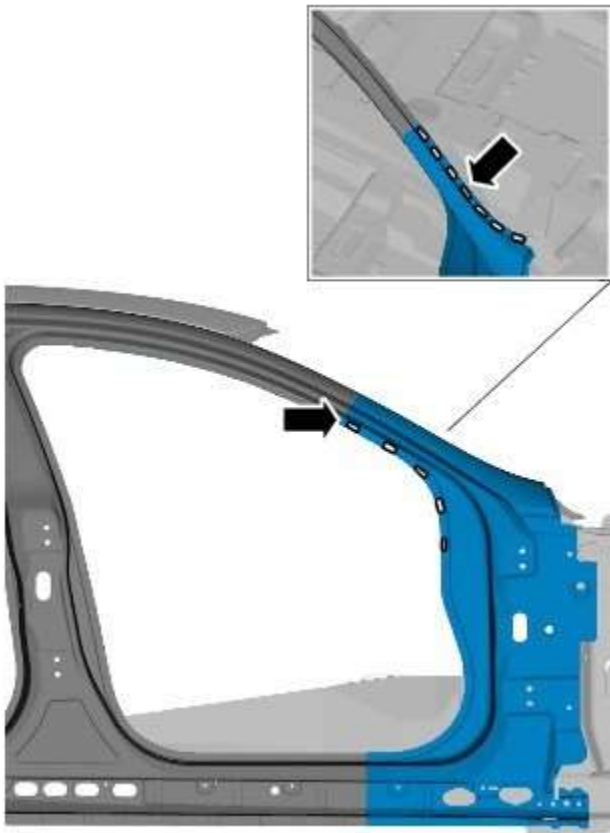
Spot weld.



E 108464

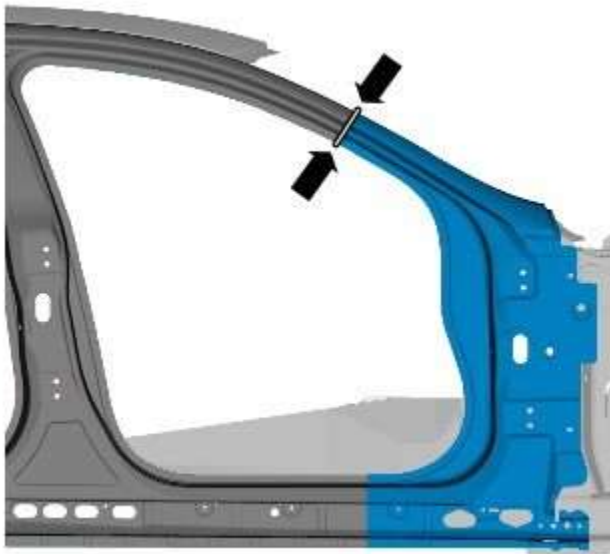
17. MAG plug weld.

18. MIG Braze the slots.



E108465

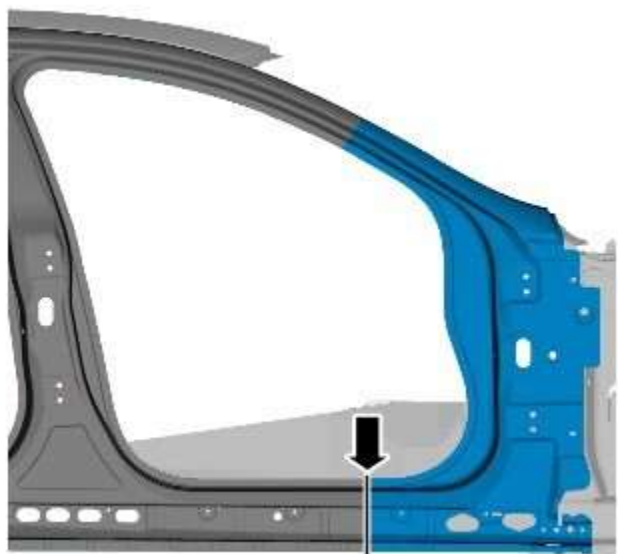
19. Dress the tack welds/braze.



E 108466

20. MIG braze the upper butt joint.

21. MAG weld the lower butt joint.



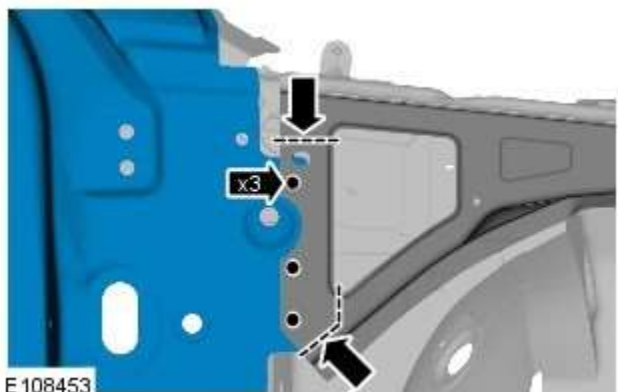
E 108467

22. Prepare the old and new panel joint surfaces of the fender apron panel closing panel section.

23.  NOTE: If a new fender apron panel closing panel is to be fitted the section will not be required.

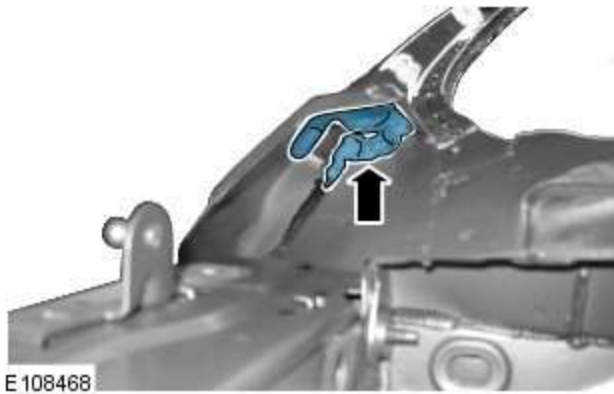
Tack MAG weld the fender apron panel closing panel section.


24. MAG plug weld and MAG weld the fender apron panel closing panel section.



E 108453

25. Dress all welded/brazed joints.



26.  NOTE: It may be necessary to temporarily seal the opening whilst the foam cures, to prevent it encroaching into the hood hinge area.

Apply expanding foam into the A-pillar as indicated.

27. Make sure that any open or exposed panel joints are suitably sealed following this procedure.
28. The installation of associated panels and components is the reversal of removal procedure.
- Tighten the hood hinge bolts to 17 Nm.
 - Tighten the upper and lower front door hinges to 30 Nm.

Side Panel Sheet Metal Repairs - A-Pillar Reinforcement

Removal and Installation

Removal



E 111836

1. **NOTE:** The A-pillar reinforcement is manufactured from Bake Hardened Steel, 300MPa, (BH300). It contains reinforcements manufactured from High Strength Low Alloy Steel, 340MPa (HSLA340).

The A-pillar reinforcement panel is serviced as a separate weld-on panel. It is not serviced with its **NVH (noise, vibration and harshness)** components.

2. **NOTE:** The A-pillar reinforcement is spot welded to the A-pillar reinforcement upper, which is boron steel. In repair spot welds are replaced with MIG braze slots in this area.

The A-pillar reinforcement is replaced in conjunction with:

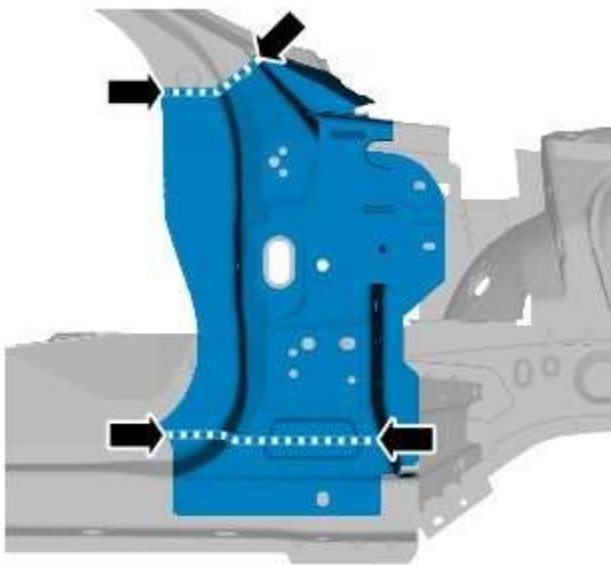
1. Front bumper cover
2. Front fender
3. Hood
4. Hood hinge
5. Front door
6. Front door hinges
7. Fender apron panel closing panel
8. A-pillar outer panel
9. Fender apron panel
10. Headliner
11. Instrument panel console
12. Windshield glass

3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).


4. Disconnect the generator electrical connectors.
5. Remove the fender apron panel.
For additional information, refer to: [Fender Apron Panel](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
6. Remove the A-pillar outer panel.
For additional information, refer to: [A-Pillar Outer Panel](#) (501-29 Side

Panel Sheet Metal Repairs, Removal and Installation).

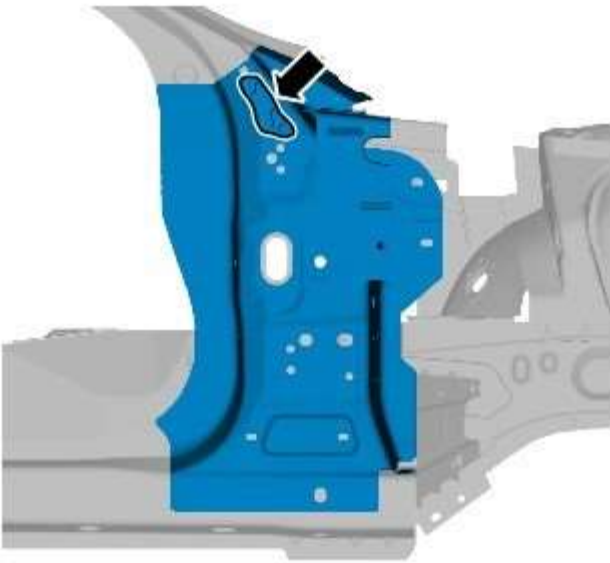
7. Remove the side air curtain module.
For additional information, refer to: [Side Air Curtain Module](#) (501-20B Supplemental Restraint System, Removal and Installation).
8. Remove the front seat.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
9. Remove the floor covering.
10. If the passenger side A-pillar reinforcement is to be repaired, remove the heater core and evaporator core housing.
For additional information, refer to: [Heater Core and Evaporator Core Housing](#) (412-01 Climate Control, Removal and Installation).
11. If the right-hand A-pillar reinforcement is to be repaired, remove the central junction box.
For additional information, refer to: [Central Junction Box \(CJB\)](#) (418-00 Module Communications Network, Removal and Installation).
12. If the drivers side A-pillar reinforcement is to be repaired, remove the pedal box.
13. Release and lay aside the insulating material at the inner bulkhead.
14. Release and position aside the inner bulkhead and floor panel wiring harness.



E 111837

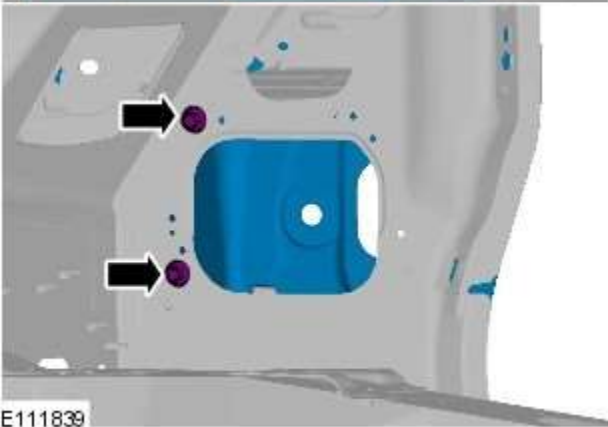
15.  **NOTE:** The NVH components may have already been removed on the outer panel.
Remove the upper and lower NVH components and if undamaged retain for reuse.

16. Remove an area of adhesive above the upper front door hinge mounting point to expose hidden spot welds.

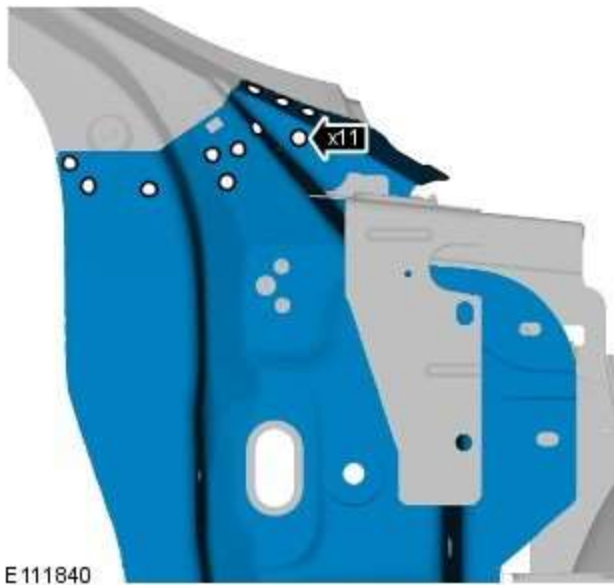



E111838

17. Remove the bolts as indicated and retain for reuse.

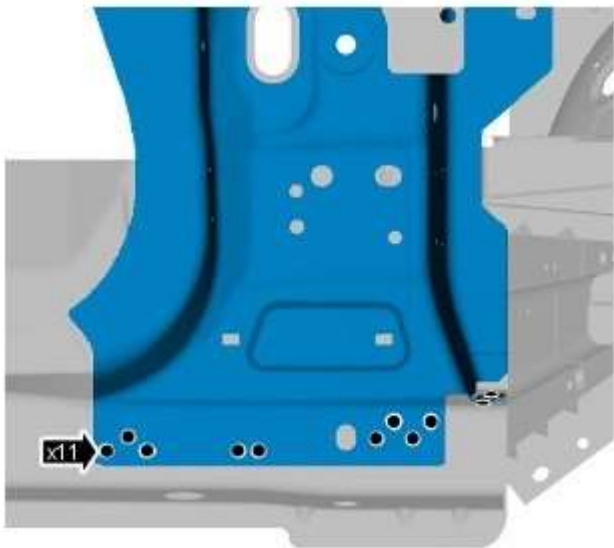



E111839



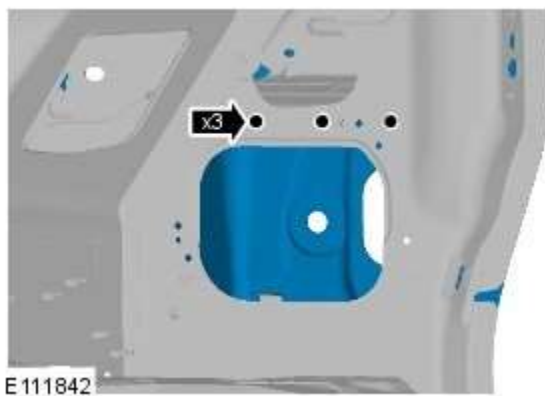
18.  NOTE: A drill bit suitable for drilling boron should be used on the boron spot welds.

Drill out the boron spot welds as indicated.

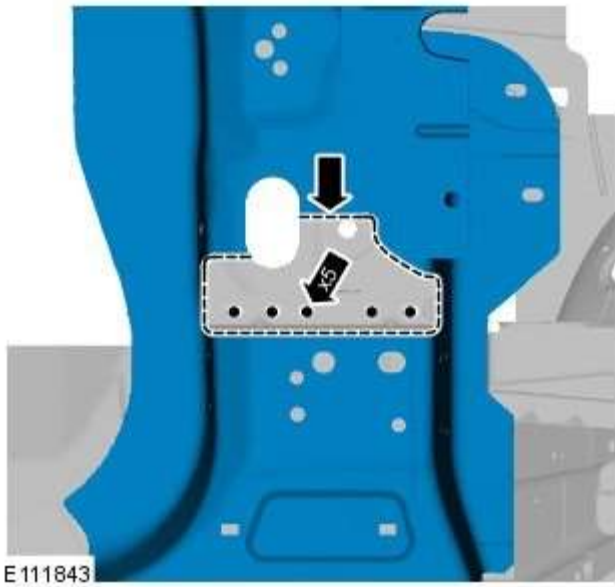


19.  NOTE: A drill bit suitable for drilling Dual Phase Steel, 600MPa, (DP600) should be used.

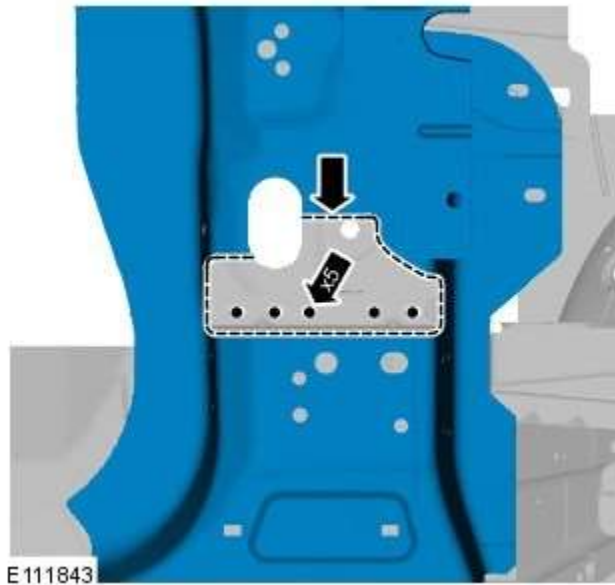
Drill out the spot welds as indicated.




20. From inside the vehicle, drill out the spot welds as indicated.

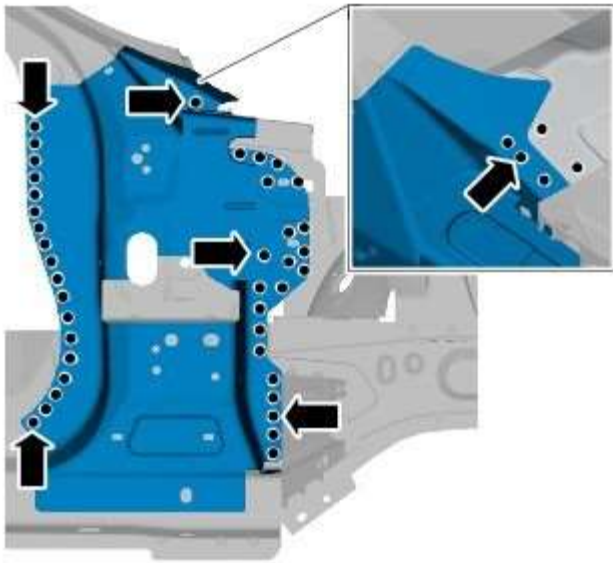


21. Cut a window in the old panel, above the front door lower hinge reinforcement, to enable access to the spot welds as indicated.



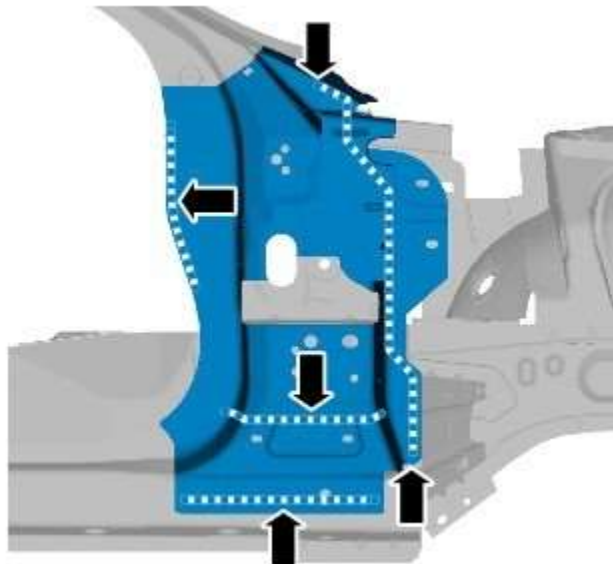
22.  NOTE: The spot welds indicated should be drilled right through, to enable MAG plug welding and a MIG braze slot on installation. The MIG braze slot is required as the original panel is MIG brazed in this area.

Drill out the spot welds as indicated.




E111844

23. Drill out the spot welds as indicated.



E 111845

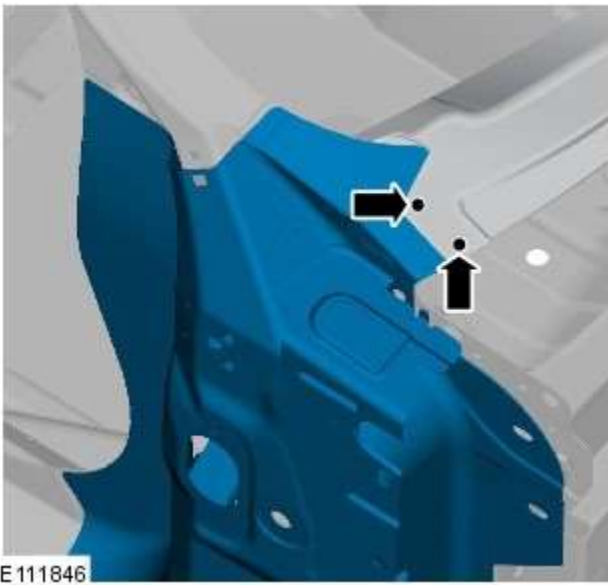
24.  NOTE: Care should be taken not to cause damage to remaining panels when separating joints containing adhesive.

Separate the joints and remove the old panel, observing the areas of NVH component and adhesive as indicated.

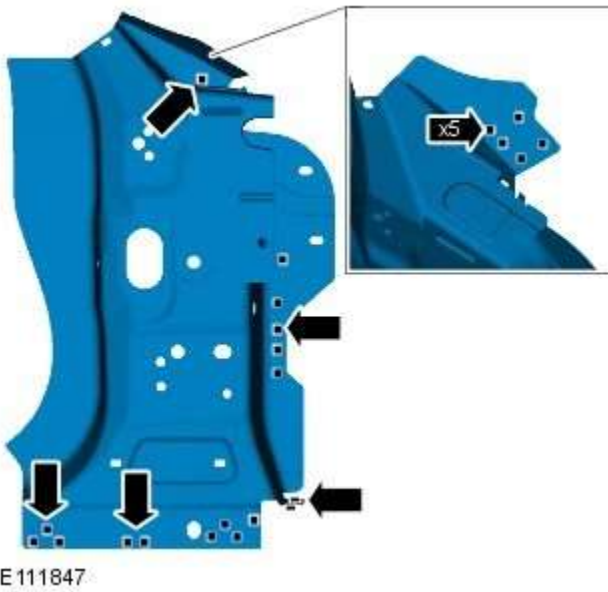
Installation

1. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

2. With the new panel in position, mark the position of MAG plug welds as indicated.

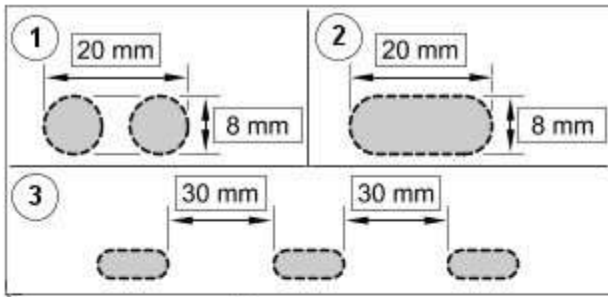


3. Remove the new panel.



4. **NOTE:** In the area of the windshield wiper motor linkage mounting, there may not be access to spot weld. In this case, MAG plug welding is acceptable in this area.

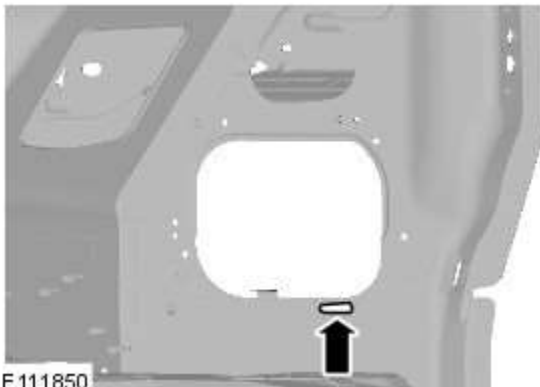
Drill holes in the new panel ready for MAG plug welding.




5. Cut slots in the new panel as indicated.



E111848



E111850

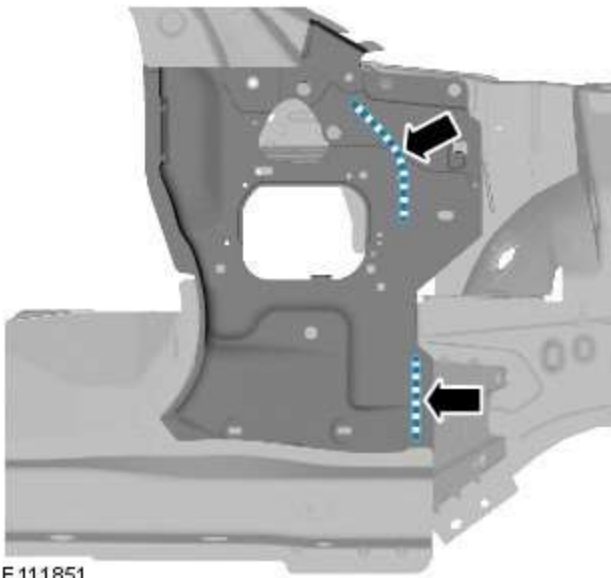
6.  NOTE: The MIG braze slot is required as the original panel is MIG brazed in this area.

Cut an elongated slot between the two drill outs in the A-pillar inner panel as indicated, ready for MIG brazing.


7. Prepare the old and new panel joint surfaces.

8. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

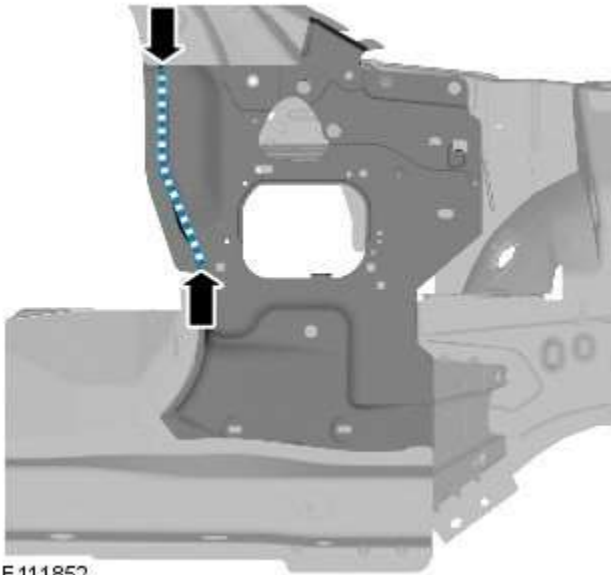
9. Remove the new panel.



E 111851

10.  NOTE: Make sure the adhesive does not encroach into the areas of the MAG plug welds as it will contaminate the weld.

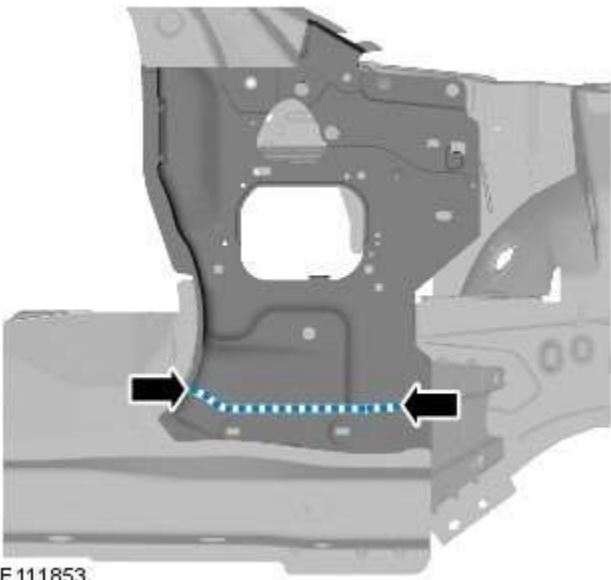
Apply adhesive to the area as indicated.



E 111852

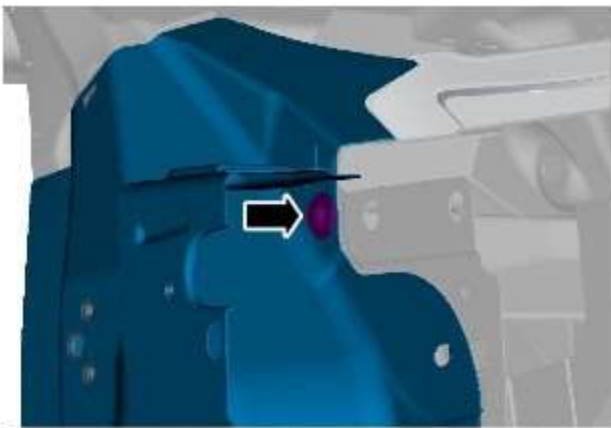
11. Apply adhesive to the area as indicated.

12. Apply sealer adhesive to the NVH components as indicated.

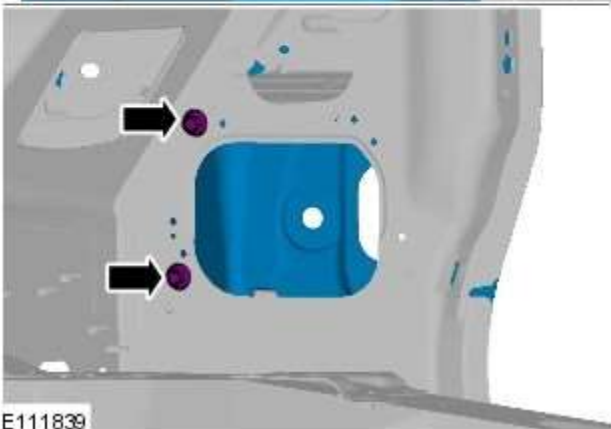


E111853

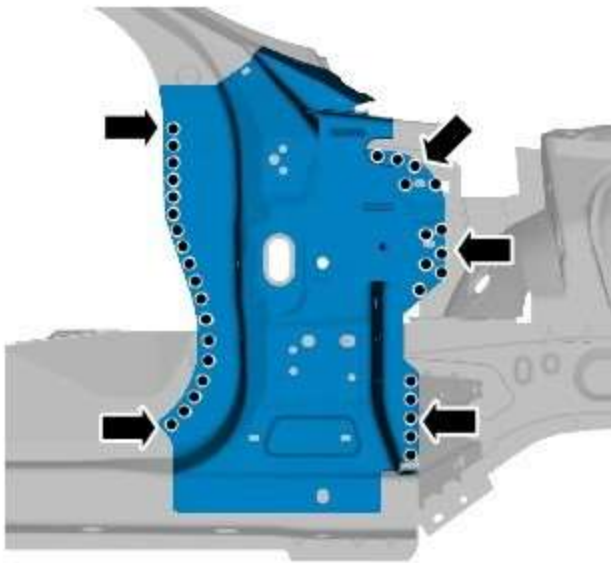
13. Offer up, align and clamp the new panel into position.




14. Install the bolts as indicated.
• Tighten to 25 Nm.



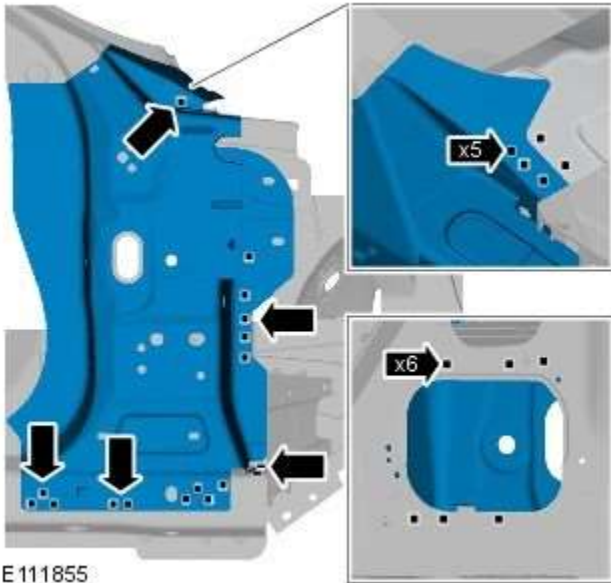
E111839



E 111854

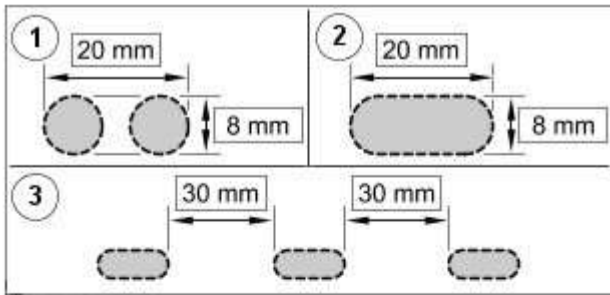
15.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.

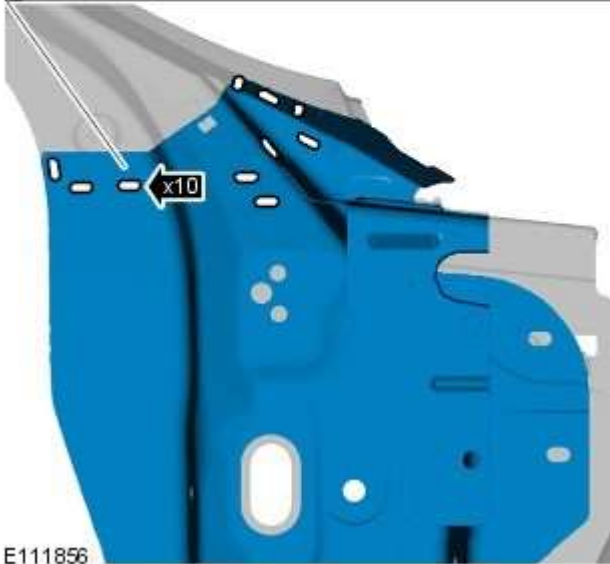


E 111855

16. MAG plug weld.



17. MIG Braze the slots.



E111856

18. MIG braze the elongated slot as indicated.

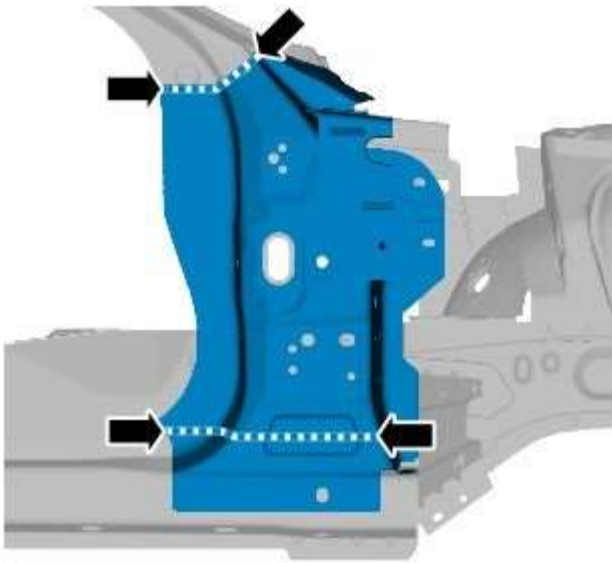


E 111849

19. Dress all welded/brazed joints and remove any excess adhesive.

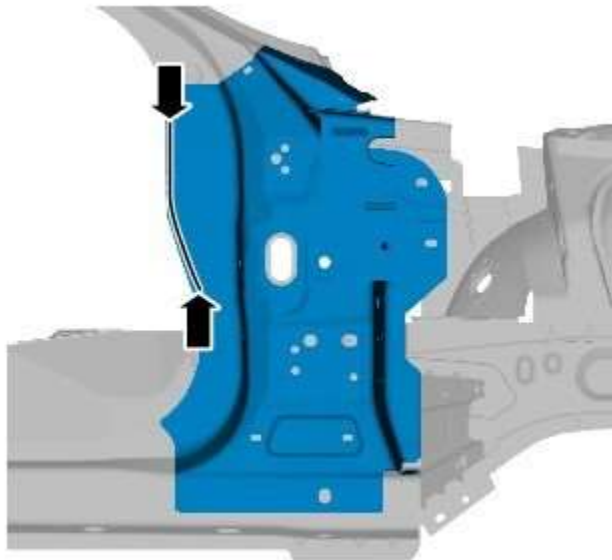
20. make sure any remaining areas of bare metal created during this procedure are treated with a zinc primer prior to the installation of outer panels.

21. Install the upper and lower NVH components as indicated.



E111837

22. When installing the A-pillar outer panel, the spot welded joint of the A-pillar reinforcement containing adhesive, should be spot welded in the same locations to allow a satisfactory weld.



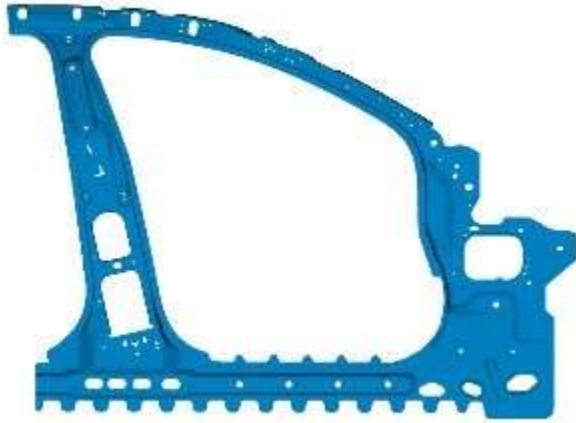
E111857

23. The installation of associated panels and components is the reversal of removal procedure.

Side Panel Sheet Metal Repairs - B-Pillar Inner Panel

Removal and Installation

Removal



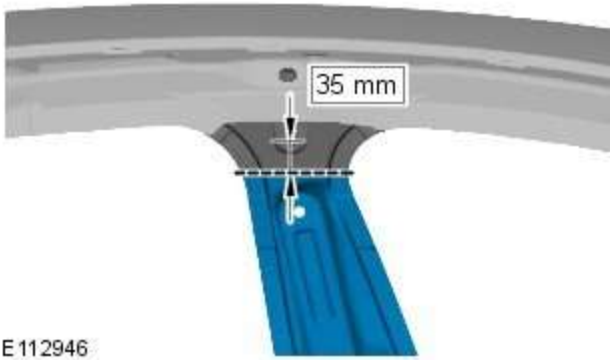
E 112942

1. **NOTE:** The B-pillar inner panel is manufactured from mild steel.

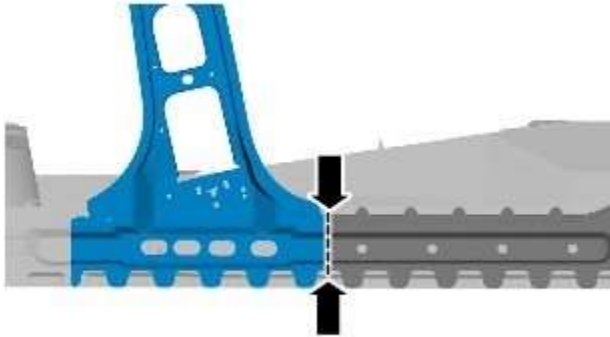
The B-pillar inner panel is cut from the bodyside inner front section service panel.

2. The B-pillar inner panel is replaced in conjunction with:
 - Front door
 - Rear door
 - Rocker panel and B-pillar outer panel
 - B-pillar reinforcement
 - Rocker panel inner reinforcement
 - Headliner
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the rocker panel inner reinforcement.
For additional information, refer to: [Rocker Panel Inner Reinforcement](#) (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

5. Cut the old panel at the point indicated.

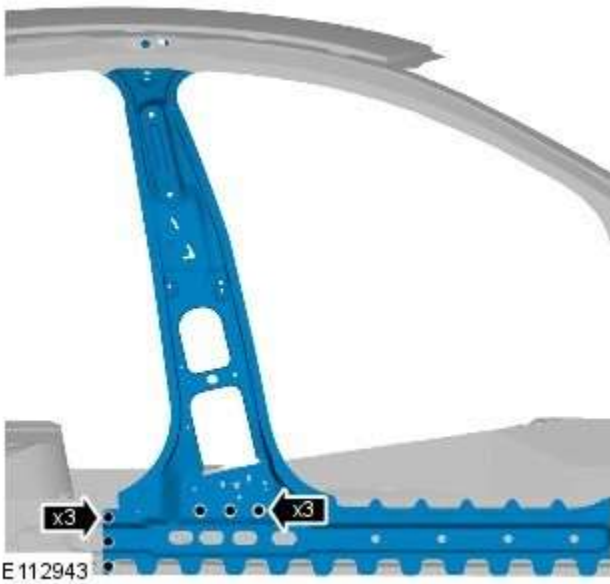


6. Cut the old panel at the point



E 112947
indicated.

7. Drill out the spot welds.

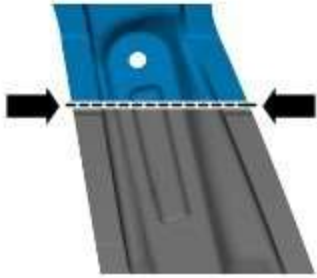


8. **NOTE:** Care should be taken when separating and removing the old panel as it will be used as a template.

Carefully separate the joints and remove the old panel.

Installation

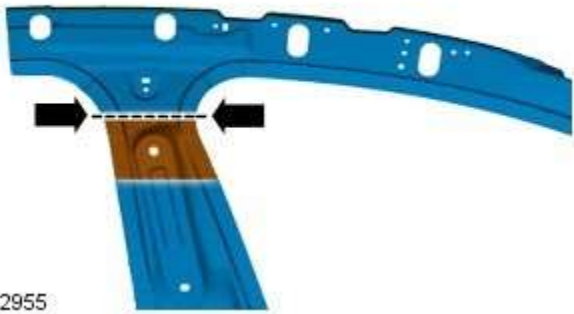
1. Cut a template from the old panel as indicated.



E 112954

2.  NOTE: Dress the panel joint surfaces of the template to ensure a good fit.

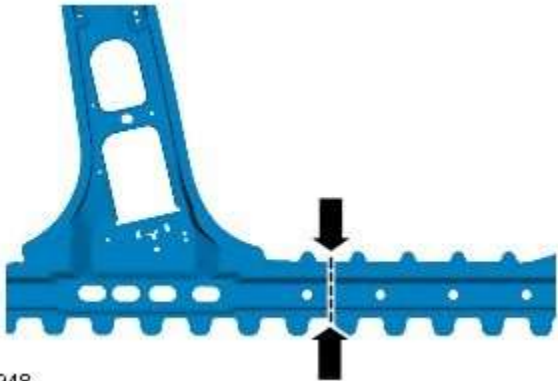
Offer up, align and clamp the template into position on the new B-pillar inner panel. Cut along the edge of the template, through the new panel, at the point indicated where the MAG butt joint is to be made.



E 112955

3. Remove the template from the new panel.

4. Using the old panel for reference and allowing for an overlap, cut the new panel at the point indicated.



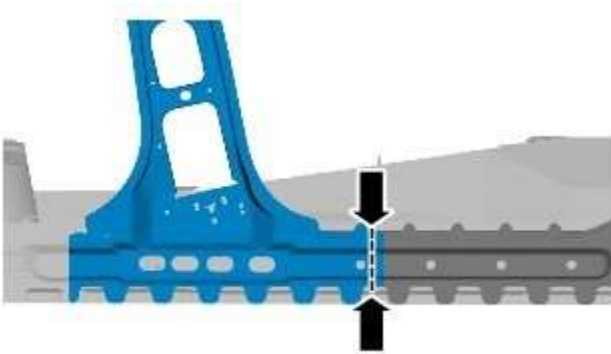
E 112948

5. Drill holes in the new panel ready for MAG plug welding.



E 112944

6. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.




E 112953

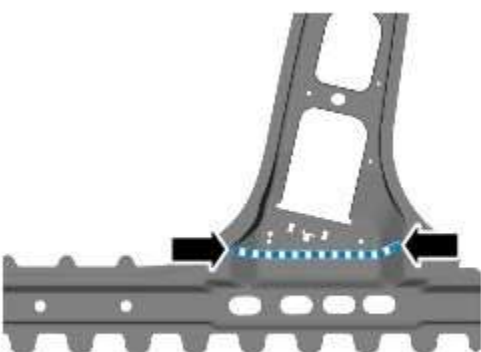
7. Cut the new and old panels at the point indicated, where the lower MAG butt joint is to be made.

8. Remove the new B-pillar inner panel.

9. Prepare the old and new panel joint surfaces.

10.  NOTE: Make sure the adhesive does not encroach into the area of MAG plug welds as it will contaminate the weld, (any unsealed areas must be sealed following the repair).

Apply weld through adhesive to the area as indicated.

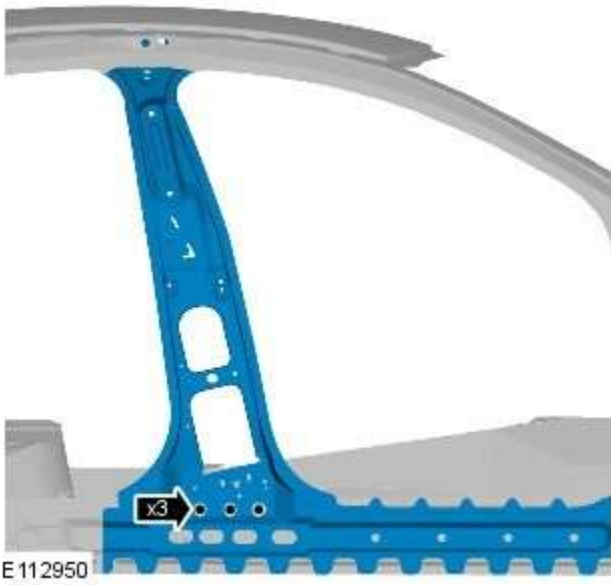


E 112945

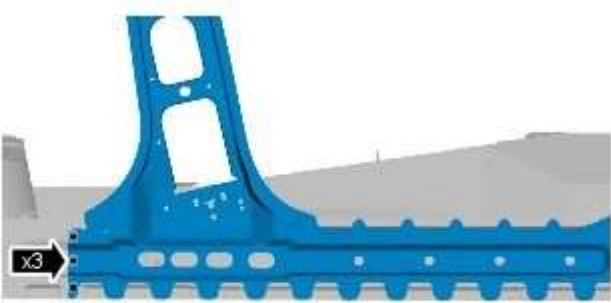
11. Offer up the new panel and clamp into position.

12. Tack MAG weld the butt joints.

13. Spot weld.



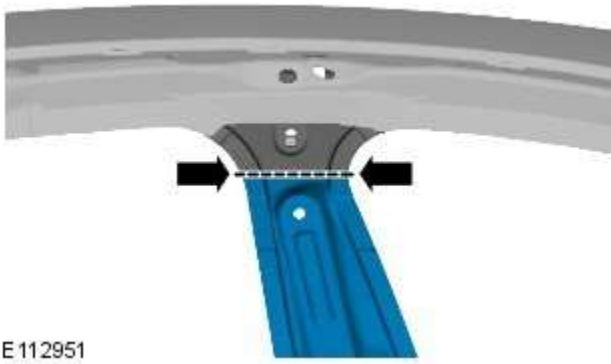
14. Dress the tack welds.



15. MAG plug weld.

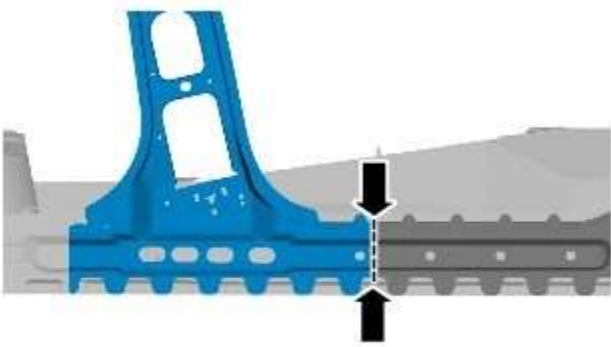
E 112949

16. MAG weld the upper butt joint.



E 112951

17. MAG weld the lower butt joint.



E 112952

18. Dress all welded joints.

19. Make sure any remaining areas of bare metal created during this procedure are treated with a zinc primer prior to the installation of other panels.

20. Make sure the joint between the B-pillar inner panel and the rocker panel inner panel is sealed following the completion of the B-pillar procedures.

21. The installation of associated panels and components is the reversal of removal procedure.

Side Panel Sheet Metal Repairs - B-Pillar Reinforcement

Removal and Installation

Removal



E107191

1. NOTE: The B-pillar reinforcement is manufactured from Dual Phase Steel, 450MPa, (DP450). It contains an internal boron reinforcement.

The B-pillar reinforcement panel is serviced as a separate weld-on panel. It is not serviced with its NVH (noise, vibration and harshness) components.

2. NOTE: The B-pillar reinforcement is spot welded to the cant rail reinforcement which is boron steel. In repair spot welds are replaced with MIG braze slots in these areas.

The b-pillar reinforcement is replaced in conjunction with:

1. Front door
 2. Rear door
 3. Rocker panel and B-pillar outer panel
 4. Headliner
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the rocker panel and B-pillar outer panel.
For additional information, refer to: [Rocker Panel and B-Pillar Outer Panel](#) (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

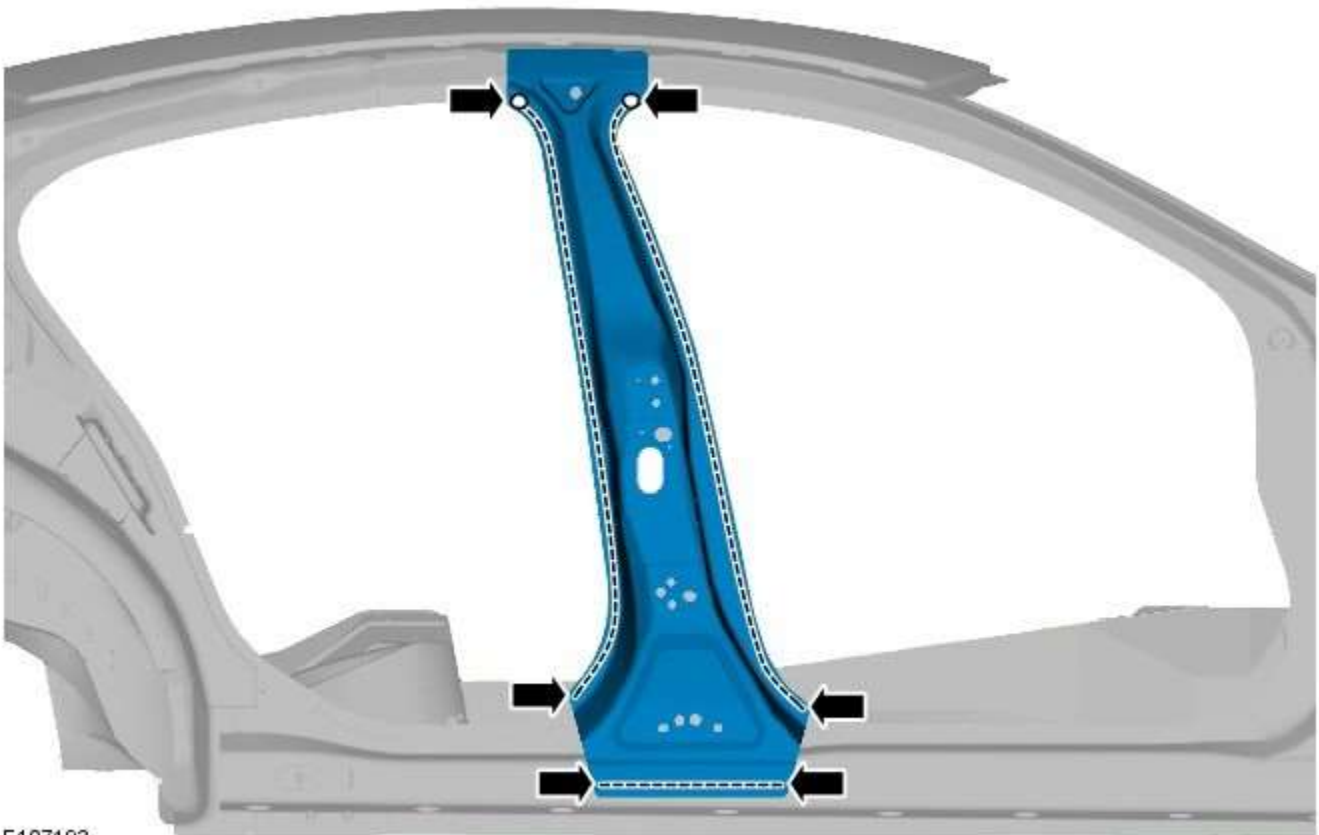
5. Cut the old panel at the point indicated.



E107192

6.  NOTE: A drill bit suitable for drilling boron should be used on the boron spot welds.

Drill out the spot welds.



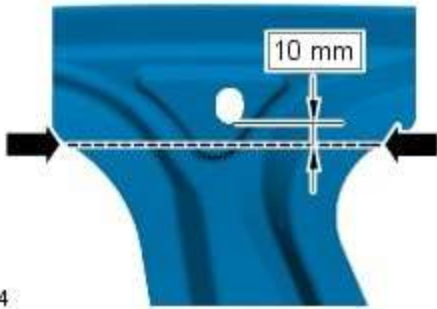
E107193

7. NOTE: Care should be taken when separating and removing the old panel as it will be used as a template. Care should also be taken in the area of the NVH components.

Carefully separate the joints and remove the old panel.

Installation


1. Cut a template from the old panel, the cut should be made approx 10mm below the hole as indicated.



E107194



E107195

2.  NOTE: Dress the panel joint surfaces of the template to ensure a good fit.
Offer up, align and clamp the template into position on the new B-pillar reinforcement panel. Cut along the edge of the template, through the new panel, at the point indicated, where the MAG butt joint is to be made.

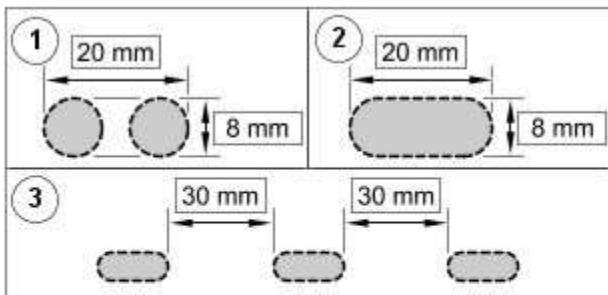
3. Remove the template from the new panel.

4. Drill holes in the new panel ready for MAG plug welding.




E 107196

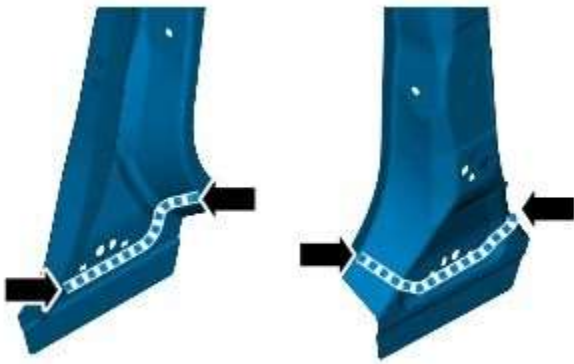
5. Cut slots in the new panel ready for MIG braze slots.



E107197


6.  **NOTE:** If necessary, renew the NVH components.
Prepare the old and new panel joint surfaces, including the NVH components.
7. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
8. Remove the new B-pillar reinforcement panel.

9. Apply sealer adhesive to the NVH components, as indicated.



E 107198

10. Offer up the new panel and clamp into position.
11. Tack MAG weld the upper butt joint.
12. Install a tack MAG weld between the B-pillar reinforcement and the rocker panel inner reinforcement to secure the panel in position, to enable a final alignment check prior to welding.

13.  **NOTE:** Temporarily install the rocker panel and B-pillar outer panel and the front and rear doors and hinges to aid alignment.

Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.

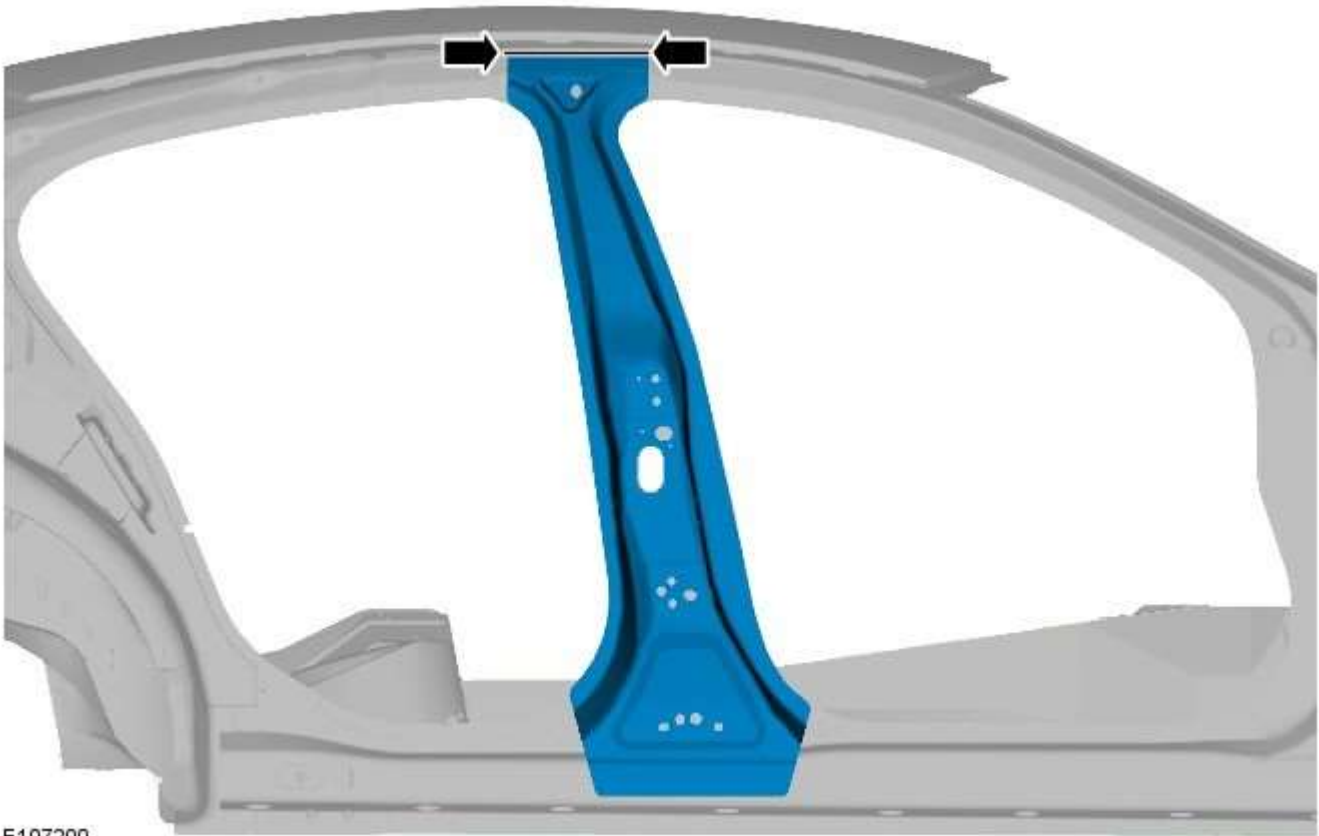
14. Remove the front and rear doors and hinges and the rocker panel and B-pillar outer panel.
15. Dress the tack welds.

16. MAG plug weld.



E 107199

17. MAG weld the upper butt joint.



E107200

18. MIG Braze the slots.



E107201

19. Dress all welded/brazed joints.

20. Make sure any remaining areas of bare metal created during this procedure are treated with a zinc primer prior to the installation of outer panels.

21. The installation of associated panels and components is the reversal of removal procedure.

Side Panel Sheet Metal Repairs - Front Door Skin Panel

Removal and Installation

Removal

1. **NOTE:** The front door skin panel is manufactured from bake hardened steel, (220 MPa), plus zinc.

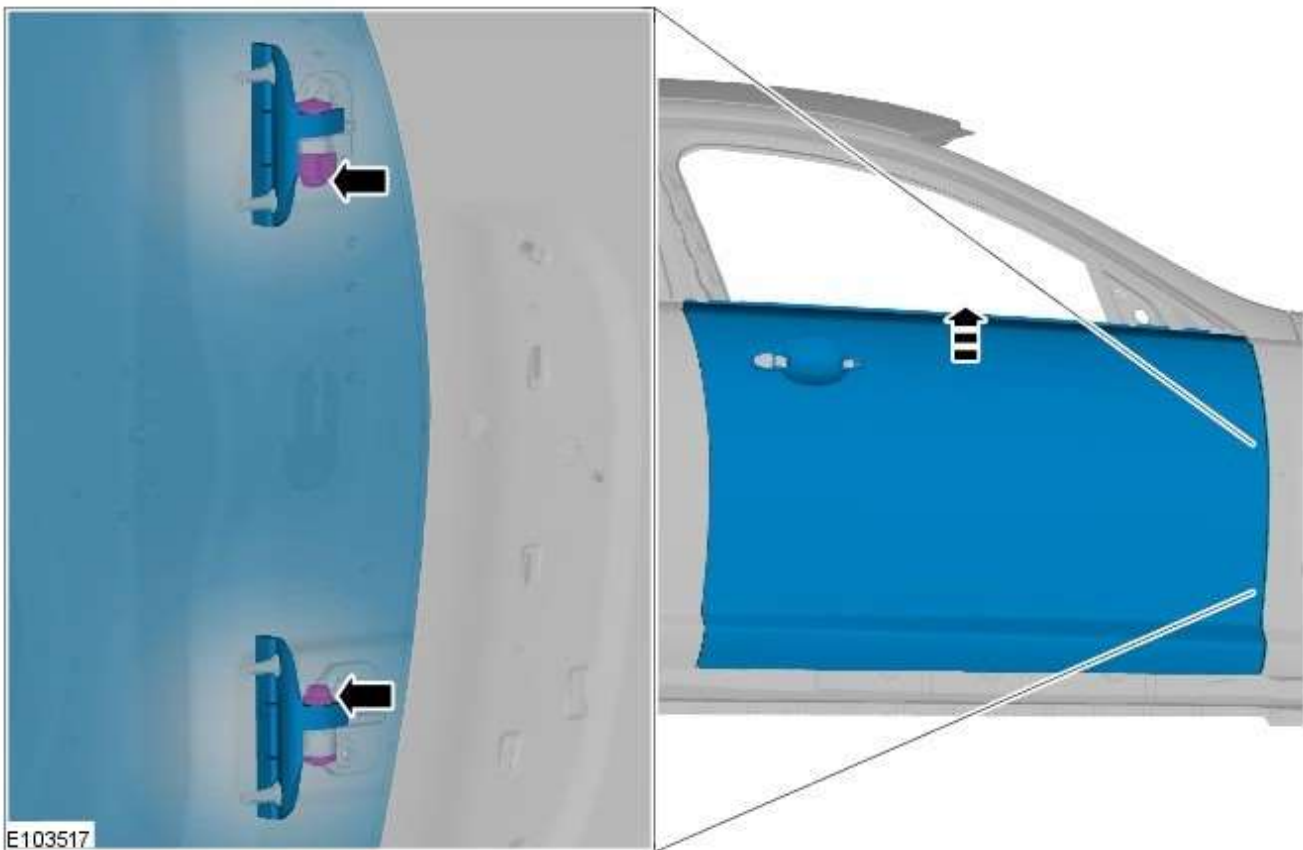
The front door skin panel is serviced as a separate panel.



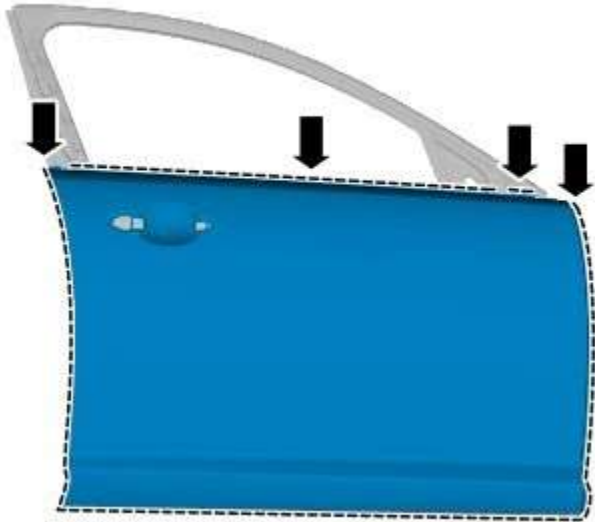
E 103510

2. The front door skin panel is replaced in conjunction with:
 1. Front door
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the front door window regulator and motor.
For additional information, refer to: [Front Door Window Regulator and Motor](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).
5. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
6. Remove the exterior mirror.
For additional information, refer to: [Exterior Mirror](#) (501-09 Rear View Mirrors, Removal and Installation).
7. Remove the front door latch.
For additional information, refer to: [Front Door Latch](#) (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).
8. Remove the front door outer window frame mouldings.
9. Remove the front door weatherstrips.

10. Remove the front door wiring harness.
11. Remove the front door impact absorbers.
12. Remove the front door glass run felt.
13. Disconnect the front door wiring harness, accessed behind the grommet on the A-pillar.
14. Remove the screw and release the front door check strap from the body.
15. Remove the front door.



16. Abrade the areas of folded flange on the old front door skin panel.

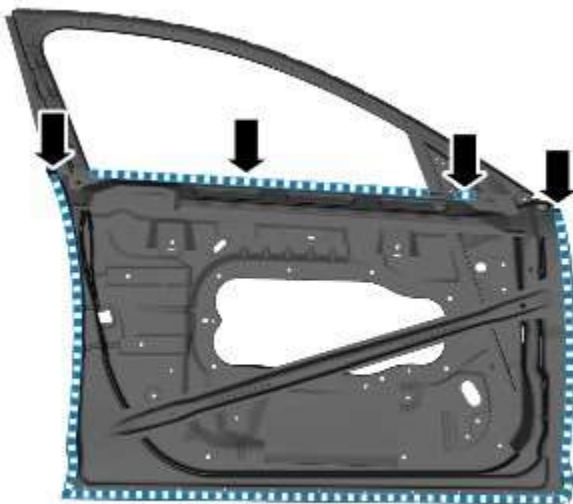


E 103511

17. Separate the adhesive and remove the bulk of the old panel.
18. Separate and remove the old panel remnants from the front door frame.

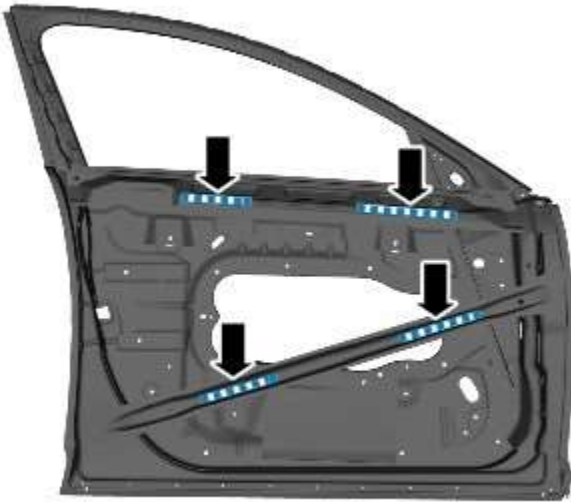
Installation

1. Prepare the old and new panel joint surfaces.
2. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
3. Remove the new panel.
4. Apply adhesive to the areas of folded flange as indicated.



E 103512

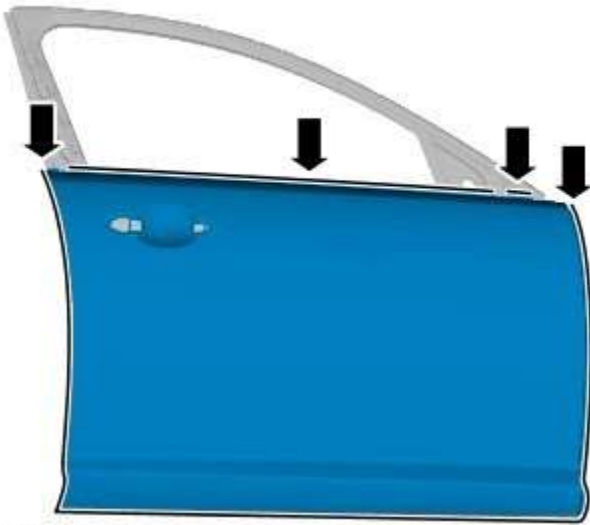
5. Apply adhesive to the impact beam/reinforcements as indicated.



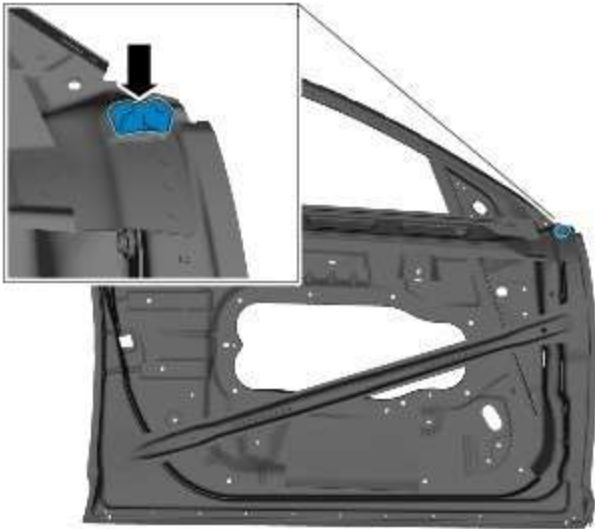
E 103513

6. Offer up the new panel, align and clamp into position.

7. Fold the flange of the front door skin panel, over the front door frame as indicated.



E 103516



- NOTE: There is access to apply the expanding foam sealer with the front door skin panel fitted to the front door frame.

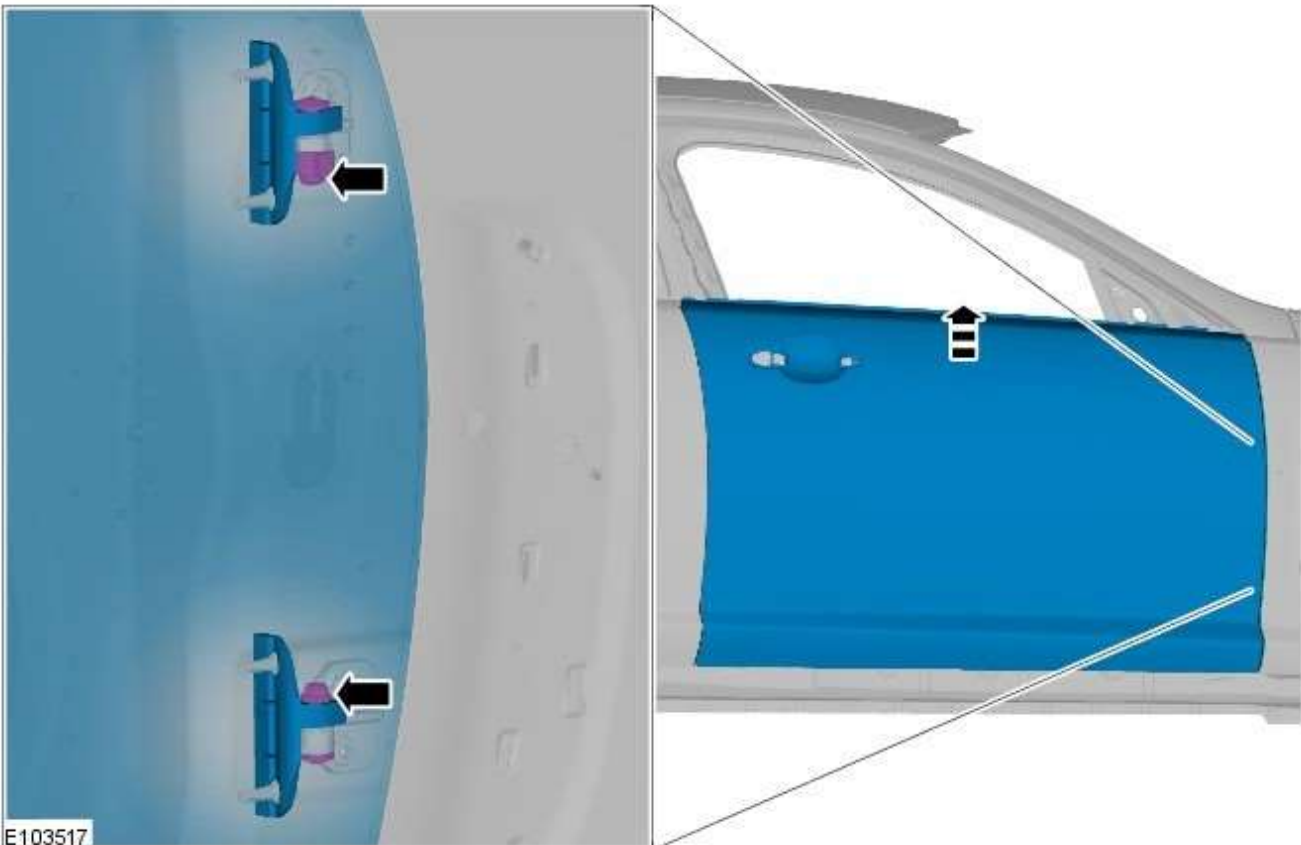
Apply expanding foam sealer to the area indicated.

E103514

- Remove any excess adhesive or expanding foam sealer.

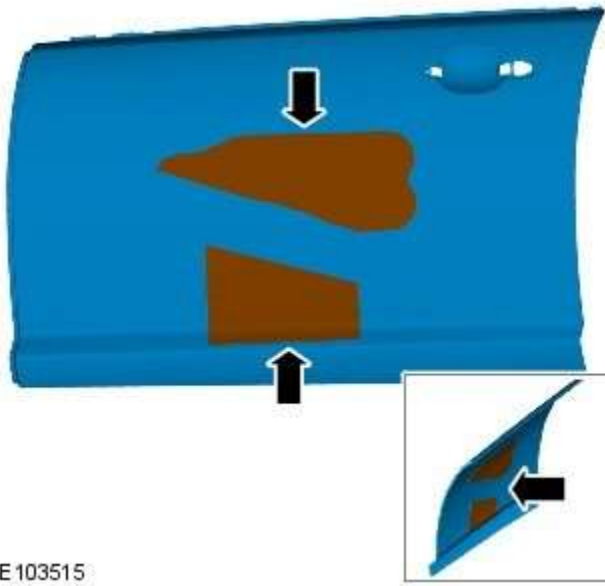
- Dress the folded flange joints.

- Install the front door.
 - Tighten to 30 Nm.



E103517

12. Check alignment, if correct, proceed to next step, if not rectify before proceeding.



13. Install the NVH (noise, vibration and harshness) components.

E 103515

14.  NOTE: Install the front door upper frame weatherstrip prior to installing the front door.

The installation of associated panels and components is the reversal of removal procedure.

Side Panel Sheet Metal Repairs - Rear Door Skin Panel

Removal and Installation

Removal

1. **NOTE:** The rear door skin panel is manufactured from bake hardened steel, (220 MPa), plus zinc

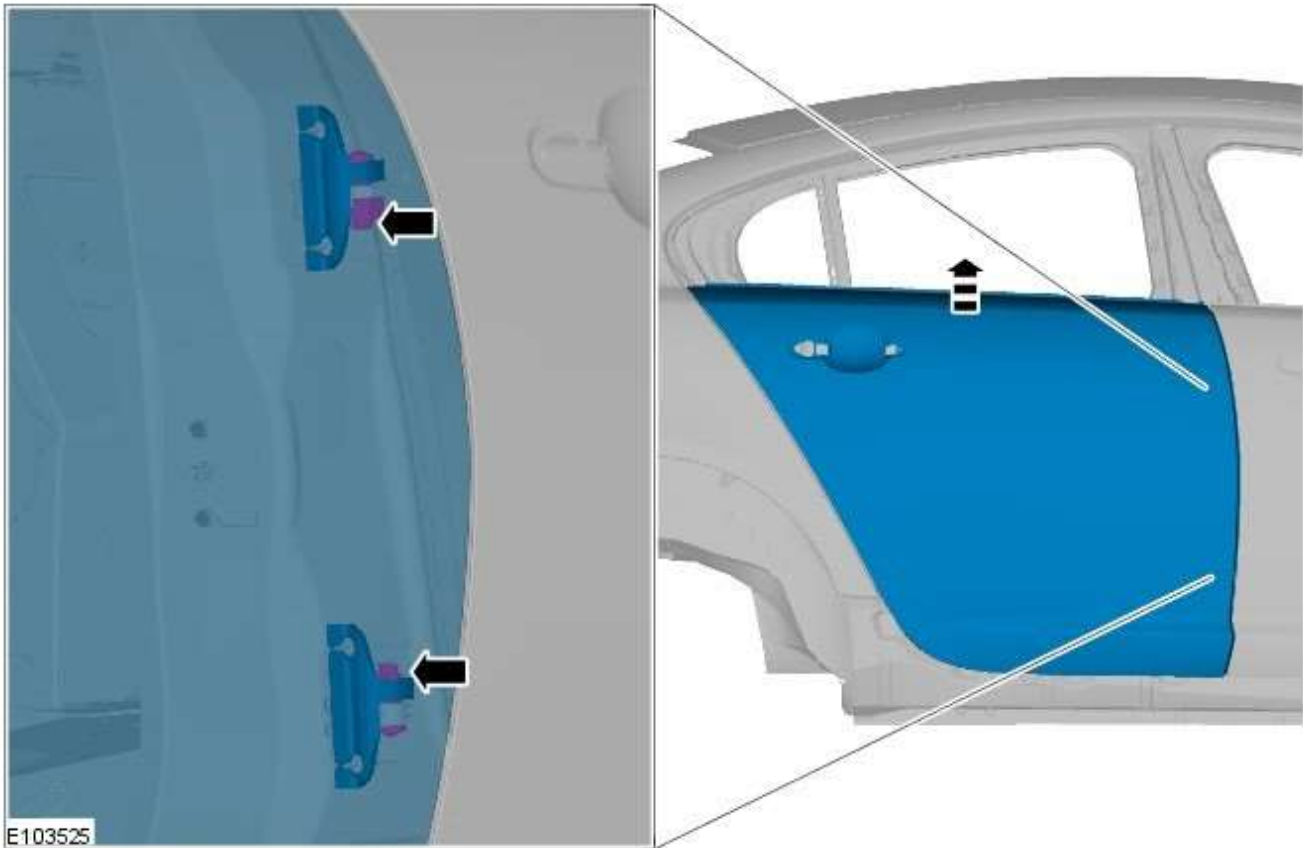
The rear door skin panel is serviced as a separate panel.



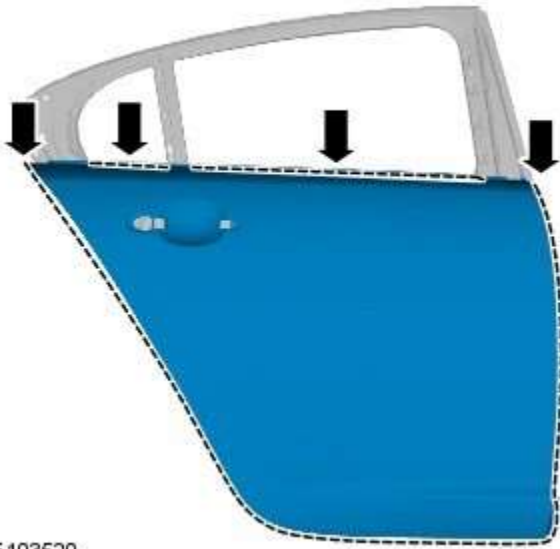
E 103519

2. The rear door skin panel is replaced in conjunction with:
 1. Rear door
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the rear door window regulator and motor.
For additional information, refer to: [Rear Door Window Regulator and Motor](#) (501-11 Glass, Frames and Mechanisms, Removal and Installation).
5. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
6. Remove the rear door latch.
For additional information, refer to: [Rear Door Latch](#) (501-14 Handles, Locks, Latches and Entry Systems, Removal and Installation).
7. Remove the rear door outer window frame mouldings.
8. Remove the rear door weatherstrips.
9. Remove the rear door wiring harness.

10. Remove the rear door impact absorbers.
11. Remove the rear door glass run felt.
12. Disconnect the rear door wiring harness, accessed behind the grommet on the B-pillar.
13. Remove the screw and release the rear door check strap from the body.
14. Remove the rear door.



15. Abrade the areas of folded flange on the old rear door skin panel.



E 103520

16. Separate the adhesive and remove the bulk of the old panel.
17. Separate and remove the old panel remnants from the rear door frame.

Installation

1. Prepare the old and new panel joint surfaces.
2. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
3. Remove the new panel.
4. Apply adhesive to the areas of folded flange as indicated.



E 103521

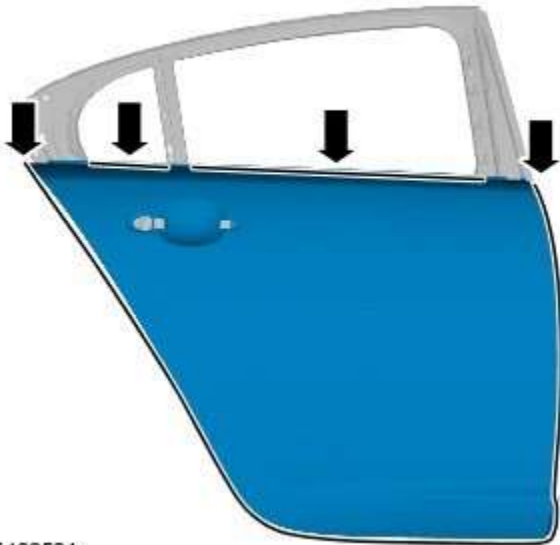
5. Apply adhesive to the impact beam/reinforcements as indicated.



E 103522

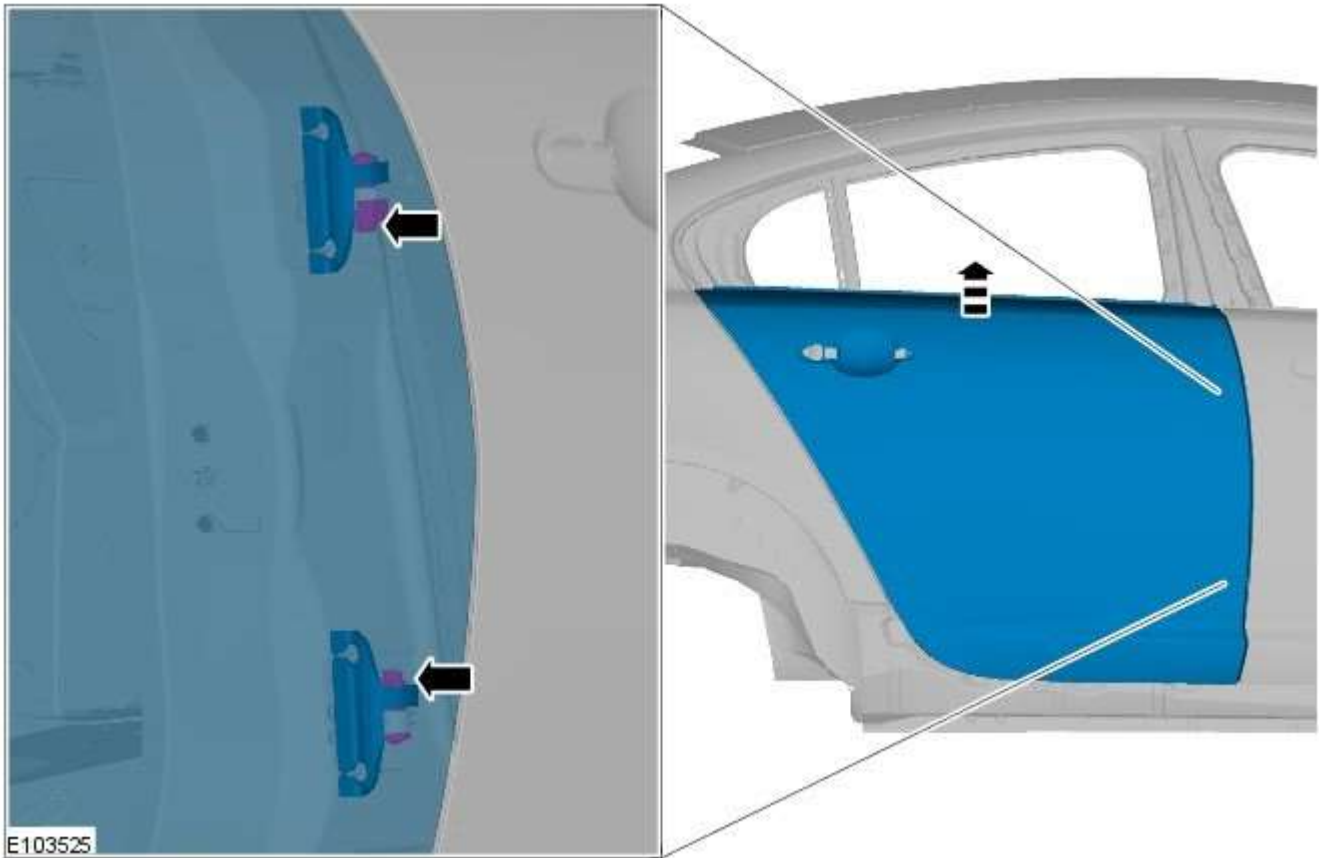
6. Offer up the new panel, align and clamp into position.

7. Fold the flange of the rear door skin panel, over the rear door frame as indicated.



E 103524

8. Remove any excess adhesive.
9. Dress the folded flange joints.
10. Install the rear door.
 - Tighten to 30 Nm.



11. Check alignment, if correct, proceed to next step, if not rectify before proceeding.

12. Install the **NVH (noise, vibration and harshness)** components.



13. The installation of associated panels and components is the reversal of removal procedure.

Side Panel Sheet Metal Repairs - Rocker Panel

Removal and Installation

Removal

1. **NOTE:** The rocker panel is manufactured from mild steel.

The rocker panel is serviced as a separate weld-on panel. It is not serviced with its riv-nuts for the fender fixings, or **NVH (noise, vibration and harshness)** components.

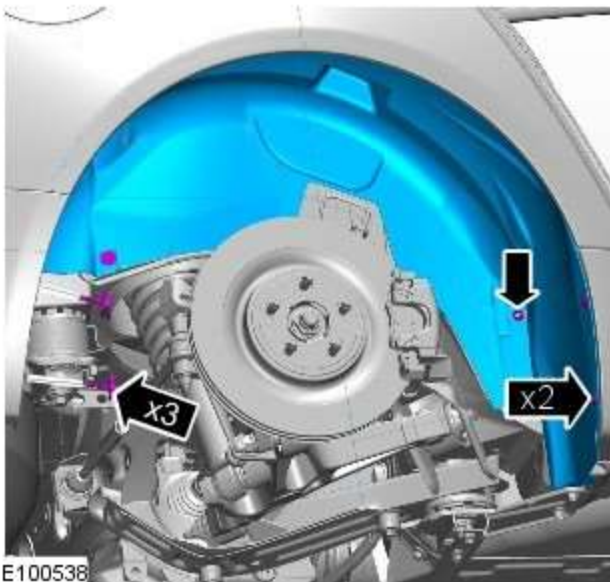


E102794

2. The rocker panel is replaced in conjunction with:
 1. Front fender
 2. Front door
 3. Rear door
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the front seat.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
5. Disconnect the generator electrical connectors.
6. Remove the rear seat cushion.
For additional information, refer to: [Rear Seat Cushion](#) (501-10 Seating, Removal and Installation).
7. Remove the front and rear door weatherstrips.

8. Remove the cowl side trim panel.
For additional information, refer to: [Cowl Side Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
9. Remove the front safety belt retractor.
For additional information, refer to: [Front Safety Belt Retractor](#) (501-20A Safety Belt System, Removal and Installation).
10. Remove the B-pillar side impact sensor.
For additional information, refer to: [B-Pillar Side Impact Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
11. Remove the C-pillar side impact sensor.
For additional information, refer to: [C-Pillar Side Impact Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
12. Release and position the floor covering to one side.
13. Release and position the inner rocker panel wiring harness to one side.
14. Remove the rear wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).


15. Remove the rear fender splash shield.



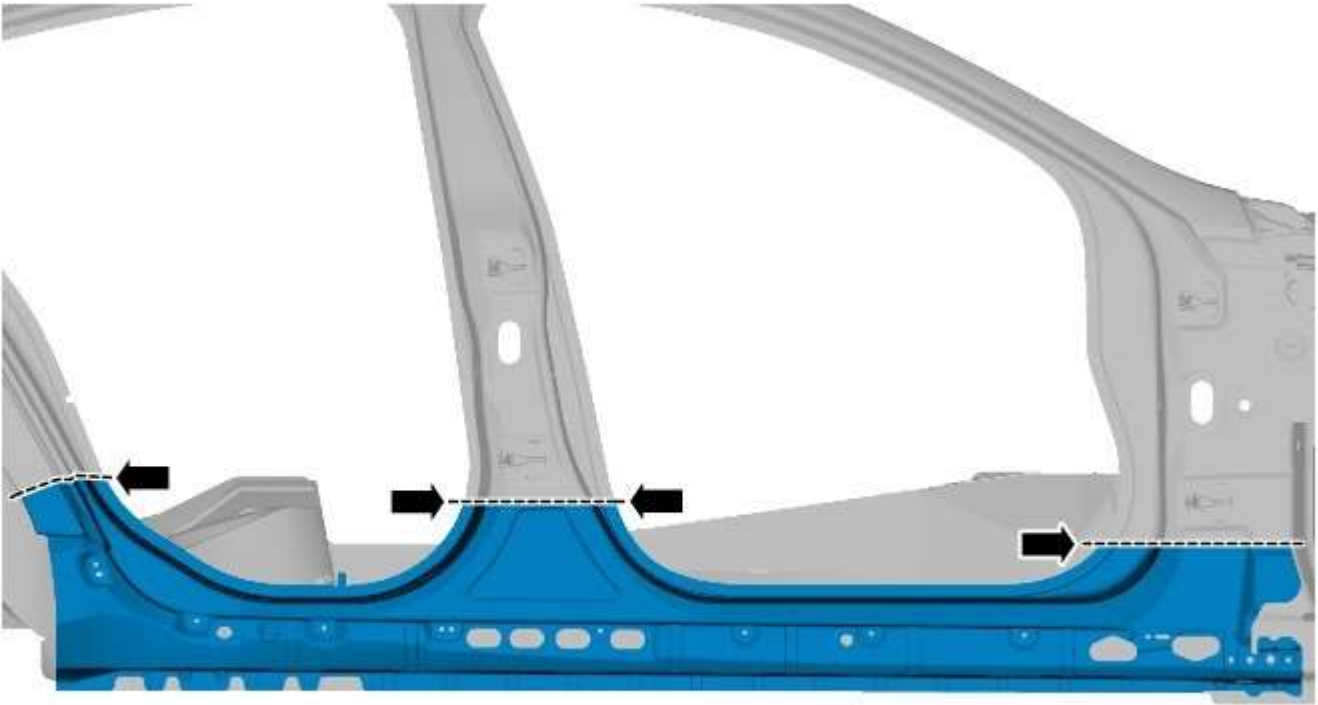
16. Remove the rocker panel outer moulding.
17. Remove the underfloor splash shield.
18. If the right-hand rocker panel is to be repaired, release and position the underfloor wiring harness to one side.
19. Remove the front fender.
For additional information, refer to: [Front Fender](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
20. Remove the front door.

For additional information, refer to: [Front Door](#) (501-03 Body Closures, Removal and Installation).

21. Remove the rear door.
For additional information, refer to: [Rear Door](#) (501-03 Body Closures, Removal and Installation).

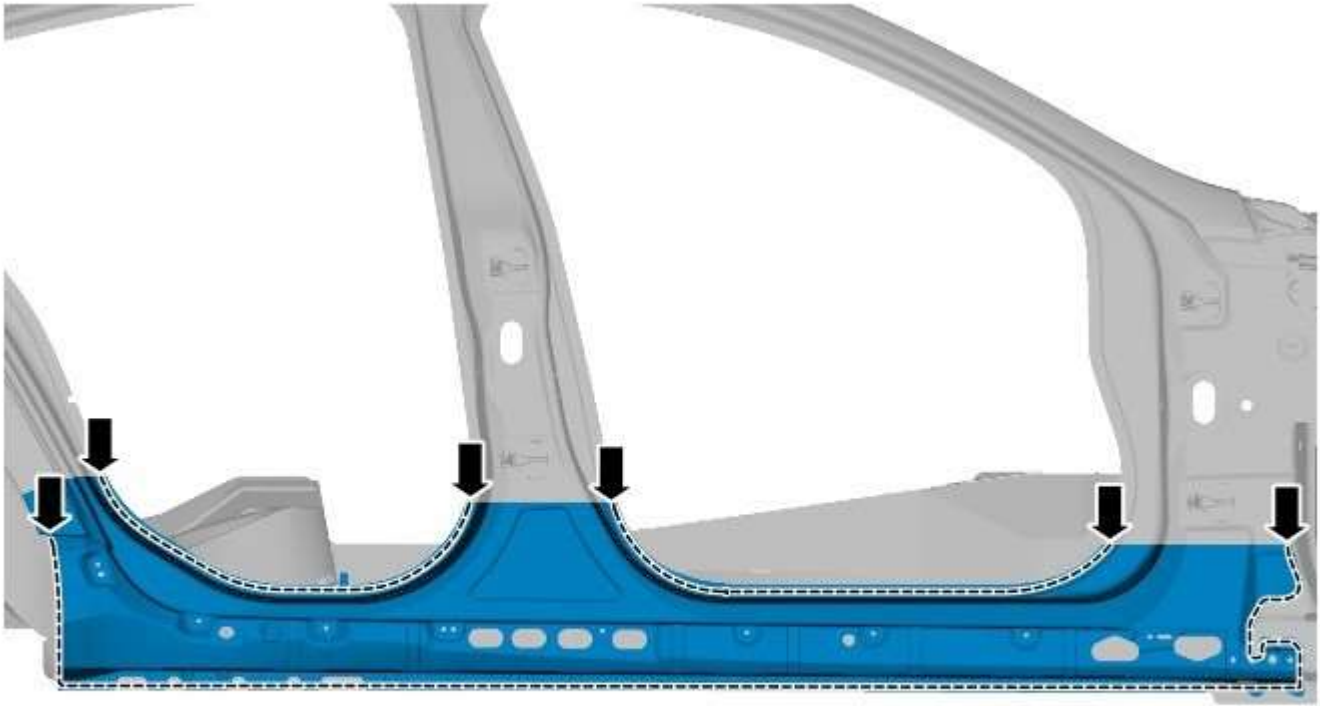
22.  **CAUTION:** Care should be taken not to cut through into the inner panels.

Using the new panel for reference and allowing for an overlap, cut the old panel at the points indicated.



E102795

23. Drill out the spot welds.

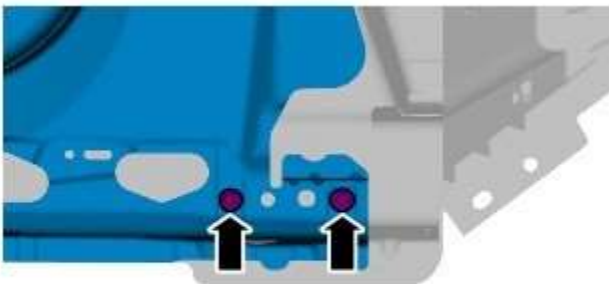


E102796

24. Separate the joints and remove the bulk of the old panel.

Installation

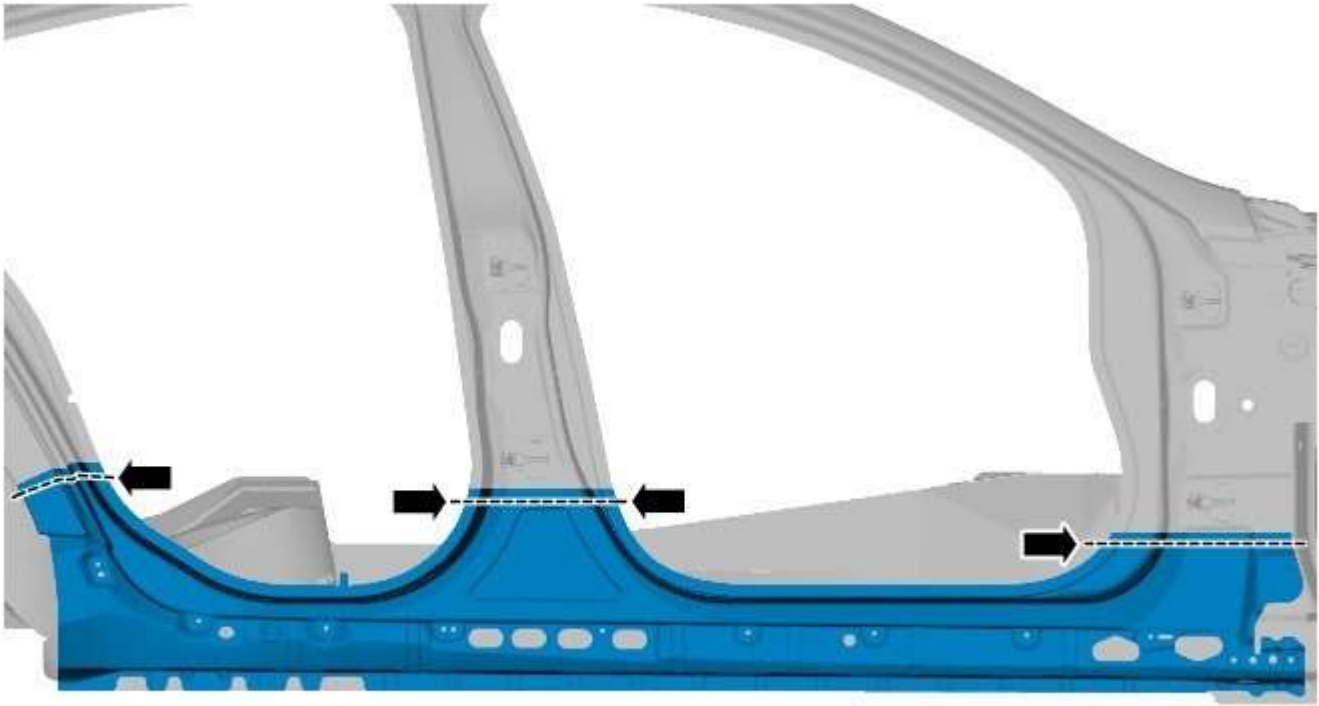
1. Install the riv-nuts into the new rocker panel as indicated.



E102797

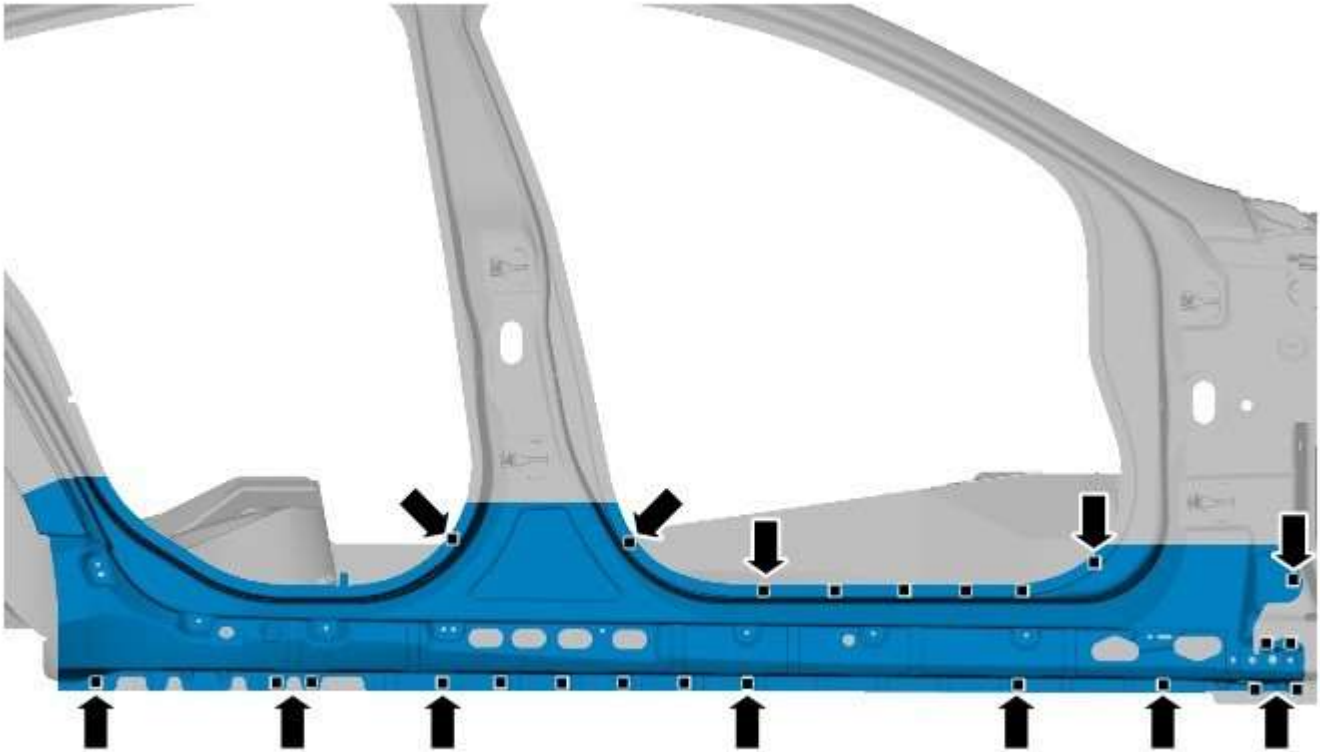
2.  **CAUTION:** Care should be taken not to cut through into the inner panels.

Offer up, align and clamp the new panel into position, overlapping the old panel remnant. Cut through the new panel, partially cutting the old panel at the points where the MAG butt joints are to be made.




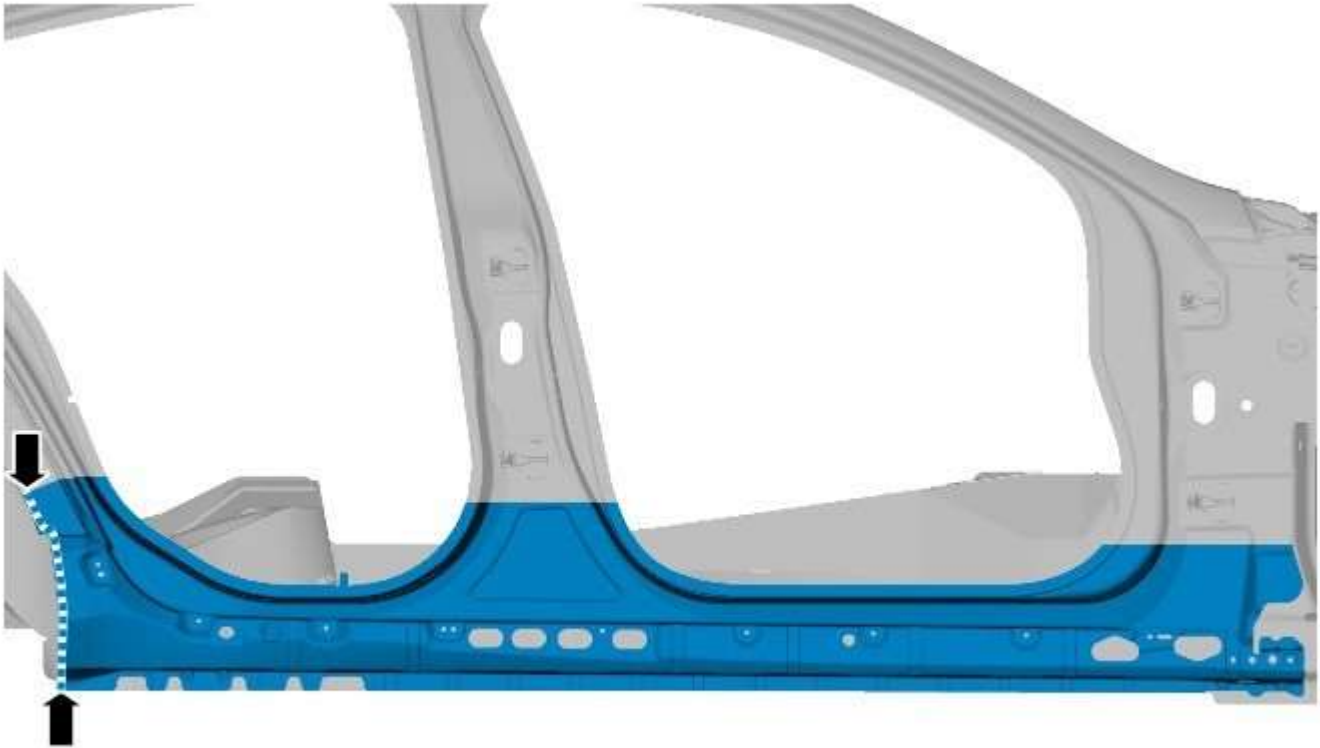
E 102798

3. Remove the new panel.
4. Cut and remove the old panel remnants.
5. Drill holes in the new panel ready for MAG plug welding.



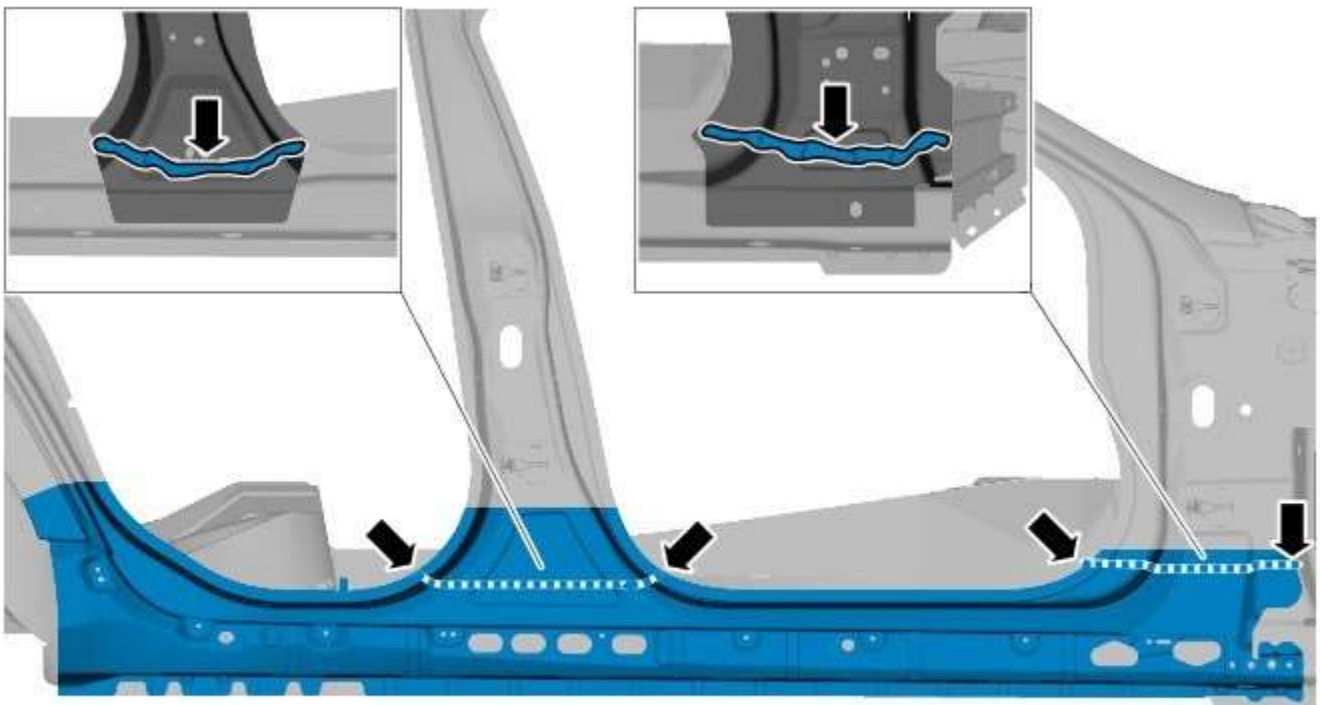
E102799

6.  NOTE: If necessary renew the NVH components.
Prepare the old and new panel joint surfaces, including the NVH components.
7. NOTE: Temporarily install the front and rear doors and front fender to aid alignment.
Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
8. Remove the front and rear doors, front fender and the new rocker panel.
9. NOTE: Make sure the adhesive does not encroach into the area of the butt joint as it will contaminate the weld (any unsealed areas must be sealed following the repair).
Apply adhesive to the area as indicated.



E 102801


10. Apply sealer adhesive to the NVH components as indicated.



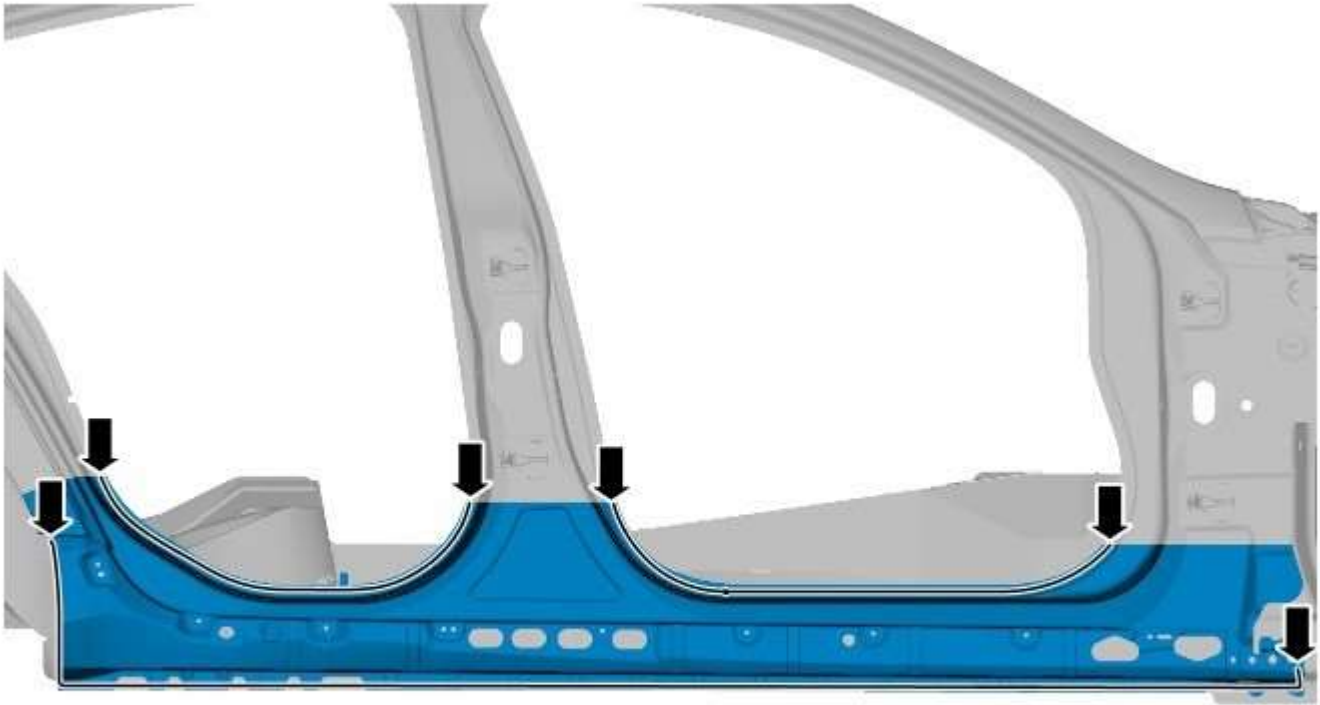
E 102800

11. Offer up the new rocker panel, align and clamp into position.

12. Tack weld the butt joints.

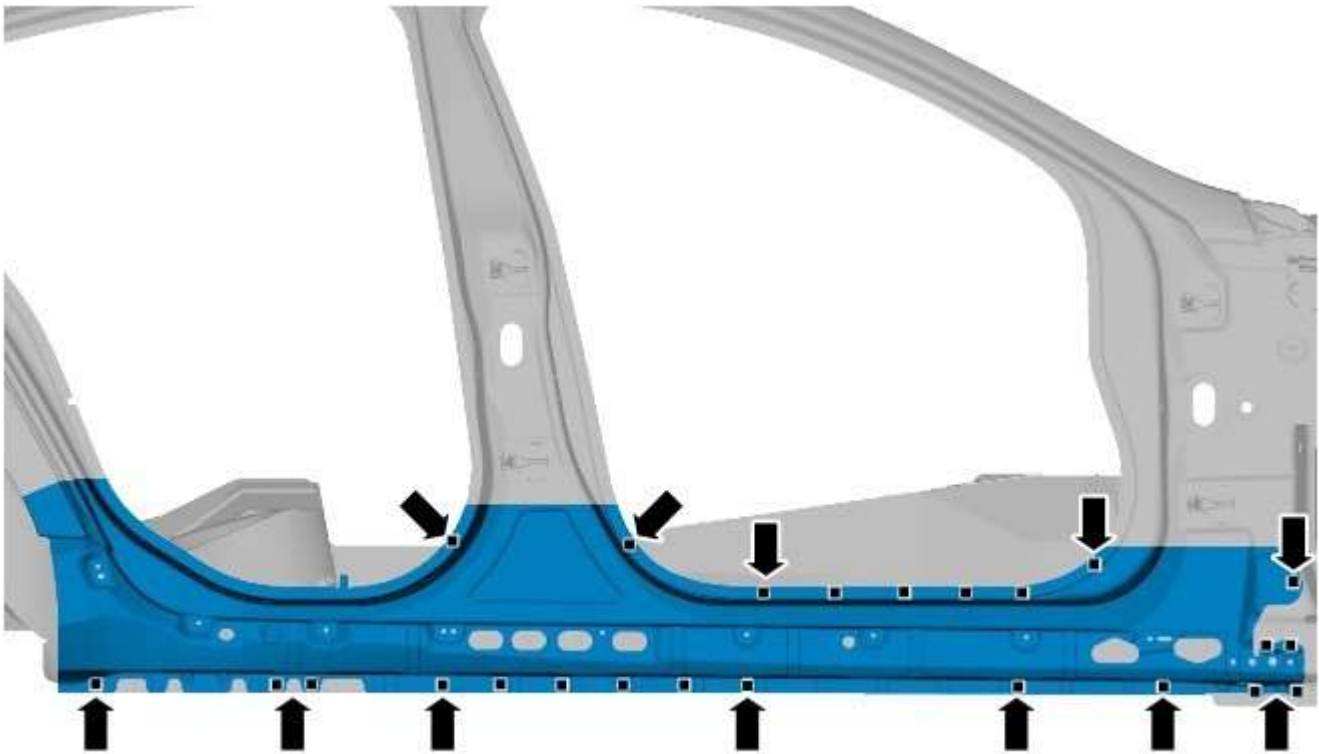
13.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.



E 102802

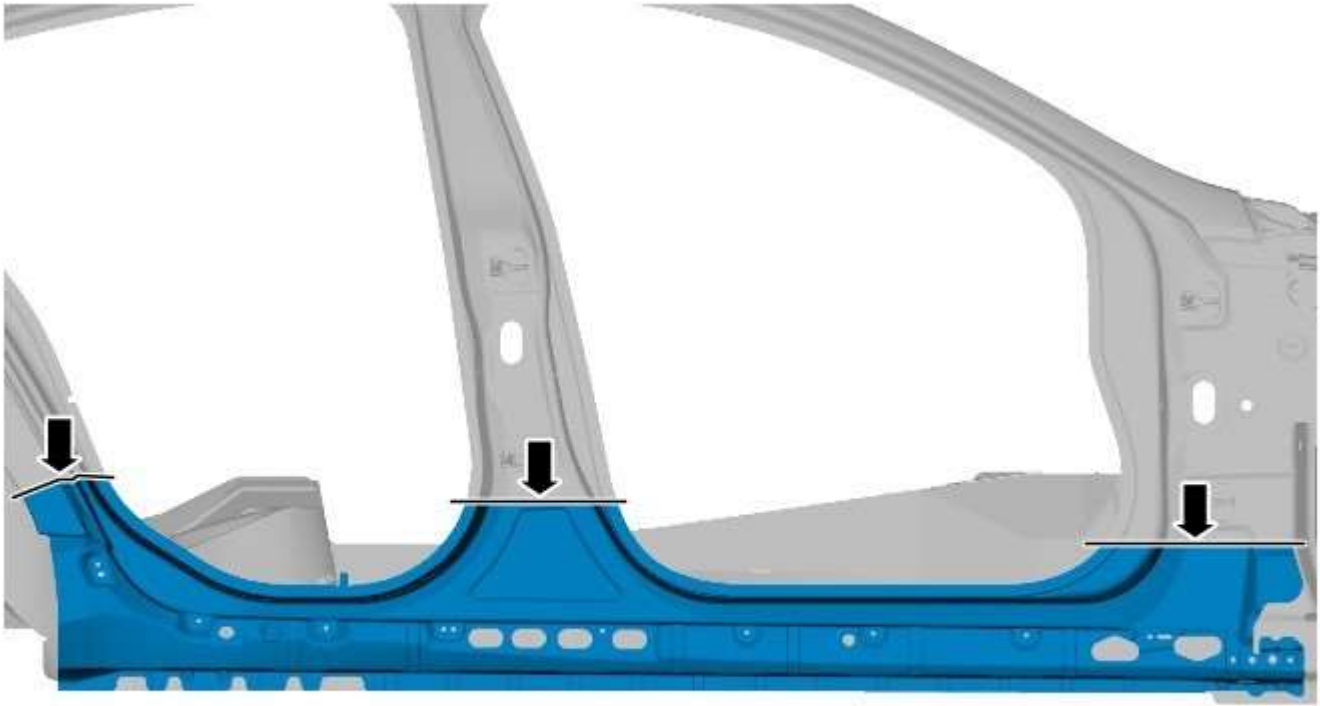
14. MAG plug weld.



E102799

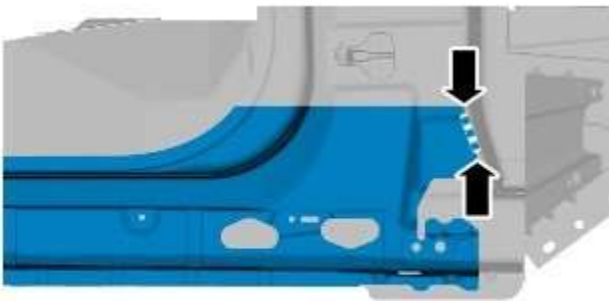
15. Dress the tack welds.

16. MAG weld the butt joints.



E102803

17. Dress all welded joints.



18. The joint between the rocker panel and A-pillar must be sealed following the repair as indicated.

E102812

19. The installation of associated panels and components is the reversal of removal procedure.

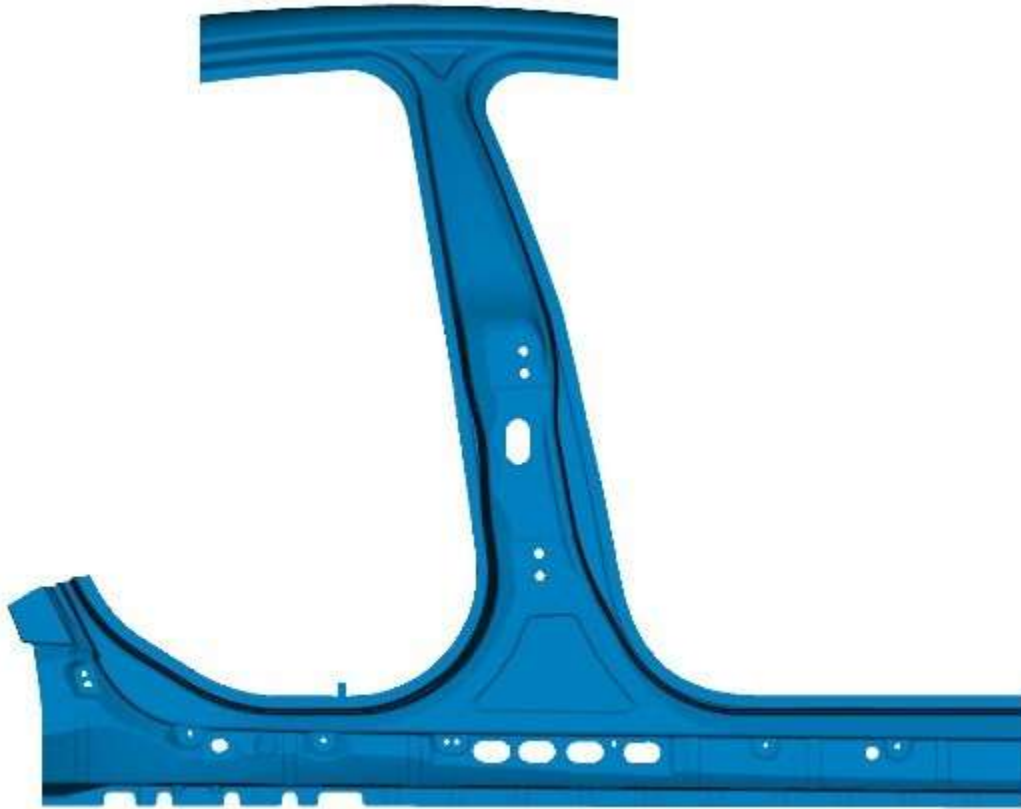
Side Panel Sheet Metal Repairs - Rocker Panel and B-Pillar Outer Panel

Removal and Installation

Removal

1. **NOTE:** The rocker panel and B-pillar outer panel is manufactured from mild steel.

The rocker panel and B-pillar outer panel is serviced as a separate weld-on panel. It is not serviced with its **NVH (noise, vibration and harshness)** components.



E104782

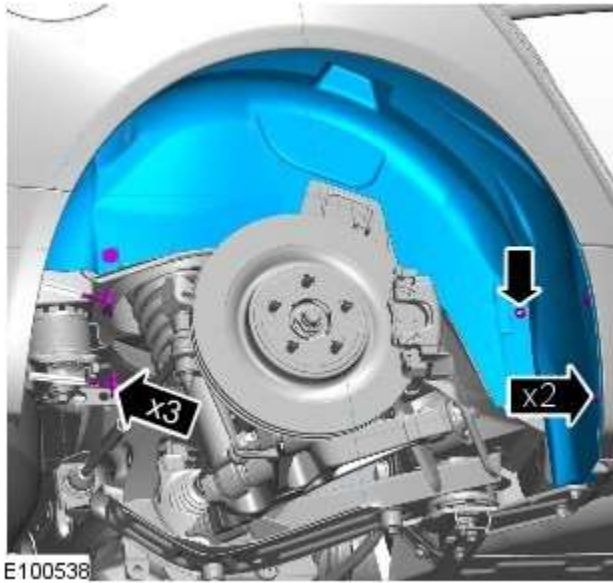
2. **NOTE:** The rocker panel and B-pillar outer panel is spot welded to the cant rail reinforcement which is boron steel. In repair spot welds are replaced with MIG braze and MIG braze slots in these areas.


The rocker panel and B-pillar outer panel is replaced in conjunction with:

1. Front door
 2. Rear door
 3. B-pillar reinforcement
 4. Headliner
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

4. Remove the front seat.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
5. Disconnect the generator electrical connectors.
6. Remove the right-hand and left-hand front scuff plate trim panels.
For additional information, refer to: [Front Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
7. Remove the front and rear door weatherstrips.
8. Remove the right-hand and left-hand rear scuff plate trim panels.
For additional information, refer to: [Rear Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
9. Remove the headliner.
For additional information, refer to: [Headliner](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
10. Remove the side air curtain module.
For additional information, refer to: [Side Air Curtain Module](#) (501-20B Supplemental Restraint System, Removal and Installation).
11. Remove the rear seat cushion.
For additional information, refer to: [Rear Seat Cushion](#) (501-10 Seating, Removal and Installation).
12. Remove the rear seat backrest.
13. Release and position the roof wiring harness to one side.
14. Remove the roof moulding.
15. Remove the cowl side trim panel.
For additional information, refer to: [Cowl Side Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
16. Remove the front safety belt retractor.
For additional information, refer to: [Front Safety Belt Retractor](#) (501-20A Safety Belt System, Removal and Installation).
17. Remove the B-pillar side impact sensor.
For additional information, refer to: [B-Pillar Side Impact Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
18. Remove the C-pillar side impact sensor.
For additional information, refer to: [C-Pillar Side Impact Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
19. Release and position the floor covering to one side.
20. Release and position the inner rocker panel wiring harness to one side.
21. Remove the rear wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and

Tires, Removal and Installation).



22.  NOTE: Right-hand shown, left-hand similar.
Remove the rear fender splash shield.

23. Remove the rocker panel outer moulding.

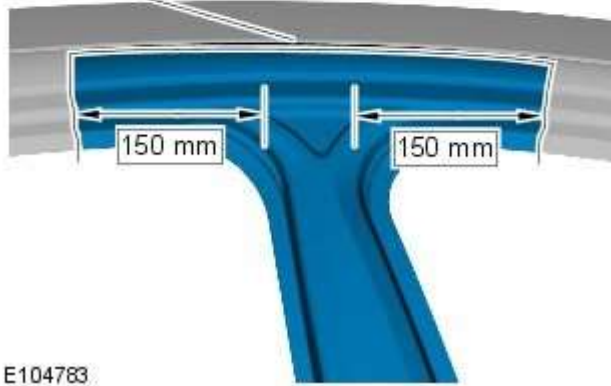
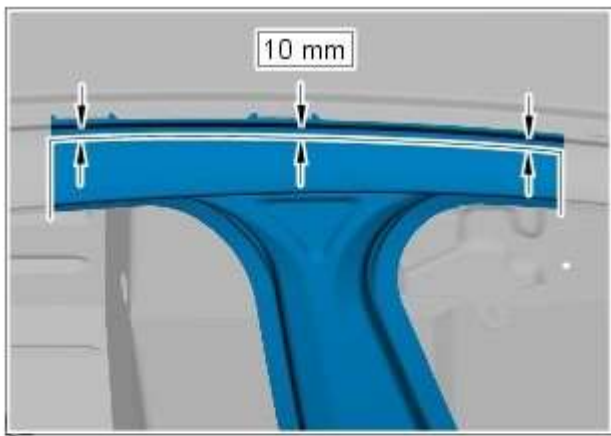
24. Remove the underfloor splash shield.

25. If the right-hand rocker panel is to be repaired, release and position the underfloor wiring harness to one side.

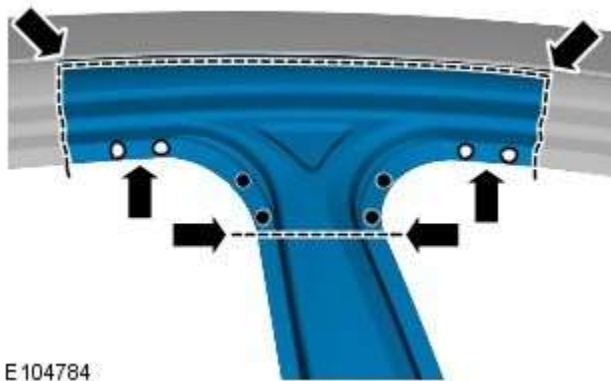
26. Remove the front door.
For additional information, refer to: [Front Door](#) (501-03 Body Closures, Removal and Installation).

27. Remove the rear door.
For additional information, refer to: [Rear Door](#) (501-03 Body Closures, Removal and Installation).

28. Remove the rear door upper and lower hinges from the B-pillar.





E104783



E104784

29. Measure and mark out a section on the B-pillar upper, on the vehicle as indicated.

30.  CAUTION: Care should be taken not to cut through into the inner panels.

 NOTE: A drill bit suitable for drilling boron should be used on the 4 upper boron spot welds.

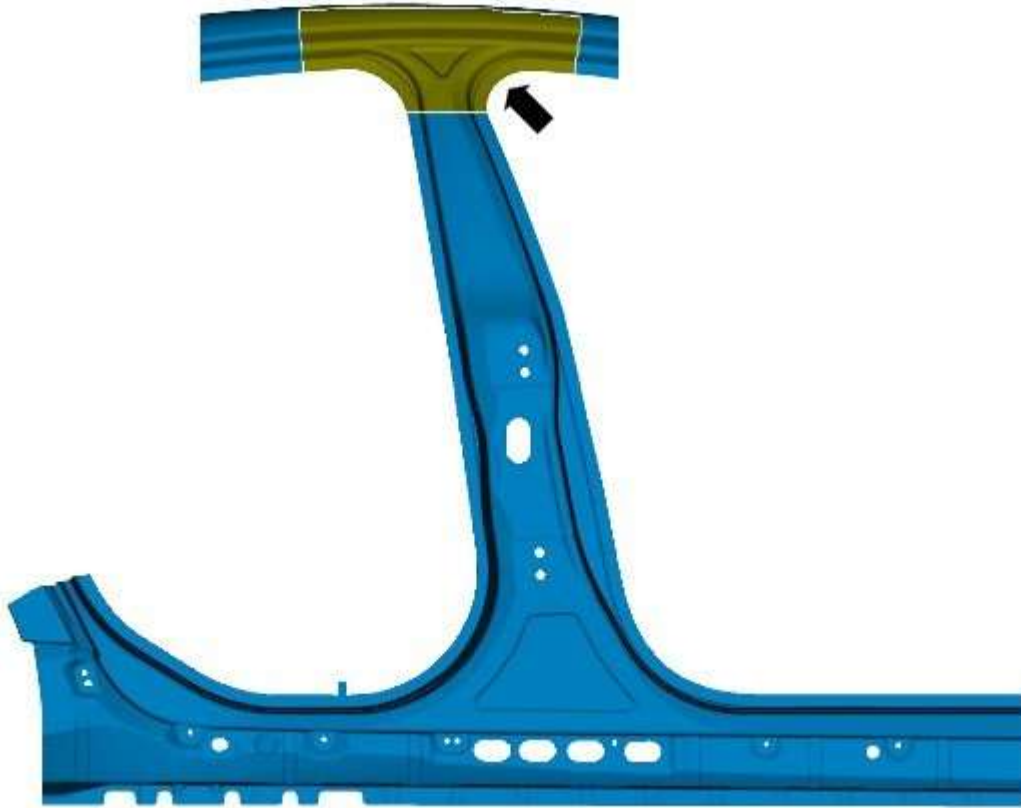
Cut the section of the B-pillar upper at the points indicated and drill out the spot welds.

31.  NOTE: Care should be taken when separating and removing the section as it will be used as a template.

Carefully separate the section of the B-pillar upper and remove.


32.  NOTE: Dress the panel joint surfaces of the template to make sure it is a good fit.

Offer up, align and clamp the template into position on the new rocker panel and B-pillar outer panel. Cut around the edge of the template, through the new rocker panel and B-pillar outer panel at the points indicated, where the MIG brazed butt joint is to be made.



E104788

33. Remove the template from the new panel.

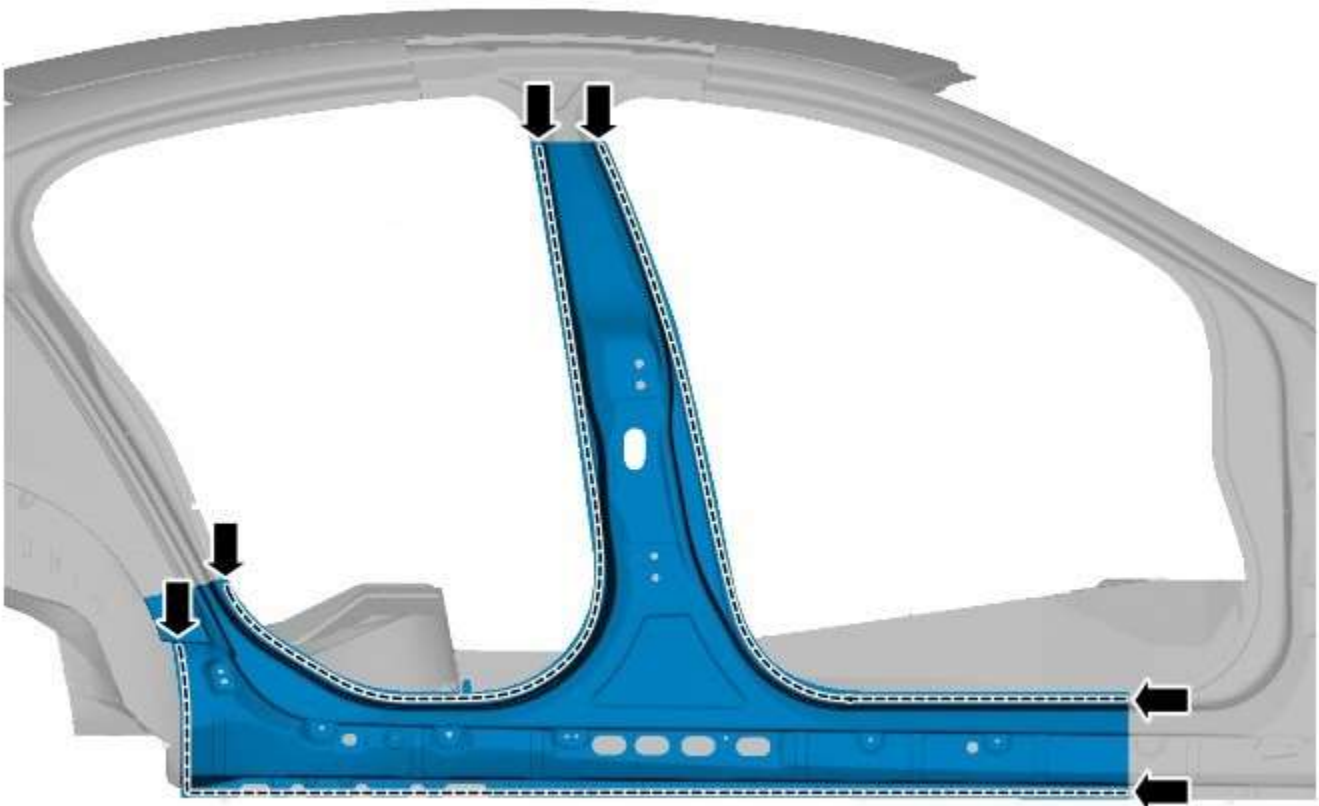
34.  NOTE: This procedure shows the rocker panel part of the rocker panel and B-pillar outer panel being installed to its service condition. The rocker panel lower butt joints could be performed closer to the B-pillar, dependant on the extent of the damage.

Using the new panel for reference and allowing for an overlap, cut the old panel at the points indicated.



E104785

35. Drill out the spot welds.



E104787

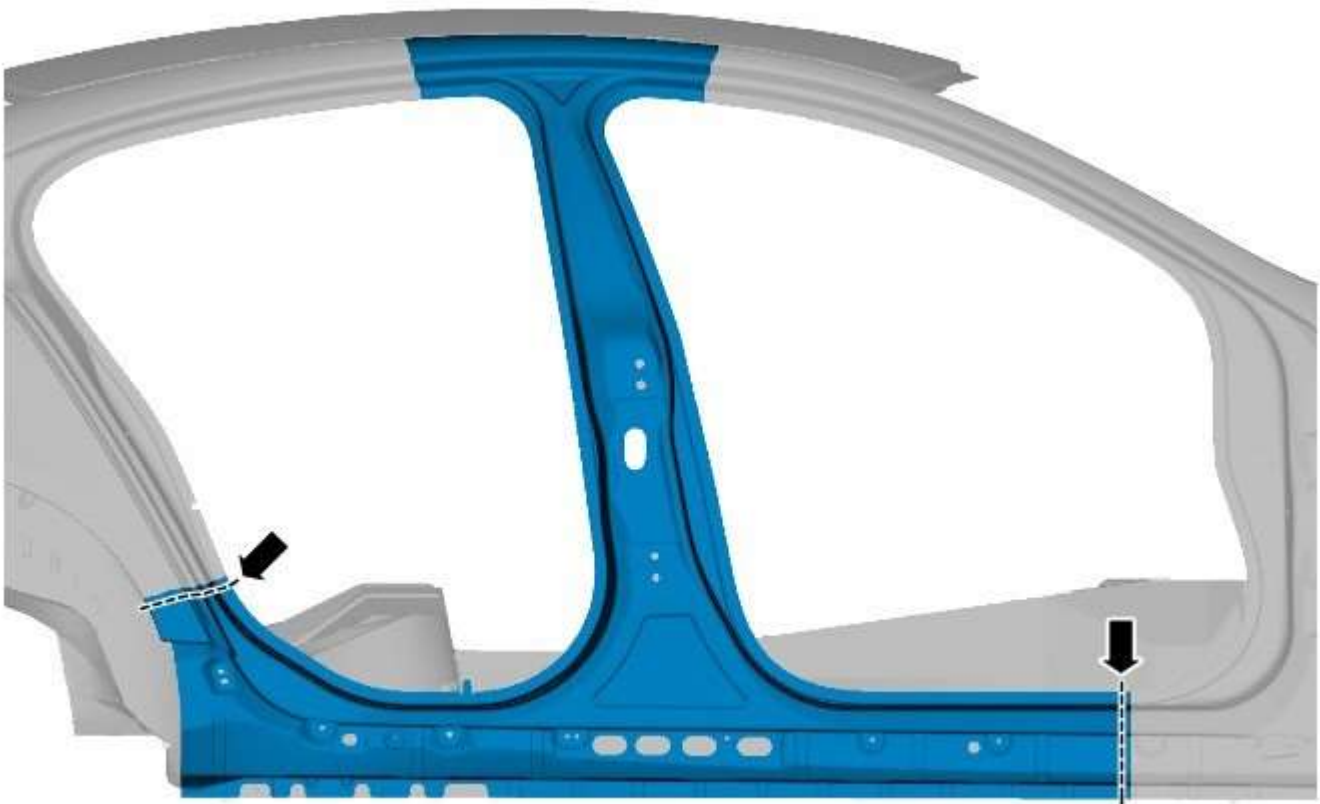
36. Separate the joints and remove the bulk of the old panel.

Installation

1.  **CAUTION:** Care should be taken not to cut through into the inner panels.

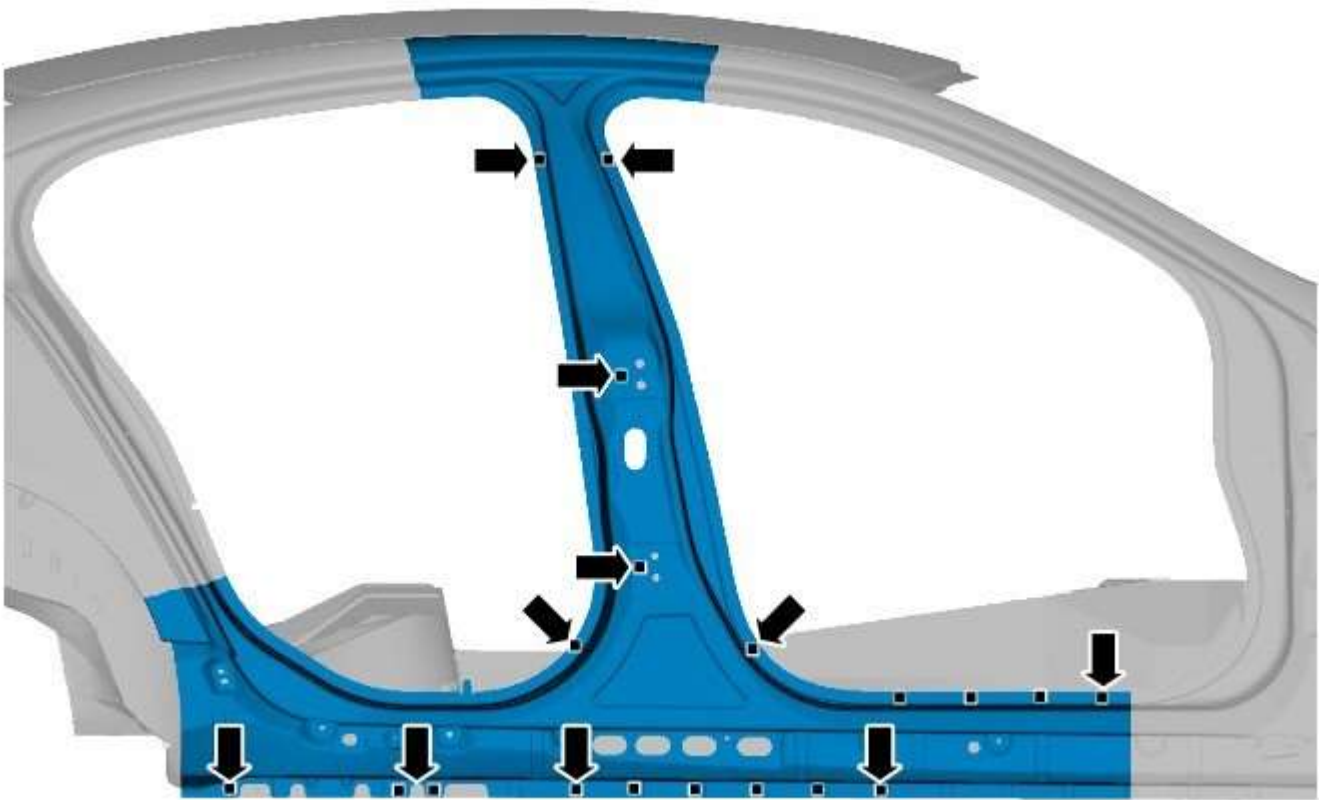
 **NOTE:** Temporarily install the front door and the rear door and hinges, to aid alignment.

Offer up, align and clamp the new panel into position, overlapping the old panel remnant. Cut through the new panel, partially cutting the old panel at the points where the MAG butt joints are to be made.



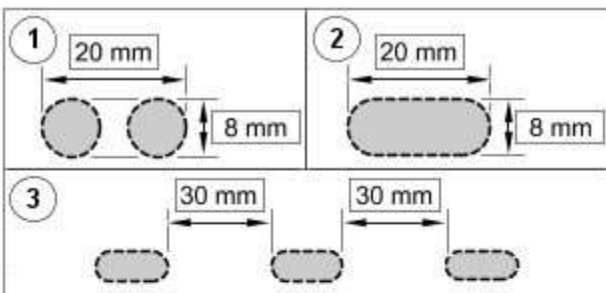
E104789

2. Remove the front door and the rear door and hinges and the new rocker panel and B-pillar outer panel.
3. Cut and remove the old panel remnants.
4. Drill holes in the new panel ready for MAG plug welding.



E104795

5. Cut slots in the new panel ready for MIG braze slots.



E104791

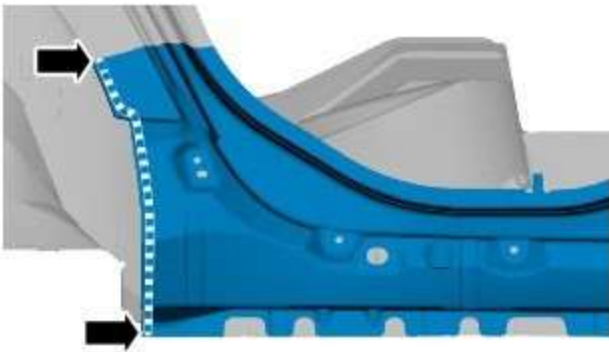
6.  NOTE: If necessary, renew the NVH component.

Prepare the old and new panel joint surfaces, including the NVH component.

7. NOTE: Temporarily install the front door and the rear door and hinges, to aid alignment.

Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.

8. Remove the front door and the rear door and hinges and the new rocker panel and B-pillar outer panel.

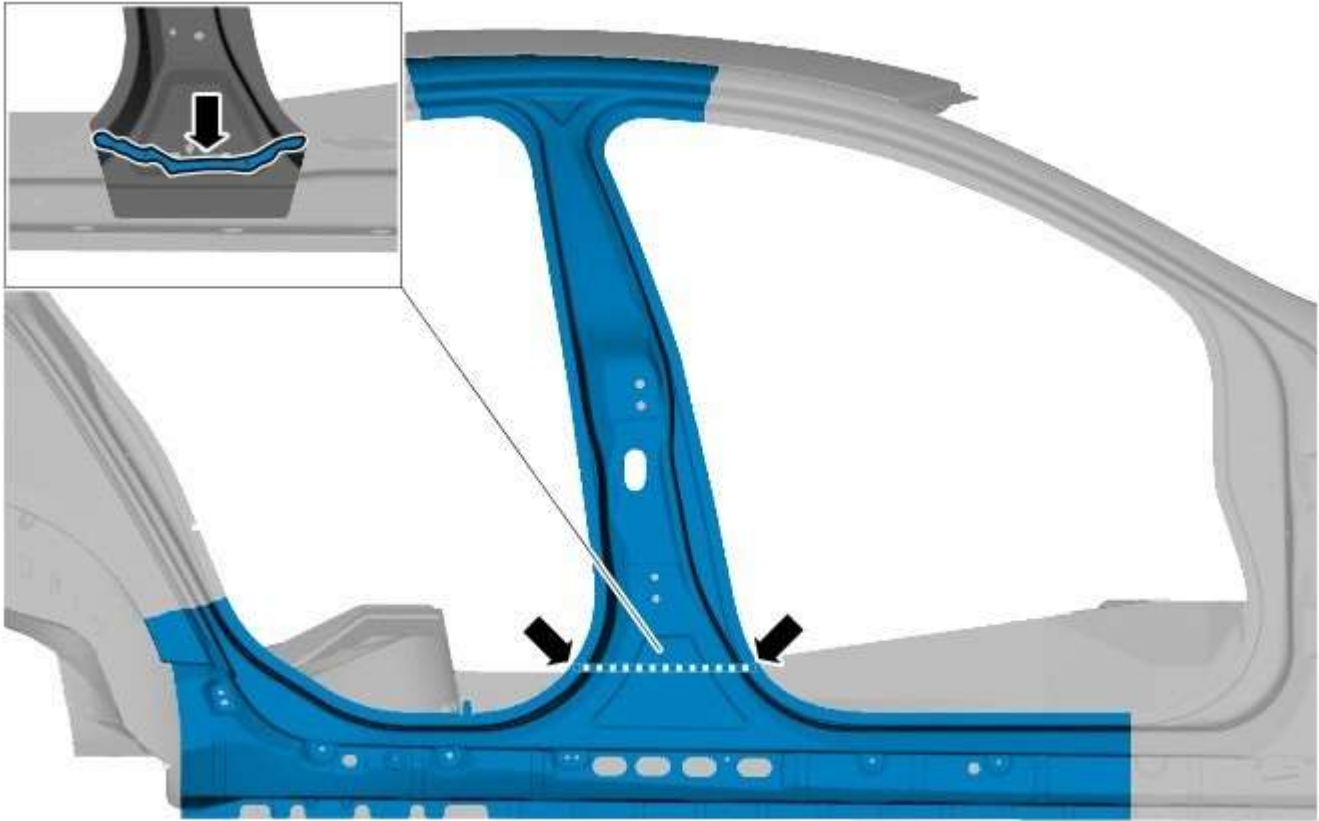


E 104790

9. NOTE: Make sure the adhesive does not encroach into the area of the butt joint as it will contaminate the weld (any unsealed areas must be sealed following the repair).


Apply adhesive to the area as indicated.

10. Apply sealer adhesive to the NVH component as indicated.



E104794

11. Offer up the new rocker panel and B-pillar outer panel, align and clamp into position.
12. Tack MIG braze the upper butt joint.
13. Tack MAG weld the lower butt joints.

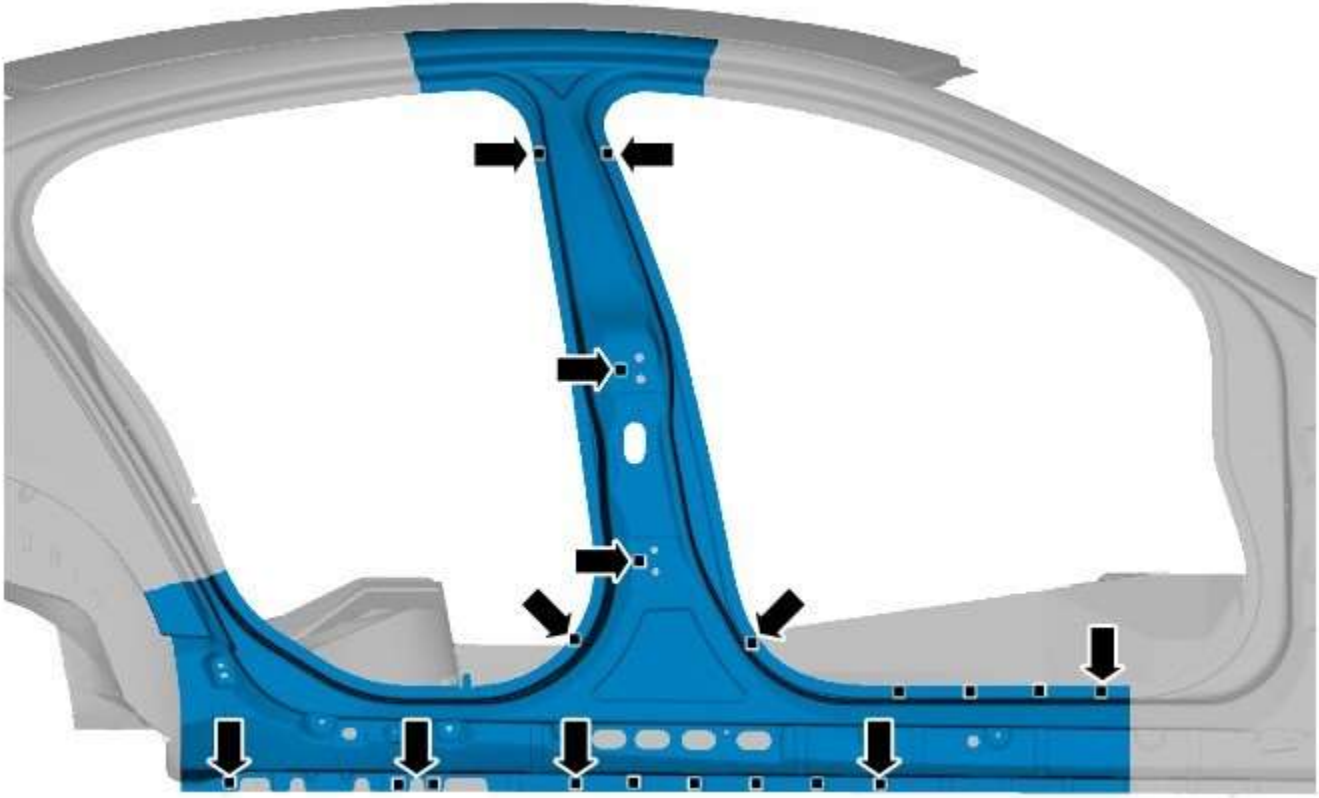
14.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.

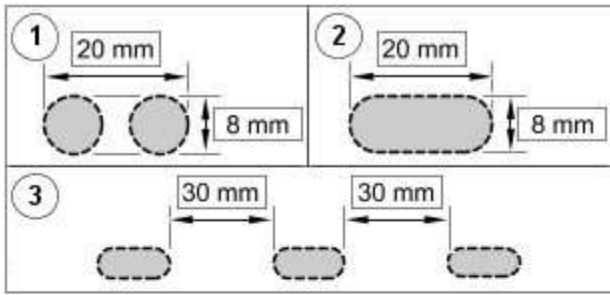


E104793

15. MAG plug weld.



E104795



16. MIG Braze the slots.



E104791

17. Dress the tack welds/braze.



E104792

18. MIG braze the upper butt joint.

19. MAG weld the lower butt joints.



E104786

20. Dress all welded/brazed joints.

21. The installation of associated panels and components is the reversal of removal procedure.

Side Panel Sheet Metal Repairs - Rocker Panel Front Section

Removal and Installation

Removal

1. **NOTE:** The rocker panel front section is manufactured from mild steel.

The rocker panel front section is cut from the rocker panel service panel. It is not serviced with its riv-nuts for the fender fixings, or **NVH (noise, vibration and harshness)** components.



E102804

2. The rocker panel front section is replaced in conjunction with:
 1. Front fender
 2. Front door
 3. Rear door
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the front seat.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
5. Disconnect the generator electrical connectors.
6. Remove the rear seat cushion.
For additional information, refer to: [Rear Seat Cushion](#) (501-10 Seating, Removal and Installation).
7. Remove the front and rear door weatherstrips.

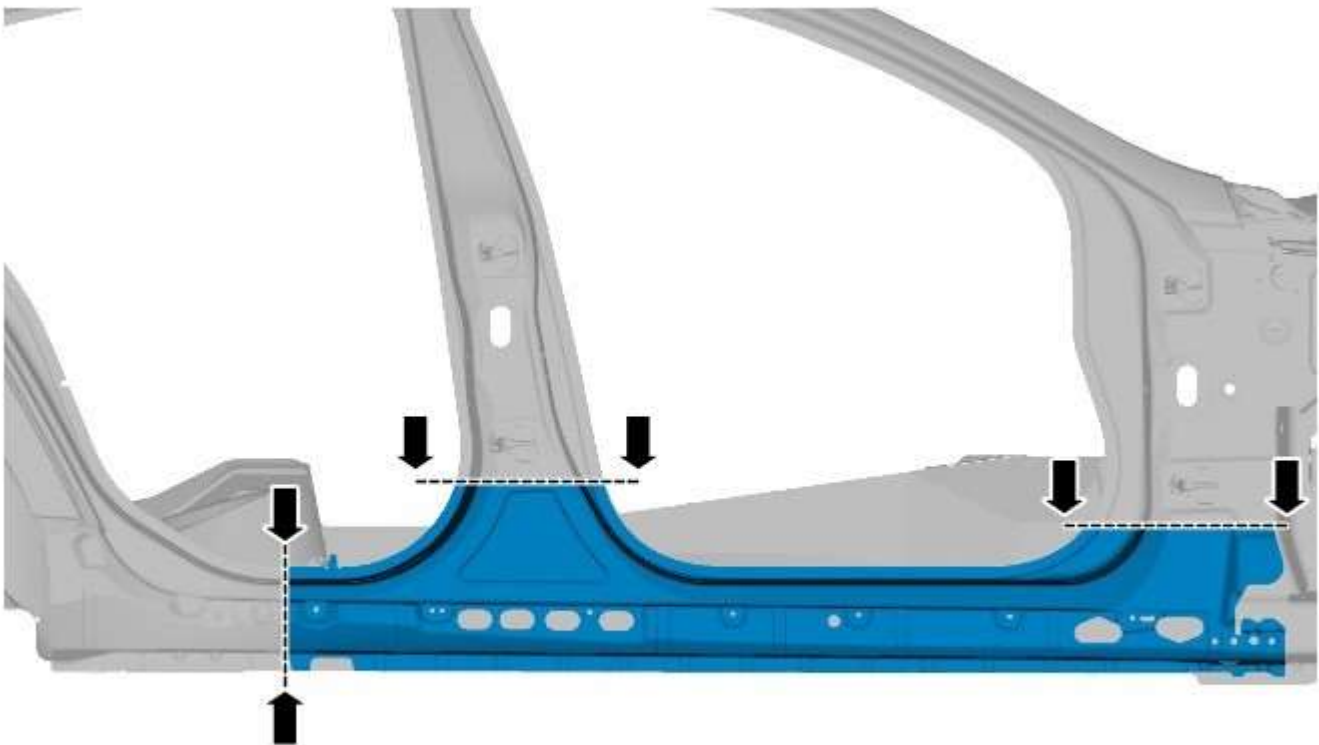
8. Remove the cowl side trim panel.
For additional information, refer to: [Cowl Side Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
9. Remove the front safety belt retractor.
For additional information, refer to: [Front Safety Belt Retractor](#) (501-20A Safety Belt System, Removal and Installation).
10. Remove the B-pillar side impact sensor.
For additional information, refer to: [B-Pillar Side Impact Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
11. Remove the C-pillar side impact sensor.
For additional information, refer to: [C-Pillar Side Impact Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
12. Release and position the floor covering to one side.
13. Release and position the inner rocker panel wiring harness to one side.
14. Remove the rocker panel outer moulding.
15. Remove the underfloor splash shield.
16. If the right-hand rocker panel front section is to be repaired, release and position the underfloor wiring harness to one side.
17. Remove the front fender.
For additional information, refer to: [Front Fender](#) (501-27 Front End Sheet Metal Repairs, Removal and Installation).
18. Remove the front door.
For additional information, refer to: [Front Door](#) (501-03 Body Closures, Removal and Installation).
19. Remove the rear door.
For additional information, refer to: [Rear Door](#) (501-03 Body Closures, Removal and Installation).
20. Cut the new rocker panel front section from the new rocker panel service panel.



E102808

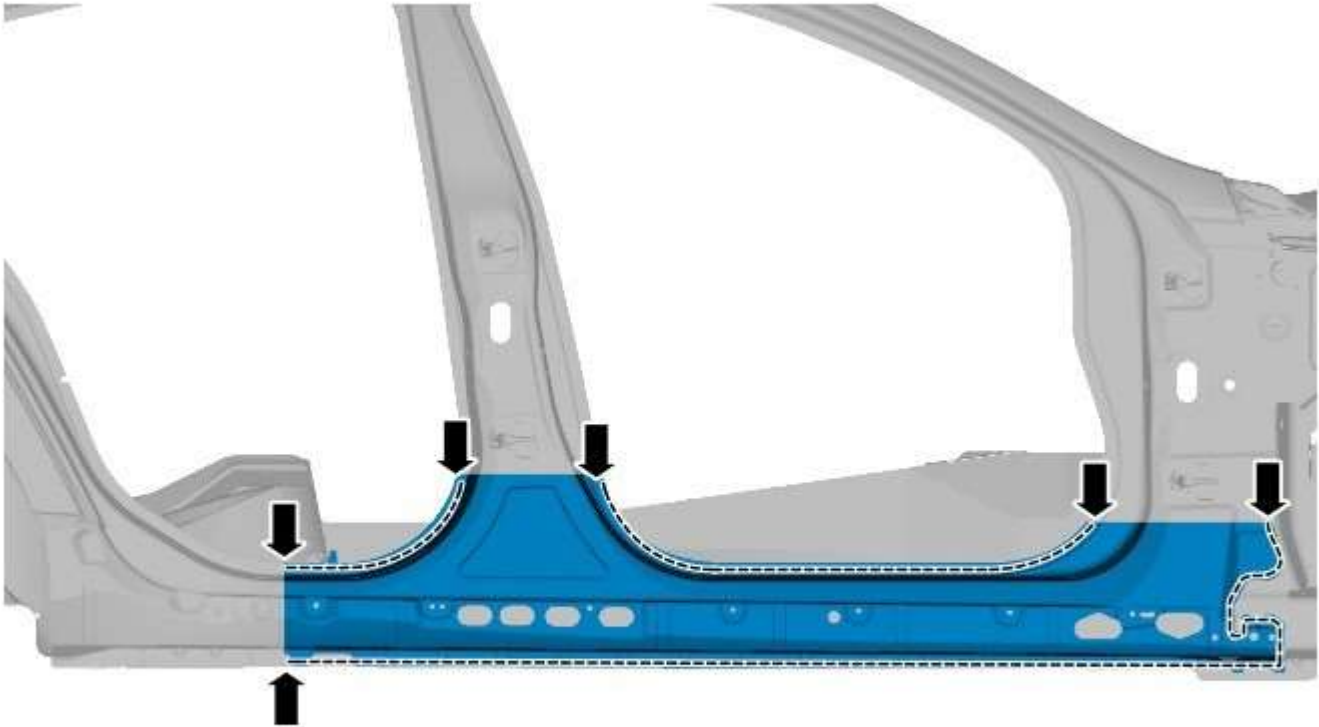
21.  **CAUTION:** Care should be taken not to cut through into the inner panels.

Using the new panel for reference and allowing for an overlap, cut the old panel at the points indicated.



E102805

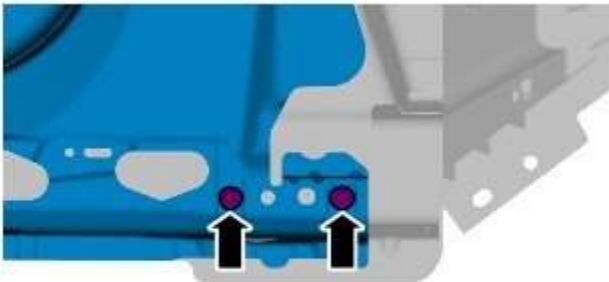
22. Drill out the spot welds.



E102806

23. Separate the joints and remove the bulk of the old panel.

Installation



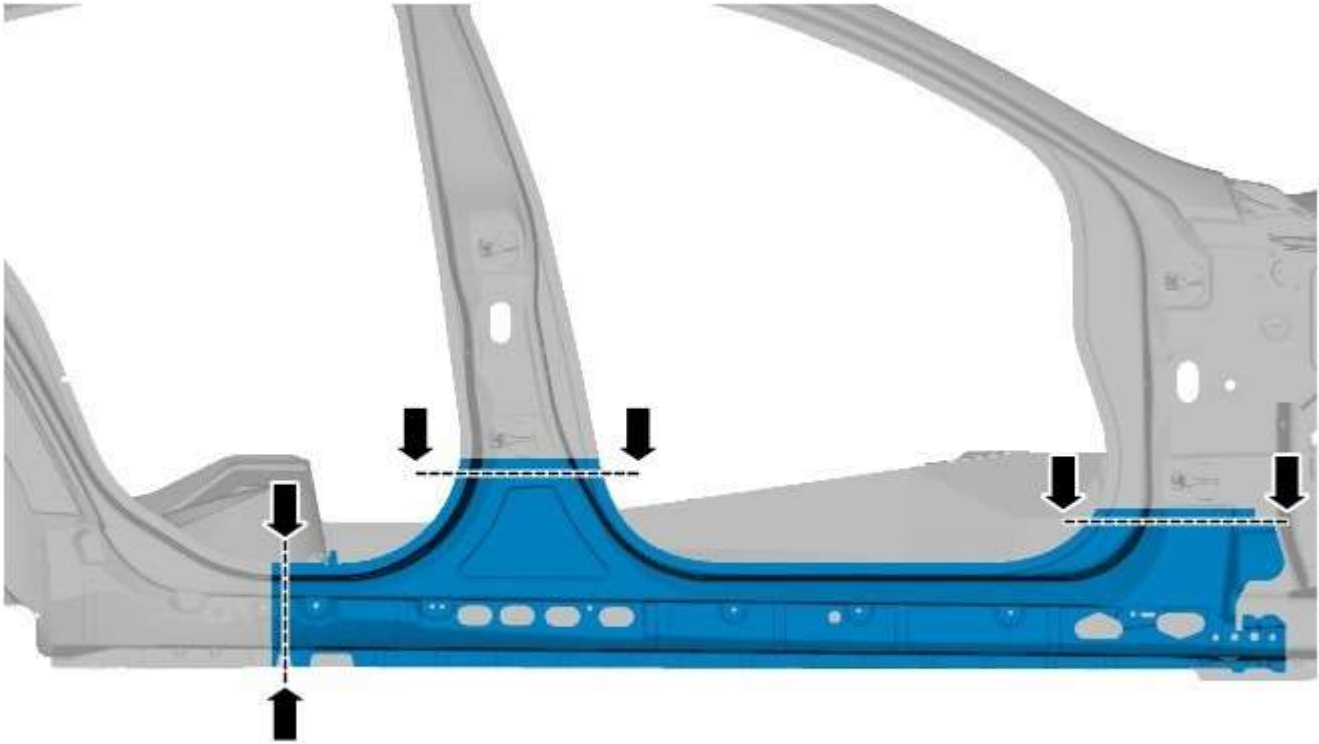
1. Install the riv-nuts into the new rocker panel front section as indicated.

E102807



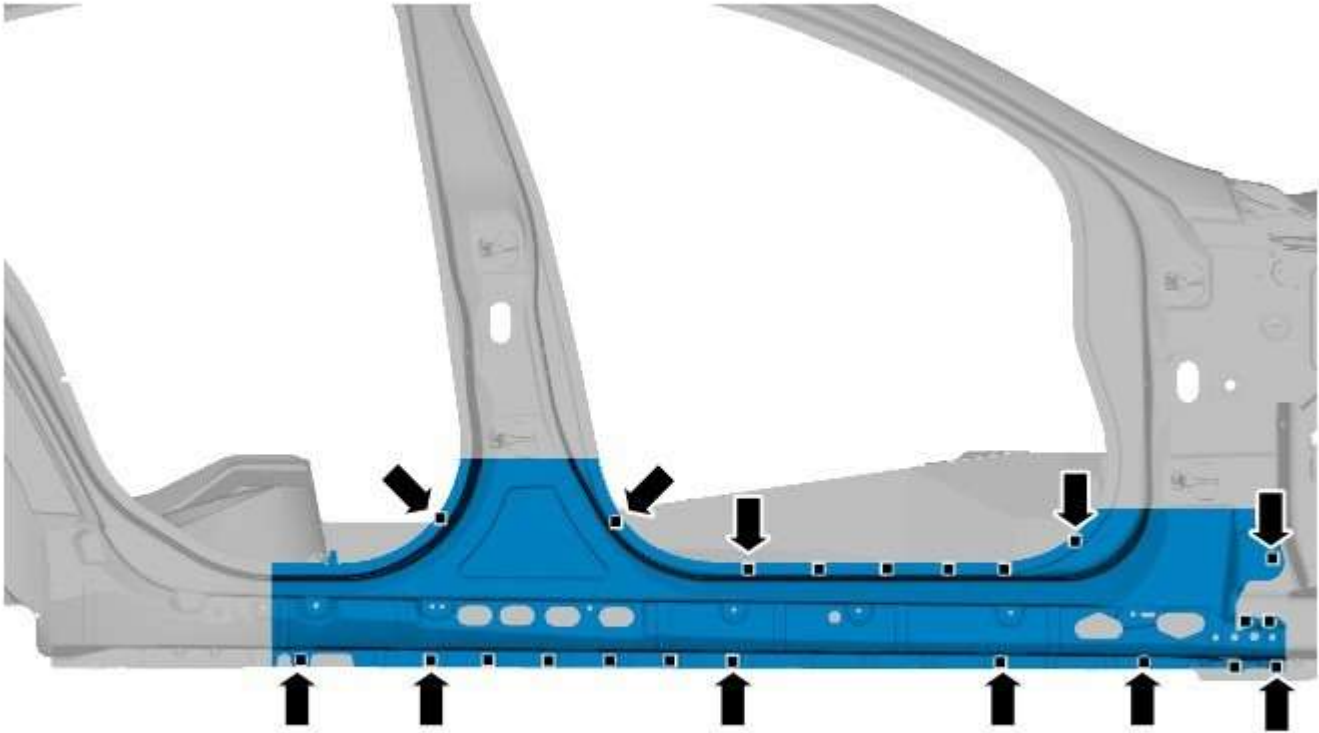
2. **CAUTION:** Care should be taken not to cut through into the inner panels.

Offer up, align and clamp the new panel into position, overlapping the old panel remnant. Cut through the new panel, partially cutting the old panel, at the points where the MAG butt joints are to be made.




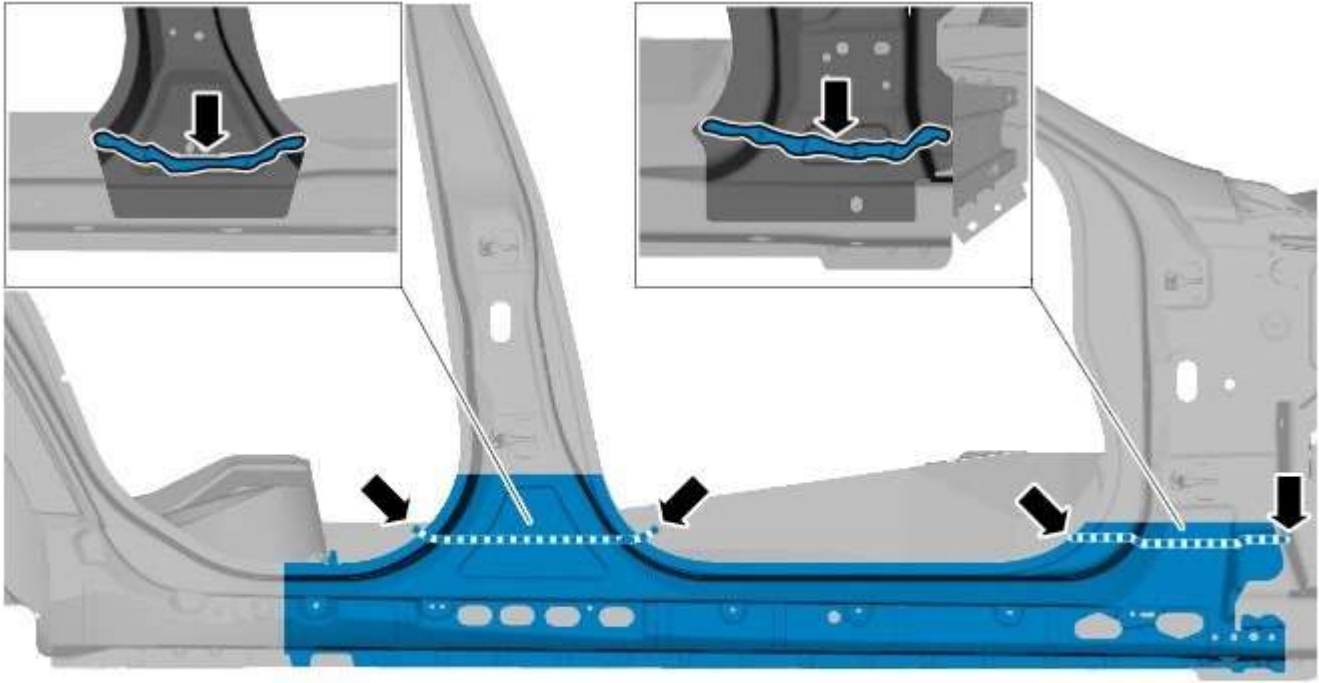
E102809

3. Remove the new panel.
4. Cut and remove the old panel remnants.
5. Drill holes in the new panel ready for MAG plug welding.



E102810


6.  NOTE: If necessary renew the NVH components.
Prepare the old and new panel joint surfaces, including the NVH components.
7. NOTE: Temporarily install the front and rear doors and front fender to aid alignment.
Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.
8. Remove the front and rear doors, front fender and the new rocker panel front section.
9. Apply sealer adhesive to the NVH components as indicated.



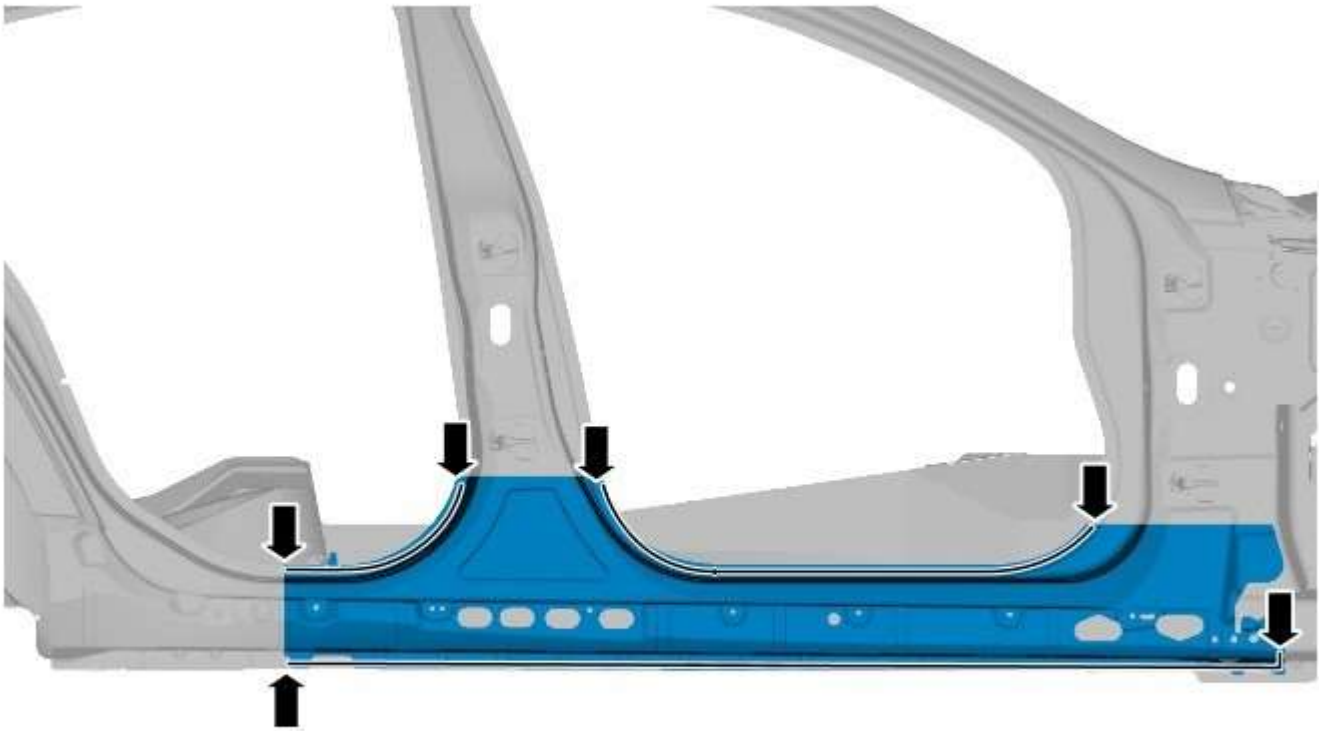
E102811

10. Offer up the new rocker panel front section, align and clamp into position.

11. Tack weld the butt joints.

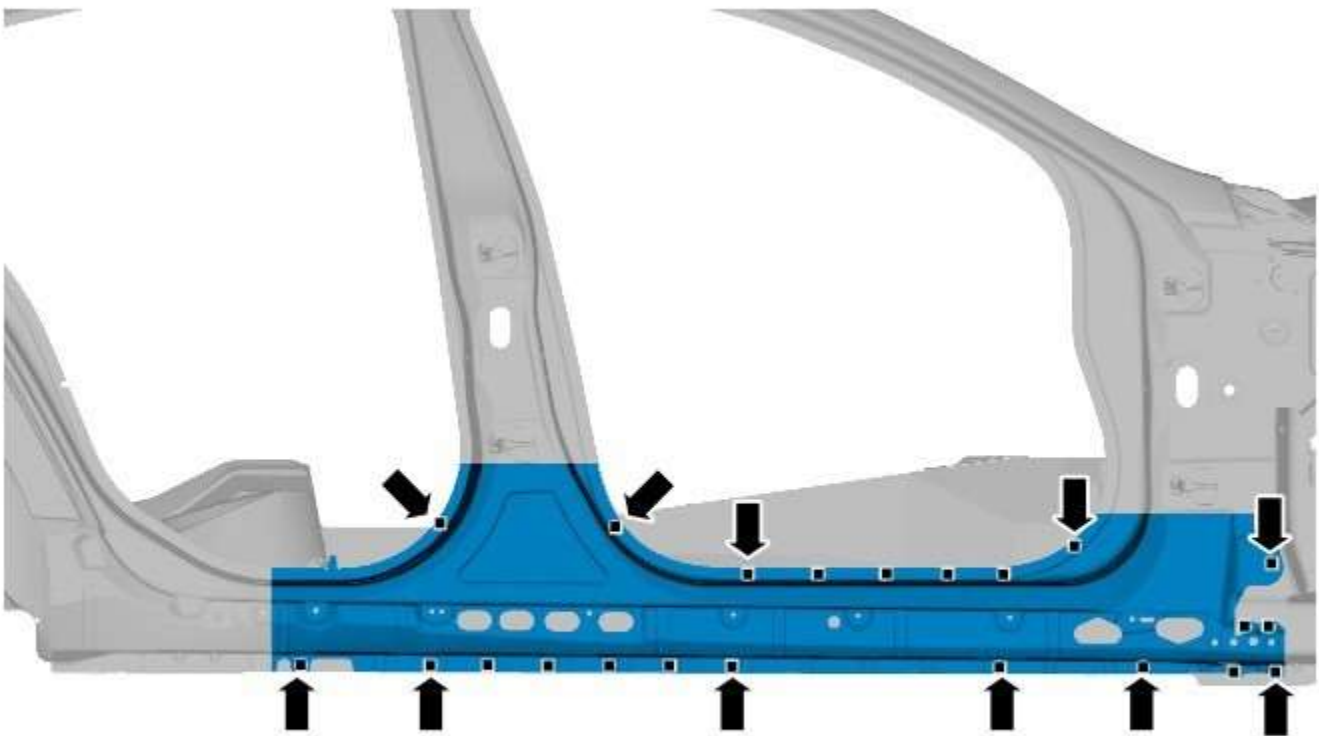
12.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.



E102813

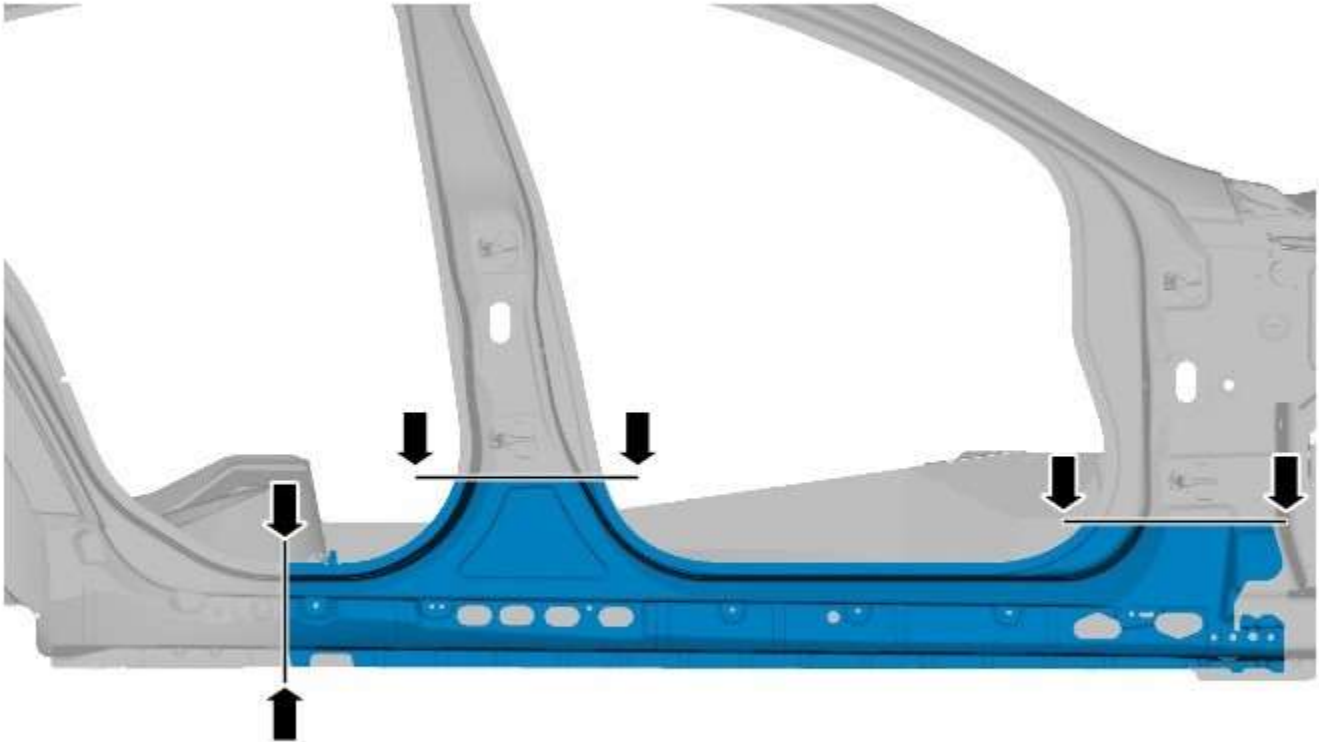
13. MAG plug weld.



E102810

14. Dress the tack welds.

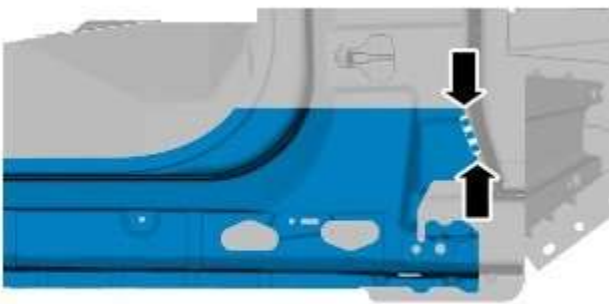
15. MAG weld the butt joints.



E102814

16. Dress all welded joints.

17. The joint between the rocker panel and A-pillar must be sealed following the repair as indicated.



E102812

18. The installation of associated panels and components is the reversal of removal procedure.

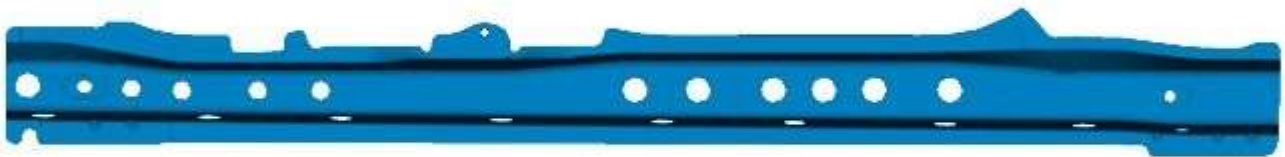
Side Panel Sheet Metal Repairs - Rocker Panel Inner Reinforcement

Removal and Installation

Removal

1. **NOTE:** The rocker panel inner reinforcement is manufactured from Dual Phase Steel, 600MPa, (DP600).

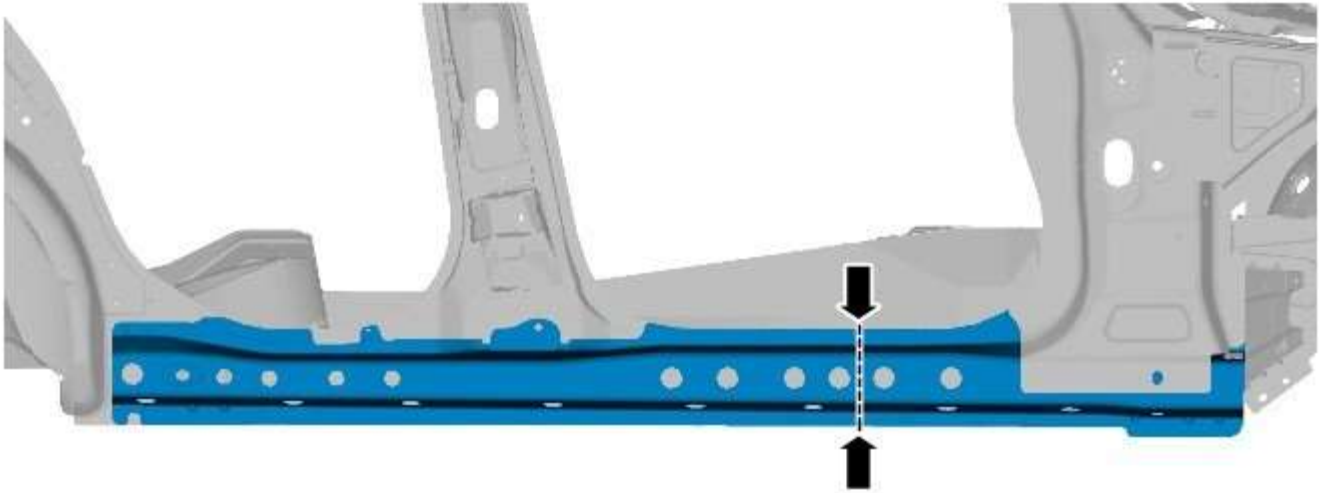
The rocker panel inner reinforcement is serviced as a separate weld-on panel. This procedure defines the rocker panel inner reinforcement to be sectioned to enable fitment of the B-pillar inner panel.



E 107660

2. The rocker panel inner reinforcement is replaced in conjunction with:
 1. Front door
 2. Rear door
 3. Rocker panel and B-pillar outer panel
 4. B-pillar reinforcement
 5. Headliner
3. For additional information relating to this repair procedure please see the following:
 For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the B-pillar reinforcement.
 For additional information, refer to: [B-Pillar Reinforcement](#) (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).
5. **NOTE:** When replaced in association with other inner and outer panel sections, make sure there is always a minimum 50mm staggered joint between every section.

Cut the old panel at the point indicated.



E107661

6. NOTES:

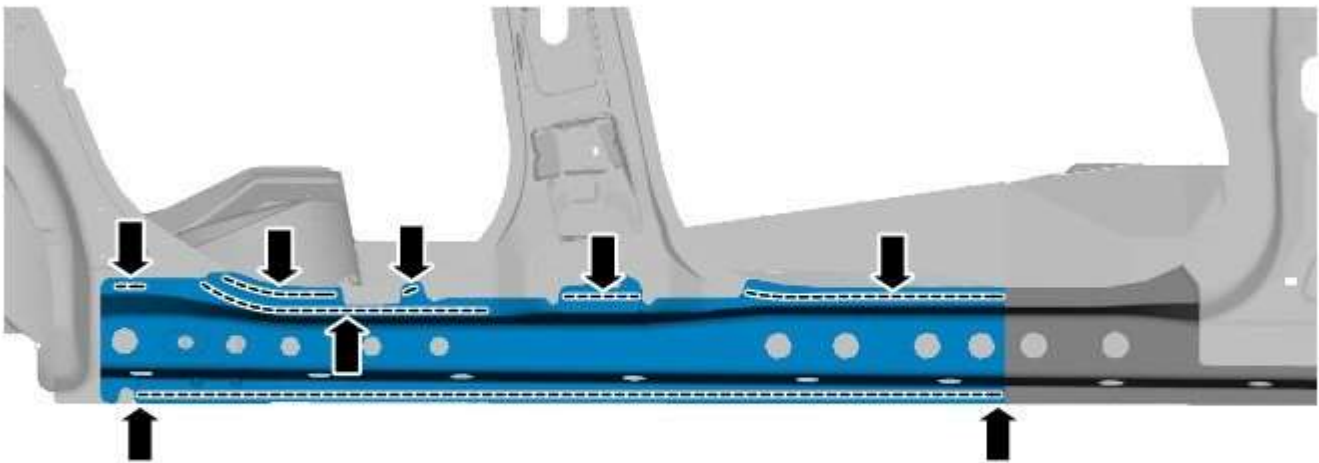


A drill bit suitable for drilling DP600 should be used.



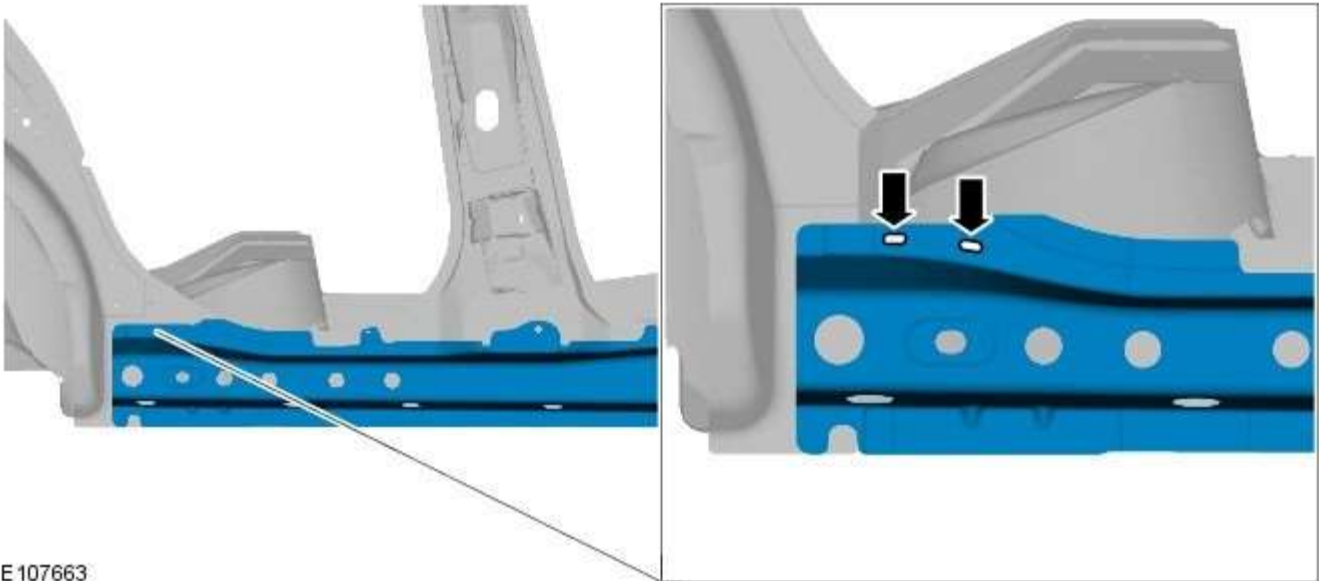
There are spot welds located under the adhesive residue left by the removal of the B-pillar reinforcement.

Drill out the spot welds.



E107662

7. Using a belt sander, release the rocker panel inner reinforcement from the MAG welds at the points indicated.



E 107663

8. Separate the joints and remove the old panel.

Installation

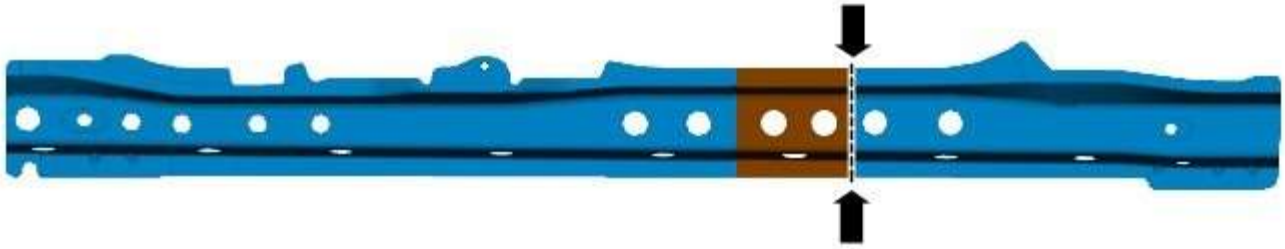
1. Cut a short section from the front end of the old panel, to be used as a template.



E 107664

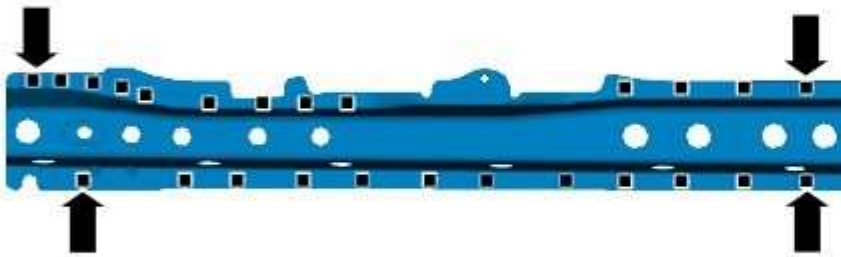
2. **NOTE:** Dress the panel joint surfaces of the template to ensure a good fit.

Offer up, align and clamp the template into position on the new rocker panel inner reinforcement. Cut along the edge of the template, through the new panel, at the point indicated, where the MAG butt joint is to be made.



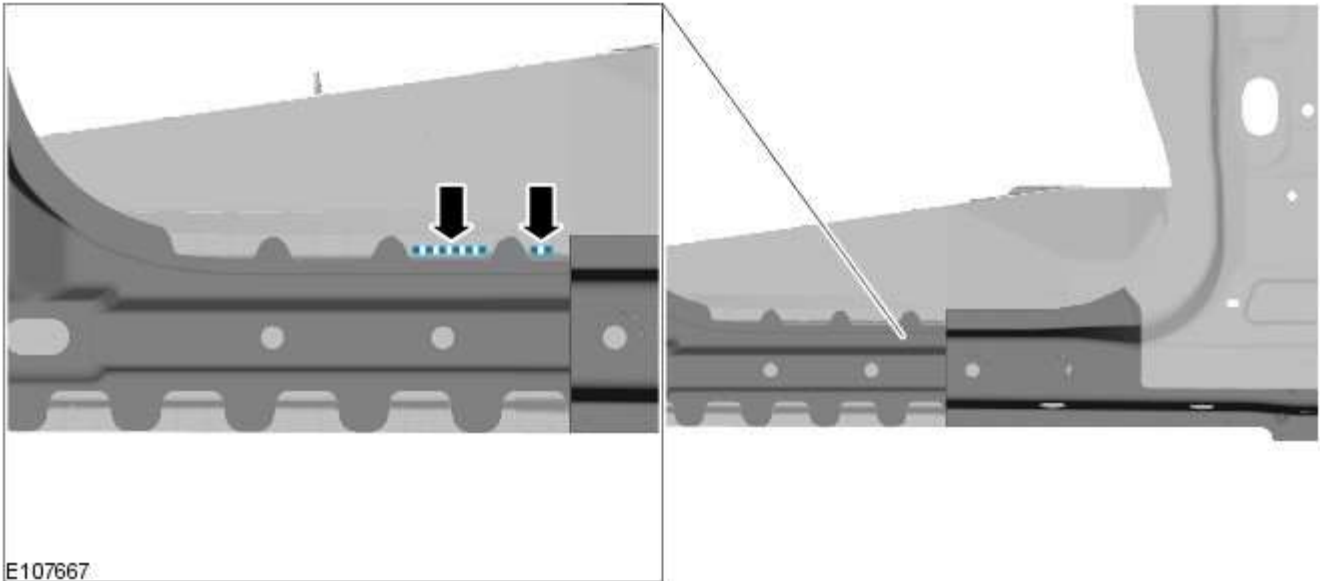
E 107665

3. Remove the template from the new panel.
4. Drill holes in the new panel ready for MAG plug welding.

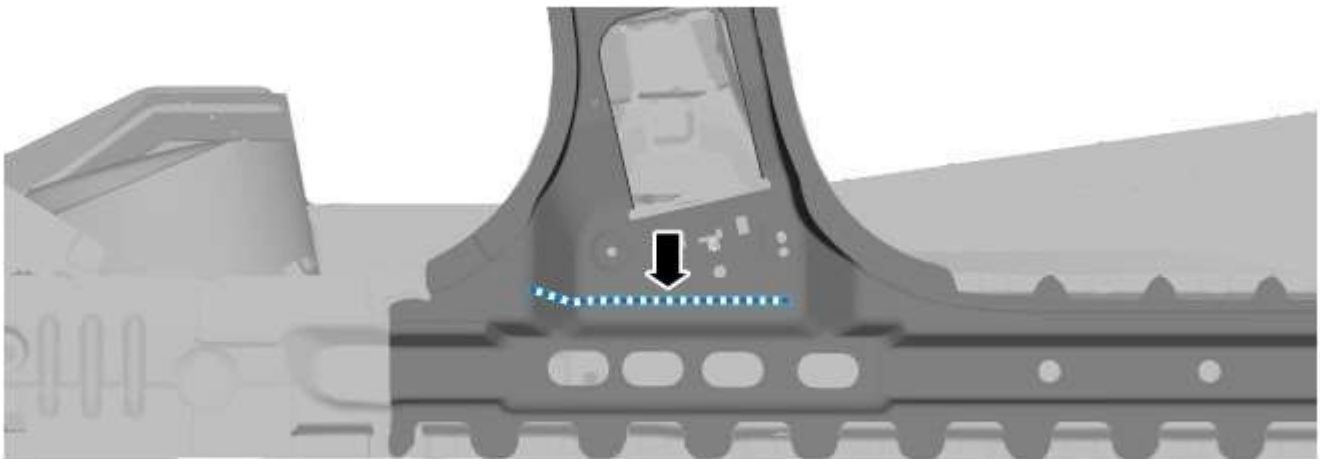


E 107666

5. Prepare the old and new panel joint surfaces.
6. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
7. Remove the new rocker panel inner reinforcement.
8. **NOTE:** Make sure the adhesive does not encroach into the areas of the MAG plug welds or butt joint as it will contaminate the weld.
Apply adhesive to the area, as indicated.




9. Apply adhesive to the area, as indicated.



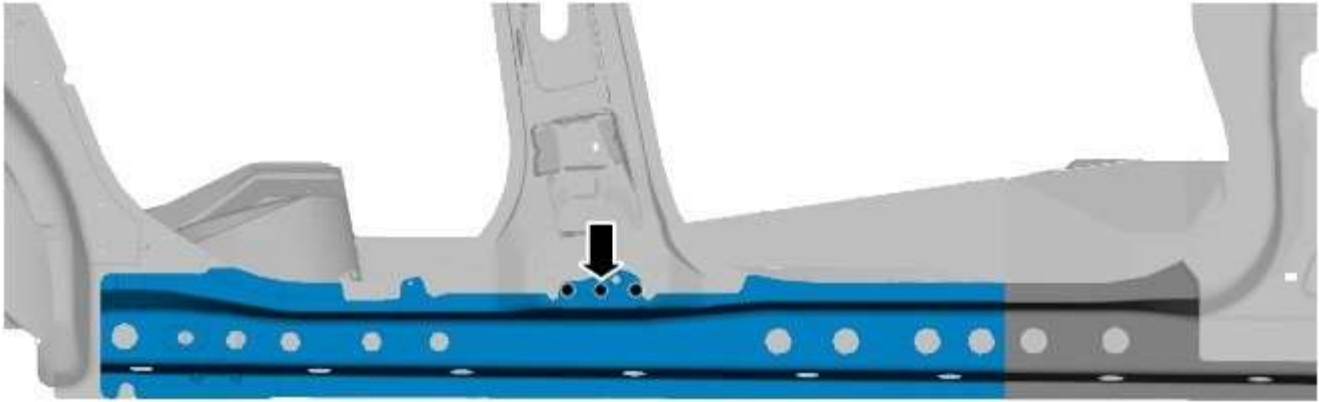
E107668

10. Offer up the new panel, align and clamp into position.

11. MAG tack weld the butt joint.

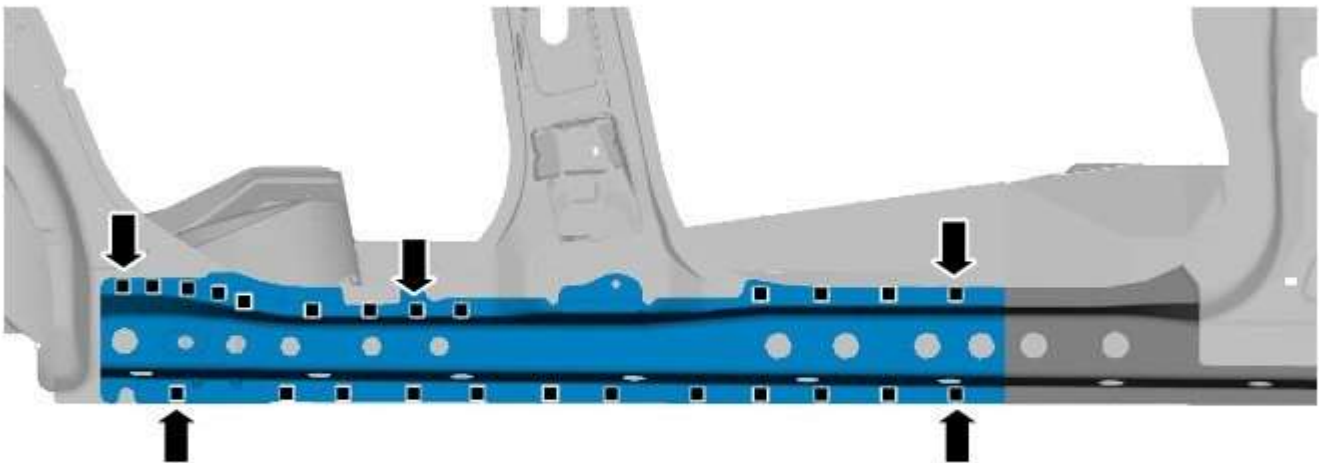
12.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.



E107669

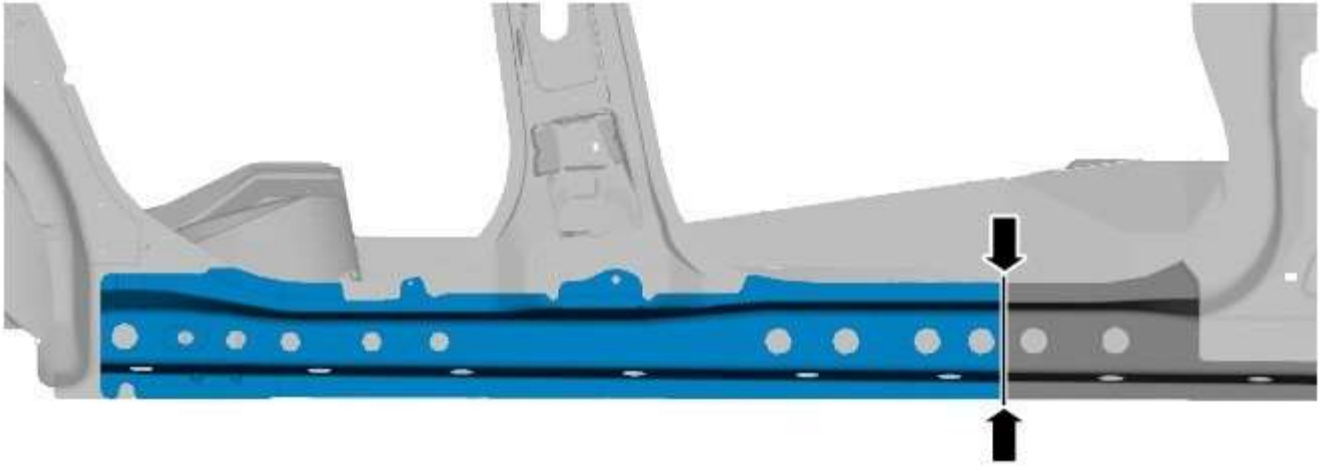
13. MAG plug weld.



E107670

14. Dress the tack welds.

15. MAG weld the butt joint.



E107671

16. Dress all welded joints.
17. Make sure any remaining areas of bare metal created during this procedure are treated with a zinc primer prior to the installation of outer panels.
18. The installation of associated panels and components is the reversal of removal procedure.

Side Panel Sheet Metal Repairs - Rocker Panel Rear Section

Removal and Installation

Removal

1. **NOTE:** The rocker panel rear section is manufactured from mild steel.

The rocker panel rear section is cut from the rocker panel service panel. It is not serviced with its **NVH (noise, vibration and harshness)** components.

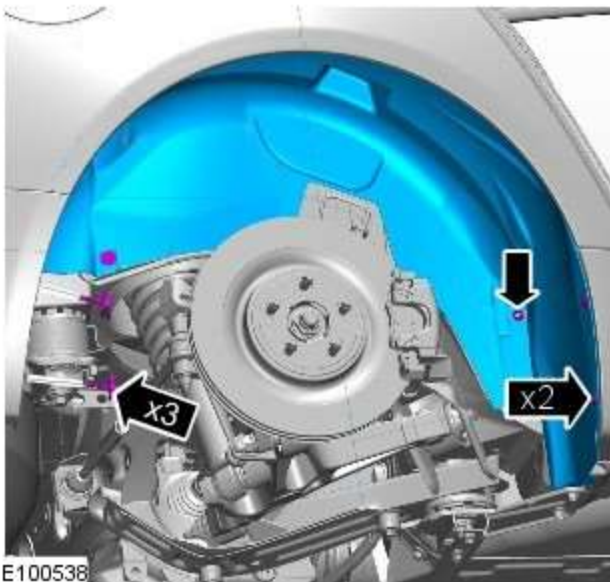


E102815

2. The rocker panel rear section is replaced in conjunction with:
 1. Front door
 2. Rear door
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the front seat.
For additional information, refer to: [Front Seat](#) (501-10 Seating, Removal and Installation).
5. Disconnect the generator electrical connectors.
6. Remove the rear seat cushion.
For additional information, refer to: [Rear Seat Cushion](#) (501-10 Seating, Removal and Installation).
7. Remove the front and rear door weatherstrips.

8. Remove the cowl side trim panel.
For additional information, refer to: [Cowl Side Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
9. Remove the front safety belt retractor.
For additional information, refer to: [Front Safety Belt Retractor](#) (501-20A Safety Belt System, Removal and Installation).
10. Remove the B-pillar side impact sensor.
For additional information, refer to: [B-Pillar Side Impact Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
11. Remove the C-pillar side impact sensor.
For additional information, refer to: [C-Pillar Side Impact Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
12. Release and position the floor covering to one side.
13. Release and position the inner rocker panel wiring harness to one side.
14. Remove the rear wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

15. Remove the rear fender splash shield.



16. Remove the rocker panel outer moulding.
17. Remove the underfloor splash shield.
18. If the right-hand rocker panel rear section is to be repaired, release and position the underfloor wiring harness to one side.
19. Remove the front door.
For additional information, refer to: [Front Door](#) (501-03 Body Closures, Removal and Installation).
20. Remove the rear door.

For additional information, refer to: [Rear Door](#) (501-03 Body Closures, Removal and Installation).

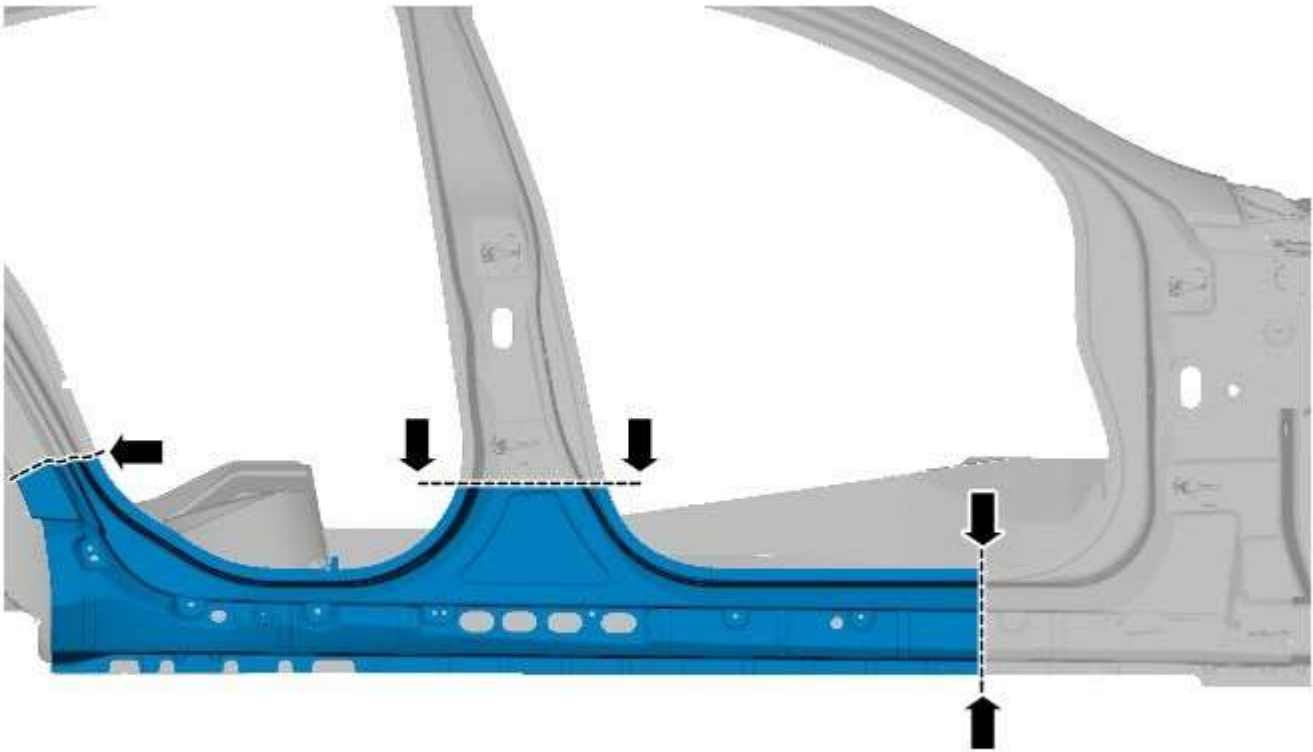
21. Cut the new rocker panel rear section from the new rocker panel service panel.



E102818

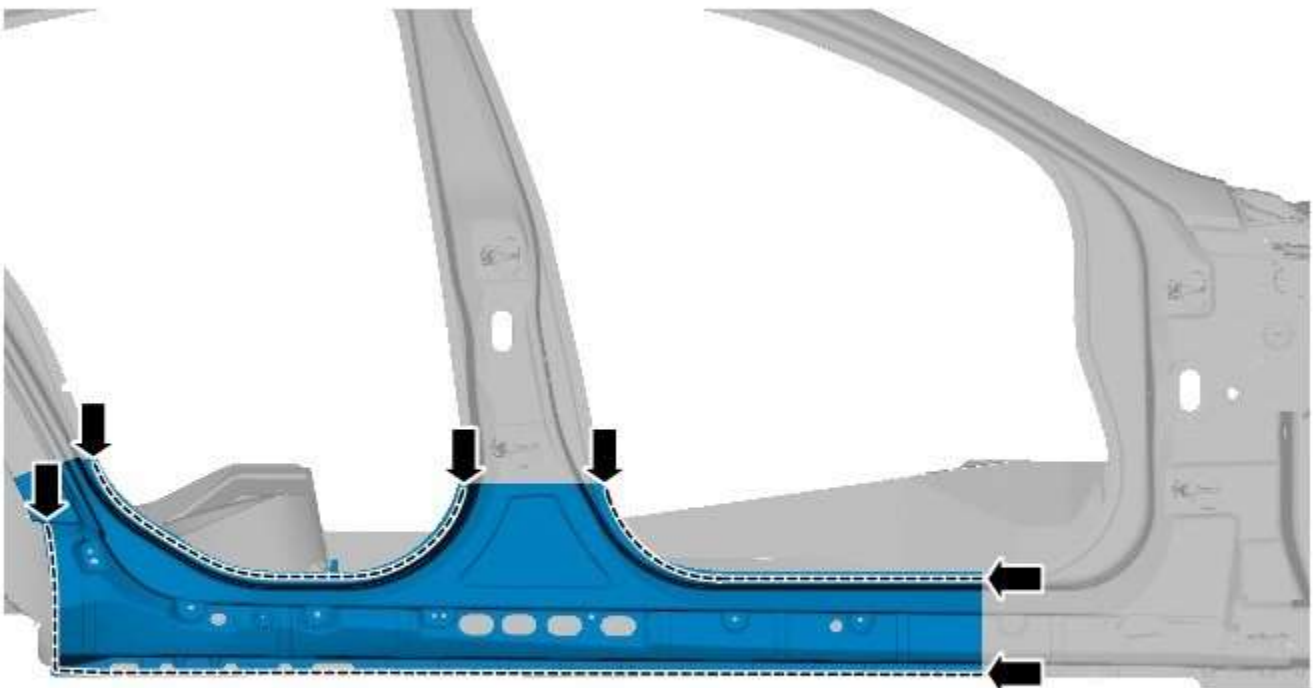
22.  CAUTION: Care should be taken not to cut through into the inner panels.

Using the new panel for reference and allowing for an overlap, cut the old panel at the points indicated.



E102816

23. Drill out the spot welds.



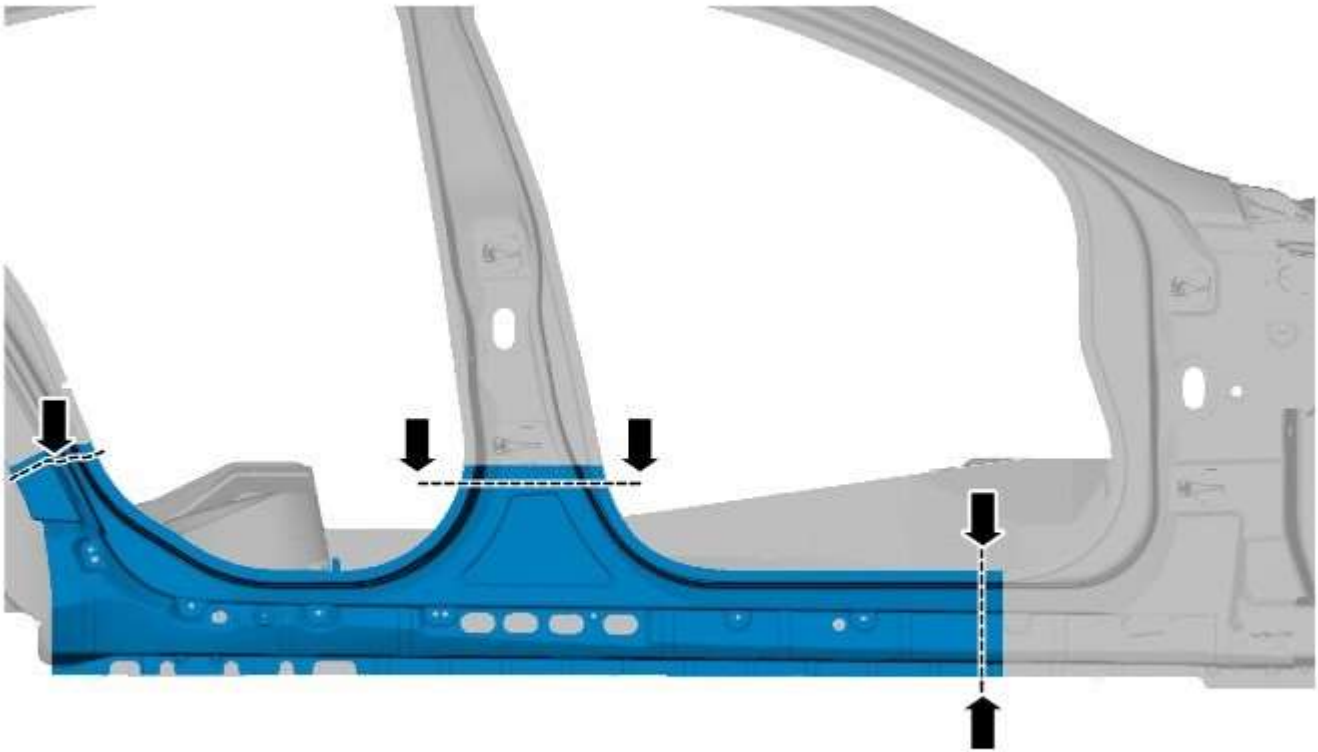
E102817

24. Separate the joints and remove the bulk of the old panel.

Installation

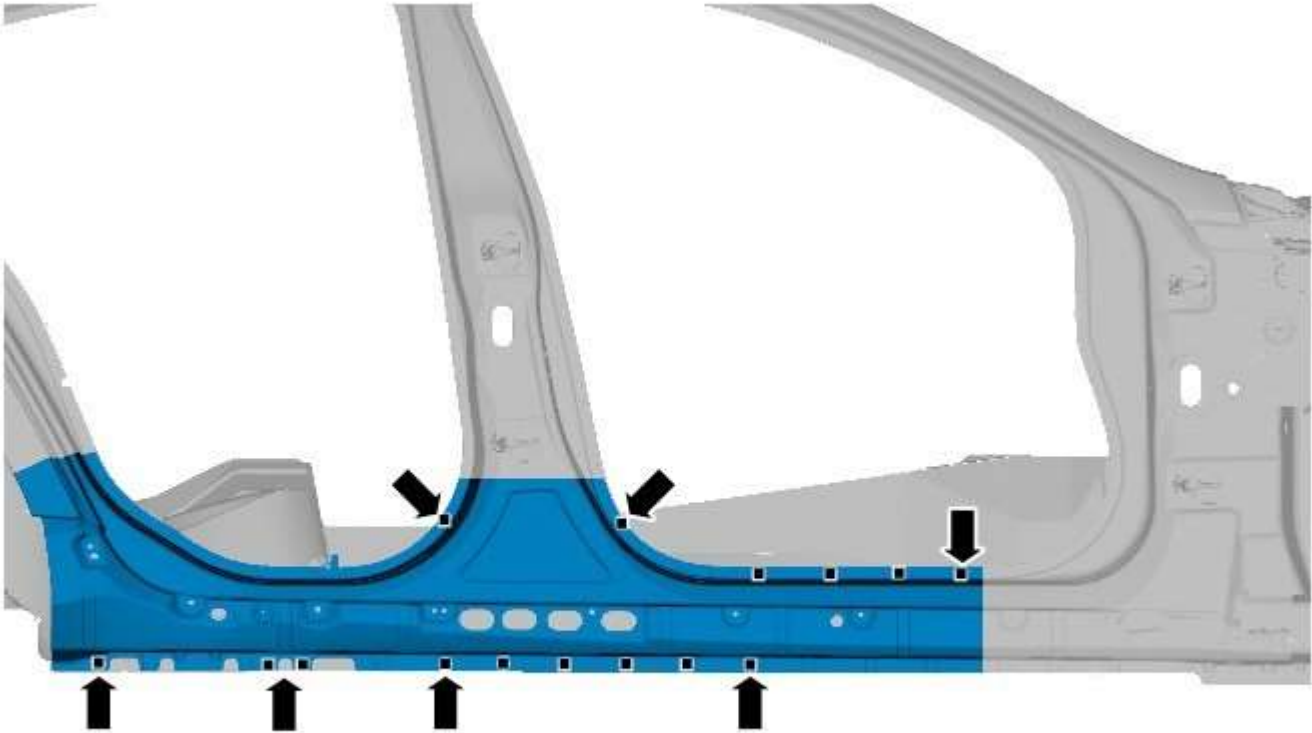
1.  **CAUTION:** Care should be taken not to cut through into the inner panels.

Offer up, align and clamp the new panel into position, overlapping the old panel remnant. Cut through the new panel, partially cutting the old panel, at the points where the MAG butt joints are to be made.





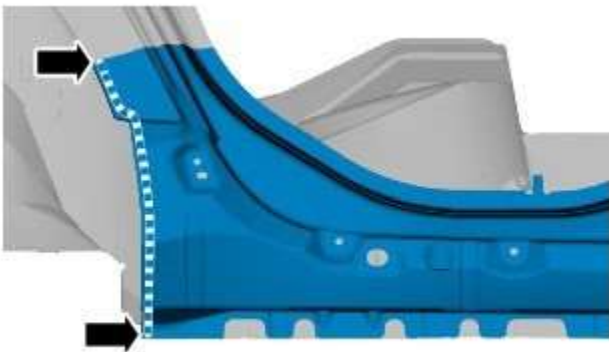
E102819

2. Remove the new panel.
3. Cut and remove the old panel remnants.
4. Drill holes in the new panel ready for MAG plug welding.



E102820

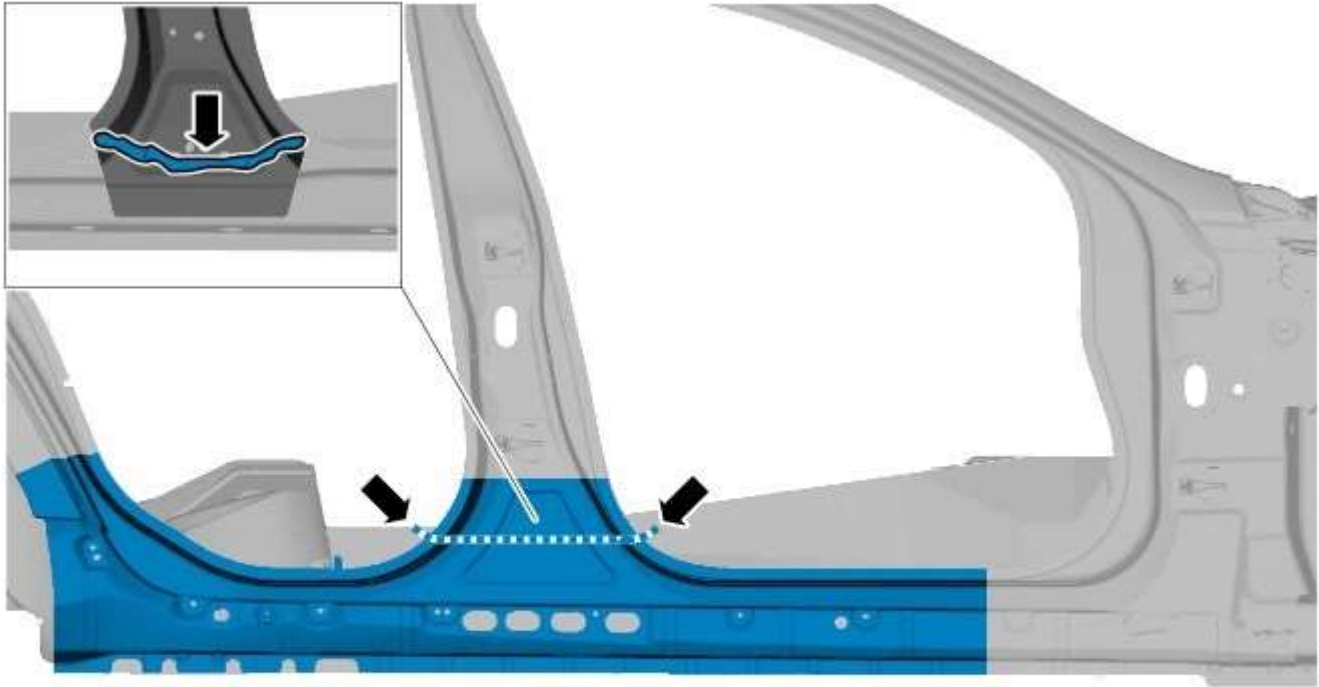
5.  NOTE: If necessary renew the NVH components.
Prepare the old and new panel joint surfaces, including the NVH components.
6.  NOTE: Temporarily install the front and rear doors to aid alignment.
Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
7. Remove the front and rear doors and the new rocker panel rear section.



E102822

8. NOTE: Make sure the adhesive does not encroach into the area of the butt joint as it will contaminate the weld (any unsealed areas must be sealed following the repair).
Apply adhesive to the area as indicated.


9. Apply sealer adhesive to the NVH components as indicated.



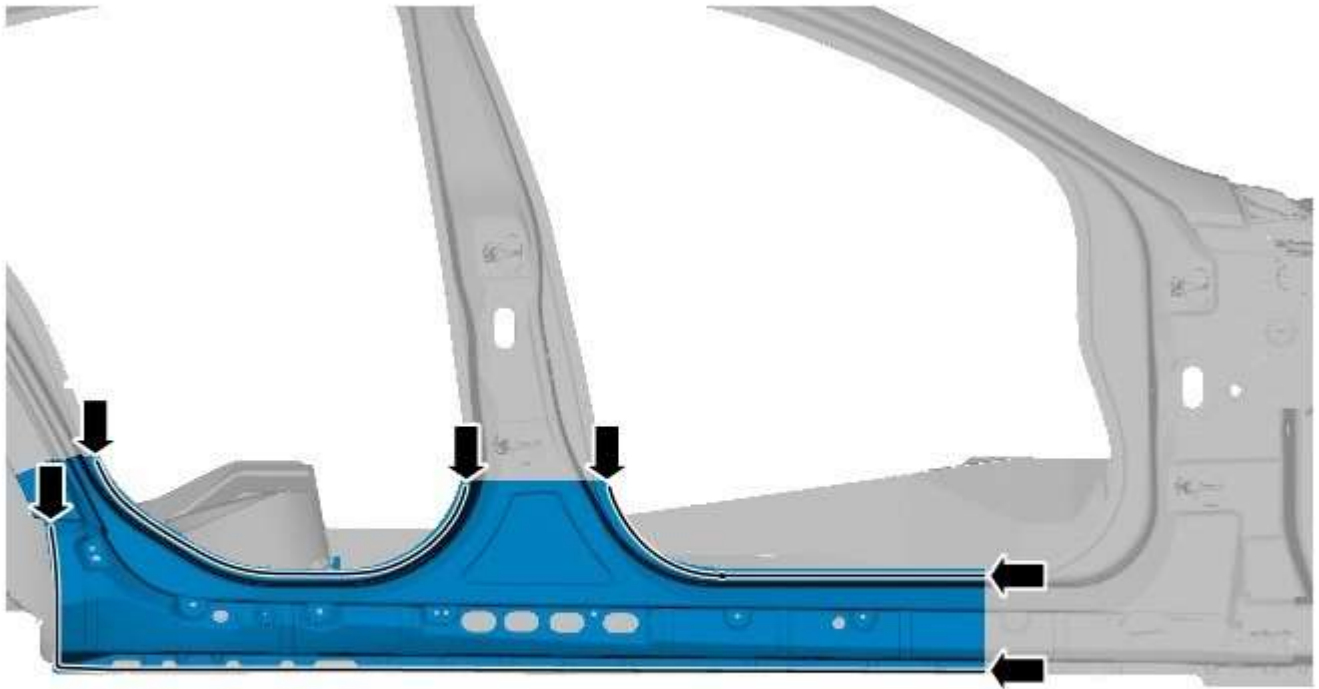
E102821

10. Offer up the new rocker panel rear section, align and clamp into position.

11. Tack weld the butt joints.

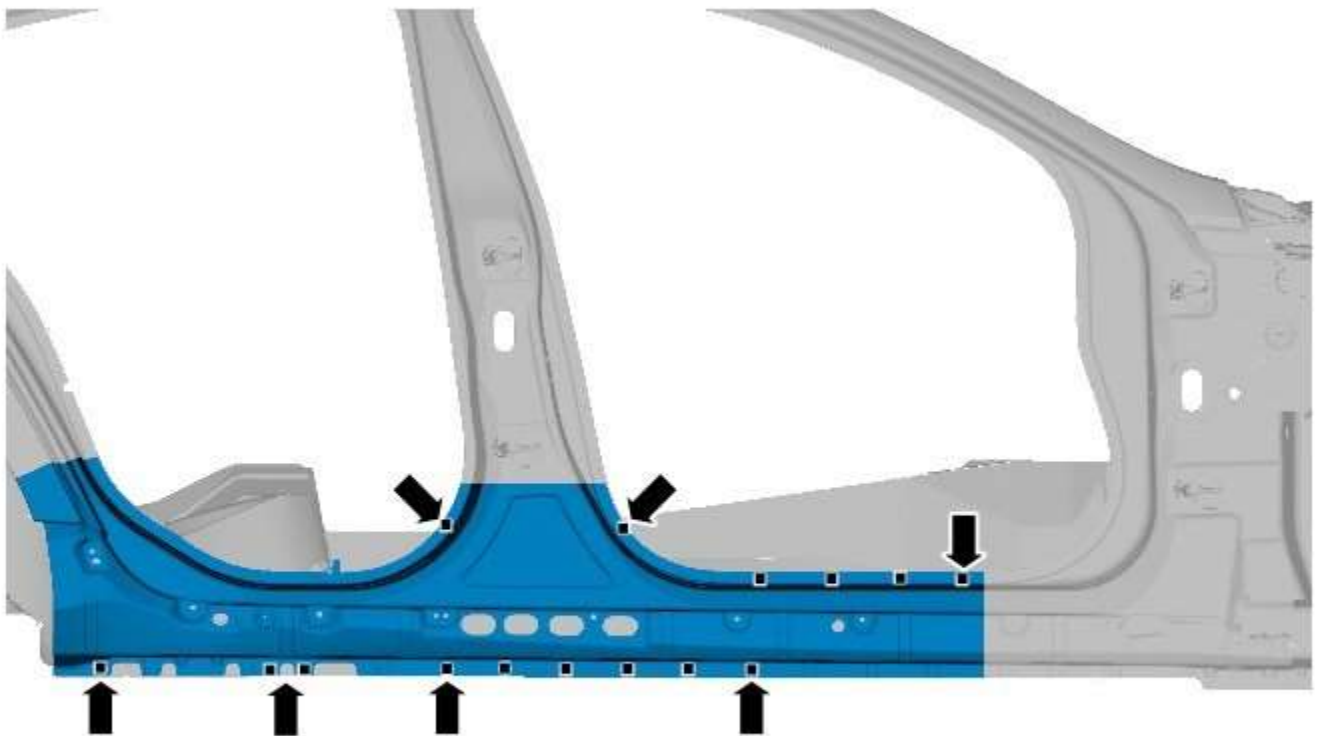
12.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.



E102823

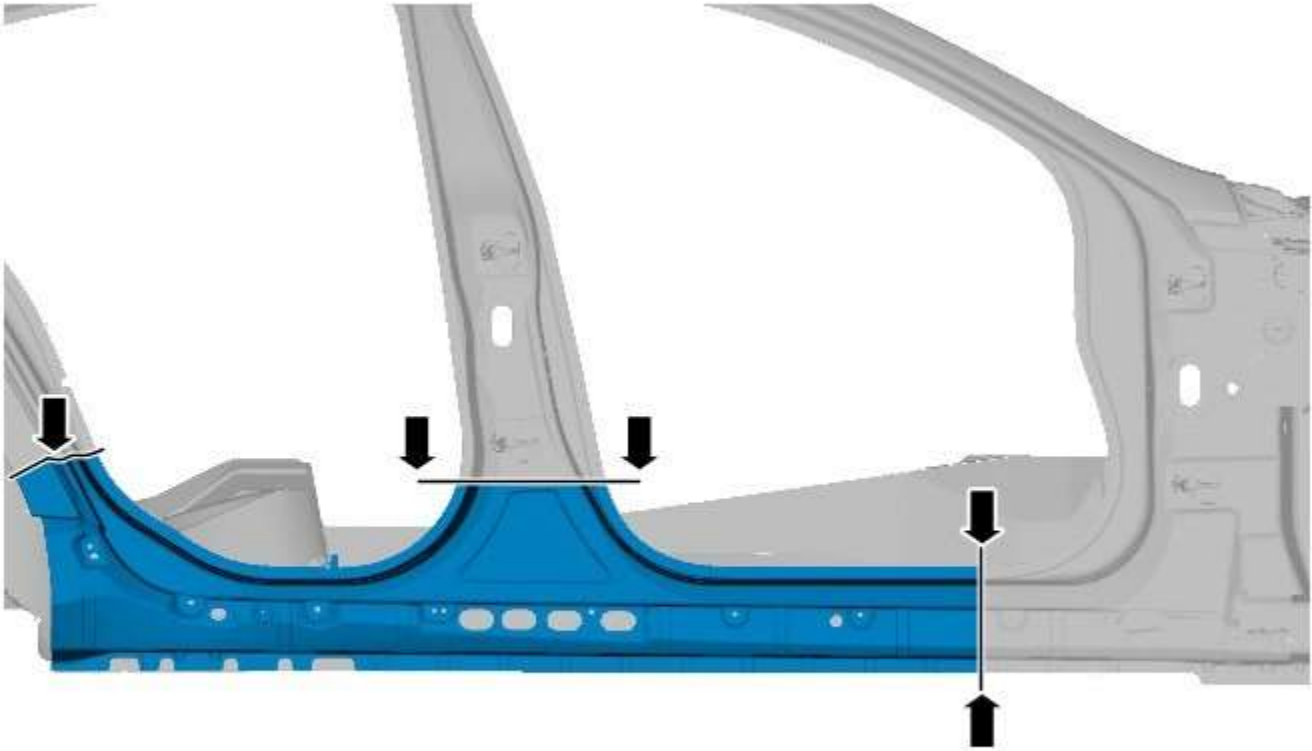
13. MAG plug weld.



E102820

14. Dress the tack welds.

15. MAG weld the butt joints.



E 102824

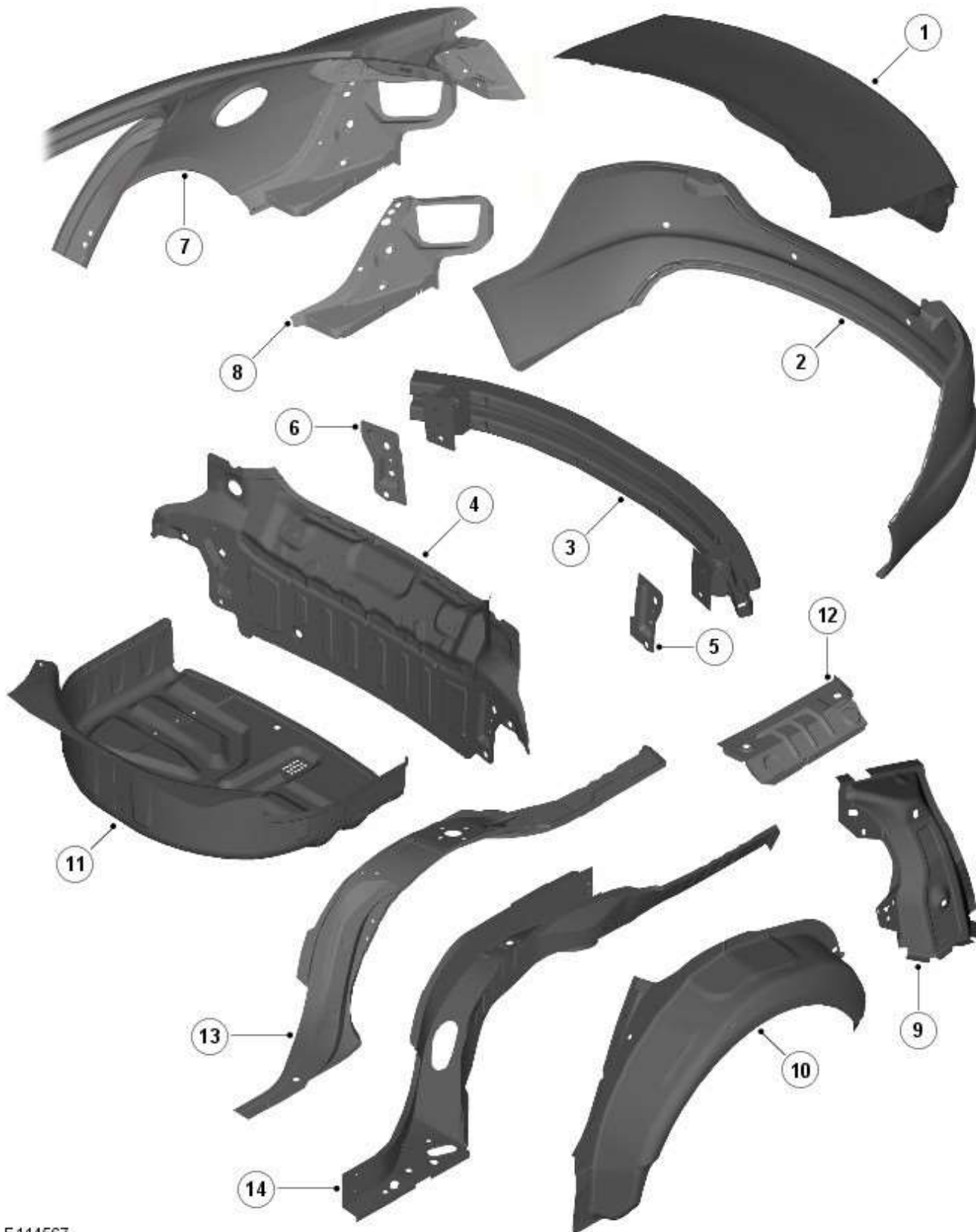
16. Dress all welded joints.

17. The installation of associated panels and components is the reversal of removal procedure.

Rear End Sheet Metal Repairs - Rear End Sheet Metal

Description and Operation

Rear end service panels





NOTE: The illustration may indicate either hand of the service panel, the opposite hand will be similar.

Item	Description
1	Luggage compartment lid
2	Rear bumper cover
3	Rear bumper
4	Back panel
5	Rear bumper mounting L/H
6	Rear bumper mounting R/H
7	Quarter panel
8	Quarter panel lower extension
9	Rear wheelhouse outer
10	Spare wheel well
11	Rear floor side extension
12	Rear side member section
13	Rear side member closing panel section

Time schedules, rear end

The following information shows the total time taken to replace single panels and complete assemblies. This time includes removal of Mechanical, Electrical and Trim, (MET), items, plus paint times based on Metallic Clear Over Base Paint, (blends to adjacent panels are not included)

The times shown were generated by Thatcham, (the Motor Insurance Repair Research Centre), and are to be used as a guide only.

Single panel times

Panel Description	Hours
Luggage compartment lid	7.5
Rear bumper cover	6.6
Back panel	9.4
Quarter panel L/H	23.2
Quarter panel R/H	24.2
Headliner remove and install	3.3
Rear window glass remove and install	1.7
Rear subframe and rear suspension remove and install	5.2

Combination panel replacement times

The following panel combination times show the total time to remove/install body panels, MET items and paint times based on Metallic Clear Over Base Paint process, (blends to adjacent panels are not included).

Combination panel times

Panel Description	Hours
Luggage compartment lid	
Rear bumper cover	
Rear bumper	
Quarter panel	
Back panel	
Headliner remove and install	
Rear window glass remove and install	
Total Time	L/H 35.2 R/H 35.9

Combination panel times

Panel Description	Hours
Luggage compartment lid	
Rear bumper cover	
Rear bumper	
Quarter panel L/H and R/H	
Back panel	
Headliner remove and install	
Rear window glass remove and install	
Total Time	44.7

Combination panel times

Panel Description	Hours
Luggage compartment lid	
Rear bumper cover	
Rear bumper	
Quarter panel	
Back panel	
Rear wheelhouse outer	
Rear side member section	

Panel Description	Hours
Rear side member closing panel section	
Spare wheel well	
Rear floor side extension	
Rear subframe and rear suspension remove and install	
Headliner remove and install	
Rear window glass remove and install	
Total Time	L/H 54.0 R/H 54.5

Combination panel times

Panel Description	Hours
Luggage compartment lid	
Rear bumper cover	
Rear bumper	
Quarter panel L/H and R/H	
Back panel	
Rear wheelhouse outer L/H and R/H	
Rear side member section L/H and R/H	
Rear side member closing panel section L/H and R/H	
Spare wheel well	
Rear floor side extension L/H and R/H	
Rear subframe and rear suspension remove and install	
Headliner remove and install	
Rear window glass remove and install	
Total Time	70.5

Combination panel times

Panel Description	Hours
Luggage compartment lid	
Rear bumper cover	
Rear bumper	
Quarter panel	
Back panel	
Rear side member section	
Rear side member closing panel section	
Spare wheel well	
Rear floor side extension	
Rear subframe and rear suspension remove and install	
Headliner remove and install	
Rear window glass remove and install	
Total Time	L/H 50.1 R/H 50.2

Combination panel times

Panel Description	Hours
Rear bumper cover	
Rear bumper	
Back panel	
Spare wheel well	
Rear subframe and rear suspension remove and install	
Total Time	26.8

Rear End Sheet Metal Repairs - Back Panel

Removal and Installation

Removal



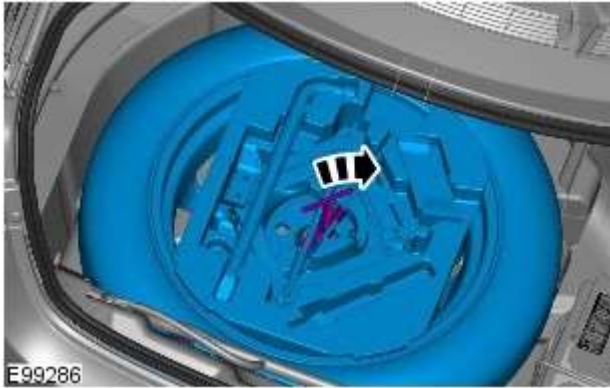
E101451

1. **NOTE:** The back panel is manufactured from mild steel.

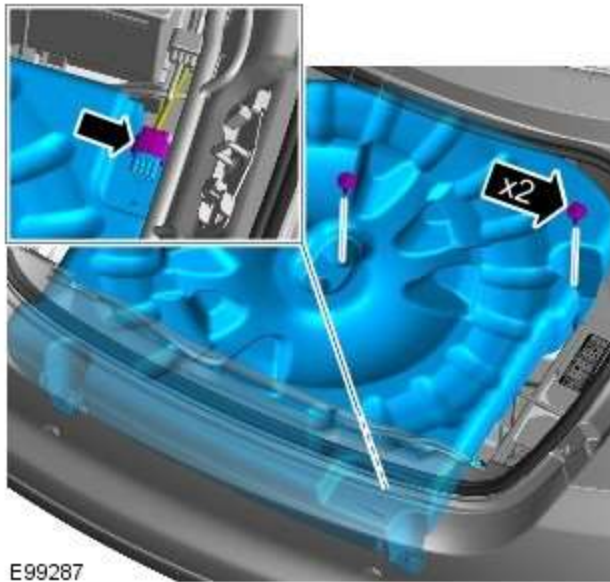
The back panel is serviced as a separate weld-on panel, it includes the back panel inner, right-hand and left-hand rear bumper mountings, it also includes its weld studs.

2. The back panel is replaced in conjunction with:
 - Rear bumper cover
 - Rear bumper
3. For additional information relating to this repair procedure please see the following: [Health and Safety Precautions](#) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the rear bumper.
For additional information, refer to: [Rear Bumper](#) (501-19 Bumpers, Removal and Installation).
5. Remove the battery.
For additional information, refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).
6. Remove the battery tray.
7. Disconnect the generator electrical connectors.
8. Remove the loadspace left-hand trim panel.
For additional information, refer to: [Loadspace Trim Panel LH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
9. Remove any electrical components in the local area of repair to prevent damage.
10. Remove the auxiliary junction box (AJB).
For additional information, refer to: [Auxiliary Junction Box \(AJB\)](#) (418-00 Module Communications Network, Removal and Installation).
11. Release the external back panel wiring harness and pull through into the loadspace.

12. Remove the luggage compartment lid weatherstrip.
13. Remove the loadspace trim panel.
For additional information, refer to: [Loadspace Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).



14. Remove the spare wheel and tire (if equipped).

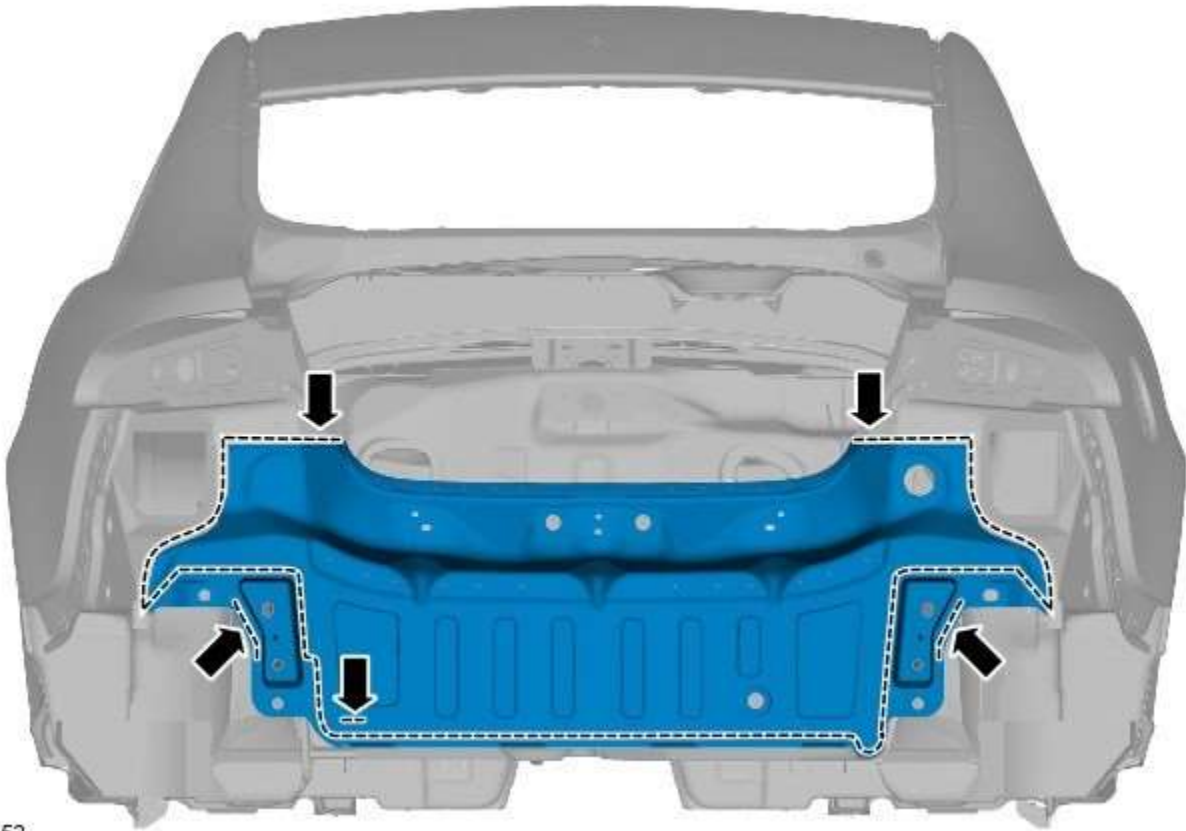


15. Remove the subwoofer speaker (if equipped).

16. Release and position the back panel and loadspace wiring harness to one side.
17. Remove the luggage compartment latch striker.
18. Remove the right-hand and left-hand forced air extraction grilles.
19. Remove the right-hand and left-hand muffler and tailpipe.
For additional information, refer to: Muffler and Tailpipe (309-00A, Removal and Installation) / Muffler and Tailpipe (309-00B, Removal and Installation) / Muffler and Tailpipe (309-00C, Removal and Installation).
20. Remove the right-hand and left-hand muffler and tailpipe heatshield.

21.  NOTE: Where applicable spot welds must be drilled from the inside, this will enable the new panel to be spot welded on installation. The lowest spot weld to the quarter panel lower extension has to be drilled from outside and MAG plug welded on installation.

Drill out the spot welds.



E101452

22. Separate the joints and remove the old panel.

Installation

1. Prepare the old and new panel joint surfaces.
2. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
3. Remove the new panel.

4. Apply adhesive to the areas indicated.



E101454

5. Offer up the new panel and clamp into position.

6. NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.



E101455

7. MAG Plug weld.



E101456

8. Dress all welded joints and remove any excess adhesive.
9. The installation of associated panels and components is the reversal of removal procedure.

Rear End Sheet Metal Repairs - Quarter Panel

Removal and Installation

Removal



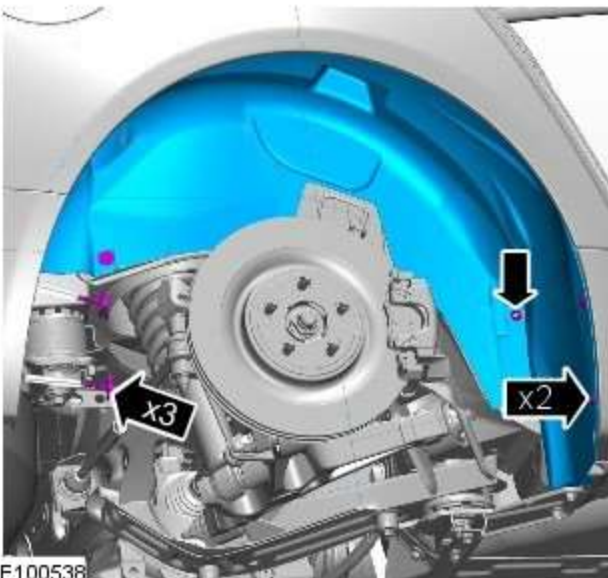
E101668

1. **NOTE:** The quarter panel is manufactured from mild steel.

The quarter panel is serviced as a separate weld-on panel, it includes the quarter panel lower extension, rear lamp mounting panel, rear lamp mounting panel insert, water drain panel and the door striker reinforcement. It is not serviced with its weld studs, or **NVH (noise, vibration and harshness)** components.

2. The quarter panel is replaced in conjunction with:
 1. Rear bumper
 2. Rear bumper cover
 3. Luggage compartment lid
 4. Rear window glass
 5. Headliner
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the rear wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

5. Remove the rear fender splash shield.



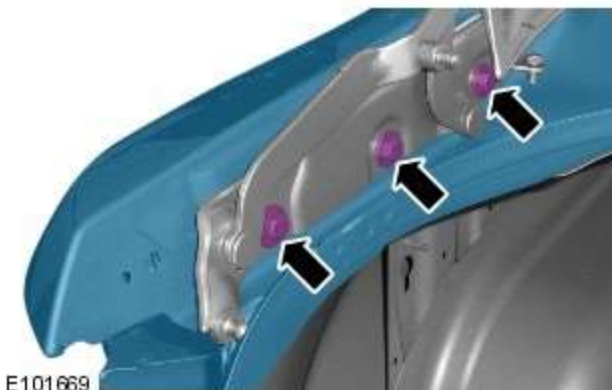
E100538

6. Remove the Rear Bumper.
For additional information, refer to: [Rear Bumper](#) (501-19 Bumpers, Removal and Installation).
7. Remove the battery.
For additional information, refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).
8. Disconnect the generator electrical connectors.
9. If the left-hand rear quarter panel is to be repaired, remove the loadspace left-hand trim panel.
For additional information, refer to: [Loadspace Trim Panel LH](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
10. If the right-hand rear quarter panel is to be repaired, remove the auxiliary junction box (AJB).
For additional information, refer to: [Auxiliary Junction Box \(AJB\)](#) (418-00 Module Communications Network, Removal and Installation).
11. Remove any electrical components in the local area of repair to prevent damage.
12. Remove the rear muffler.
For additional information, refer to: [Rear Muffler](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation) / [Rear Muffler](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation) / [Rear Muffler](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
13. Remove the exhaust muffler and tailpipe heatshield.
14. Remove the rear scuff plate trim panel.
For additional information, refer to: [Rear Scuff Plate Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
15. Remove the loadspace trim panel.
For additional information, refer to: [Loadspace Trim Panel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
16. Remove the forced air extraction grille.
17. Release and lay aside the back panel and loadspace wiring harness.
18. Remove the luggage compartment lid weatherstrip.
19. Remove the rear bumper cover side retainer.
20. Remove the roof moulding.
21. Remove the headliner.
For additional information, refer to: [Headliner](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
22. Remove the side air curtain module.


For additional information, refer to: [Side Air Curtain Module](#) (501-20B Supplemental Restraint System, Removal and Installation).

23. Remove the rear window glass.
24. Remove the audio unit antenna amplifier.
For additional information, refer to: [Audio Unit Antenna Amplifier](#) (415-01A Information and Entertainment System, Removal and Installation).
25. If the left-hand rear quarter panel is to be repaired, remove the diversity antenna module.
26. Remove the C-Pillar side impact sensor.
For additional information, refer to: [C-Pillar Side Impact Sensor](#) (501-20B Supplemental Restraint System, Removal and Installation).
27. Remove the rear door striker.
28. Remove the luggage compartment lid.
29. If the right-hand rear quarter panel is to be repaired, drain the fuel tank.
For additional information, refer to: [Fuel Tank Draining](#) (310-00 Fuel System - General Information, General Procedures).
30. If the right-hand rear quarter panel is to be repaired, remove the fuel filler door.
31. If the right-hand rear quarter panel is to be repaired, remove the fuel tank filler pipe.
For additional information, refer to: Fuel Tank Filler Pipe (310-01 Fuel Tank and Lines - 3.0L, Removal and Installation) / Fuel Tank Filler Pipe (310-01 Fuel Tank and Lines - 4.2L, Removal and Installation).

32. Remove the luggage compartment lid hinge.






33.  NOTE: The upper butt joint must be performed below the 4 metal thickness parts of the door and rear window apertures, (to enable spot welding back).

Cut the old panel at the points illustrated, allowing for overlap, ensuring the final cut is performed below the 4 metal thickness parts of the door and rear window aperture.

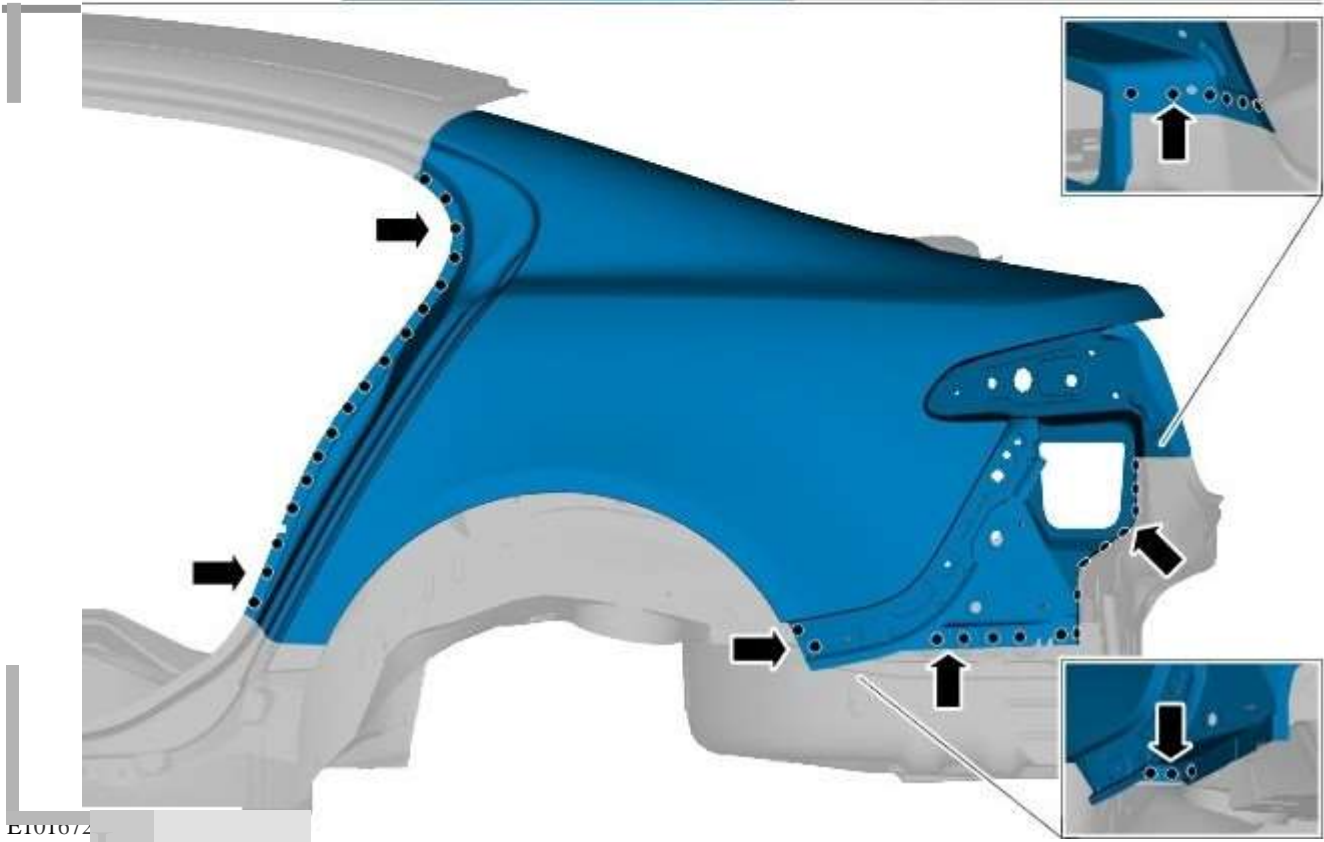
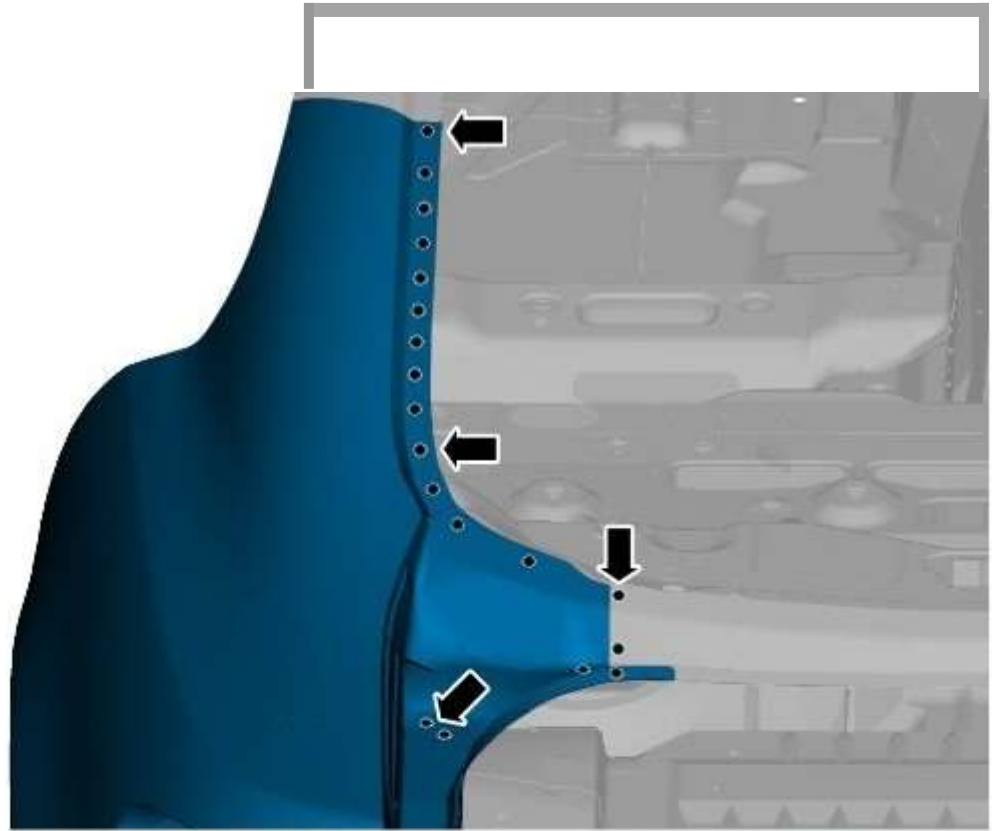


34.  NOTE: This procedure assumes that the door striker reinforcement panel is undamaged. In this case, the original remains on the vehicle and the new door striker reinforcement panel is removed from the quarter panel service panel and discarded.

Drill out the spot weld.

35.  NOTE: Use a belt sander where there is no access to drill.

Drill out the spot welds.

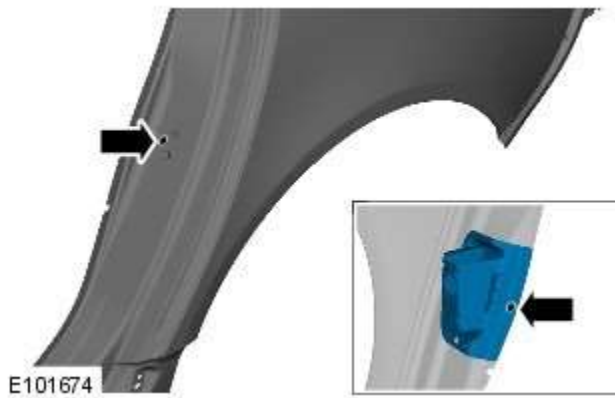


E101072

36. Separate the joints and remove the old panel, also releasing the [NVH](#) components.



Installation



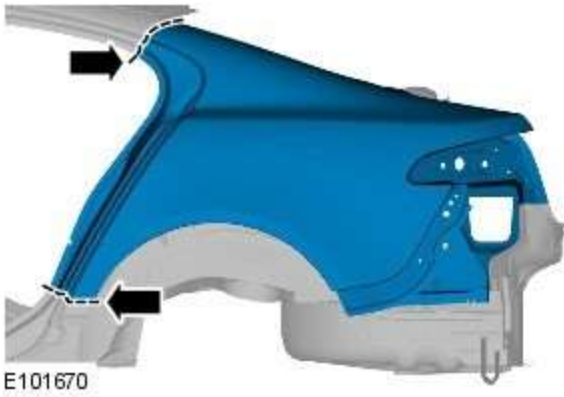
1. NOTE: This procedure assumes that the door striker reinforcement panel is undamaged. In this case, the original remains on the vehicle and the new door striker reinforcement panel is removed from the quarter panel service panel and discarded.

Remove the door striker reinforcement panel from the quarter panel service panel.



2. Trim the excess from the upper part of the service panel.

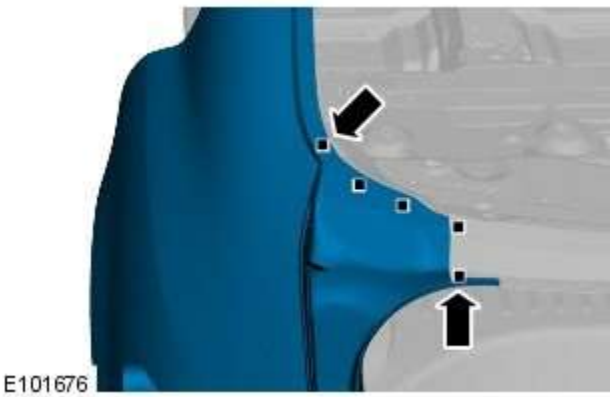
3. Prepare the old and new panel joint surfaces, including the NVH components.



- NOTE: Temporarily install the luggage compartment lid and hinge to aid alignment.

Offer up, align and clamp into position, overlapping the old panel. Cut the new and old panels at the points where the MAG butt joints are to be made.

- Remove the new panel, the luggage compartment lid and the old panel.



- Where applicable, drill holes in the new panel ready for MAG plug welding.


- Apply adhesive to the areas indicated.



8. If necessary, renew the NVH components.


9. Apply sealer adhesive to the NVH components.



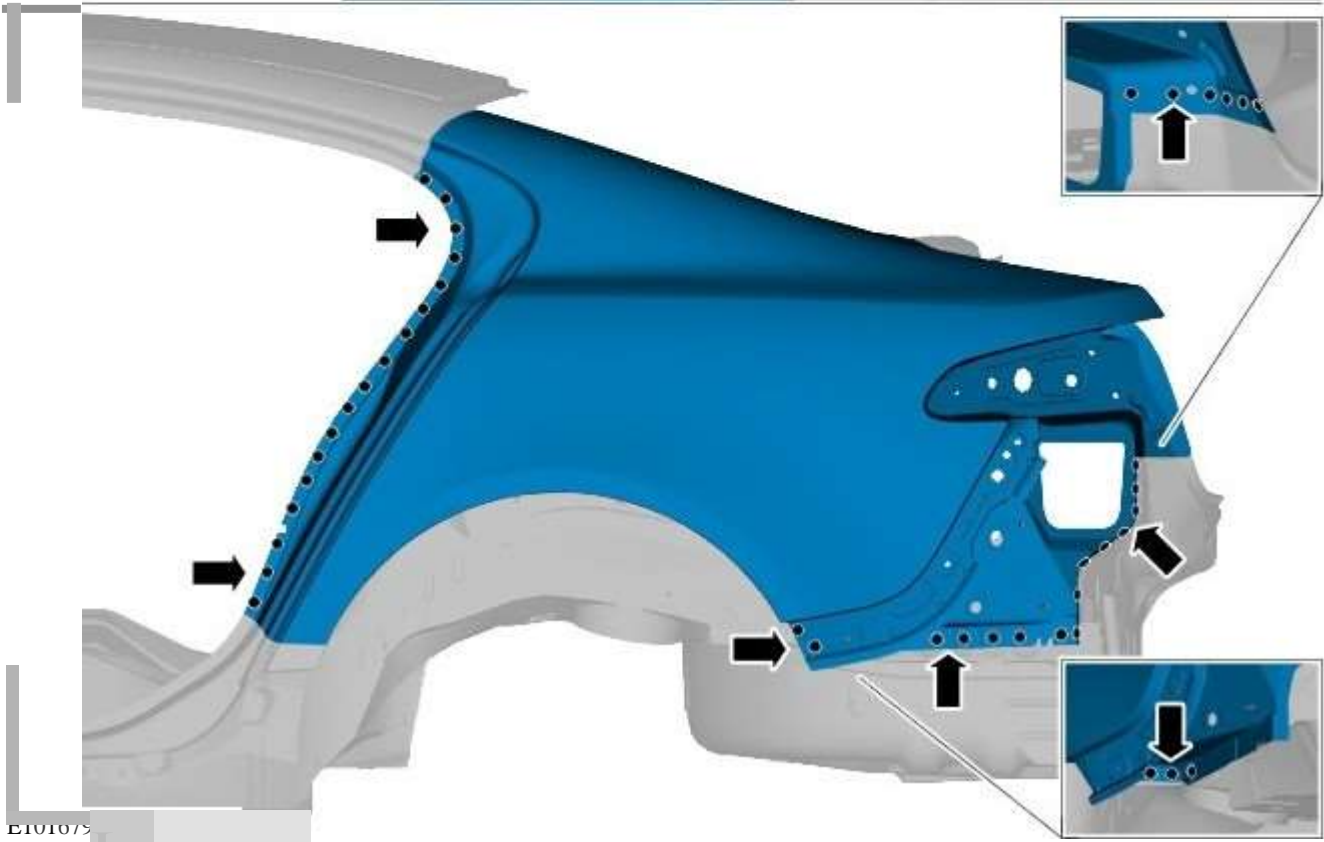
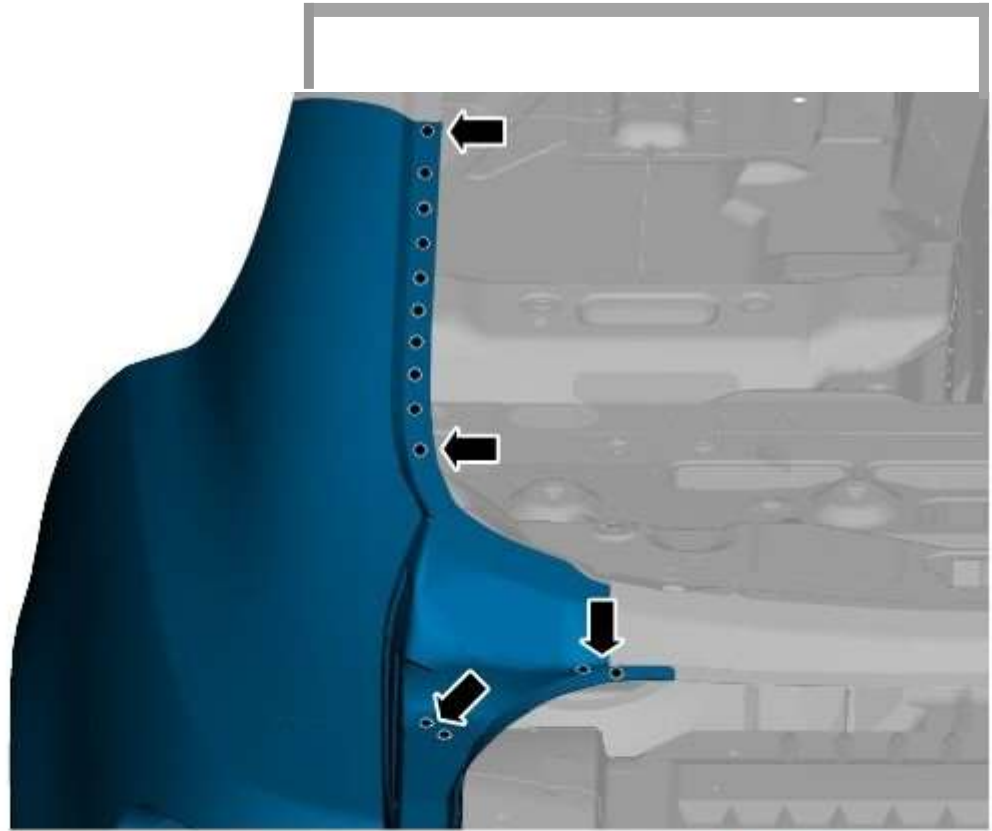
10.  NOTE: Temporarily install the luggage compartment lid and hinge to aid alignment.

Offer up the new panel, align and clamp into position.

11. Tack weld the butt joints.

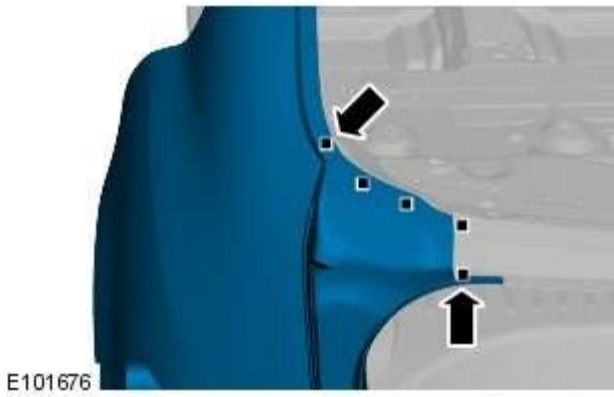
12.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.

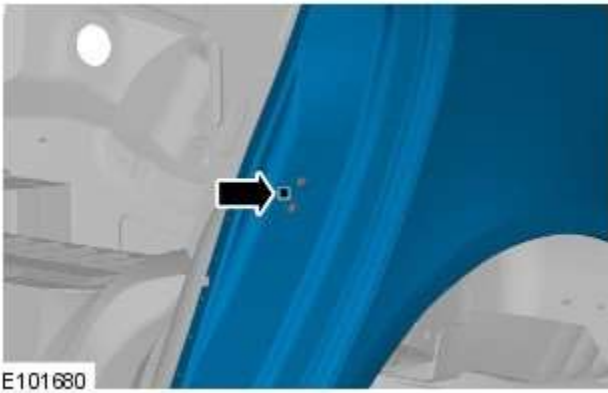


E101075

13. MAG plug weld.




14. MAG plug weld the new panel to the door striker reinforcement panel.

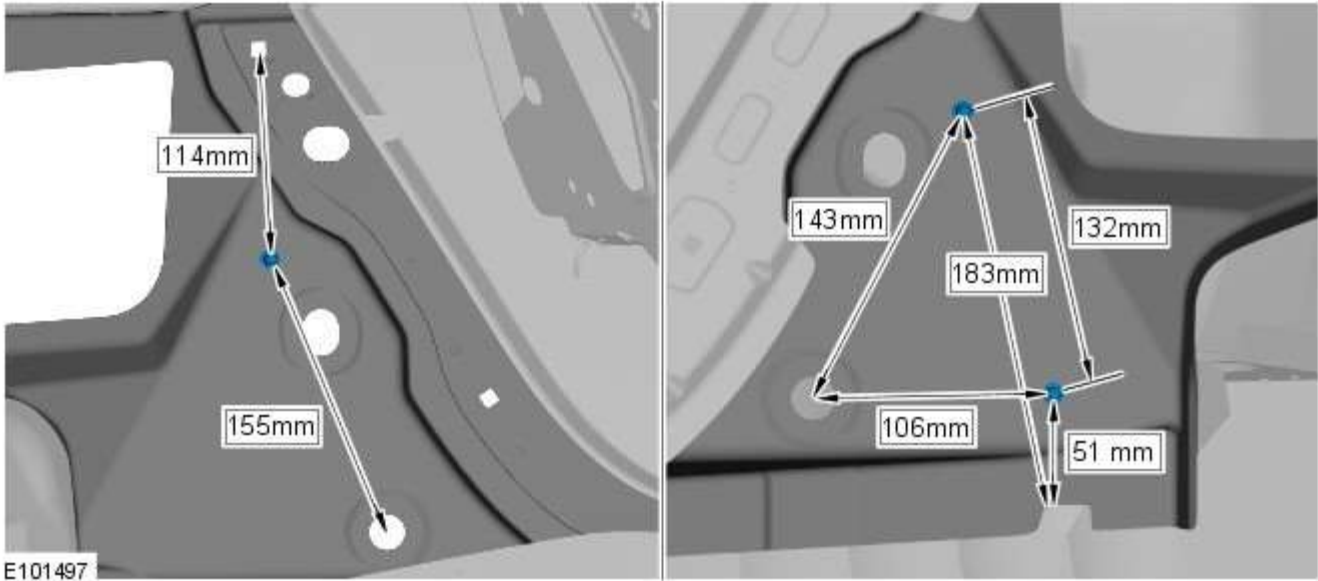


15. Dress the tack welds.



16. MAG weld the butt joints.

17.  NOTE: Stud dimensions: 6mm x 1.0mm thread, 20mm length.
Prepare the new panel and install the weld studs as indicated.



18. Dress all welded joints and remove any excess adhesive.

19. The installation of associated panels and components is the reversal of removal procedure.

Rear End Sheet Metal Repairs - Quarter Panel Lower Extension

Removal and Installation

Removal



E101492

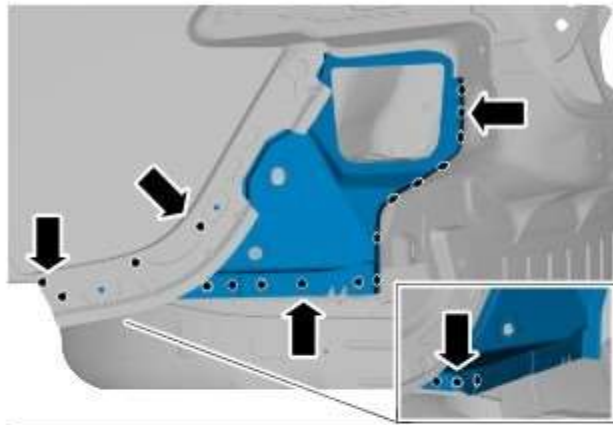
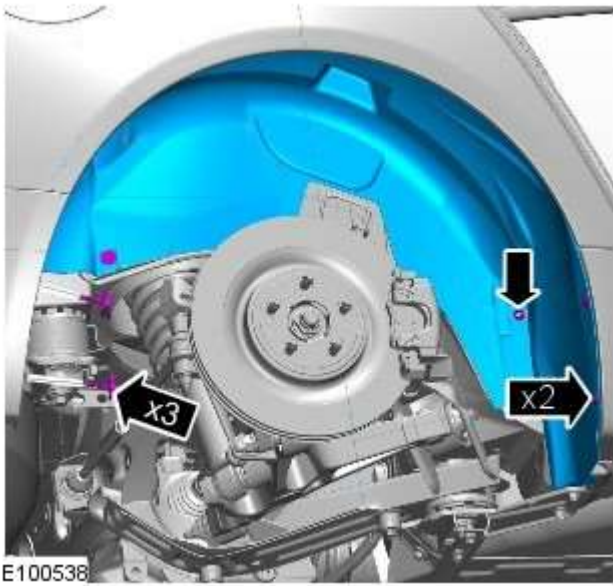
1. **NOTE:** The Quarter Panel Lower Extension is manufactured from mild steel.

The quarter panel lower extension is serviced as a separate weld-on panel, it is also serviced on the quarter panel. It is serviced without weld studs.


2. The quarter panel lower extension is replaced in conjunction with:
 1. Rear bumper cover
 2. Rear bumper
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the battery.
For additional information, refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).
5. Disconnect the generator electrical connectors.
6. Remove any electrical components in the local area of repair to prevent damage.
7. Remove the Rear Bumper.
For additional information, refer to: [Rear Bumper](#) (501-19 Bumpers, Removal and Installation).
8. Remove the rear muffler.
For additional information, refer to: [Rear Muffler](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation) / [Rear Muffler](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation) / [Rear Muffler](#) (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).
9. Remove the exhaust muffler and tailpipe heatshield.
10. Remove the forced air extraction grille.

11. Release and lay aside the back panel and loadspace wiring harness.
12. Remove the rear bumper cover side retainer.
13. Remove the rear wheel and tire.
For additional information, refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).

14. Remove the rear fender splash shield.



E101493

15.  NOTE: Where applicable spot welds must be drilled from the inside, this will enable the new panel to be spot welded on installation. Use a belt sander where there is no access to drill.

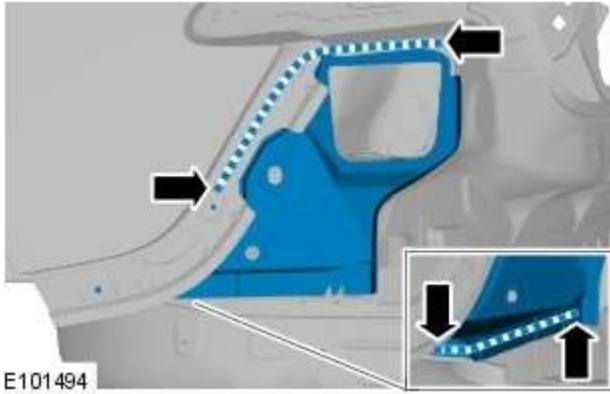
Drill out the spot welds.

16. Separate the joints and remove the old panel.

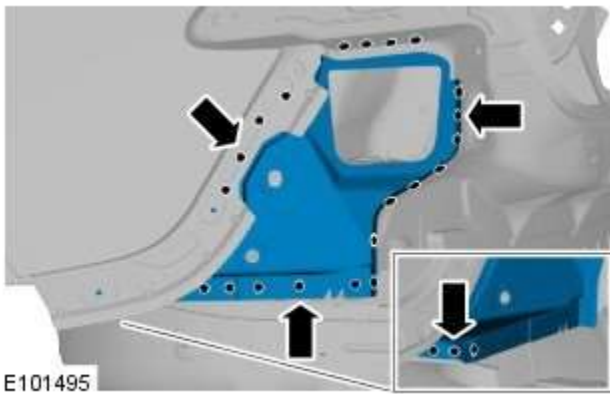
Installation

1. Prepare the old and new panel joint surfaces.
2. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
3. Remove the new panel.

4. Apply adhesive to the areas indicated.



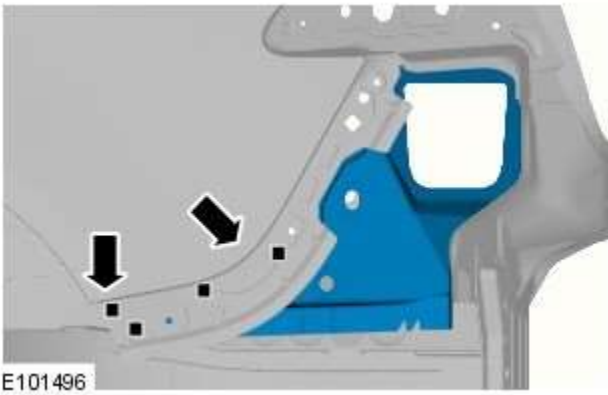
5. Offer up the new panel and clamp into position.




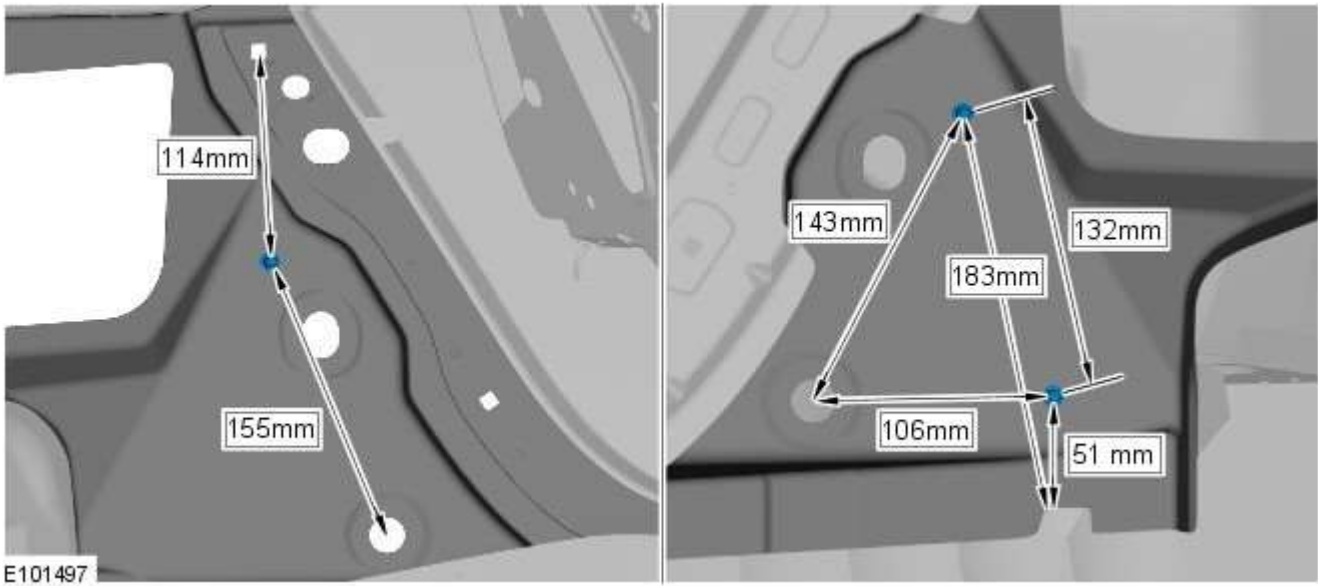
6. **NOTE:** Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.

7. MAG plug weld.



8.  NOTE: Stud dimensions: 6mm x 1.0mm thread, 20mm length.
Prepare the new panel and install the weld studs as indicated.



9. Dress all welded joints and remove any excess adhesive.

10. The installation of associated panels and components is the reversal of removal procedure.

Rear End Sheet Metal Repairs - Rear Bumper Mounting

Removal and Installation

Removal



E101457

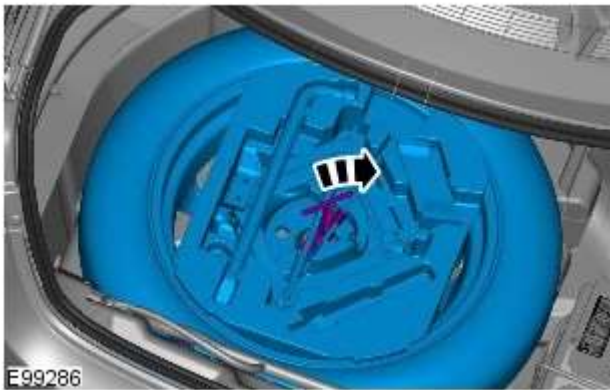
1. **NOTE:** The rear bumper mounting is manufactured from mild steel.

The rear bumper mounting is serviced on the back panel and must be removed from this to carry out this procedure.

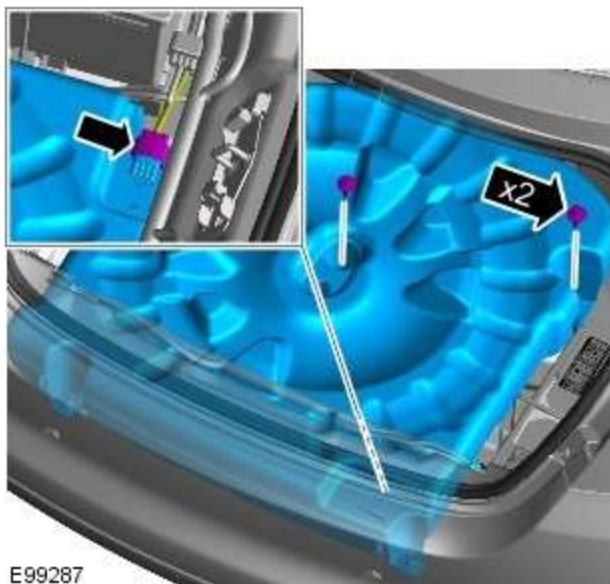
2. The rear bumper mounting is replaced in conjunction with:
 - Rear bumper cover
 - Rear bumper
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Disconnect the battery ground cable.
For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
5. If the right-hand rear bumper mounting is to be repaired, remove the battery.
For additional information, refer to: [Battery](#) (414-01 Battery, Mounting and Cables, Removal and Installation).
6. If the right-hand rear bumper mounting is to be repaired, remove the battery tray.
7. Disconnect the generator electrical connectors.
8. Remove the rear bumper.
For additional information, refer to: [Rear Bumper](#) (501-19 Bumpers, Removal and Installation).
9. Remove any electrical components in the local area of repair to prevent damage.
10. If the right-hand rear bumper mounting is to be repaired, remove the auxiliary junction box (AJB).
For additional information, refer to: [Auxiliary Junction Box \(AJB\)](#) (418-00 Module Communications Network, Removal and Installation).

11. Release the external back panel wiring harness and pull through into the loadspace.
12. Remove the luggage compartment lid weatherstrip.

13. Remove the spare wheel and tire (if equipped).

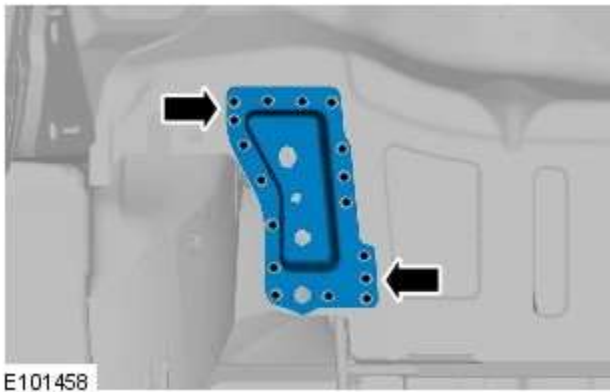


14. Remove the subwoofer speaker (if equipped).



15. Release and position the back panel and loadspace wiring harness to one side.
16. Remove the right-hand or left-hand muffler and tailpipe as necessary. For additional information, refer to: Muffler and Tailpipe (309-00A, Removal and Installation) / Muffler and Tailpipe (309-00B, Removal and Installation) / Muffler and Tailpipe (309-00C, Removal and Installation).
17. Remove the right-hand or left-hand muffler and tailpipe heatshield as necessary.

18. Drill out the spot welds.



19. Separate the joints and remove the old panel.

Installation

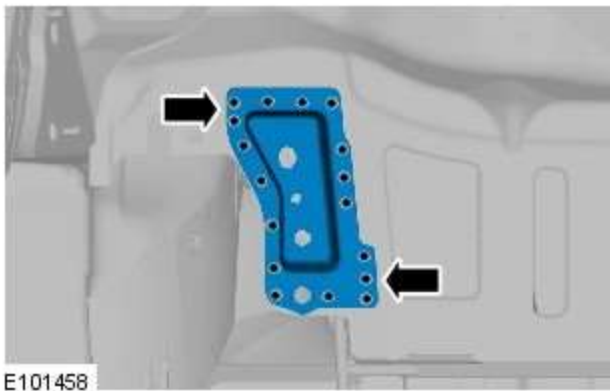
1. **NOTE:** Spot welds must be drilled from the inside, this will enable the new panel to be spot welded on installation.

Drill the rear bumper mounting off the back panel service panel.



2. Prepare the old and new panel joint surfaces.

3. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not, rectify and recheck before proceeding.



4. **NOTE:** Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld.

5. Dress all welded joints.

6. The installation of associated panels and components is the reversal of removal procedure.

Rear End Sheet Metal Repairs - Rear Floor Side Extension

Removal and Installation

Removal

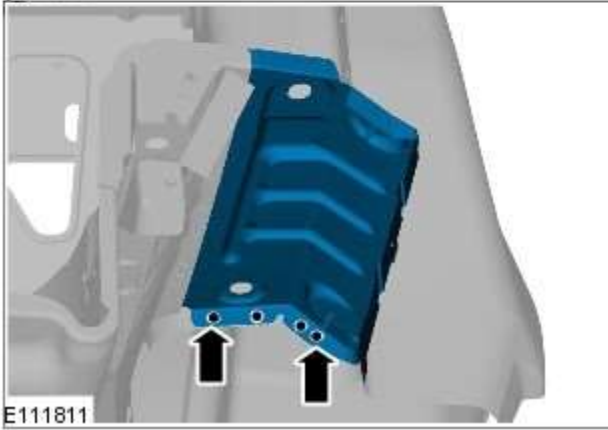
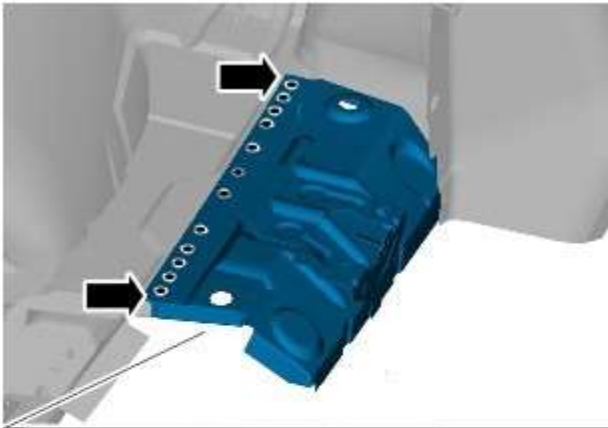



E111810


1. **NOTE:** The rear floor side extension is manufactured from mild steel.

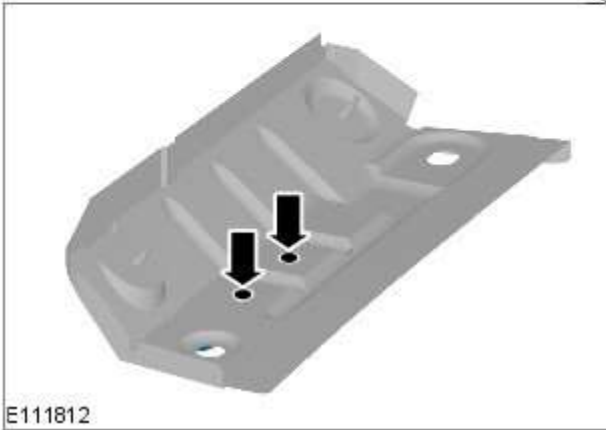
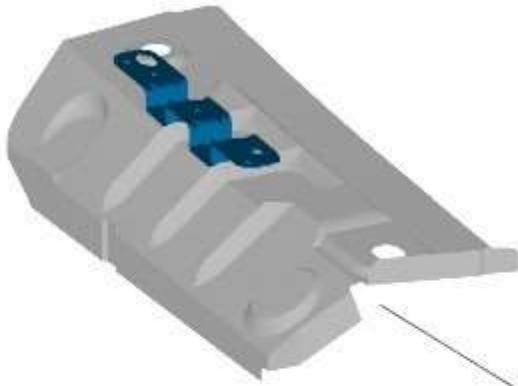
The rear floor side extension is serviced as a separate weld-on panel. It is not serviced with its brackets or weld studs


2. The rear floor side extension is replaced in conjunction with:
 - Rear bumper cover
 - Rear bumper
 - Quarter panel
 - Back panel
 - Luggage compartment lid
 - Rear window glass
 - Headliner
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the quarter panel.
For additional information, refer to: [Quarter Panel](#) (501-30 Rear End Sheet Metal Repairs, Removal and Installation).
5. Remove the back panel.
For additional information, refer to: [Back Panel](#) (501-30 Rear End Sheet Metal Repairs, Removal and Installation).
6. Disconnect the generator electrical connectors.
7. If the right-hand rear floor side extension is being repaired, release and lay aside the battery positive cable.



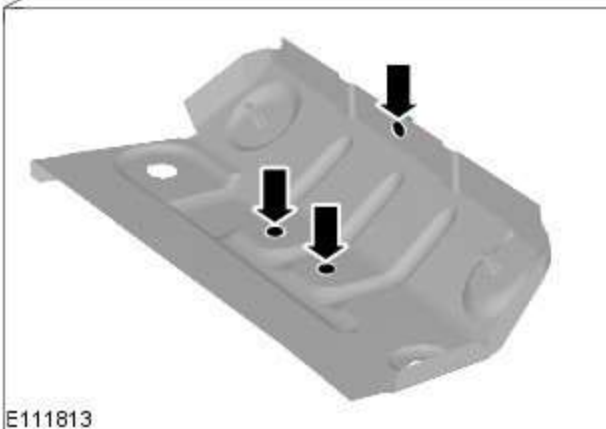
8.  NOTE: Use a belt sander where there is no access to drill.
Drill out the spot welds.


9.  NOTE: Retain the old panel for reference to the weld stud location points.
Separate the joints and remove the old panel.



10.  NOTE: Drill out from underneath to allow spot welds to be used in installation. If undamaged, retain the mounting bracket for re-use on installation.

If the left-hand rear floor side extension is to be repaired, drill out the spot welds, from underneath and remove the mounting bracket.

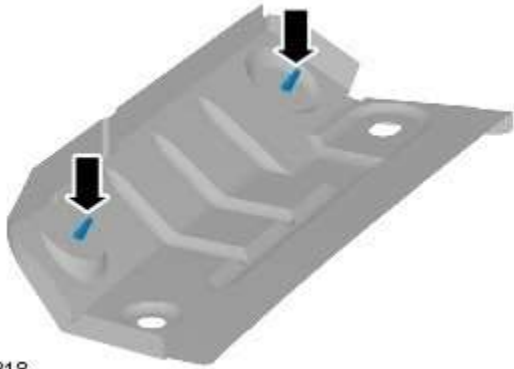


11.  NOTE: Drill out from underneath to allow spot welds to be used in installation. If undamaged, retain the AJB (auxiliary junction box) mounting bracket for re-use on installation.

If the right-hand rear floor side extension is to be repaired, drill out the spot welds, from underneath and remove the AJB mounting bracket.

Installation

1. Prepare the old and new panel joint surfaces.



E 111818

2. **NOTE:** Stud dimensions: 6mm x 1mm thread, 20mm length.

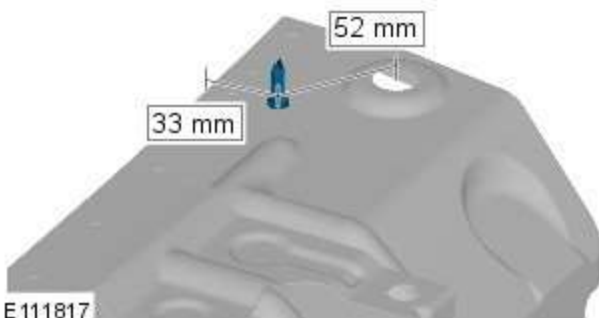
If the left-hand rear floor side extension is to be repaired, using the old panel for reference, install the weld studs for the left-hand muffler and tailpipe heatshield as indicated.



E 111819

3.  **NOTE:** Stud dimensions: 6mm x 1mm thread, 20mm length.

If the right-hand rear floor side extension is to be repaired, using the old panel for reference, install the weld studs for the right-hand muffler and tailpipe heatshield as indicated.

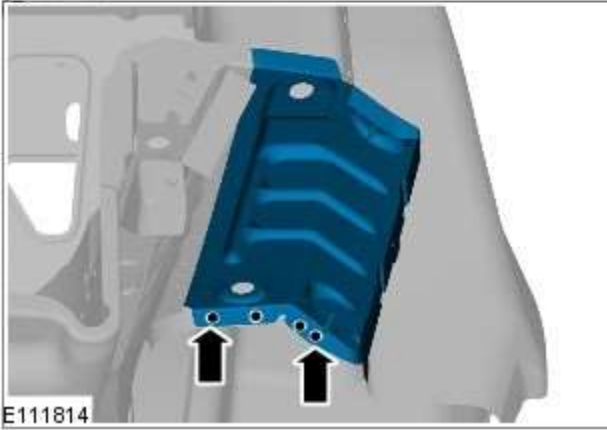
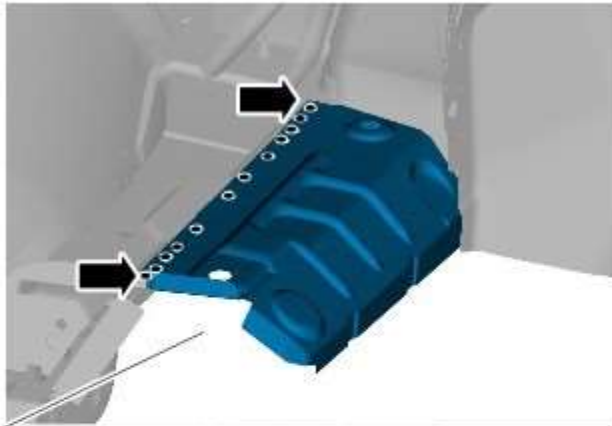


E 111817

4.  **NOTE:** Stud dimensions: 6mm x 1mm thread, 20mm length.

If the right-hand rear floor side extension is to be repaired, install the weld stud as indicated.

5. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

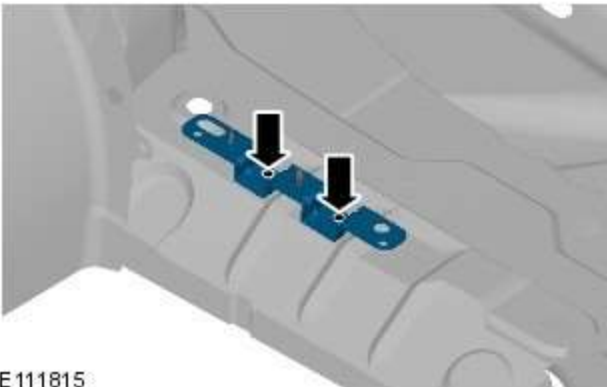


- NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original.

Spot weld.

- If the left-hand rear floor side extension is to be repaired, prepare the panel joint surfaces of the mounting bracket.

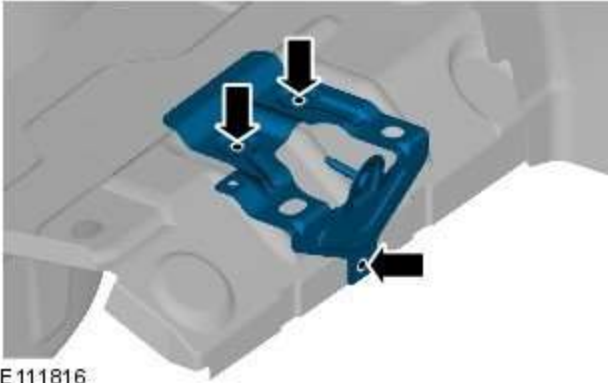
- If the left-hand rear floor side extension is to be repaired, offer up the mounting bracket and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



- If the left-hand rear floor side extension is to be repaired, spot weld the mounting bracket as indicated.

- If the right-hand rear floor side extension is to be repaired, prepare the panel joint surfaces of the AJB mounting bracket.

- If the right-hand rear floor side extension is to be repaired, offer up the AJB mounting bracket and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.



E 111816

12. If the right-hand rear floor side extension is to be repaired, spot weld the AJB mounting bracket as indicated.

13. Dress all welded joints.

14. Make sure any remaining areas of bare metal created during this procedure are treated with a zinc primer prior to the installation of outer panels.

15.  NOTE: Make sure all underbody joints are fully sealed following this repair procedure.

The installation of associated panels and components is the reversal of removal procedure.

Rear End Sheet Metal Repairs - Rear Side Member Closing Panel Section

Removal and Installation

Removal



E111918

1. **NOTE:** The rear side member closing panel section is manufactured from High Strength Low Alloy Steel, 350MPa, (HSLA350).

The rear side member closing panel section is cut from the rear side member closing panel service panel.

2. In this procedure, to make sure the vehicle is correctly aligned, it must be placed on an approved alignment jig.
3. The rear side member closing panel section is replaced in conjunction with:
 - Rear bumper cover
 - Rear bumper
 - Luggage compartment lid
 - Back panel
 - Spare wheel well
 - Towing eye bracket
 - Rear floor side extension
 - Rear side member section
 - Rear subframe and rear suspension, as an assembly
4. For additional information relating to this repair procedure please see the following:
 For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
5. **NOTE:** This procedure assumes that if the rear side member closing panel section is damaged, the rear side member section will also be damaged. Therefore the replacement procedure for the rear side member closing panel section is combined within the rear side member section procedure.

 Remove the rear side member section.
 For additional information, refer to: [Rear Side Member Section](#) (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

Installation

1. The installation of associated panels and components is the reversal of removal procedure.

Rear End Sheet Metal Repairs - Rear Side Member Section

Removal and Installation

Removal



E111917

1. **NOTE:** The rear side member section is manufactured from High Strength Low Alloy Steel, 350MPa, (HSLA350).

The rear side member section is cut from the rear side member service panel.

2. This procedure assumes that if the rear side member section is damaged, the rear side member closing panel section will also be damaged. Therefore this procedure combines the repair of the rear side member section and the rear side member closing panel section.



E111918

3. **NOTE:** The rear side member closing panel section is manufactured from High Strength Low Alloy Steel, 350MPa, (HSLA350).

The rear side member closing panel section is cut from the rear side member closing panel service panel.

4. In this procedure, to make sure the vehicle is correctly aligned, it must be placed on an approved alignment jig.

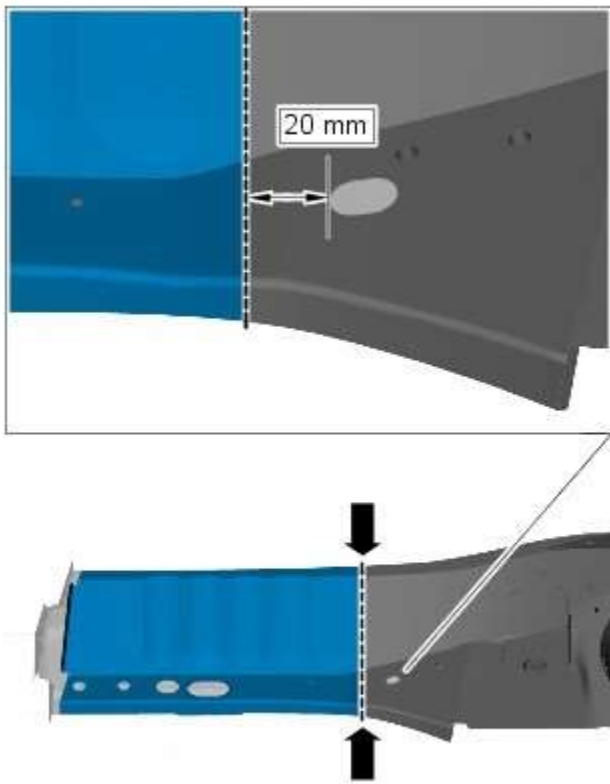
5. The rear side member section is replaced in conjunction with:


- Rear bumper cover
- Rear bumper
- Luggage compartment lid
- Back panel
- Spare wheel well
- Towing eye bracket
- Rear floor side extension
- Rear side member closing panel section
- Rear subframe and rear suspension, as an assembly

6. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) /

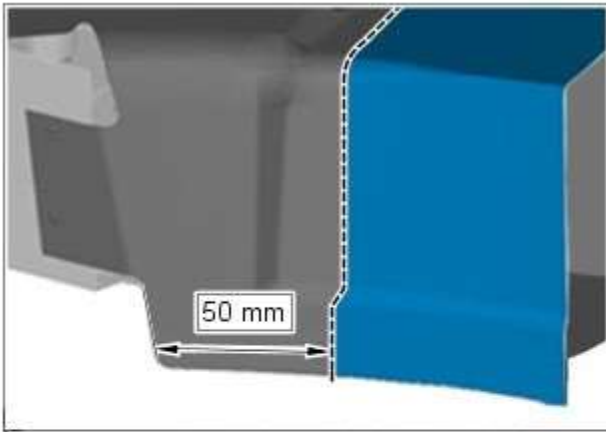
[Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).


7. Disconnect the generator electrical connectors.
8. Remove the luggage compartment lid.
For additional information, refer to: [Luggage Compartment Lid](#) (501-03 Body Closures, Removal and Installation).
9. Remove the spare wheel well.
For additional information, refer to: [Spare Wheel Well](#) (501-30 Rear End Sheet Metal Repairs, Removal and Installation).
10. Remove the rear floor side extension.
For additional information, refer to: [Rear Floor Side Extension](#) (501-30 Rear End Sheet Metal Repairs, Removal and Installation).
11. Remove the rear muffler hanger bracket from the side member.



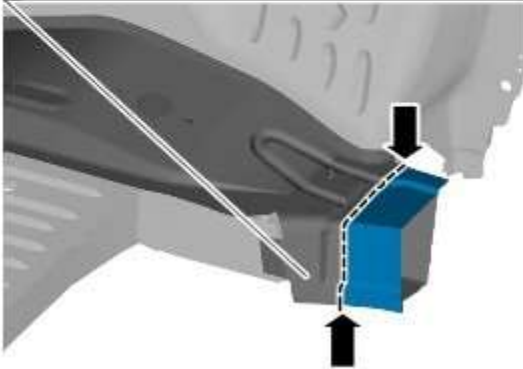
12.  NOTE: The measurements shown allow the section to be performed, avoiding the inner reinforcements and allowing for a minimum 50mm staggered joint with the rear side member closing panel section. The measurement is taken from the edge of the hole in the rear side member, not the inner reinforcement.

Mark out the position where the rear side member section MAG butt joint is to be made. Cut through the rear side member at this point, also cutting through the rear side member closing panel as indicated.



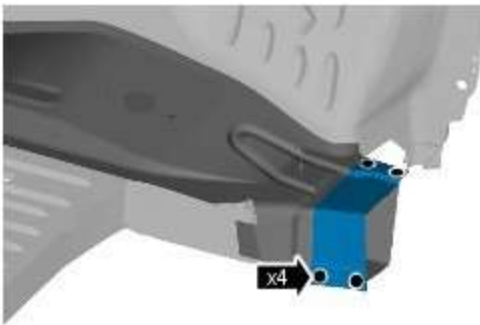
13.  **CAUTION:** Care should be taken not to cut through into the rear side member.

Mark out the position where the rear side member closing panel section MAG butt joint is to be made. Cut through the rear side member closing panel at this point as indicated.



E111920

14. Drill out the spot welds from the rear side member closing panel remnant.

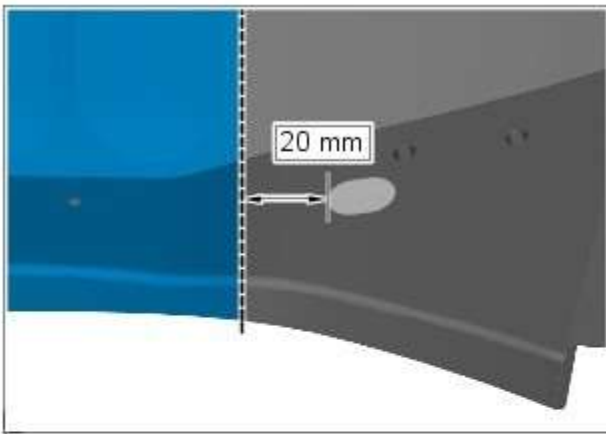


E111921

15. Separate the joints and remove the rear side member closing panel remnant.

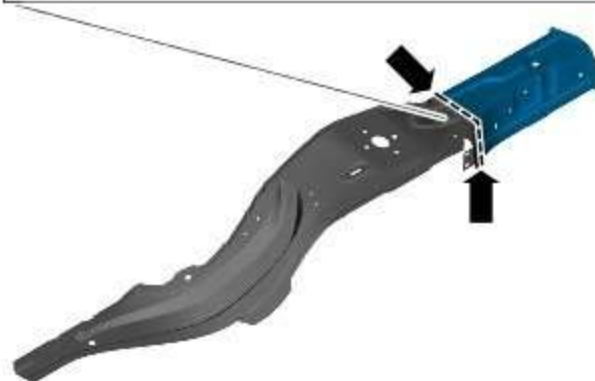
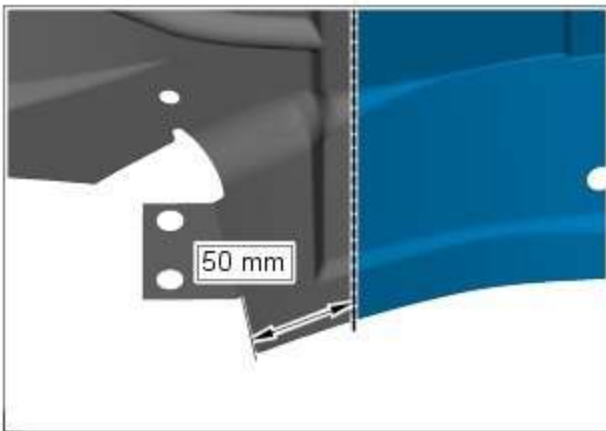
Installation

1. Mark out the position on the rear side member service panel, where the section MAG butt joint is to be made and cut the panel at this point as indicated.



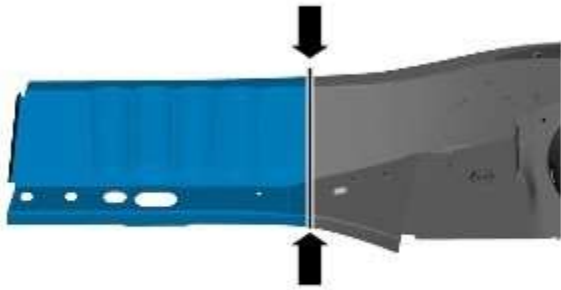
E111922

2. Mark out the position on the rear side member closing panel service panel, where the section MAG butt joint is to be made and cut the panel at this point as indicated.



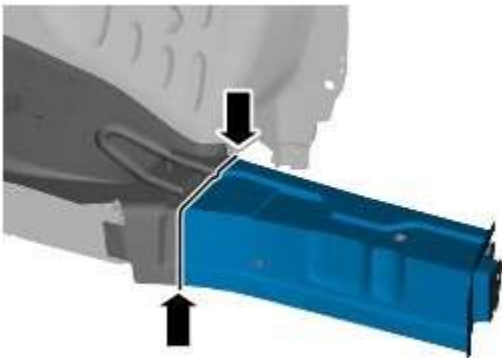
E111923

3. Prepare the panel joint surfaces of the old and new rear side member and rear side member closing panel sections.
4. Offer up the new rear side member section and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
5. Tack MAG weld the rear side member section butt joint.
6. Dress the rear side member section MAG tack welds.
7. MAG weld the rear side member section butt joint.



E111924

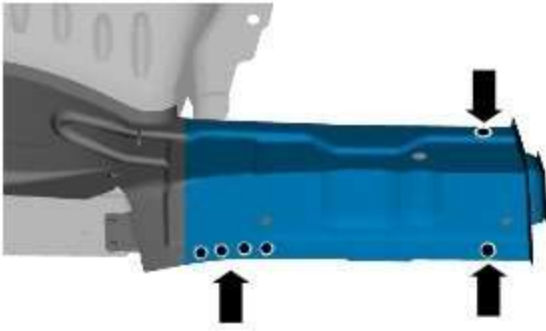
8. Dress the rear side member section MAG butt joint.
9. Apply a zinc rich primer to any bare metal surfaces at this stage.
10. Offer up the new rear side member closing panel section and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
11. Tack MAG weld the rear side member closing panel section butt joint.
12. Dress the rear side member closing panel section MAG tack welds.




E111925

13. MAG weld the rear side member closing panel section butt joint.

14. Dress the rear side member section MAG tack welds.



E 111926

15.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original. Where there is adhesive in the original joint, spot welds should be installed through the original.

Spot weld the rear side member closing panel section to the rear side member as indicated.

16. Dress the spot welds.
17. Make sure any remaining areas of bare metal created during this procedure are treated with a zinc primer prior to the installation of outer panels.
18. The installation of associated panels and components is the reversal of removal procedure.
1. Tighten the rear muffler hanger bracket bolts to 25 Nm.

Rear End Sheet Metal Repairs - Rear Wheelhouse Outer

Removal and Installation

Removal

1. NOTES:



The rear wheelhouse outer is manufactured from mild steel.



The illustration shows the right-hand service panel, the left-hand is similar but without the fuel filler aperture.

The rear wheelhouse outer is serviced as a separate weld-on panel.

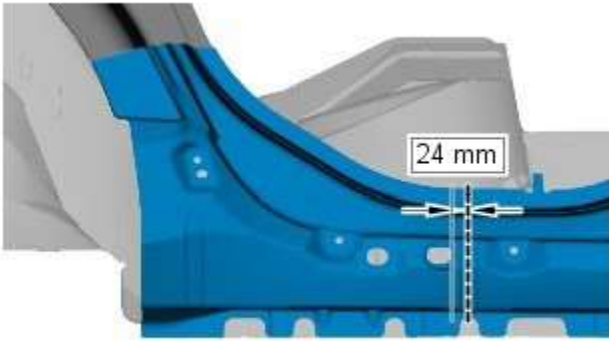


E 108371

2. The rear wheelhouse outer is replaced in conjunction with:
 - Rear bumper cover
 - Quarter Panel
 - Rocker panel (rear, dog leg, part as a minimum)
 - Rocker panel inner reinforcement section
 - Quarter panel inner reinforcement, (new service panel required to enable rear wheelhouse outer replacement)
 - Luggage Compartment Lid
 - Rear window glass
 - Headliner

3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).

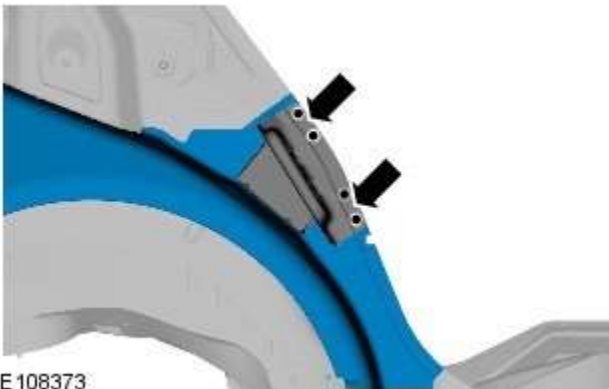
4. Remove the quarter panel.
For additional information, refer to: [Quarter Panel](#) (501-30 Rear End Sheet Metal Repairs, Removal and Installation).



E 108372

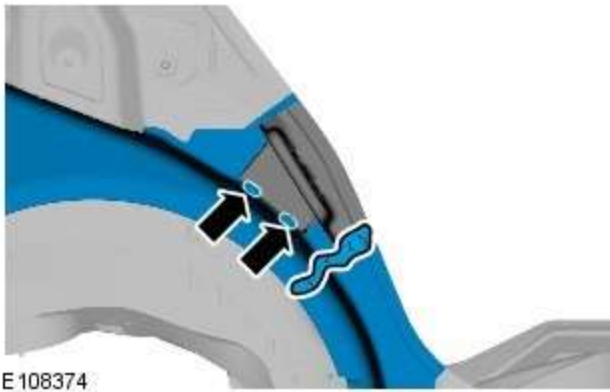
5. Remove a section of rocker panel to allow access to the joints for removal of the rear wheelhouse outer. Using the rocker panel rear section procedure for reference, perform a section cut in a suitable position, dependant on the extent of damage. The section must be no less than that indicated.
For additional information, refer to: [Rocker Panel Rear Section](#) (501-29 Side Panel Sheet Metal Repairs, Removal and Installation).

6. Disconnect the generator electrical connectors.
7. Remove the rear safety belt retractor.
For additional information, refer to: [Rear Safety Belt Retractor](#) (501-20A Safety Belt System, Removal and Installation).
8. Disconnect, release the inner quarter panel wiring harness and position it to one side.
9. If the right-hand rear wheelhouse outer is being repaired, release the battery positive cable and position it to one side.
10. Release the inner quarter panel insulating material and position it to one side.




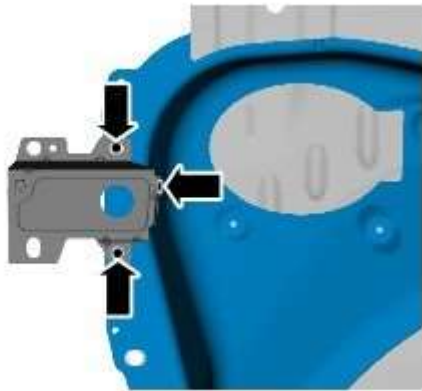
E 108373

11. Drill out the spot welds from the striker reinforcement panel.




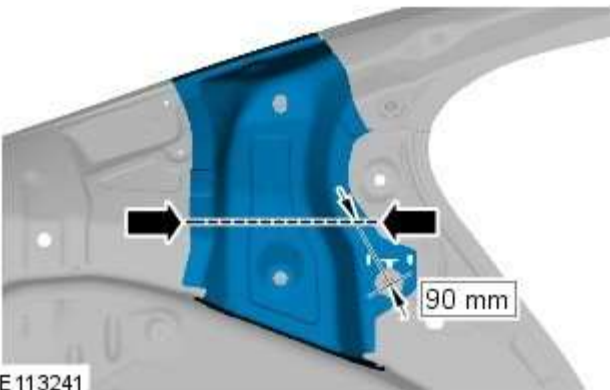
E 108374

12.  **NOTE:** A new striker reinforcement panel is supplied on the quarter panel service panel.
- Separate the joints, the adhesive and the NVH (noise, vibration and harshness) component and remove the striker reinforcement panel.




E 108375

13.  **NOTE:** Care should be taken when separating and removing the ECM (engine control module) mounting bracket if it is to be reused.
- If the right-hand rear wheelhouse outer is to be repaired, drill out the spot welds as indicated and remove the ECM mounting bracket. Retain for reuse on installation.




E 113241

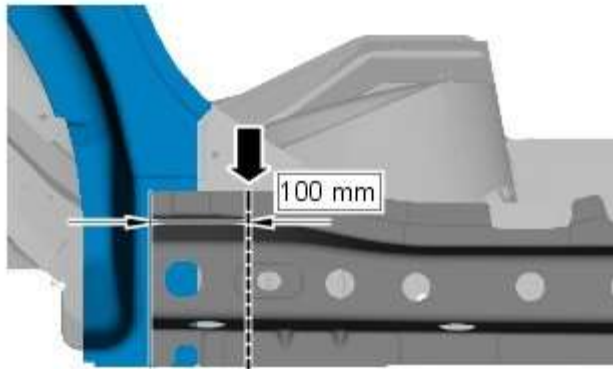
14.  **NOTE:** It is necessary to section the quarter panel inner reinforcement at the point indicated, to make sure the integrity of the safety belt anchorage point. The right-hand panel is illustrated, the left-hand is similar.
- Cut the quarter panel inner reinforcement, horizontally, approximately 90mm from the centre of the safety belt anchorage point as indicated.



E 113242

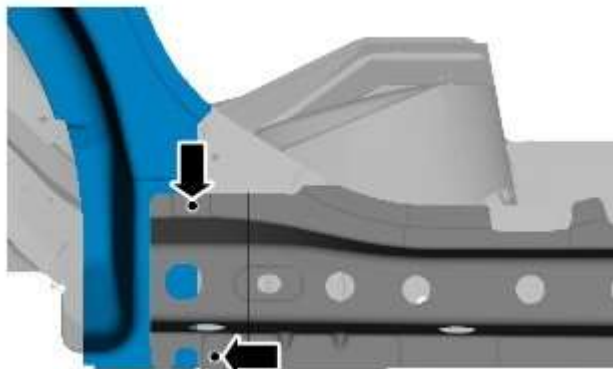
15.  **NOTE:** The right-hand panel is illustrated, the left-hand is similar although there are additional spot welds to drill out.
- Drill out the spot welds from the quarter panel inner reinforcement section at the points indicated.

16.  NOTE: Retain the quarter panel inner reinforcement section as part of this will be used as a template and to form a backing plate.
- Separate the joints and remove the quarter panel inner reinforcement section.



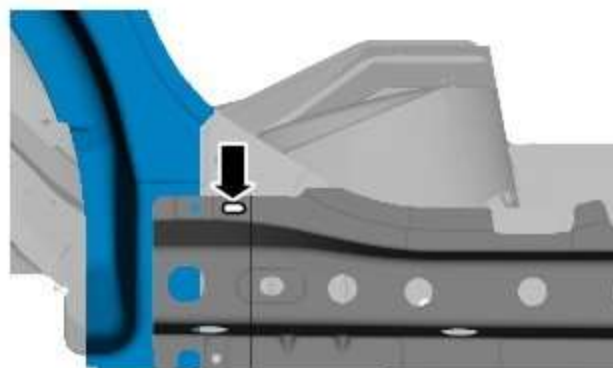
E 108376

17. Cut the rocker panel inner reinforcement at the point indicated.





E 108377

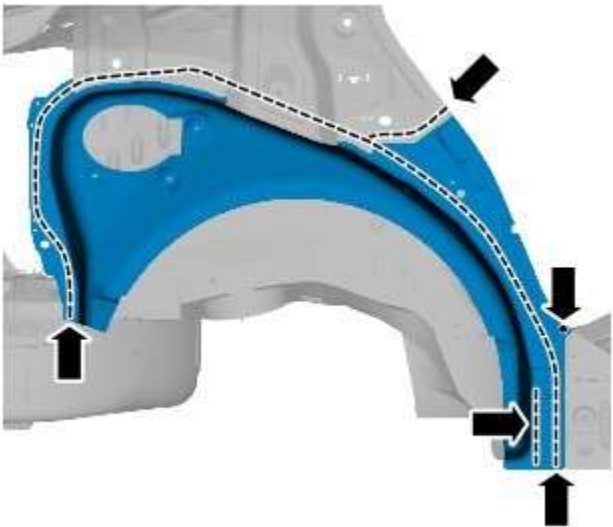
18. Drill out the spot welds.



E 108378

19.  NOTE: Care should be taken, when releasing the MAG weld, as the rocker panel inner reinforcement section is to be reused.
- Using a belt sander, release the rocker panel inner reinforcement from the MAG weld at the point indicated.


20.  NOTE: Care should be taken when separating and removing the rocker panel inner reinforcement section as it is to be reused.
- Separate the joints and remove the rocker panel inner reinforcement section. Retain for reuse on installation.



E 108379

21. NOTES:

 Where it is possible, spot welds should be drilled from inside to enable them to be replicated on installation.

 The quarter panel inner reinforcement section is removed for this procedure, the illustration shows it in place and is for reference only.

Drill out the spot welds.

22. Separate the joints and remove the old panel.

Installation

1. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

2. With the new panel in position, mark the position of MAG plug welds as indicated.



E 108380

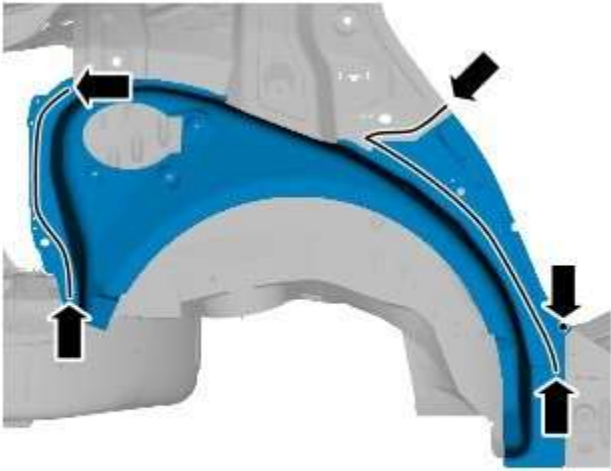
3. Remove the new panel.

4. Drill holes ready for MAG plug welding, including those previously marked.




E 108381

5. Prepare the old and new panel joint surfaces.

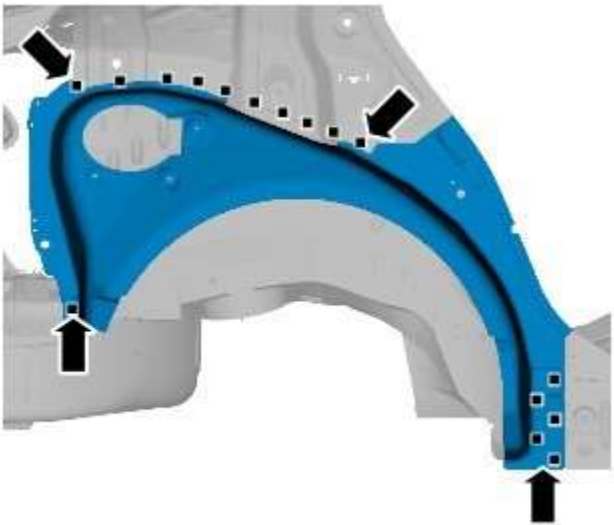


E 108382

6.  **NOTE:** Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original.

Spot weld.

7. MAG Plug weld.



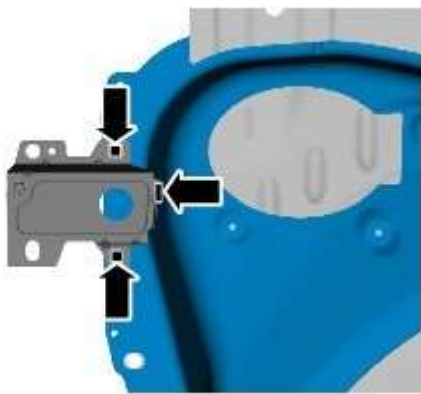
E 108383

8. Dress MAG plug welds.


9. If the right-hand rear wheelhouse outer is being repaired, prepare the panel joint surfaces of the ECM mounting bracket.

10. Offer up the ECM mounting bracket and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

11. MAG Plug weld the ECM mounting bracket.



E 108384

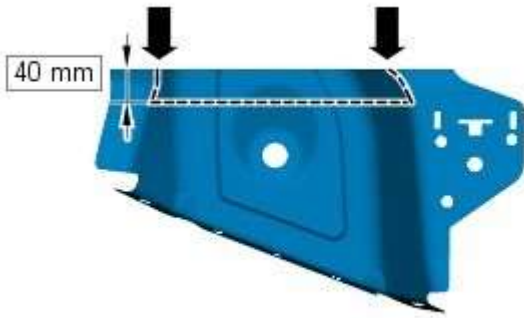
12.  NOTE: It may be necessary to remove or bend the safety belt mounting part of the template to aid alignment. Retain the template as this will be used to form a backing plate.



E 113243

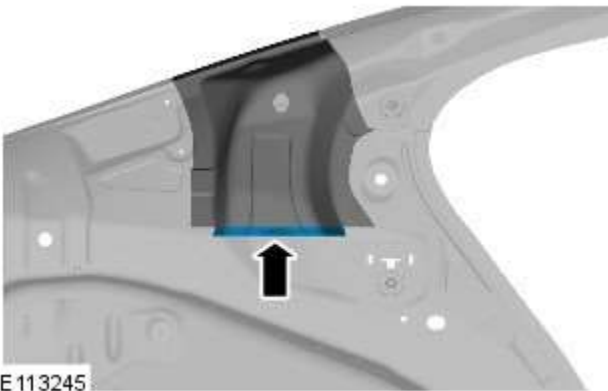
Offer up, align and clamp the old quarter panel inner reinforcement, "template", into position on the inside of the new quarter panel inner reinforcement. Cut along the top edge of the template, through the new quarter panel inner reinforcement, at the point where the MAG butt joint is to be made.


13. Remove the template from the new quarter panel inner reinforcement.



14. Cut and form a backing strip, a minimum of 40mm in width, from the template as indicated.

E113244



15.  NOTE: The backing strip should be positioned centrally so that it will fit equally between the original and the new quarter panel inner reinforcement sections, where the MAG butt weld is to be performed.

Offer up the backing strip to the original quarter panel inner reinforcement and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

E 113245

16. Remove the backing strip.

17. Drill holes in the original quarter panel inner reinforcement ready for MAG plug welding as indicated.




E 113246

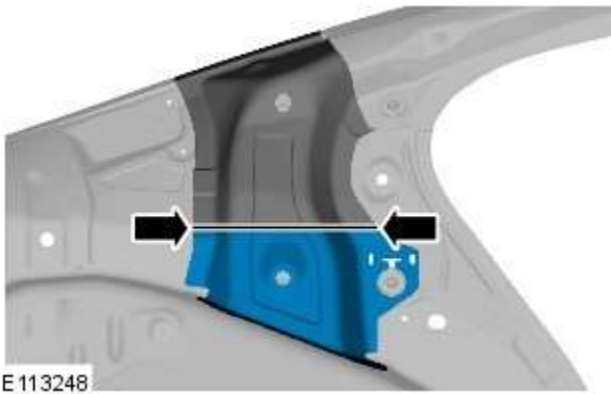
18. Prepare the panel joint surfaces of the new and the original quarter panel inner reinforcement and the backing strip.


19. Offer up the backing strip, align and clamp into position.



20.  NOTE: Do not dress the MAG plug welds.
MAG Plug weld the backing strip into position, as indicated.

21. Offer up the new quarter panel inner reinforcement and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
22. MAG tack weld the butt joint.
23. Dress the tack welds.



24.  NOTE: Do not dress the MAG butt weld.
MAG weld the butt joint.



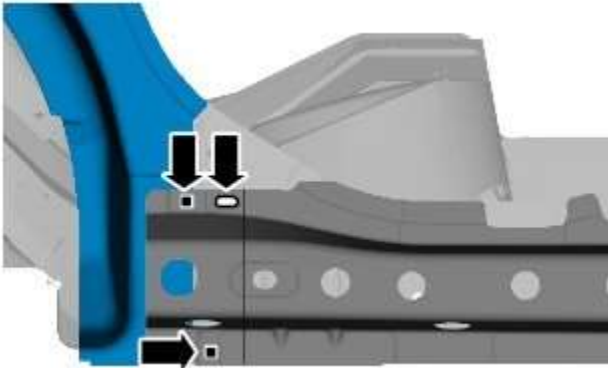
25. NOTES:
-  The right-hand panel is illustrated, the left-hand is similar although there are additional spot welds to install.
-  Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original.
- Spot weld.

26. Prepare the old and new panel joint surfaces, ready for installation of the rocker panel inner reinforcement section.
27. Offer up the rocker panel inner reinforcement section and clamp into position. Check alignment, if correct, proceed to next step, if not rectify

and recheck before proceeding.

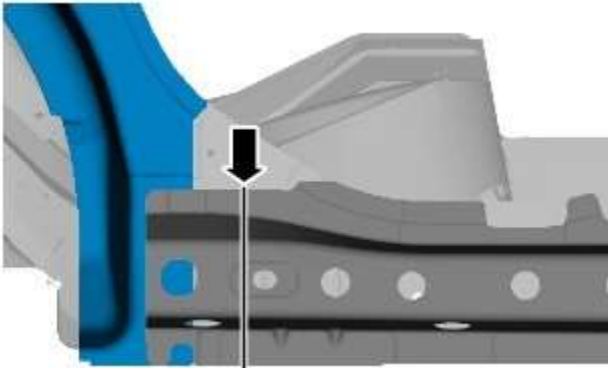
28. MAG tack weld the butt joint.

29. MAG plug weld.



E 108385

30. Dress the tack welds.



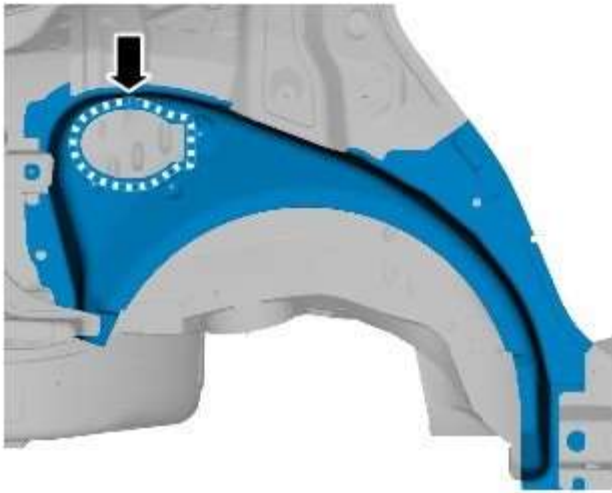
E 108386

31. MAG weld the butt joint.

32.  NOTE: Do not dress the MAG welds at the quarter panel inner reinforcement.

Dress all welded joints.

33. Make sure any remaining areas of bare metal created during this procedure are treated with a zinc primer, prior to the installation of outer panels.





E108387

34. If the right-hand rear wheelhouse outer is being repaired, prepare the NVH component at the fuel filler aperture, apply sealer adhesive, and install as indicated.



E 108389

35.  NOTE: The NVH component at the striker reinforcement panel should be installed with the new quarter panel, sealer adhesive should be applied as the new quarter panel is installed.
Remove the NVH component from the old striker reinforcement panel, prepare, apply sealer adhesive and install on the new striker reinforcement panel on the quarter panel service panel.

36.  NOTE: Adhesive must be applied to the striker reinforcement panel as the new quarter panel is installed.
- Apply adhesive to the new striker reinforcement panel on the new quarter panel.



E 108388

37. The installation of associated panels and components is the reversal of removal procedure.

Rear End Sheet Metal Repairs - Spare Wheel Well

Removal and Installation

Removal

1.  NOTE: The spare wheel well is manufactured from mild steel.


The spare wheel well is serviced as a separate weld-on panel, it is not serviced with the towing eye bracket, the spare wheel retaining bracket, or its weld studs.



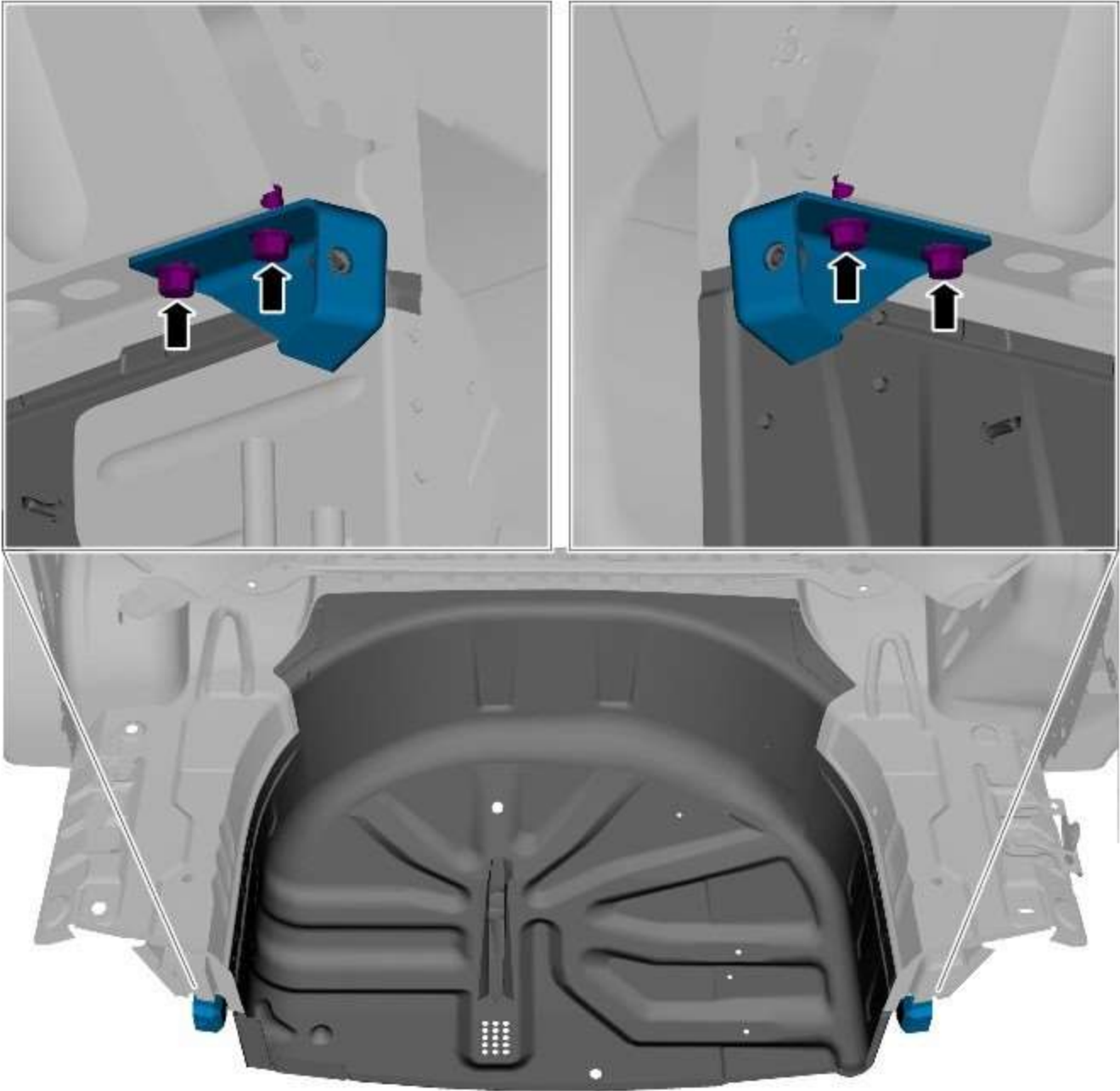
E112677

2. The spare wheel well is replaced in conjunction with:
 - Rear bumper cover
 - Rear bumper Back panel
 - Towing eye bracket
 - Rear subframe and rear suspension, as an assembly
3. For additional information relating to this repair procedure please see the following:
For additional information, refer to: [Health and Safety Precautions](#) (100-00 General Information, Description and Operation) / [Body Repairs](#) (501-25A Body Repairs - General Information, Description and Operation) / [Corrosion Protection](#) (501-25B Body Repairs - Corrosion Protection, Description and Operation) / [Body and Frame](#) (501-26 Body Repairs - Vehicle Specific Information and Tolerance Checks, Description and Operation).
4. Remove the back panel.
For additional information, refer to: [Back Panel](#) (501-30 Rear End Sheet Metal Repairs, Removal and Installation).

5. Disconnect the generator electrical connectors.
6. Disconnect the battery positive cable and position it to one side.
7. Remove the rear subframe and rear suspension, as an assembly. For additional information, refer to: [Rear Subframe - V6 3.0L Petrol \(502-00 Uni-Body, Subframe and Mounting System, Removal and Installation\)](#).
8. Remove the fuel tank filler pipe. For additional information, refer to: Fuel Tank Filler Pipe (310-01B, Removal and Installation).
9. Release the left-hand and right-hand luggage floor wiring harnesses and position them to one side.
10. Make sure that the rear seats are covered to prevent any damage during this repair procedure.

11.  NOTE: If undamaged, the left-hand and right-hand rear bumper retaining brackets should be reinstalled.

Remove the left-hand and right-hand rear bumper retaining brackets.




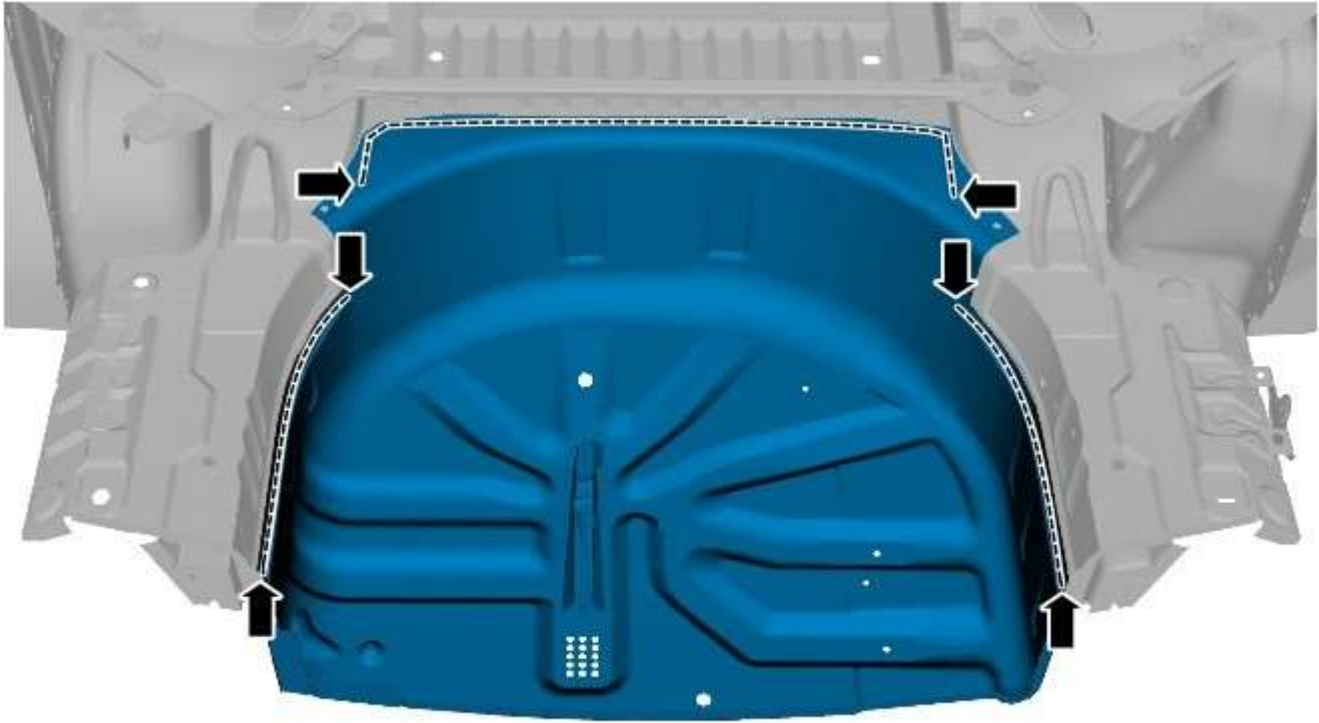
E112678

12. Remove the bolts as indicated.



E112679


13.  NOTE: Remove the sealer to expose the spot welds.
Drill out the spot welds.



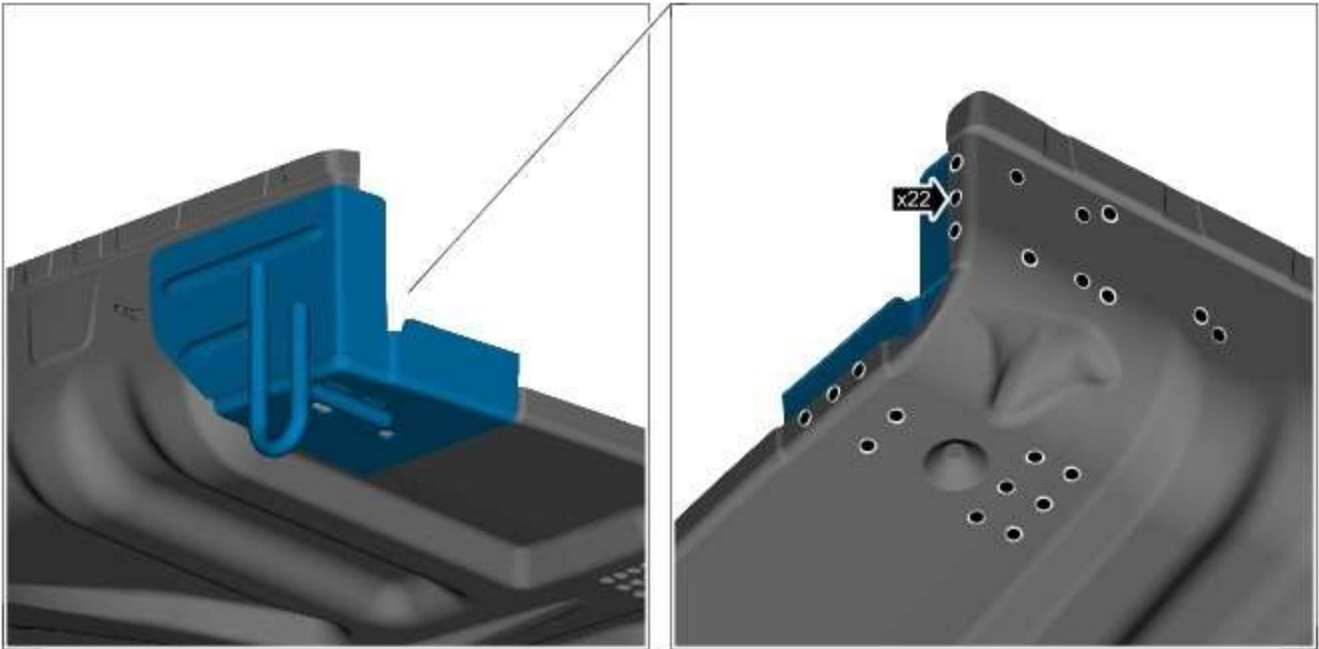
E112680

14.  NOTE: Retain the old panel for reference to the weld stud location points.


Separate the joints and remove the old panel.

15.  NOTE: Drill out from inside the spare wheel well to allow spot welds to be used in installation. If undamaged, retain the towing eye bracket for re-use on installation.

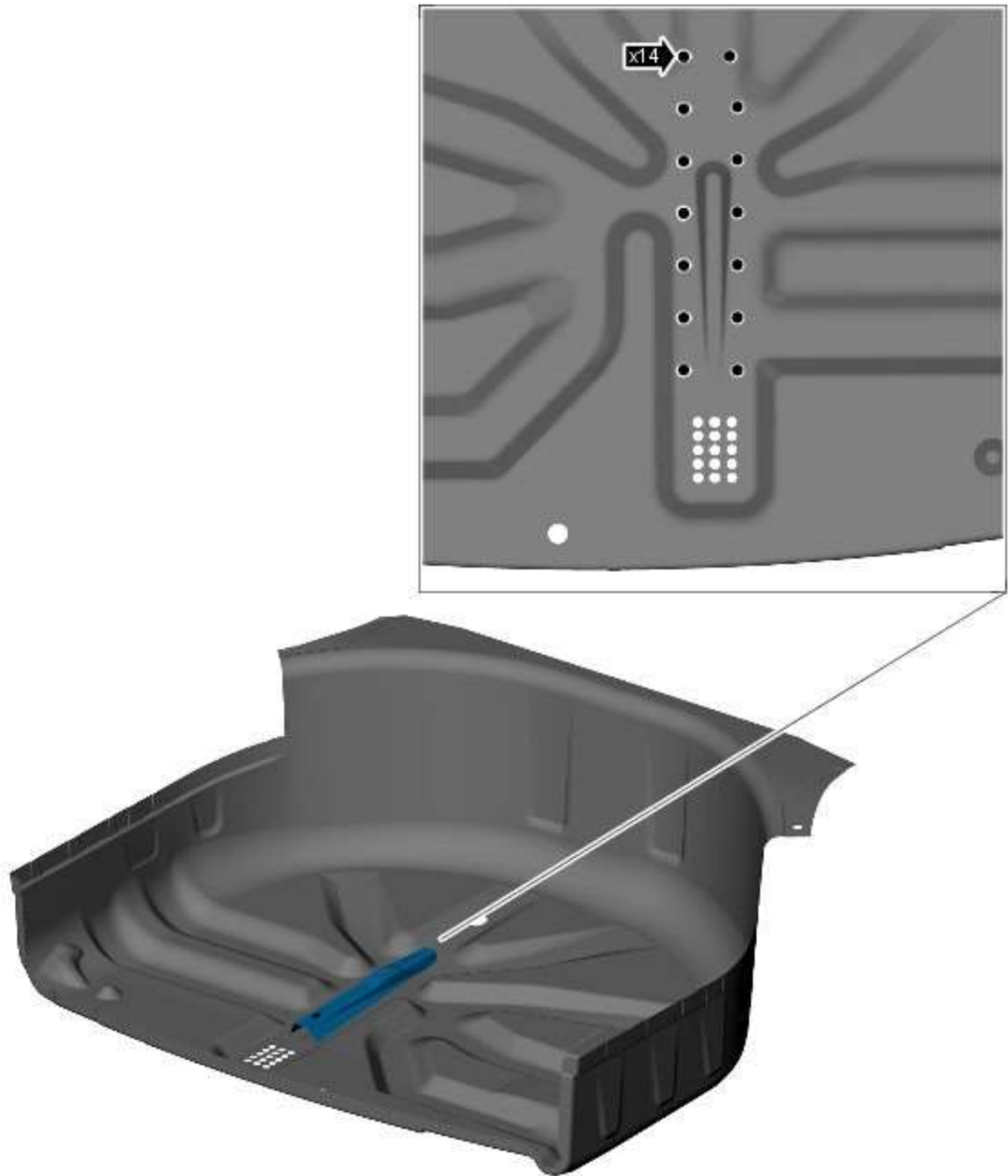
Drill out the spot welds and remove the towing eye bracket from the old panel.




E112681

16.  NOTE: Drill out from underneath to allow spot welds to be used in installation. If undamaged, retain the spare wheel retaining bracket for re-use on installation.

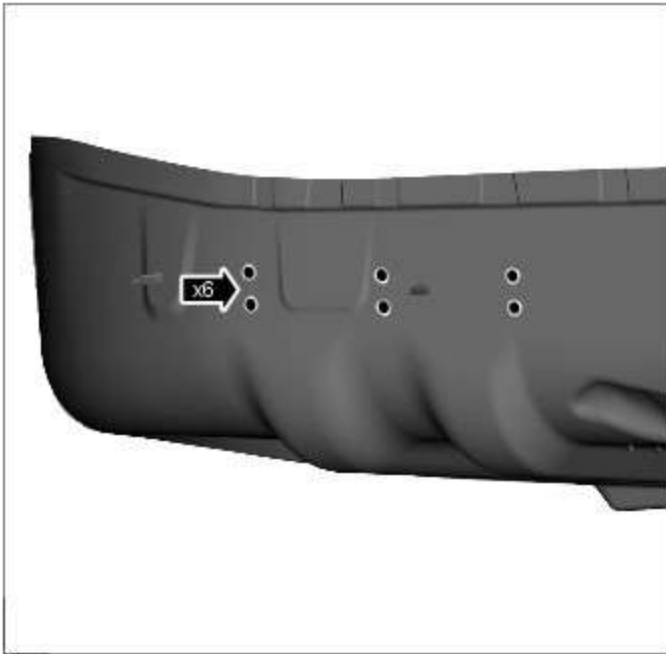
Drill out the spot welds and remove the spare wheel retaining bracket from the old panel.



E112682

17.  NOTE: Drill out from underneath to allow spot welds to be used in installation. If undamaged, retain the spare wheel well reinforcement plate for re-use on installation.

Drill out the spot welds and remove the spare wheel well reinforcement plate from the old panel.

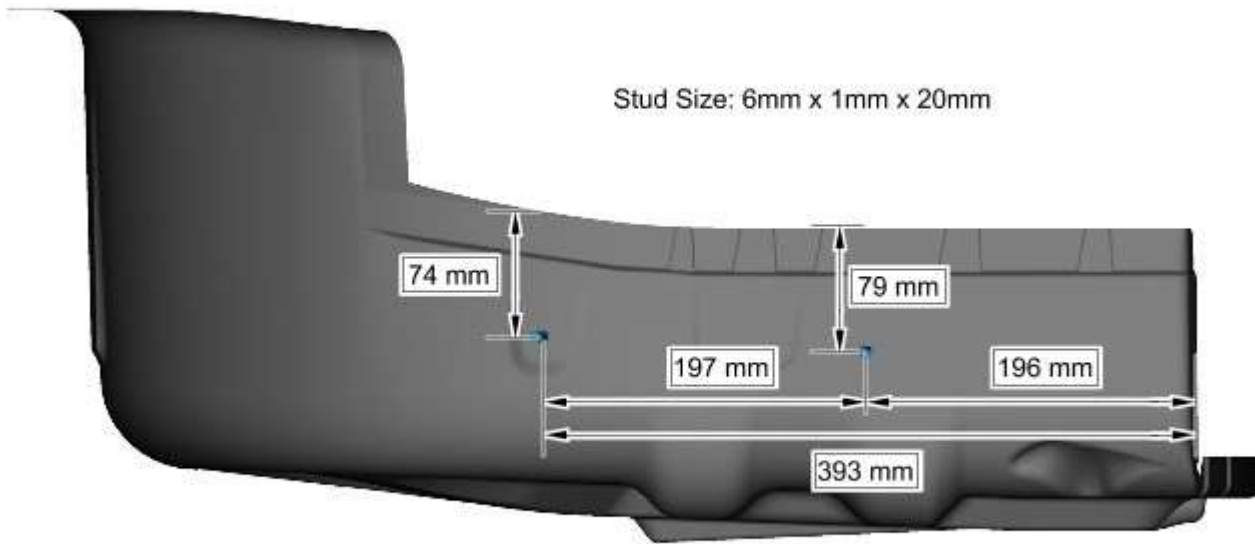


E112683

Installation

1. **NOTE:** Stud dimensions: 6mm x 1mm thread, 20mm length.

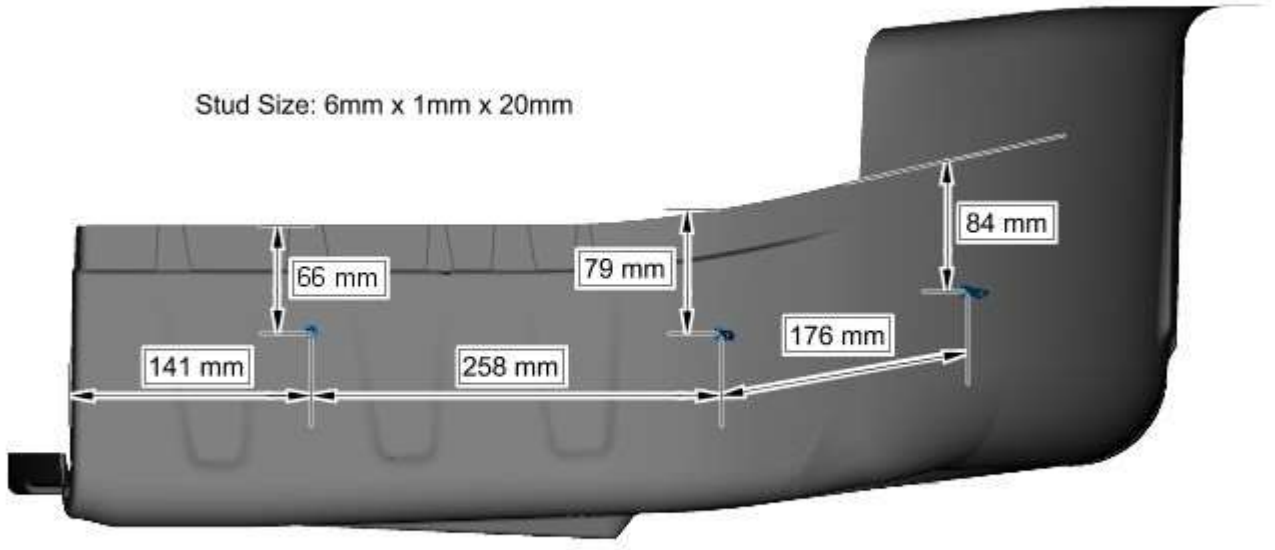
Using the old panel for reference, mark up and prepare the new spare wheel well and install the weld studs for the left-hand muffler and tailpipe heatshield as indicated.



E112684

2.  NOTE: Stud dimensions: 6mm x 1mm thread, 20mm length.

Using the old panel for reference, mark up and prepare the new spare wheel well and install the weld studs for the right-hand muffler and tailpipe heatshield as indicated.



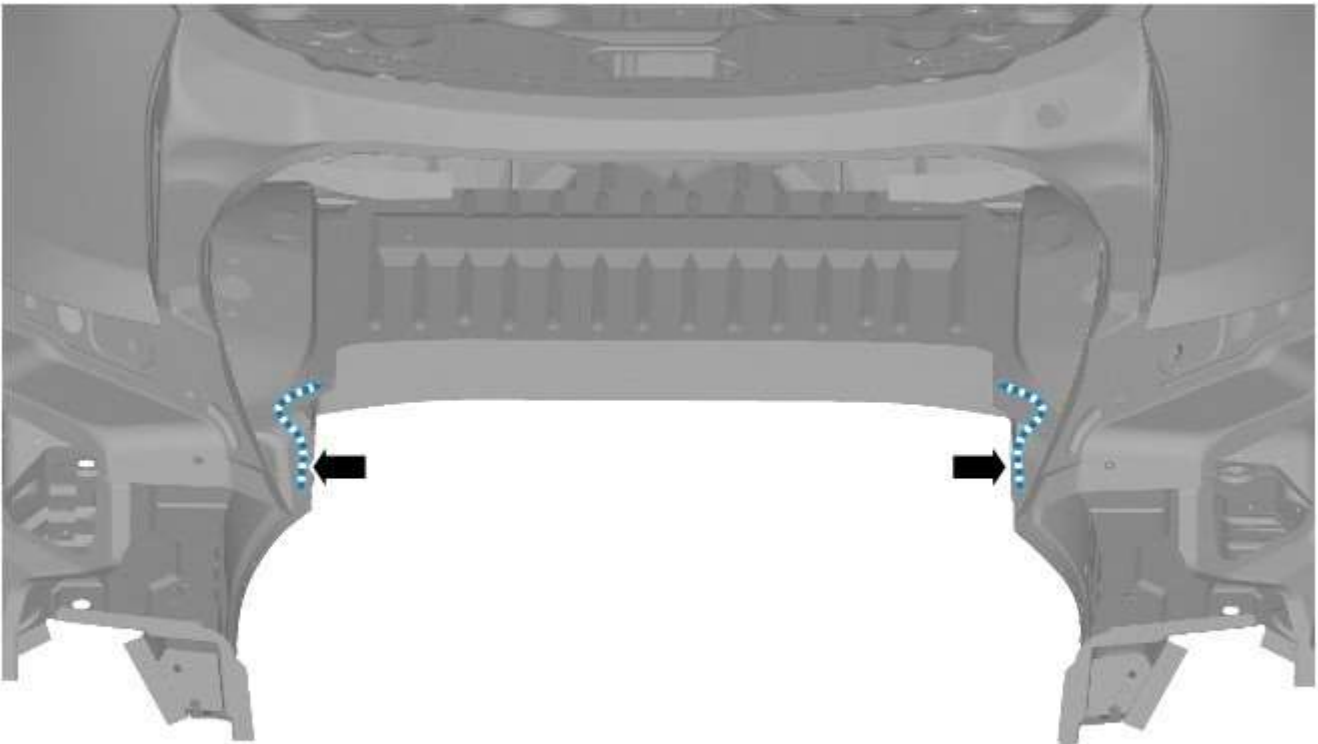
E112685

3. Drill holes in the new panel ready for MAG plug welding.



E112686

4. Prepare the old and new panel joint surfaces.
5. Offer up the new panel and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
6. Remove the new panel.
7. **NOTE: Make sure that the adhesive does not encroach into the areas of the MAG plug welds as it will contaminate the weld.**
Apply adhesive to the area as indicated.




E112687

8. Offer up, align and clamp the new panel into position.
9. Install the bolts as indicated.
 - Tighten to 25 Nm.



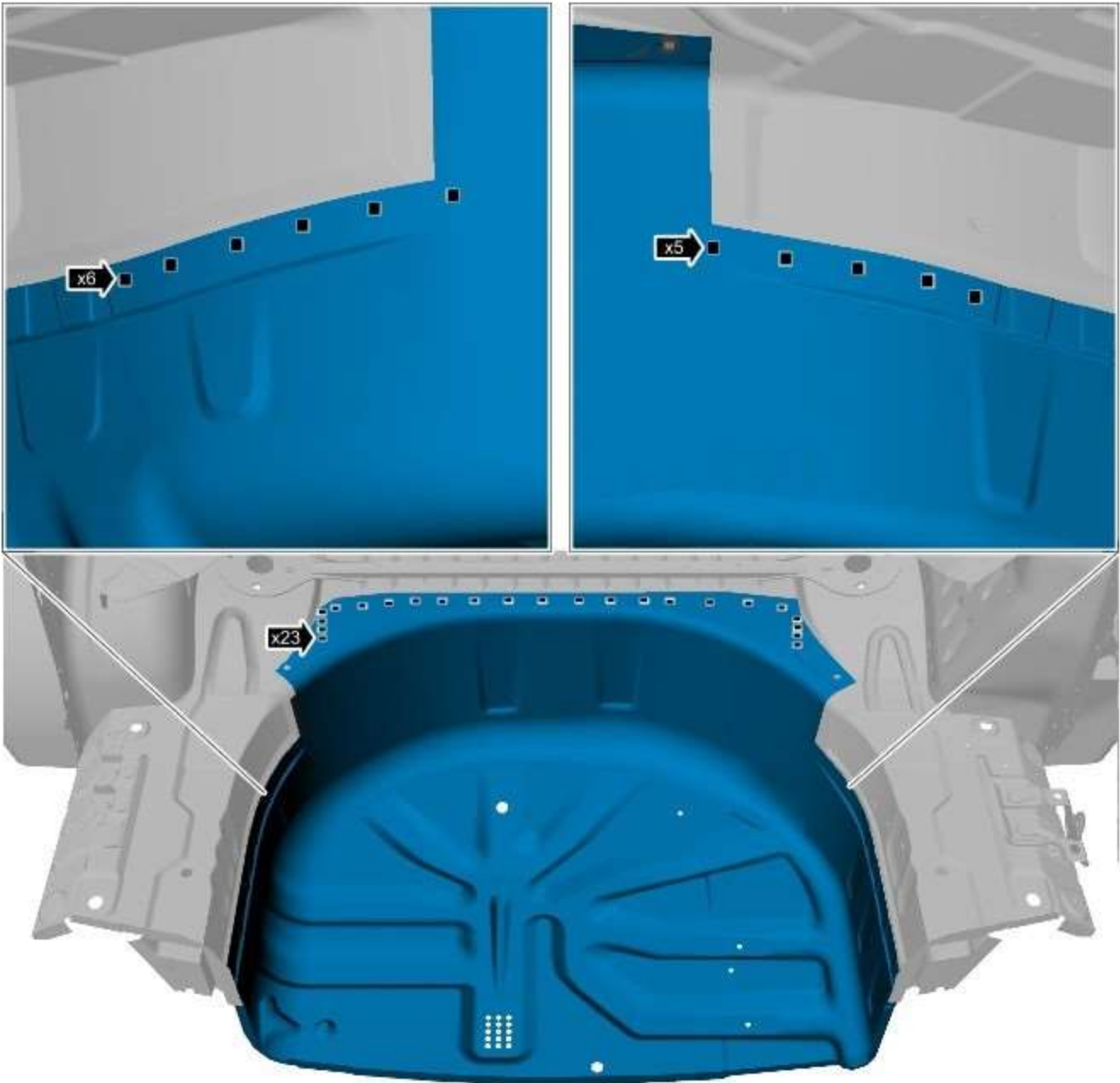
E112679

10.  NOTE: Spot welds must be installed 5mm away from the originals and in the same quantities, whenever this is possible. Where this is not possible, spot welds should be installed adjacent to the original.
Spot weld.




E 112688

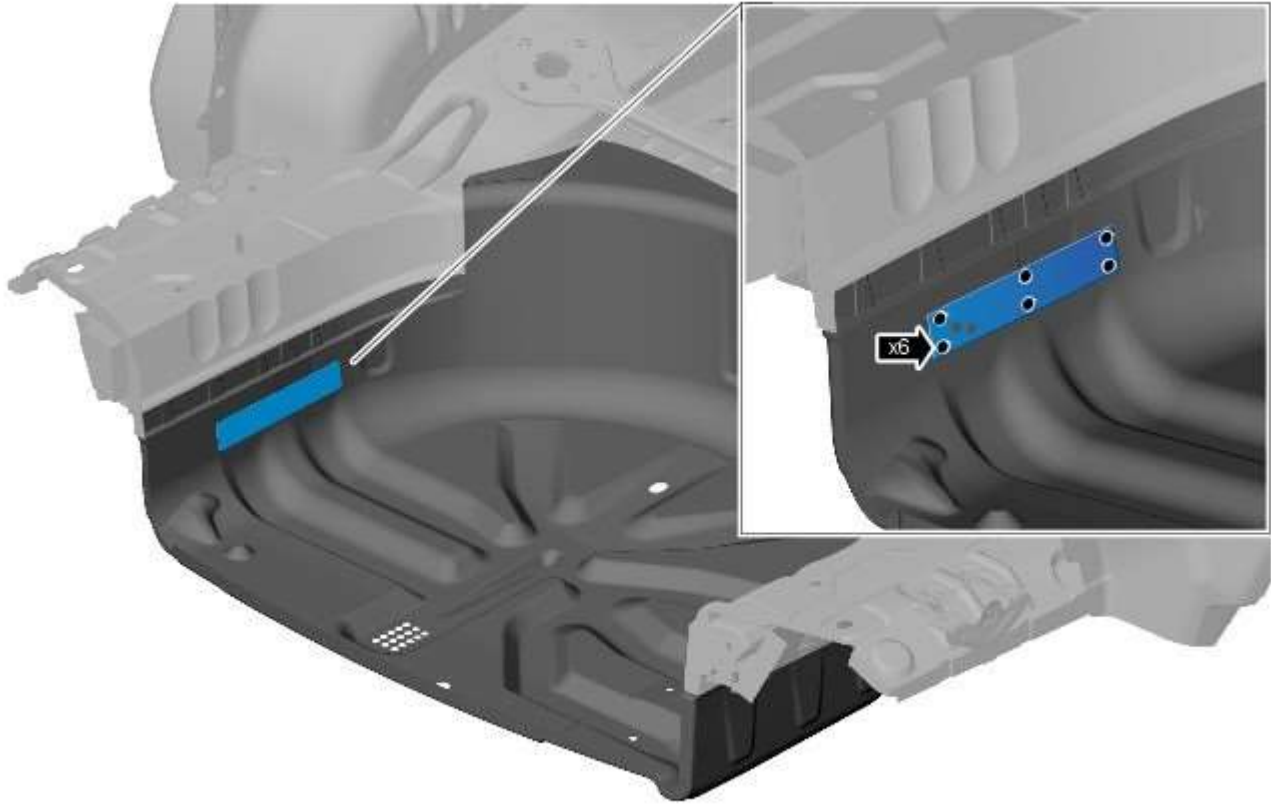
11. MAG plug weld.




E 112689

12. Prepare the panel joint surfaces of the spare wheel well reinforcement plate.
13. Offer up the spare wheel well reinforcement plate and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
14.  NOTE: If a new spare wheel well reinforcement plate is installed, two additional spot welds will be installed when the towing eye bracket is installed.

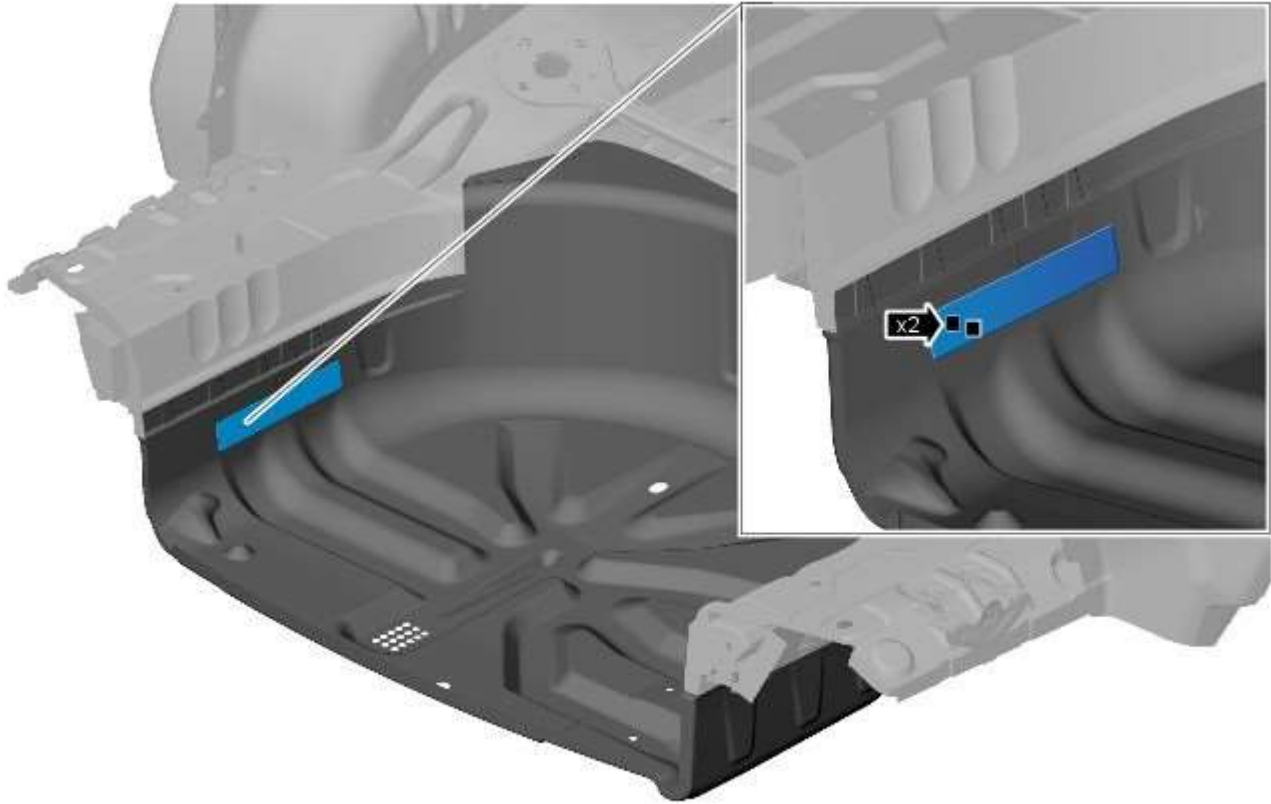
Spot weld the original spare wheel well reinforcement plate to the spare wheel well.



E112690

15.  NOTE: If a new spare wheel well reinforcement plate is installed, MAG plug welds are not required.


Drill through the two holes in the original spare wheel well reinforcement panel, through the spare wheel well, ready for MAG plug welding.



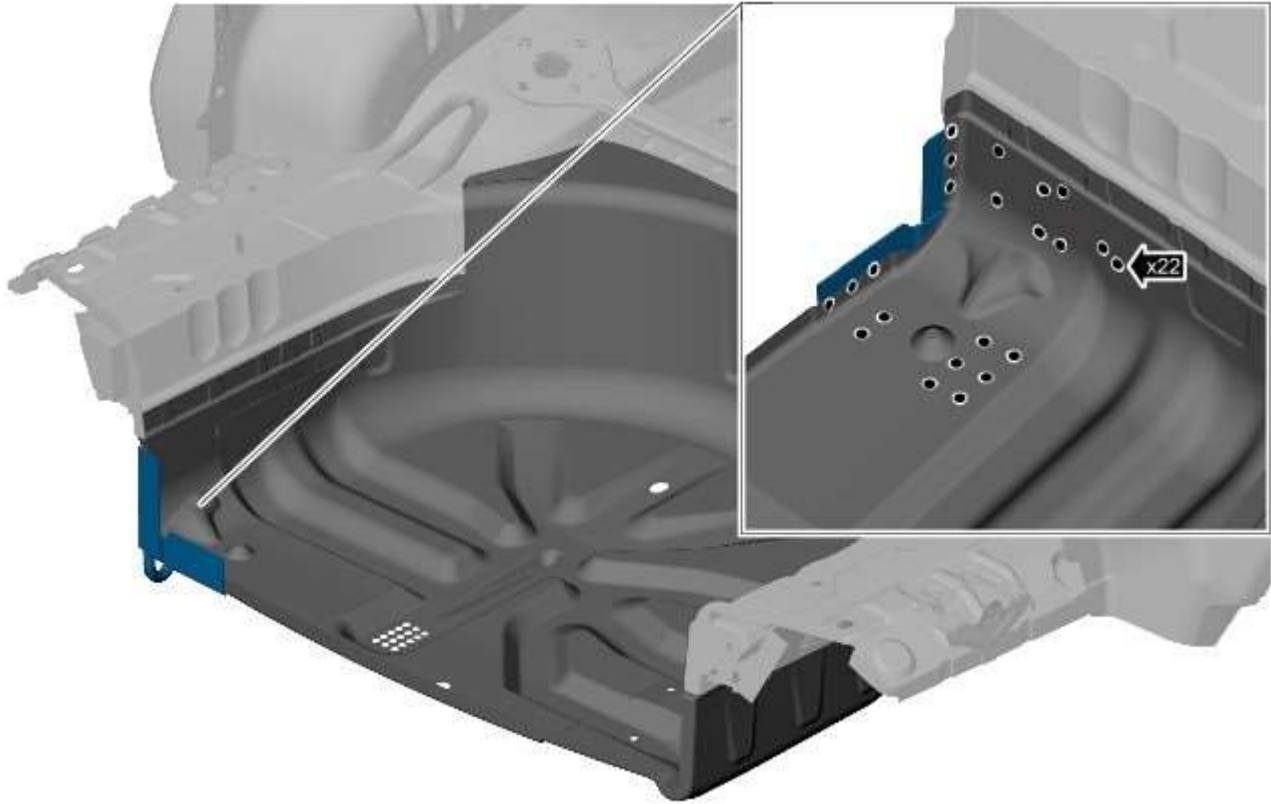
E112691

16. Prepare the panel joint surfaces of the towing eye bracket.


17. Offer up the towing eye bracket and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.

18.  **NOTE:** If a new spare wheel well reinforcement plate is installed, the towing eye bracket can be fully spot welded. If the original spare wheel well reinforcement plate is installed, two MAG plug welds will be required.

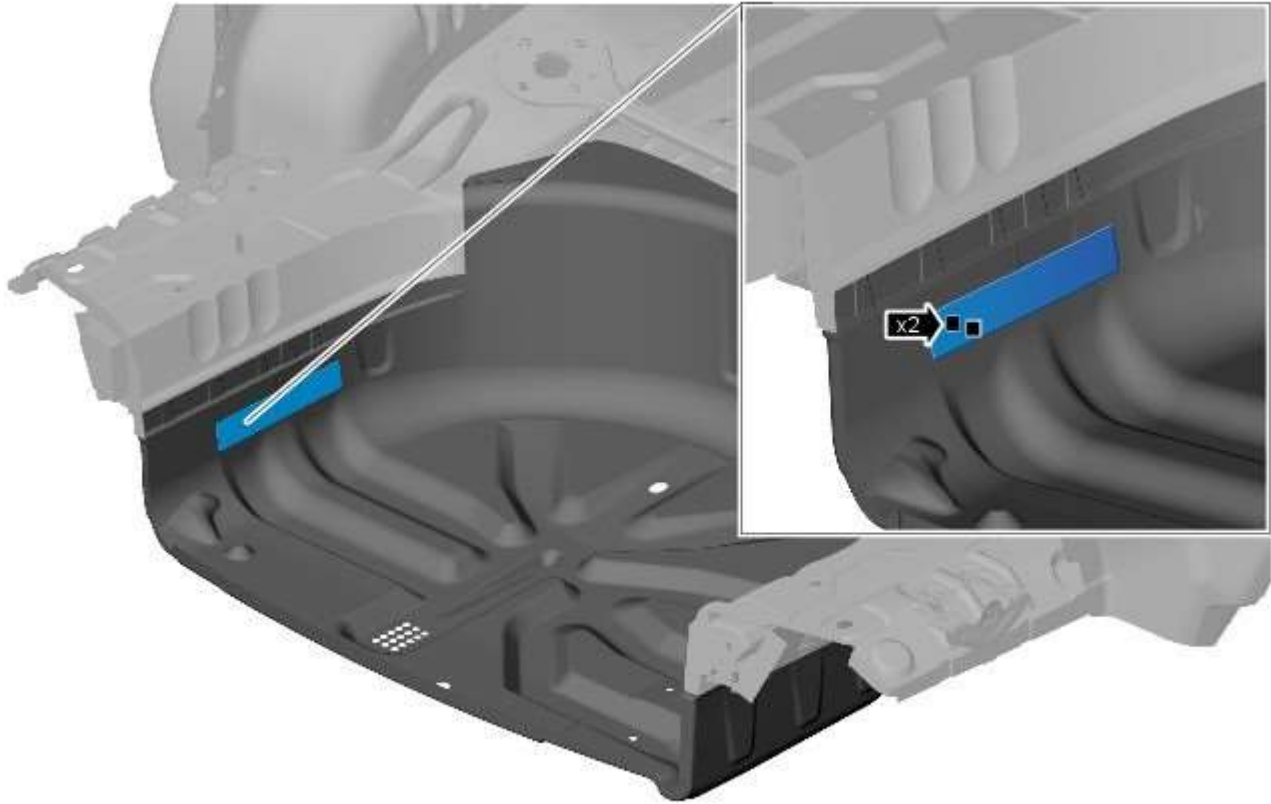
Spot weld the towing eye bracket to the spare wheel well.



E112692

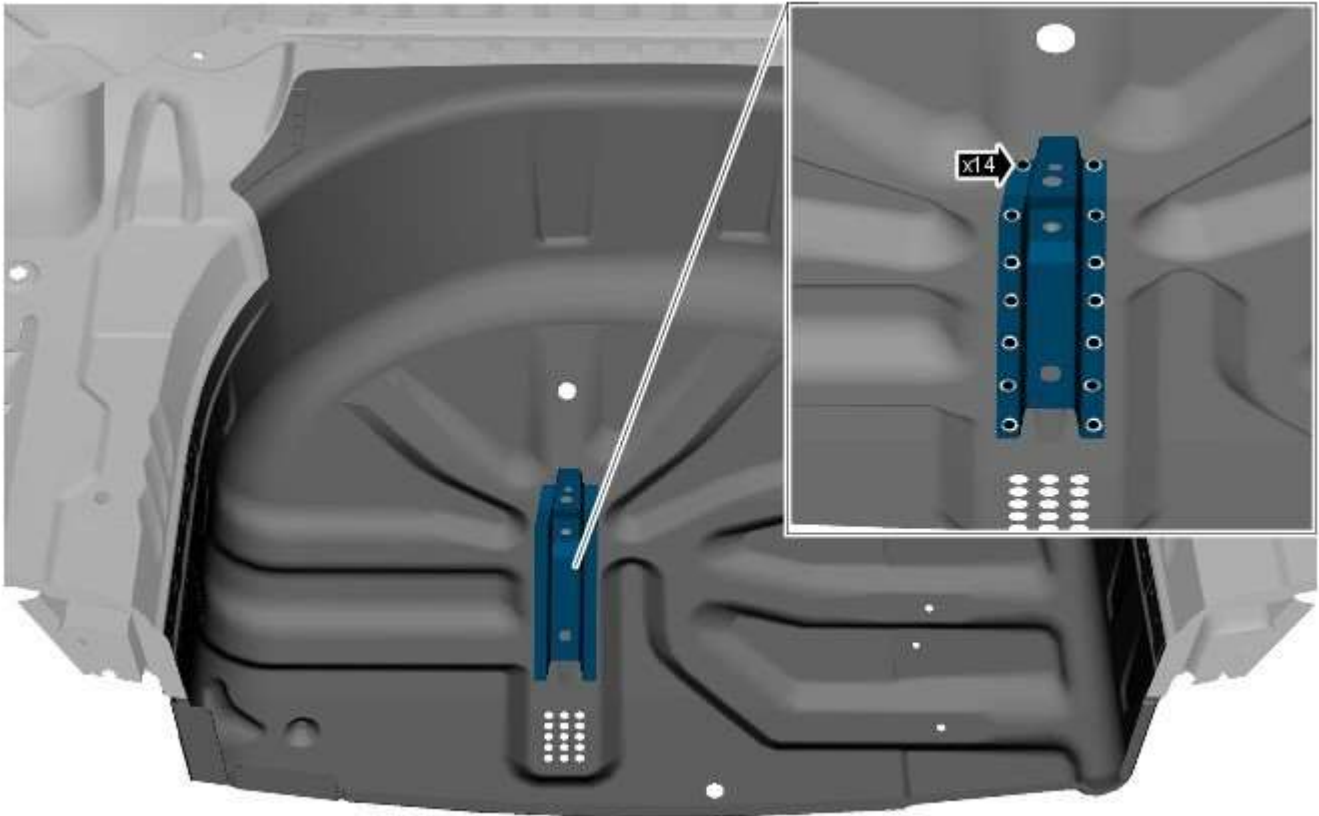
19.  NOTE: If a new spare wheel well reinforcement plate is installed, the towing eye bracket can be fully spot welded. If the original spare wheel well reinforcement plate is installed, two MAG plug welds will be required.

MAG plug weld the spare wheel well reinforcement plate through the spare wheel well into the towing eye bracket.



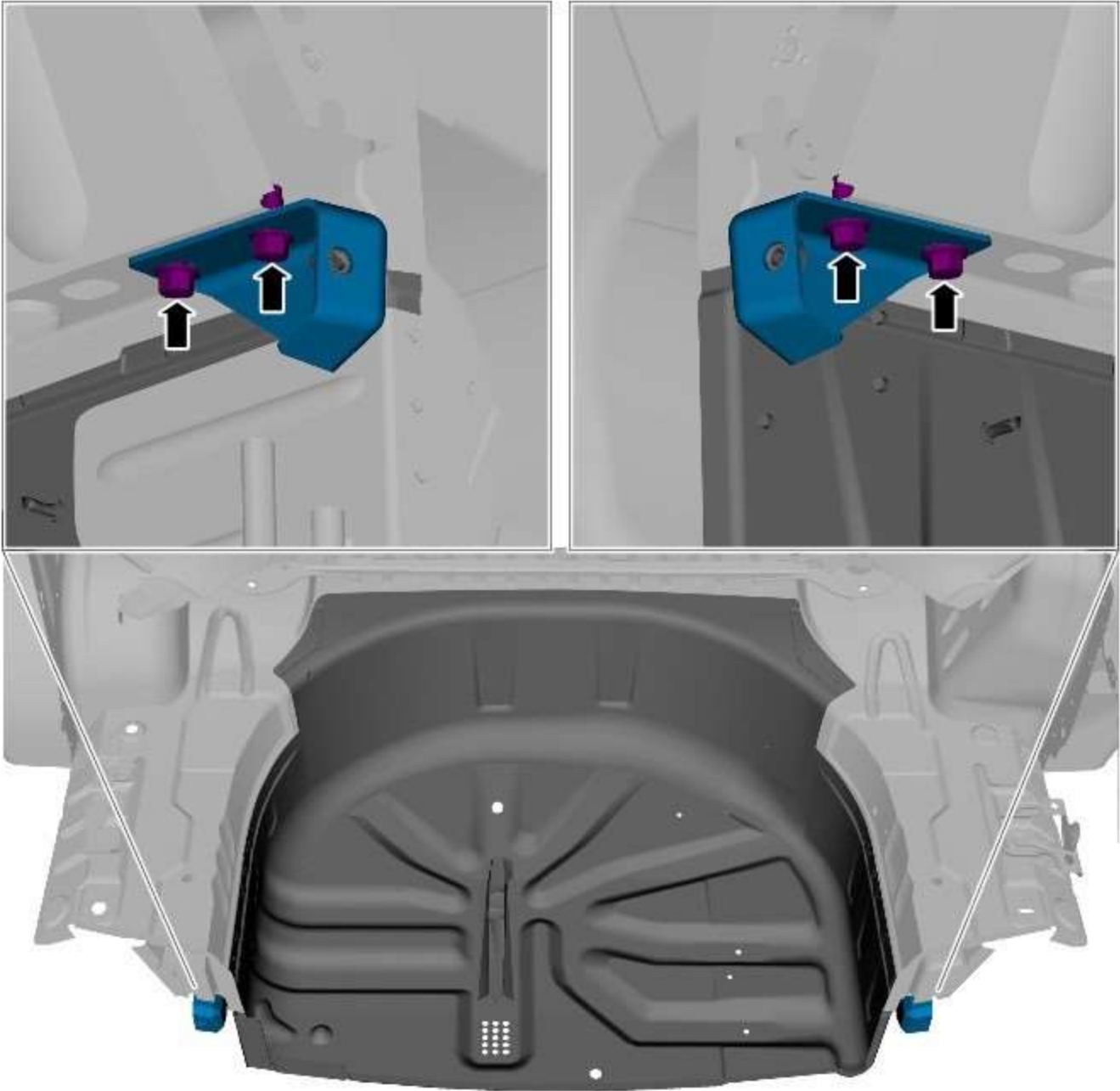
E112691

20. Prepare the panel joint surfaces of the spare wheel retaining bracket.
21. Offer up the spare wheel retaining bracket and clamp into position. Check alignment, if correct, proceed to next step, if not rectify and recheck before proceeding.
22. Spot weld the spare wheel retaining bracket to the spare wheel well.



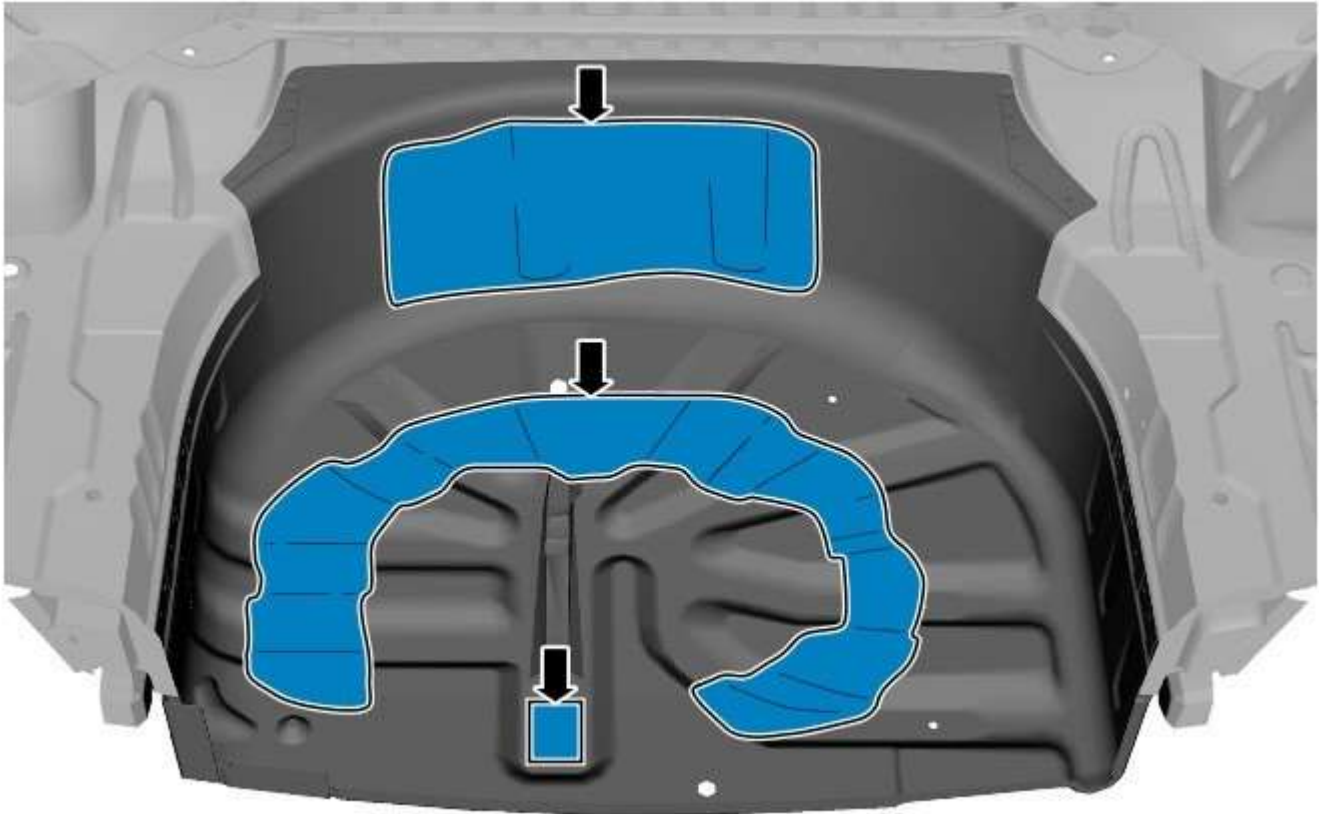
E112693

23. Dress all welded joints.
24. Make sure that any remaining areas of bare metal created during this procedure are treated with a zinc primer prior to the installation of outer panels.
25. Install the left-hand and right-hand rear bumper retaining brackets.
 - Tighten to 25 Nm.



E112678

26. Install the **NVH (noise, vibration and harshness)** sound deadening material as indicated.



E112694

27.  NOTE: Make sure all underbody joints are fully sealed following this repair procedure.

The installation of associated panels and components is the reversal of removal procedure.

Uni-Body, Subframe and Mounting System -



Torque Specifications

Description	Nm	lb-ft	lb-in
Front lower arm to front subframe retaining nut and bolt	175	129	-
Rear lower arm to front subframe retaining nut and bolt	175	129	-
Engine mount lower retaining nut	63	46	-
Steering gear retaining bolts	100	74	-
Front Shock absorber and spring assembly retaining bolt	175	129	-
Front subframe to body front retaining bolt			
Stage 1	100	73	-
Stage 2	270°	270°	-
Front subframe to body rear retaining bolt			
Stage 1	80	59	-
Stage 2	240°	240°	-
Front Stabilizer bar link retaining nuts	43	31	-
Front Stabilizer bar link retaining bolts	55	41	-
Rear Shock absorber and spring assembly retaining bolt	133	98	-
Rear subframe reinforcement plate retaining bolts	47	35	-
Rear subframe to body retaining bolts			
Stage 1	80	59	-
Stage 2	240°	240°	-

Uni-Body, Subframe and Mounting System - Front Subframe V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Special Tool(s)

 <p>303-021</p>	<p>303-021 Engine support bracket</p>
 <p>E115254</p>	<p>303-1436 Engine Lifting Bracket Front</p>
 <p>E138547</p>	<p>502-005 Alignment Bolts, Subframe</p>


General Equipment

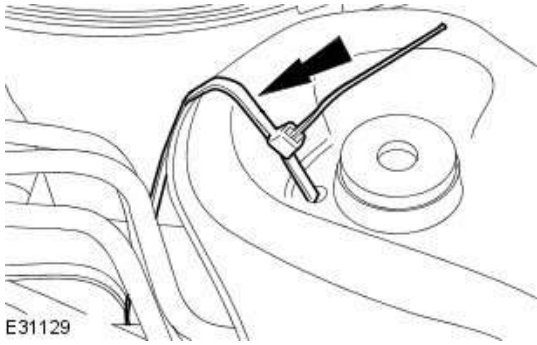
Powertrain Jack

Removal

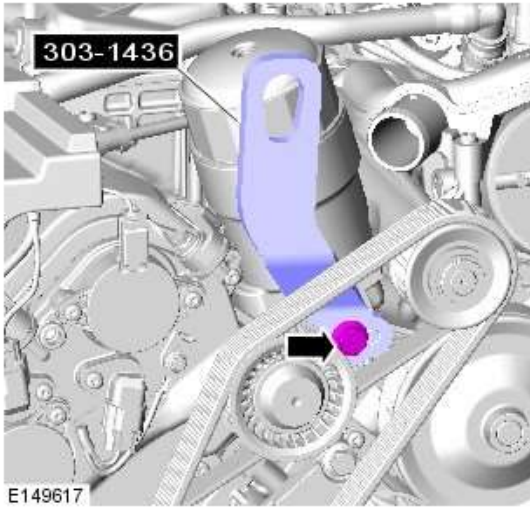


NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

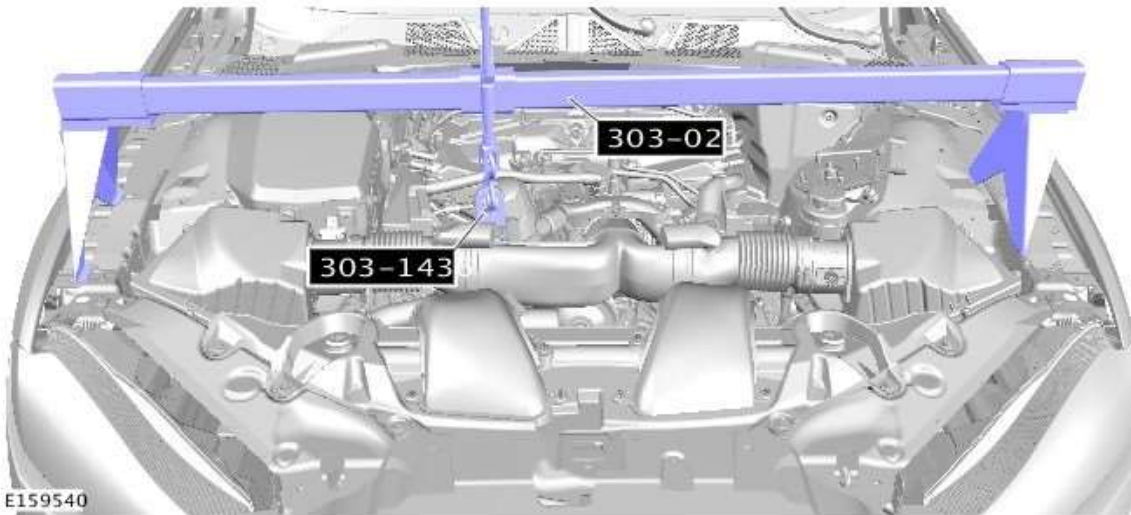
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2.  **WARNING:** Make sure to support the vehicle with axle stands.
Raise and support the vehicle.
3. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
5. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).




6. Secure the radiator assembly.



- 7.
- *Special Tool(s):* [303-1436](#)
 - *Torque:* 40 Nm



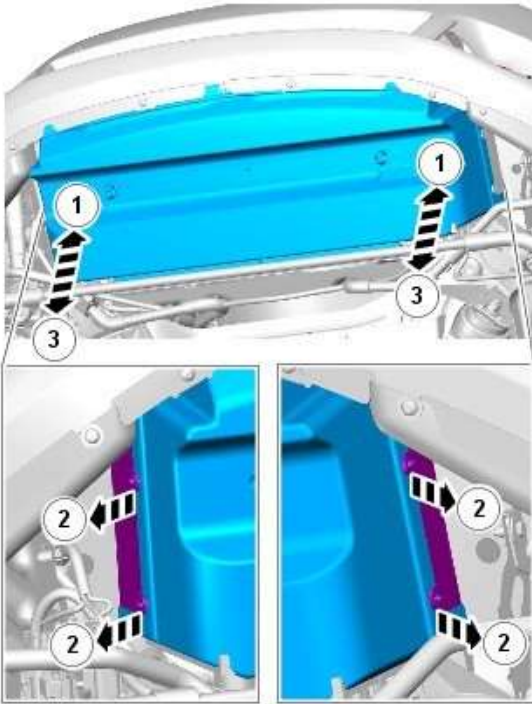
8. CAUTIONS:

 Support the engine on a jack. The angle may need to be adjusted during this procedure.

 Make sure to protect the paintwork.

- *Special Tool(s):* [303-021](#)
- *Special Tool(s):* [303-1436](#)

9.



E97870

10.

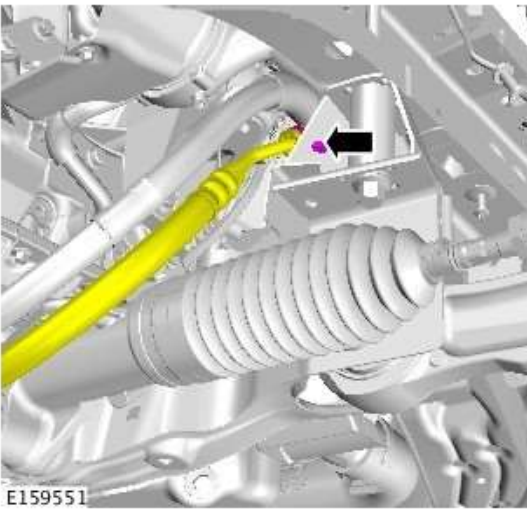


E159549

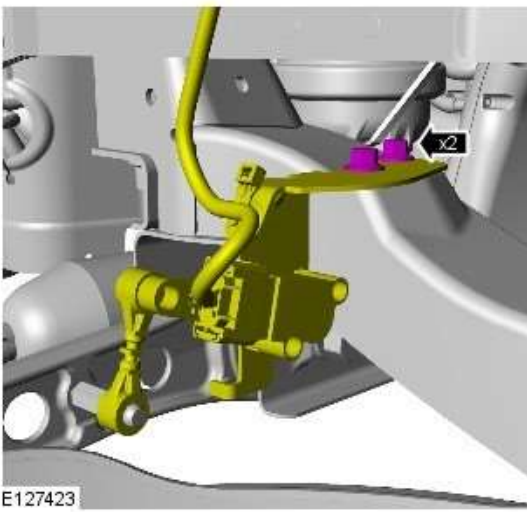
11.



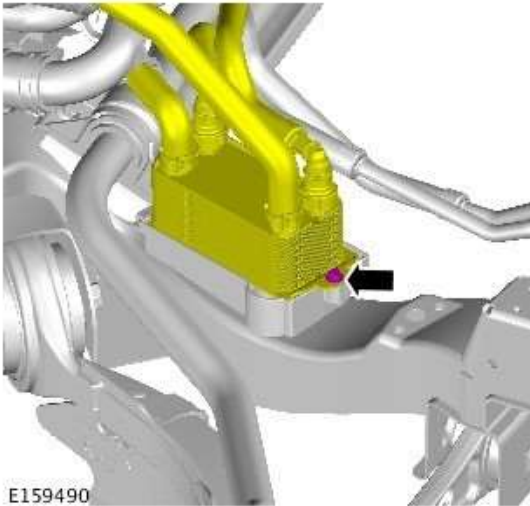
12.



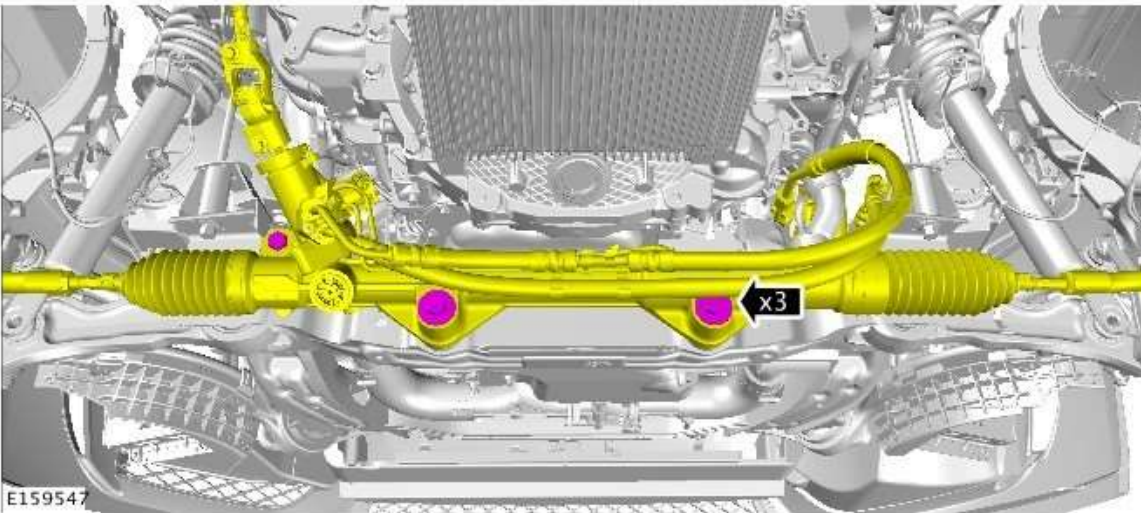
13.



14.




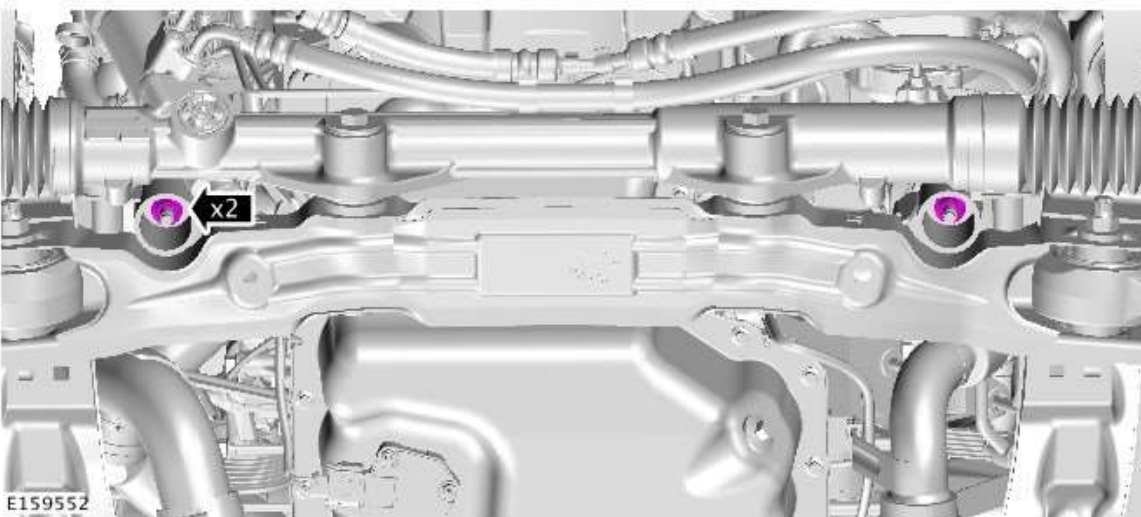
E159490



E159547

15.  **CAUTION:**
Make sure to
support the
steering gear.

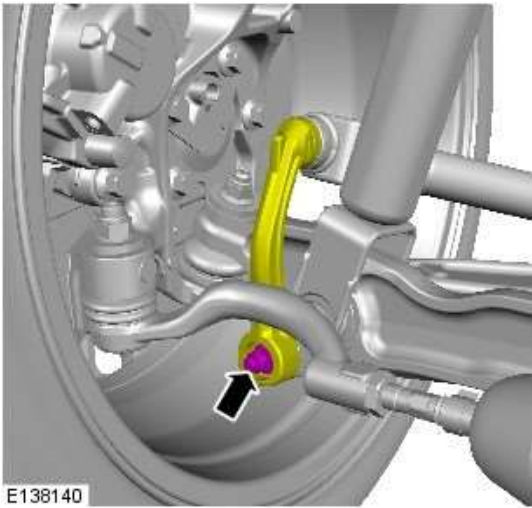
 **NOTE:**
LHD illustration
shown, RHD is
similar.



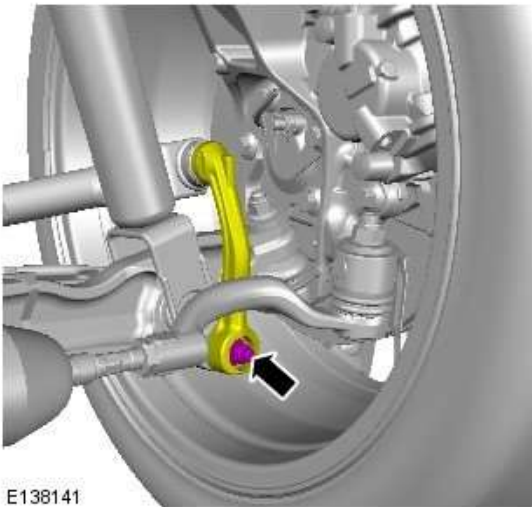
E159552

16.

17.



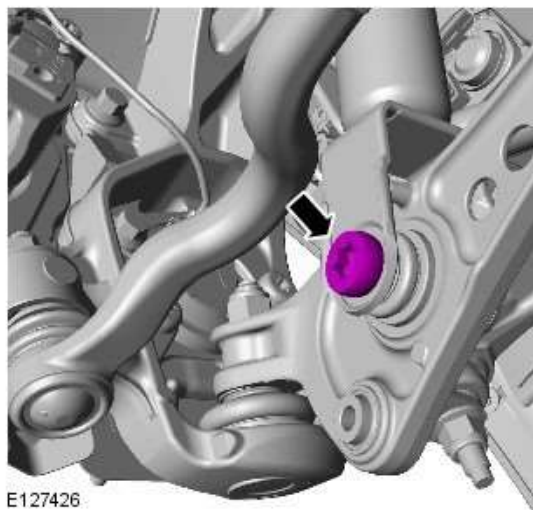
18.

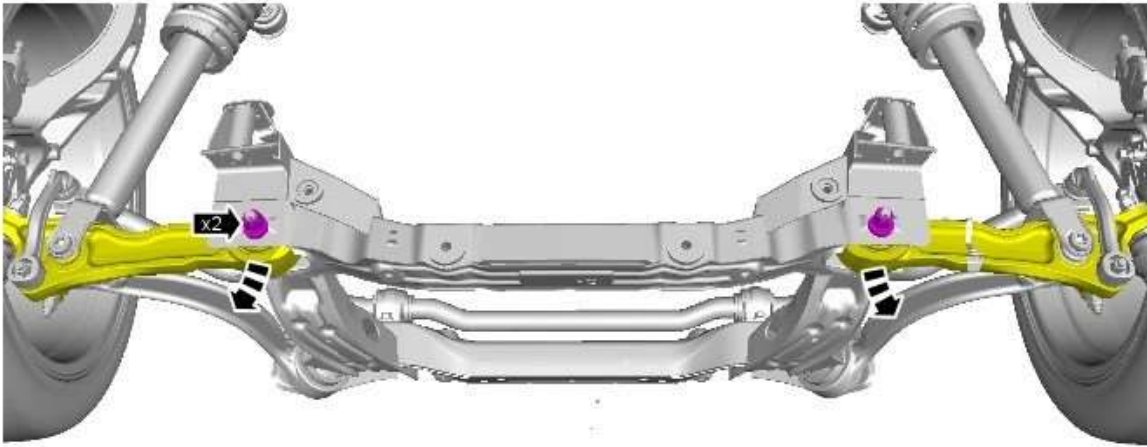


19. NOTES:


 LH illustration shown, RH is similar.

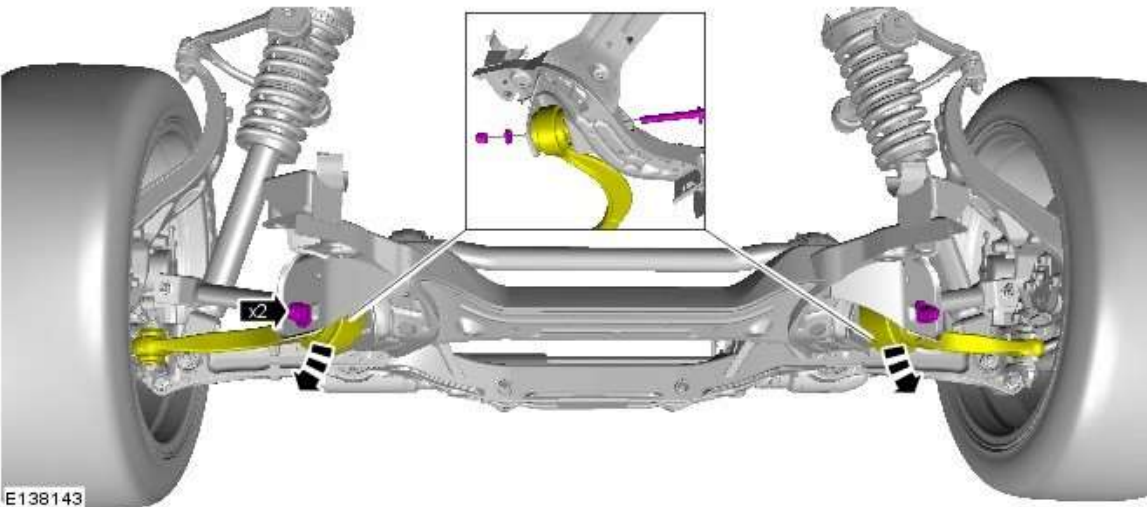
 Repeat the step for the other side.







E138142

20.  **NOTE:**
 Note the fitted position of each bolt, mark the washers and sub-frame before removal to aid assembly.

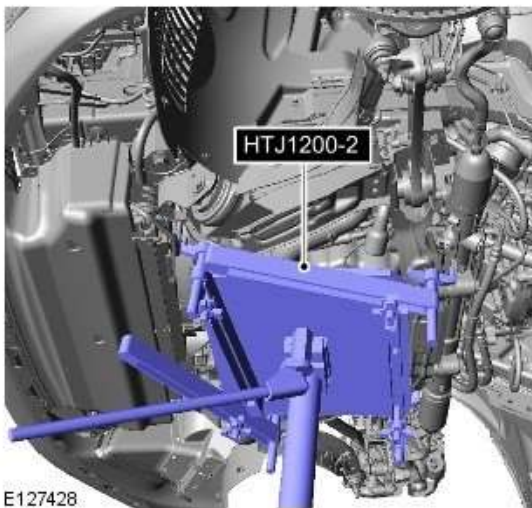


E138143

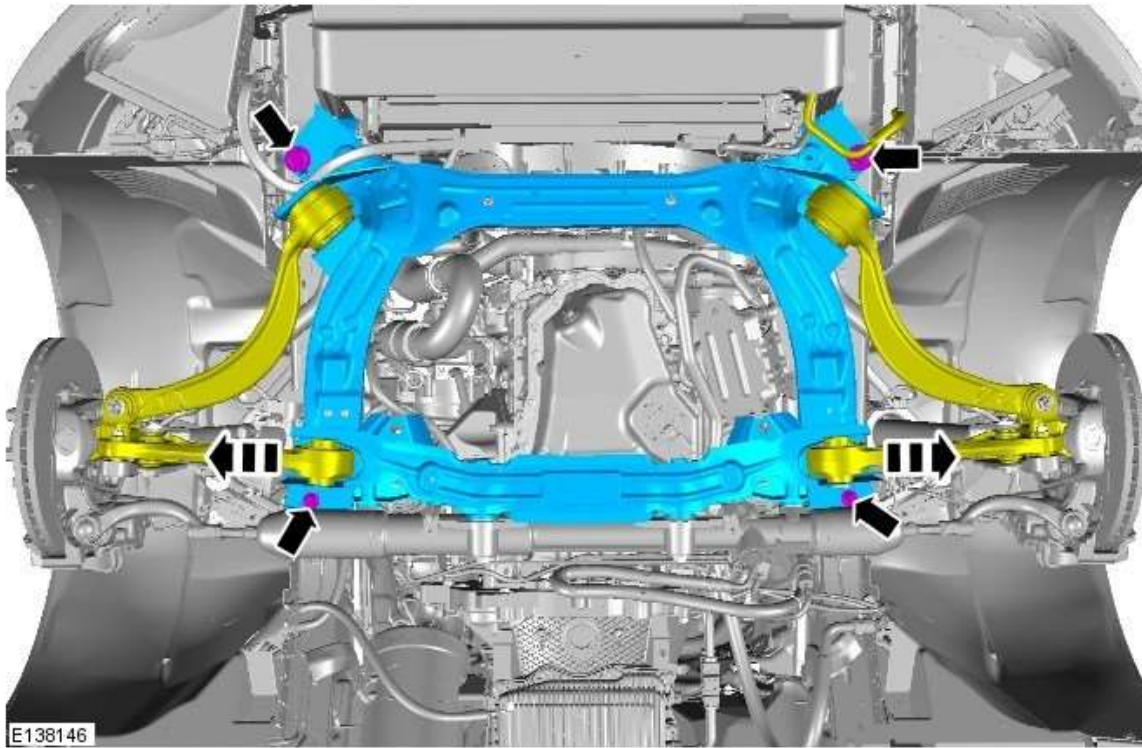
21.  **CAUTION:**
 Make sure the wheel knuckle is supported. Failure to follow these instructions may result in damage to the vehicle.


-  **NOTE:**
 Note the fitted position of each bolt, mark the washers and sub-frame before removal to aid assembly.

22. General Equipment: [Powertrain Jack](#)




E127428



23.  **CAUTION:**
Take extra care not to damage the air conditioning (A/C) pipes when lowering the component.

NOTES:

 This step requires the aid of another technician.

 Do not disassemble further if the component is removed for access only.



24.

E127430



25.

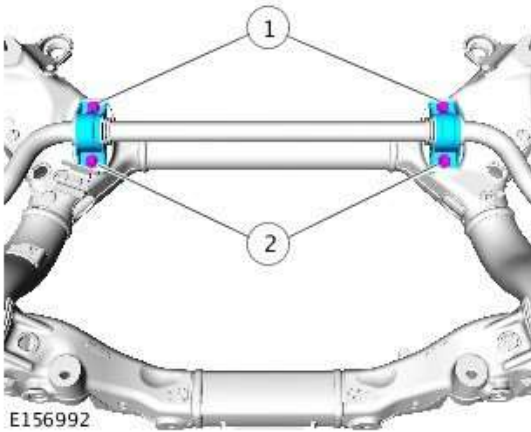
E127431

Installation




E127431

1.  CAUTION: Only tighten the bolts finger-tight at this stage.



E156992

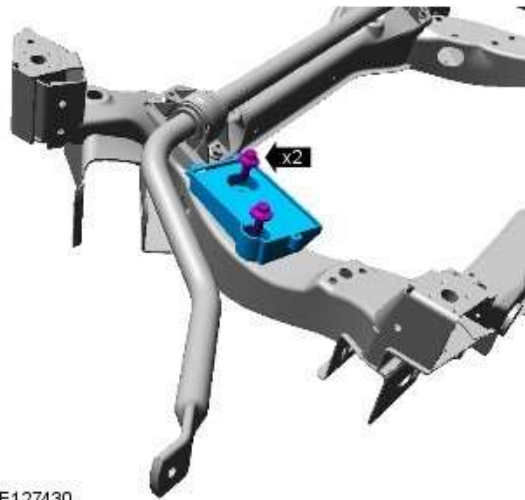
2.  CAUTION: Tighten the bolts in the sequence shown.

Torque:

Bolt 1 63 Nm

Bolt 2 63 Nm

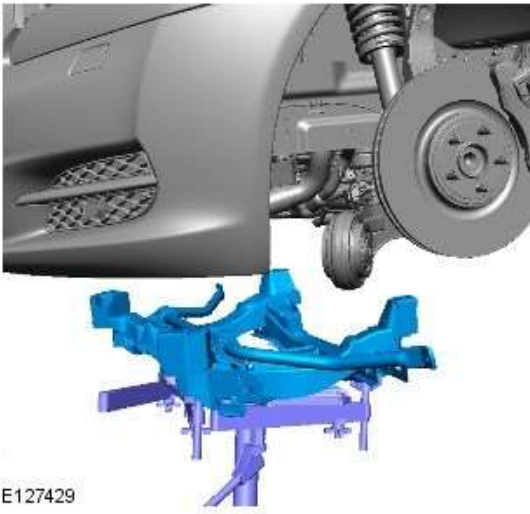
Bolt 1 63 Nm



E127430

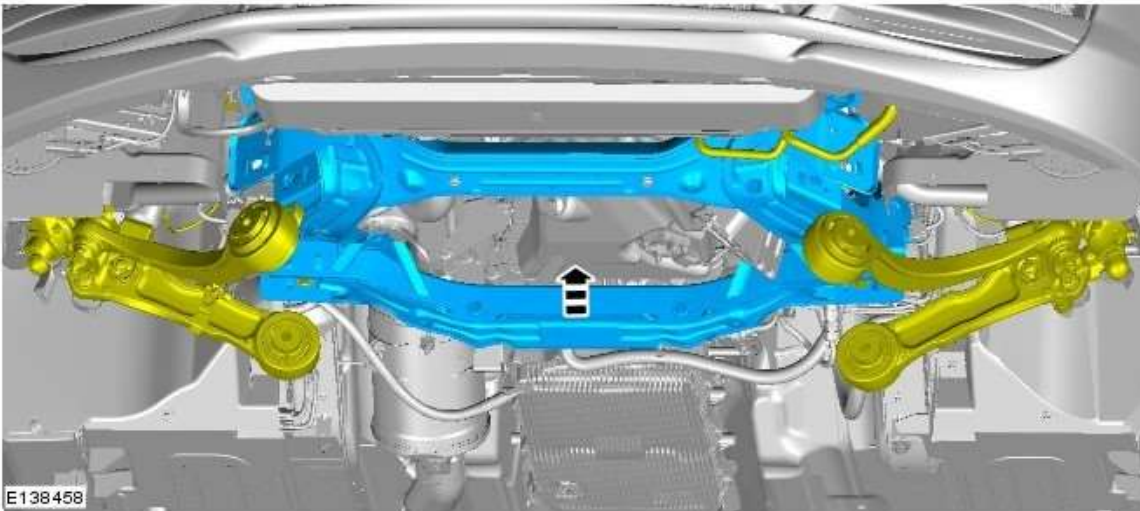
3. *Torque:* 12 Nm

4. General Equipment: [Powertrain Jack](#)



E127429

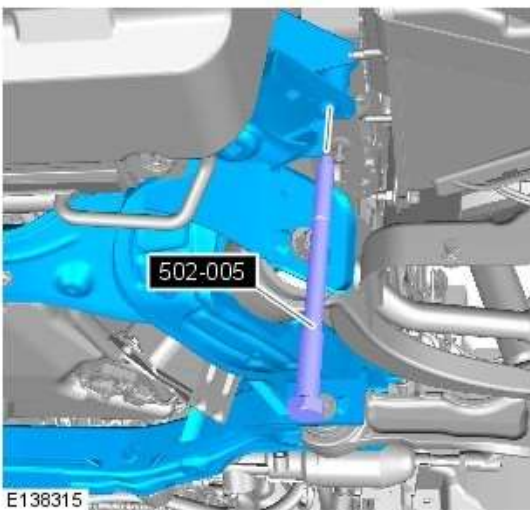
5.



E138458

6. Install the special tool to the front subframe.

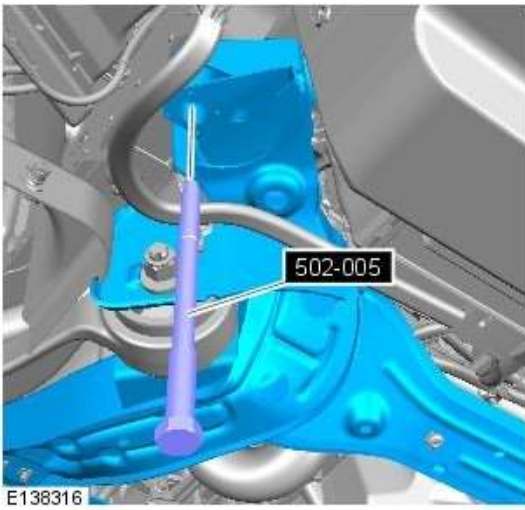
Special Tool(s): [502-005](#)



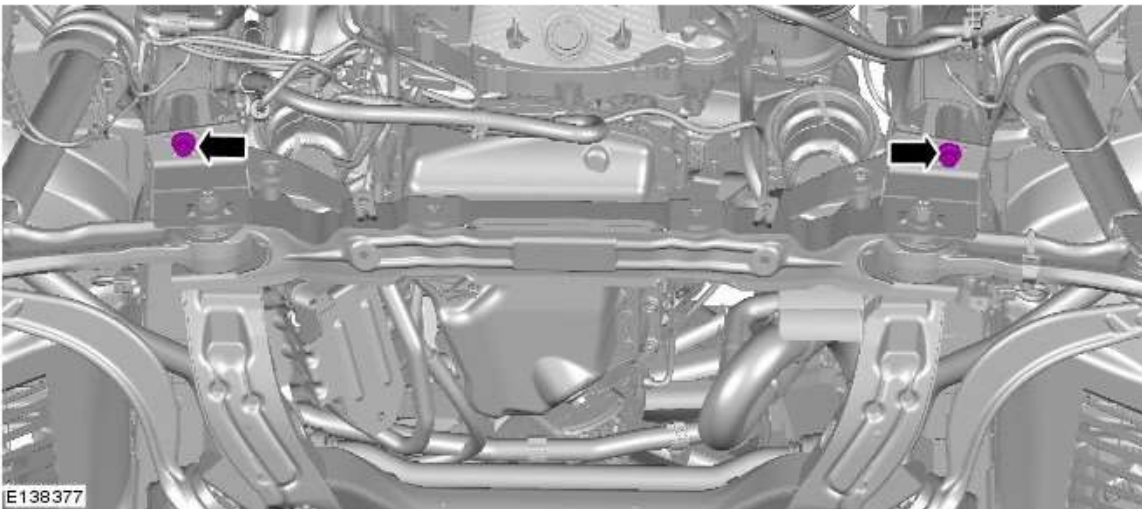
E138315

7. Install the special tool to the front subframe.

Special Tool(s): [502-005](#)



8. Torque:
Stage 1: 80
Nm
Stage 2:
240°



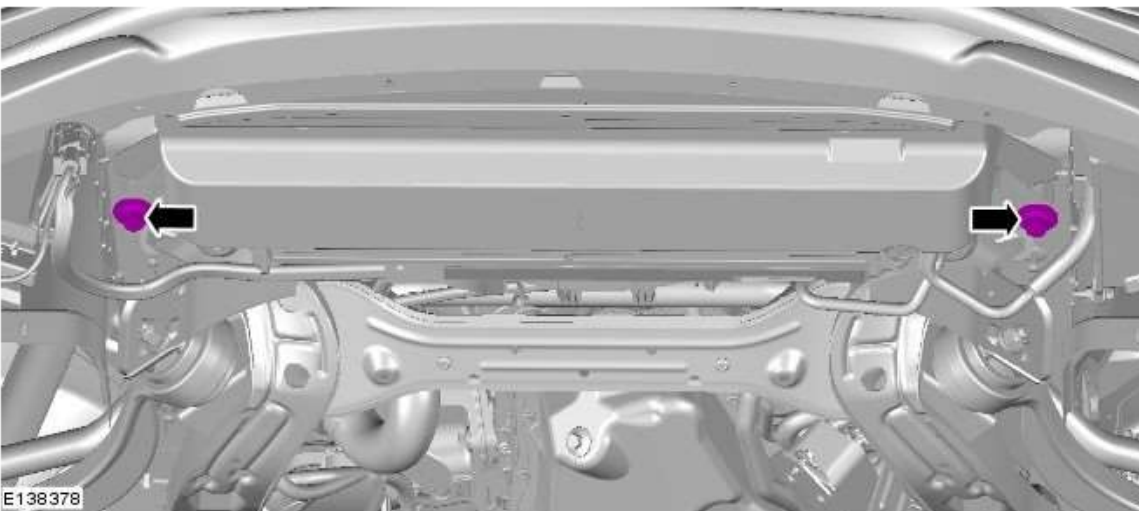
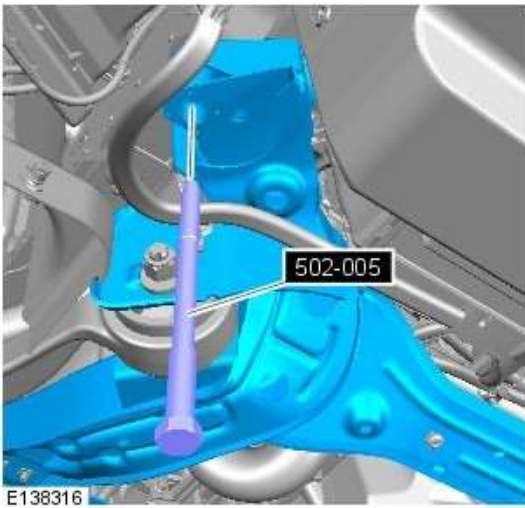
9. Remove the special tool.

Special Tool(s): [502-005](#)

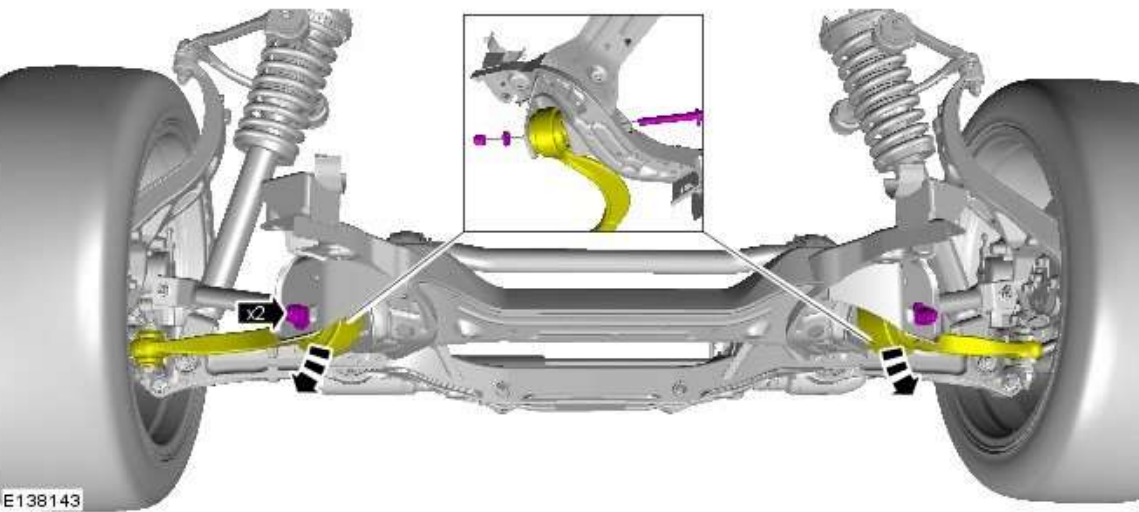



10. Remove the special tool.

Special Tool(s): [502-005](#)

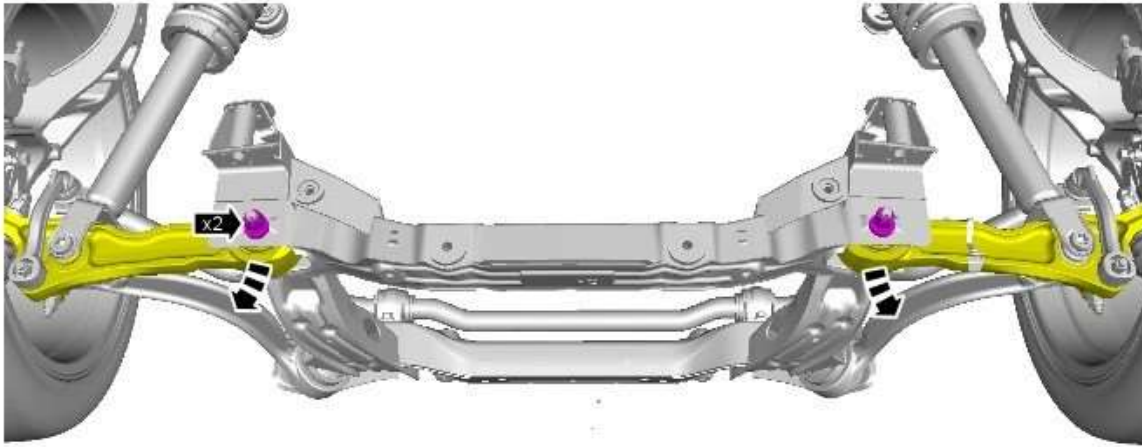


11. Torque:
Stage 1:
100 Nm
Stage 2:
270°



12.  CAUTION:
Make sure each
bolt aligns with
the removal
markings.

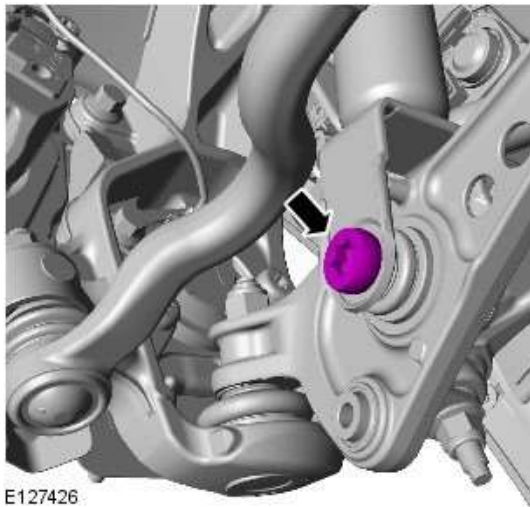
Torque: 175
Nm




E138142

13.  **CAUTION:** Make sure each bolt aligns with the removal markings.

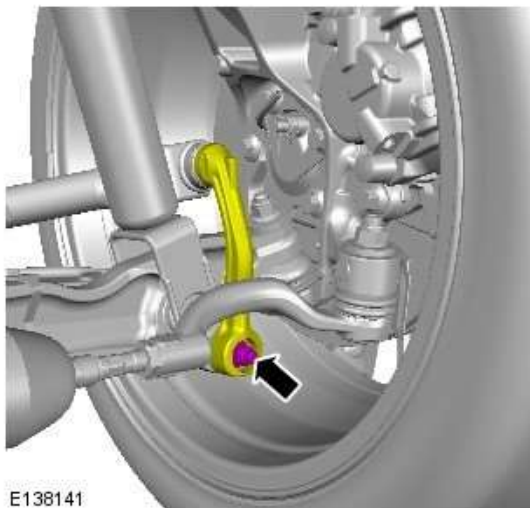
Torque: 175 Nm



E127426

14.  **NOTE:** Repeat the step for the other side.

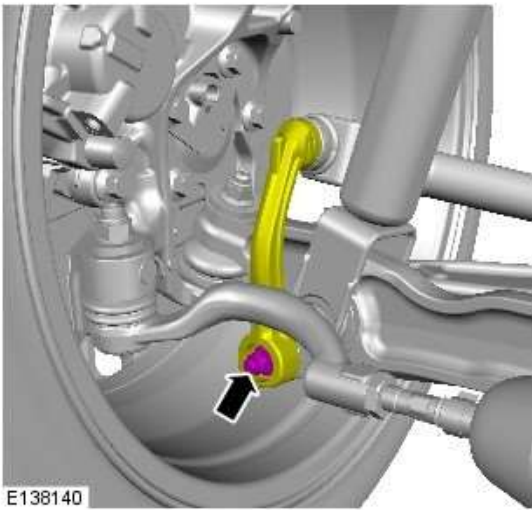
Torque: 175 Nm



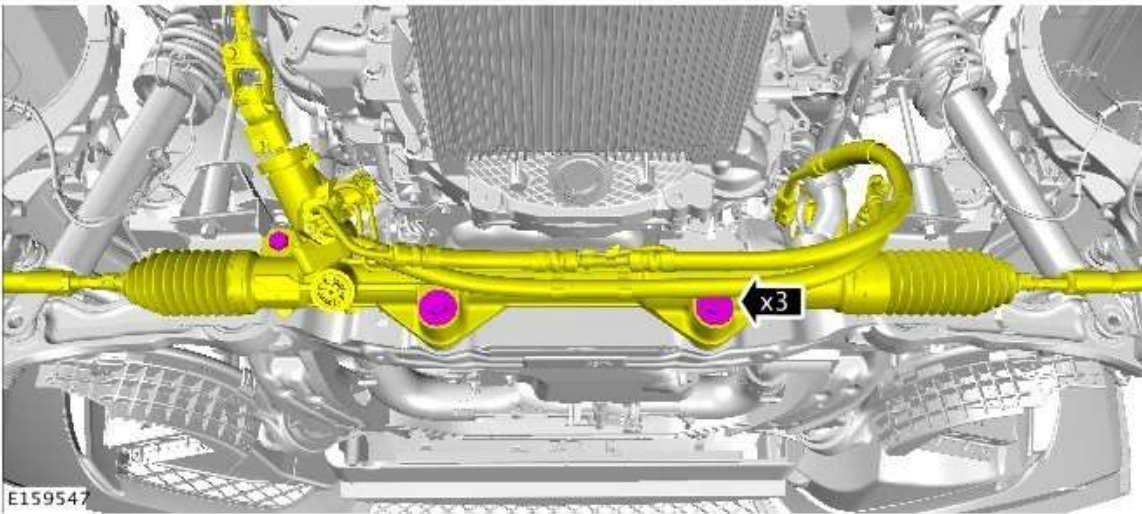
E138141

15. *Torque: 43 Nm*

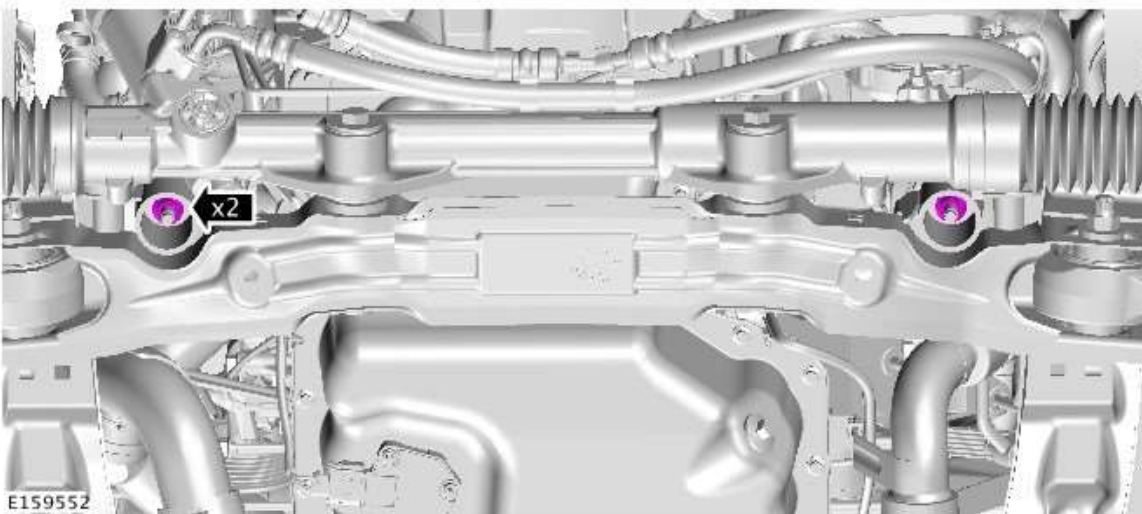
16. Torque: 43 Nm



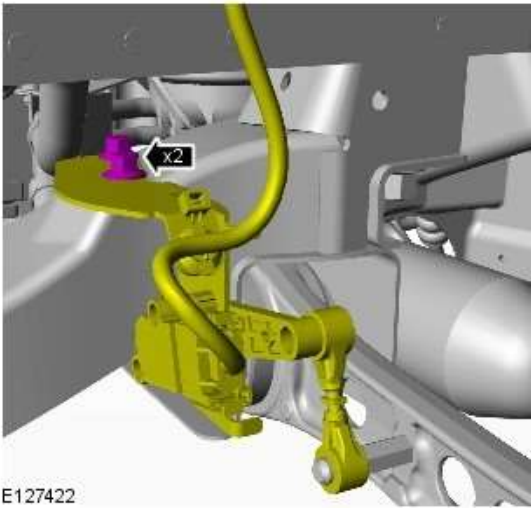
17. Torque: 100 Nm



18. Torque: 45 Nm

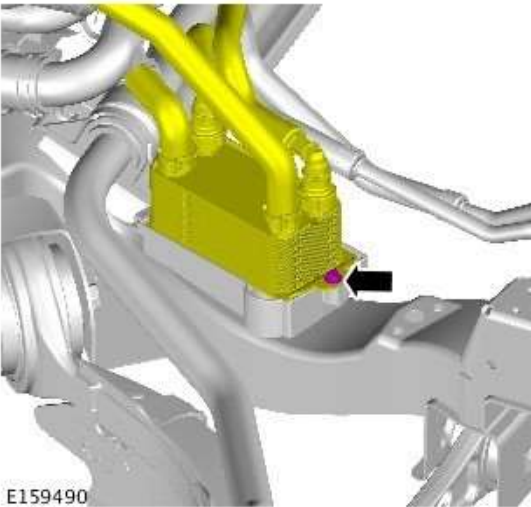


19. Torque: 22 Nm



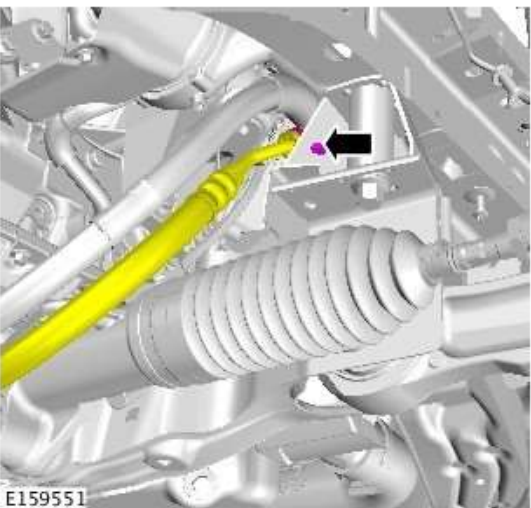
E127422

20. Torque: 5 Nm



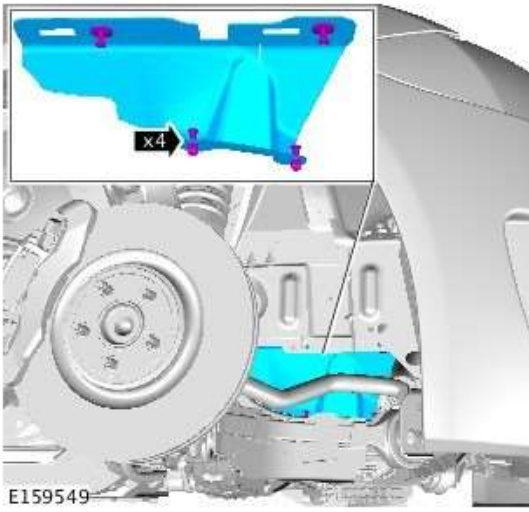
E159490

21.

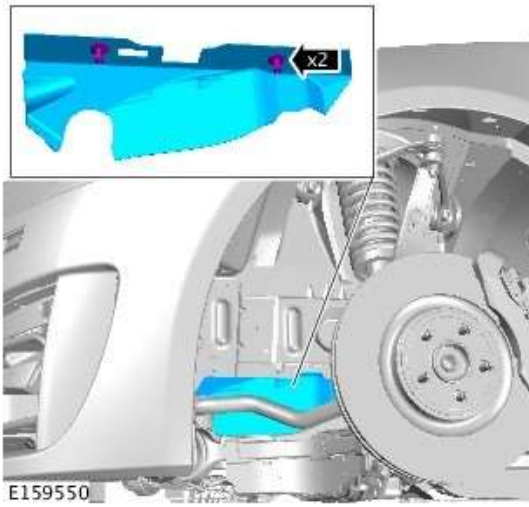


E159551

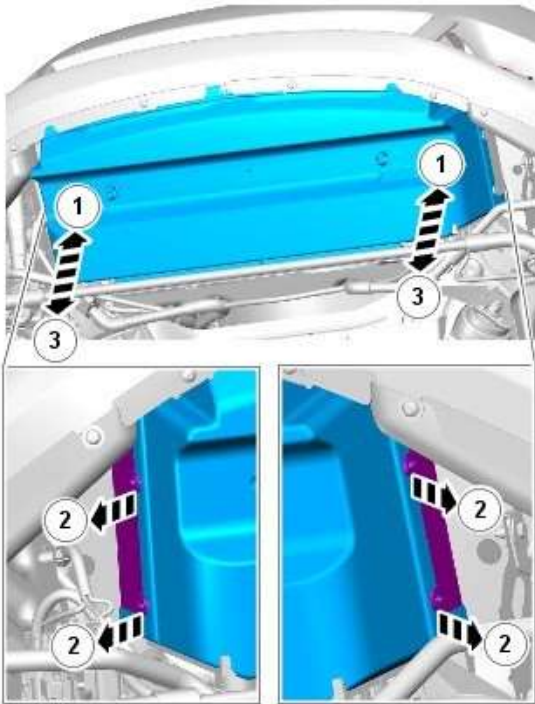
22.



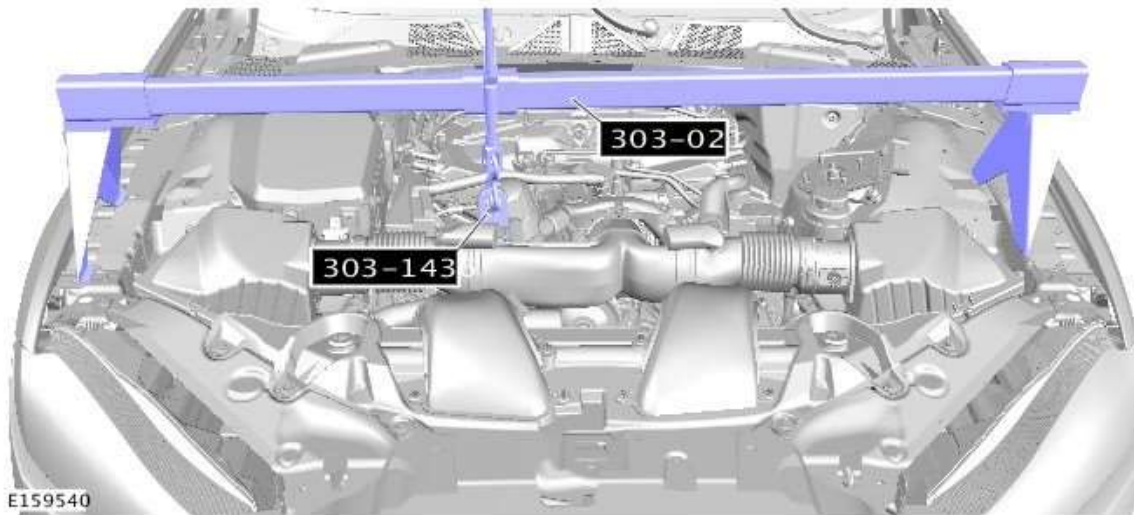
23.



24.



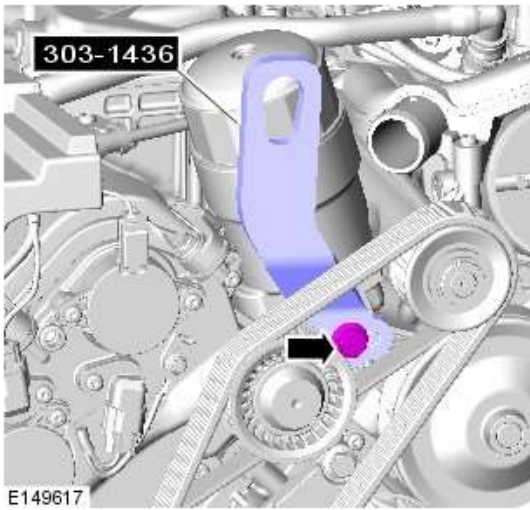
E97870



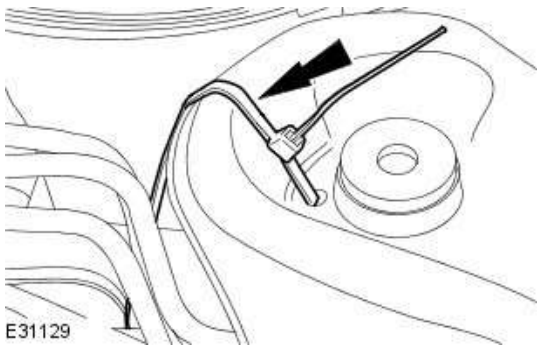
E159540

25.  **CAUTION:**
Make sure to protect the paintwork.

- *Special Tool(s):*
[303-1436](#)
- *Special Tool(s):*
[303-021](#)



26. Special Tool(s): [303-1436](#)



27. Release the radiator assembly.

28. Refer to: [Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).
29. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
30. Refer to: [Radiator Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).
31. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
32. Refer to: [Camber and Caster Adjustment](#) (204-00 Suspension System - General Information, General Procedures).

Uni-Body, Subframe and Mounting System - Rear Subframe V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

General Equipment

Powertrain Jack

Removal



NOTE: Removal steps in this procedure may contain installation details.

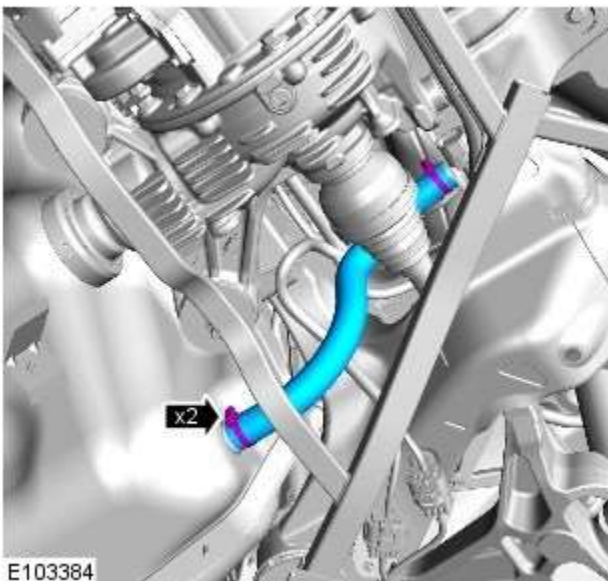
1. Refer to: [Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions](#) (100-00 General Information, Description and Operation).



2. **WARNING:** Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

3. Refer to: [Fuel Tank Draining](#) (310-00 Fuel System - General Information, General Procedures).
4. Refer to: [Wheel and Tire](#) (204-04 Wheels and Tires, Removal and Installation).
5. Refer to: [Driveshaft - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (205-01 Driveshaft, Removal and Installation).



6. **CAUTION:** Be prepared to collect escaping fluids.

NOTES:

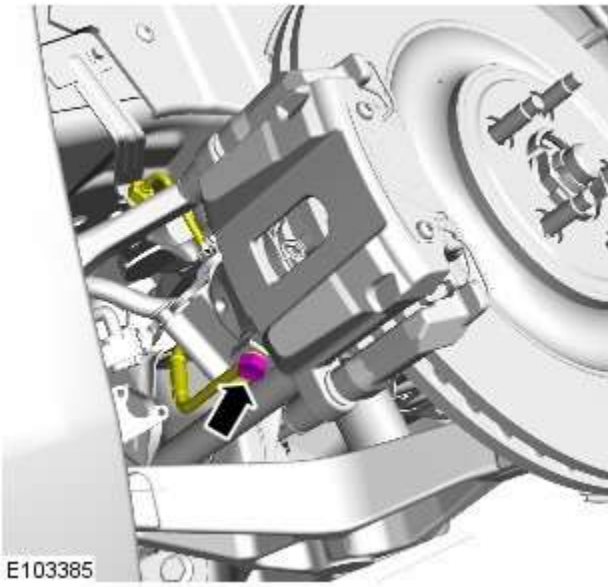


The fuel tank has a non-return valve in the filler stub pipe, only the fuel present in the filler hose will be spilt.



Some variation in the illustrations may occur, but the essential information is always correct.

7. Using the special tool, press and hold the brake pedal.



8. **WARNING:** If the fluid is spilled on the paintwork, the affected area must be immediately washed down with cold water.

CAUTIONS:



Make sure that a new sealing washer is installed.

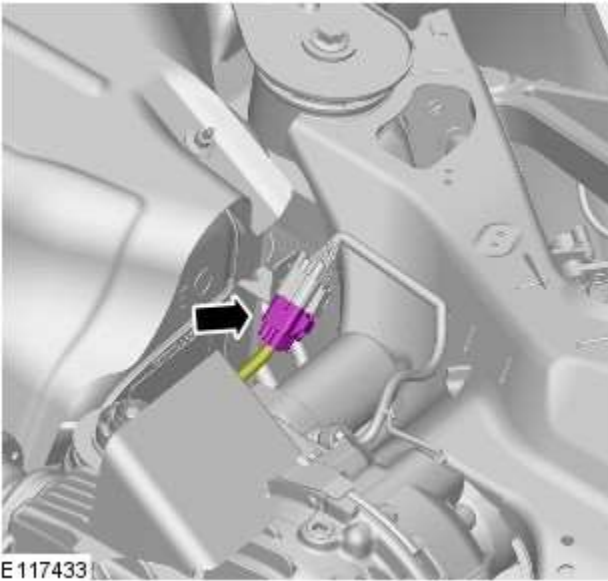


Be prepared to collect escaping fluids.



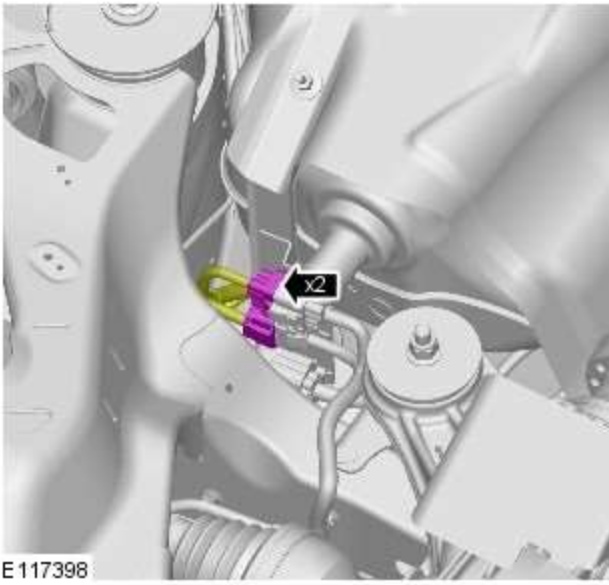
NOTE: LH illustration shown, RH is similar.

Torque: 35 Nm

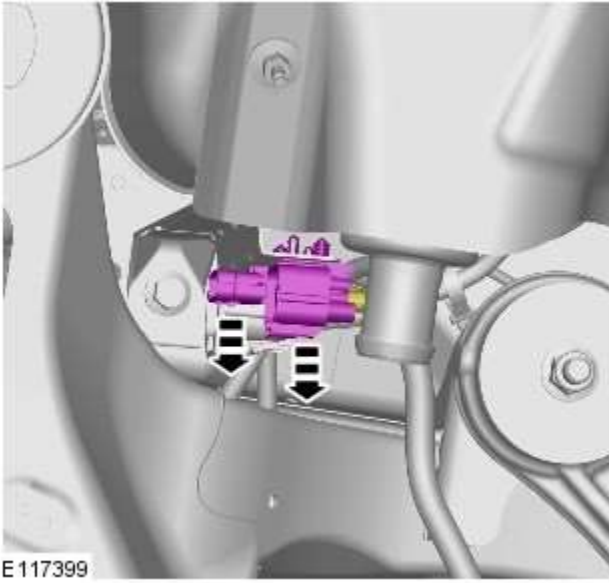


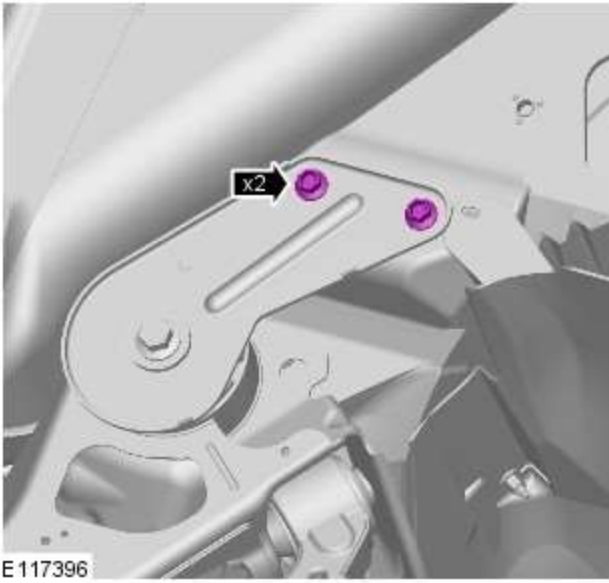
9.

10.



11.

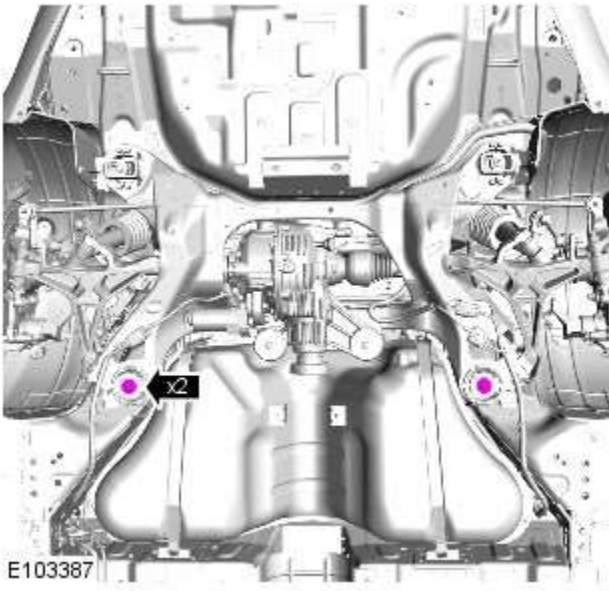





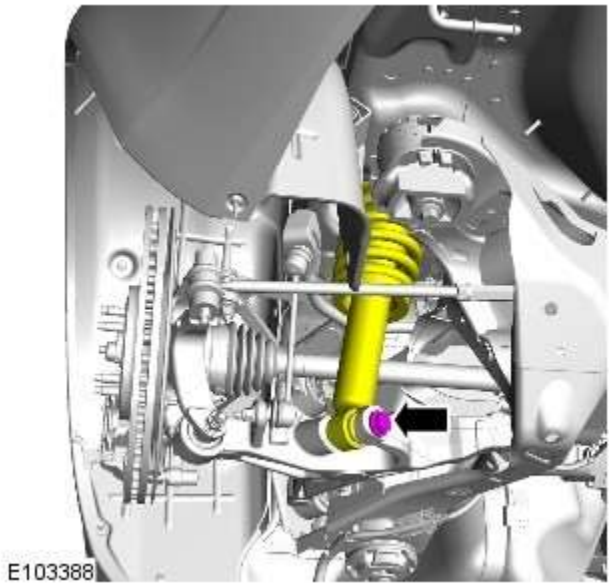
12.  NOTE: Left-hand shown, right-hand similar.
Torque: 47 Nm



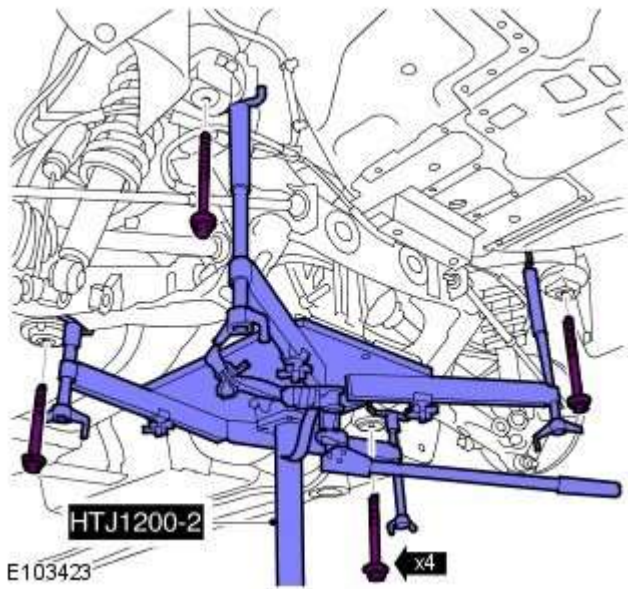
13.  NOTE: Left-hand shown, right-hand similar.



14.  **WARNING:** Install the M12 subframe bolts prior to removing axle support.



15.  **NOTE:** LH illustration shown, RH is similar.
Torque: 133 Nm



16.  **CAUTION:** Make sure that new bolts are installed.

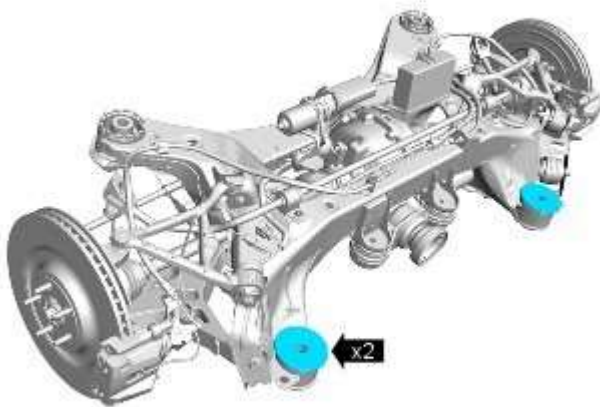
General Equipment: [Powertrain Jack](#)

Torque:

Stage 1: 80 Nm

Stage 2: 240°

- 17.



E103390

Installation





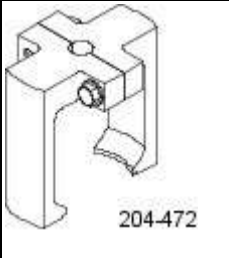
1. To install, reverse the removal procedure.
2. Refer to: [Brake System Bleeding](#) (206-00 Brake System - General Information, General Procedures).
3. Refer to: [Camber and Caster Adjustment](#) (204-00 Suspension System - General Information, General Procedures).

Uni-Body, Subframe and Mounting System - Rear Subframe Rear Bushing

TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol

Removal and Installation

Special Tool(s)

 <p>204-469</p>	<p>Forcing bolt 204-469</p>
 <p>204-475</p>	<p>Receiver-bush 204-475</p>
 <p>204-474</p>	<p>Replacer-bush 204-474</p>
 <p>204-473</p>	<p>Remover bush 204-473</p>
 <p>204-472</p>	<p>Remover support-bush 204-472</p>

Removal

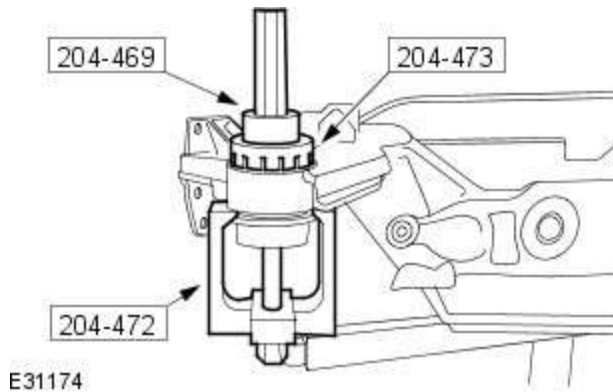
Vehicles with 3.0L diesel engine

1. For additional information, refer to: [Rear Subframe - TDV6 3.0L Diesel](#) (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

Vehicles with 5.0L

2. For additional information, refer to: [Rear Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

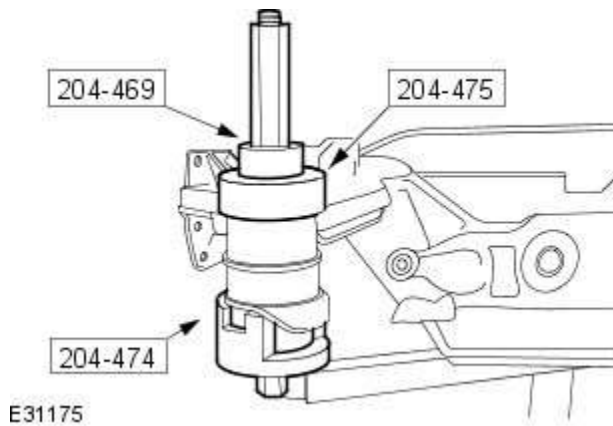
All vehicles




3.  NOTE: Note the orientation of the bushing before removal.

Installation

All vehicles



1.  NOTE: Make sure the bushing is correctly orientated.

Vehicles with 5.0L

2. For additional information, refer to: [Rear Subframe - V8 5.0L Petrol/V8 S/C 5.0L Petrol](#) (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).

Vehicles with 3.0L diesel engine

3. For additional information, refer to: [Rear Subframe - TDV6 3.0L Diesel](#) (502-00 Uni-Body, Subframe and Mounting System, Removal and Installation).