Published: 11-May-2011

Engine System - General Information - Engine 5.0L

Diagnosis and Testing

Special Tool(s)

	Oil pressure testing adaptor, 303-1451
	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
• Coolant leaks • Oil leaks • Leaks in the fuel system • Visibly damaged or worn parts • Loose or missing fixings	• 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	• 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	• Carry out general engine checks: - Compression test. Refer to component tests in this section. - Valve clearances - Spark plug condition and color
Poor idle	• Ensure the air intake system is free from leaks • Carry out general engine checks: - 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 - 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	• Ensure the air intake system is free from leaks • Carry out general engine checks: - 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 - 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	• 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: - Compression test. Refer to component tests in this section. - Valve clearances - Spark plug condition and color
Noise	• 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 customers 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.

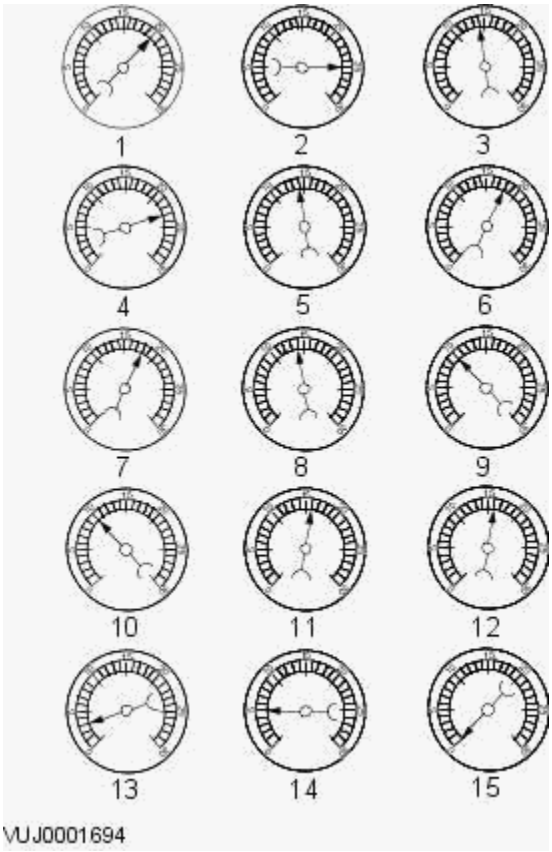
The reading should be steady. As necessary, adjust the gauge damper control (where used) if the needle is fluttering rapidly. Adjust damper until needle moves easily without excessive flutter.

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.



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

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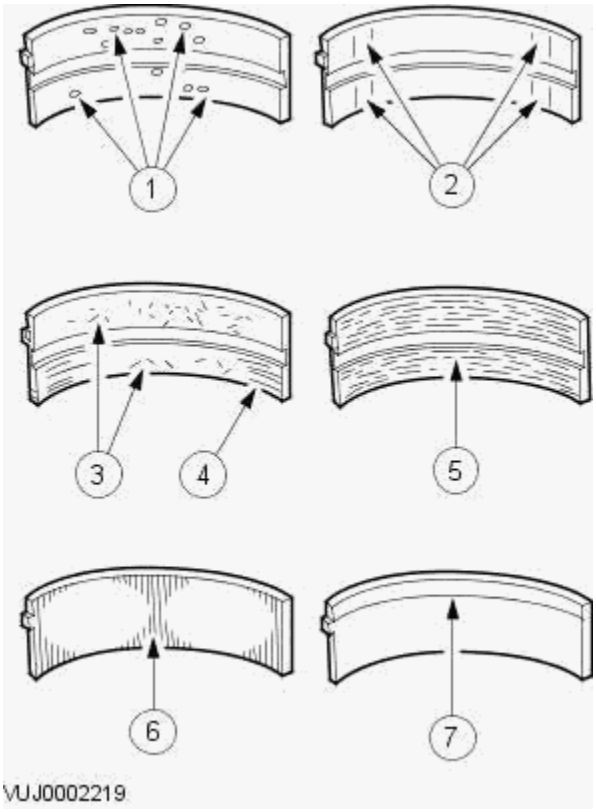
Engine System - General Information - Bearing Inspection

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.

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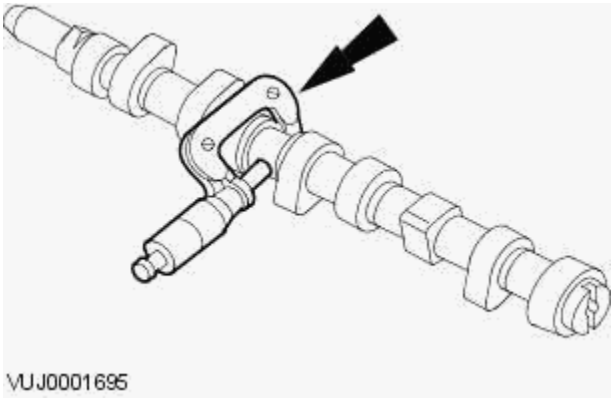
Engine System - General Information - Camshaft Bearing Journal Diameter

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.

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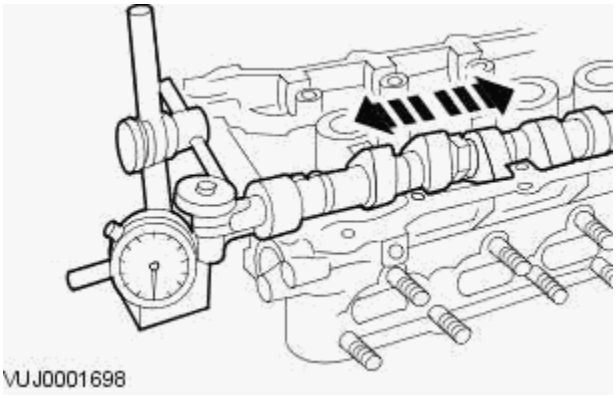
Engine System - General Information - Camshaft End Play

General Procedures



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.

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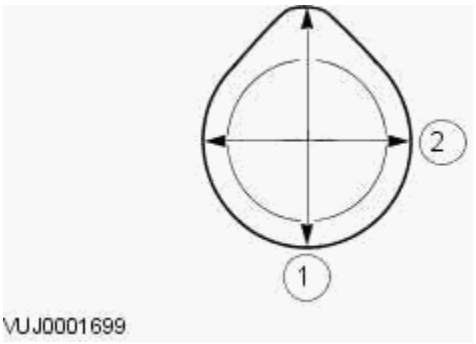
Engine System - General Information - Camshaft Lobe Lift

General Procedures



1. Measure the diameter (1) and diameter (2) with a vernier caliper. The difference in measurements is the lobe lift.

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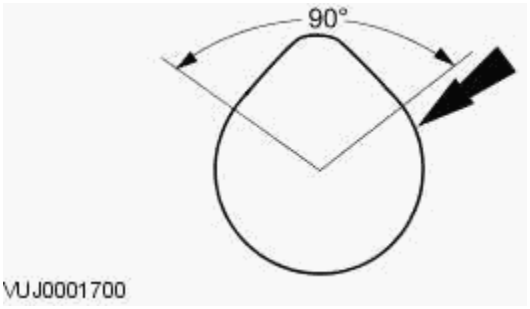
Engine System - General Information - Camshaft Surface Inspection

General Procedures



1. Inspect camshaft lobes for pitting or damage in the active area. Minor pitting is acceptable outside the active area.

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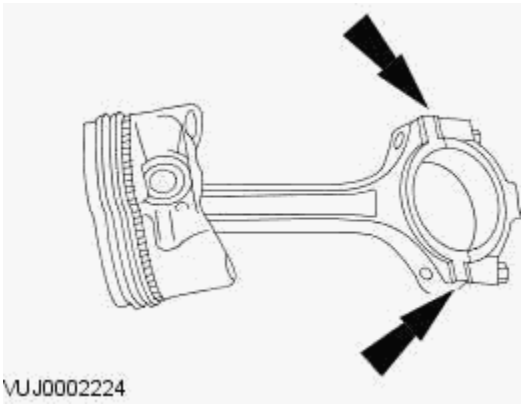
Engine System - General Information - Connecting Rod Cleaning

General Procedures



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.

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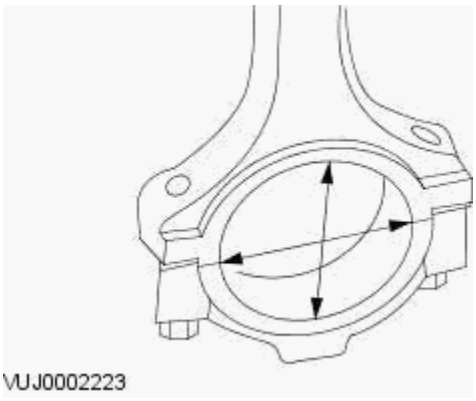
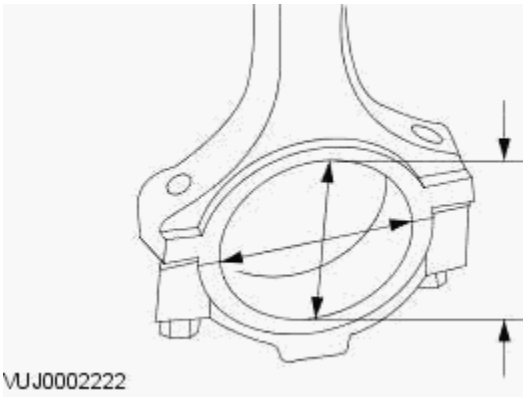
Engine System - General Information - Connecting Rod Large End Bore

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.



2. Measure the bearing bore diameter in two directions. Verify the bearing bore is within specification.

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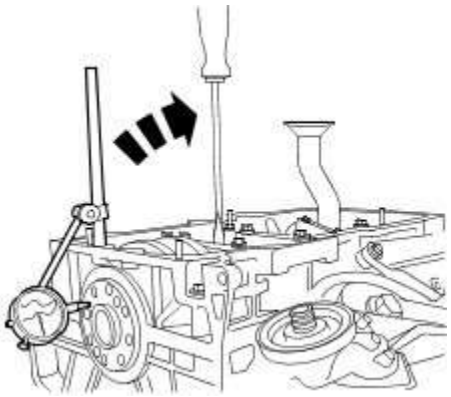
Engine System - General Information - Crankshaft End Play

General Procedures



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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.

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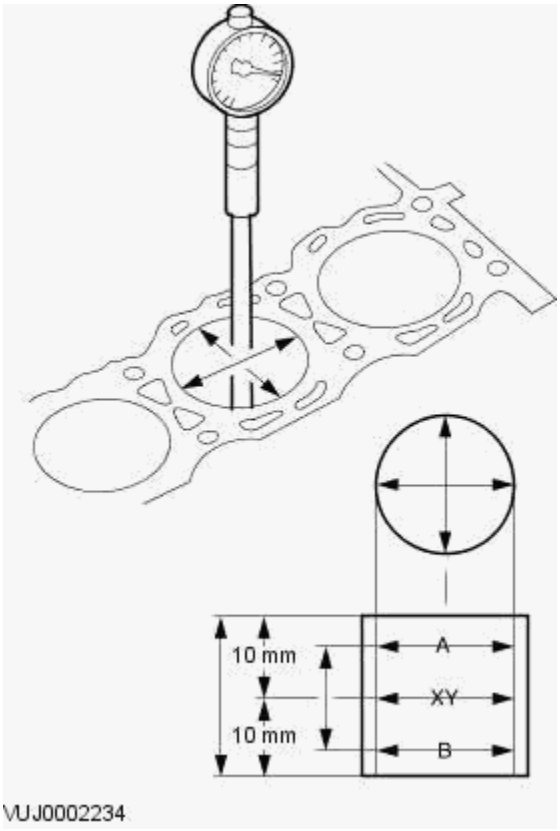
Engine System - General Information - Cylinder Bore Out-of-Round

General Procedures



1. 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.

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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.

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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:

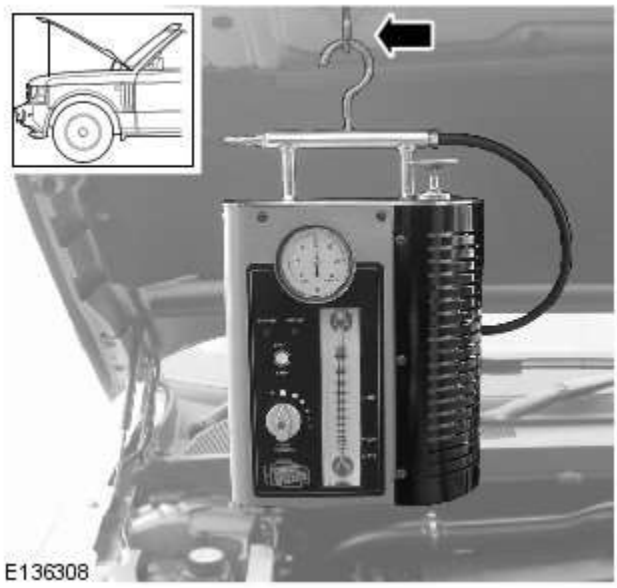
The vehicle battery must be in good condition and fully charged before carrying out this procedure.

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.



1. 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.

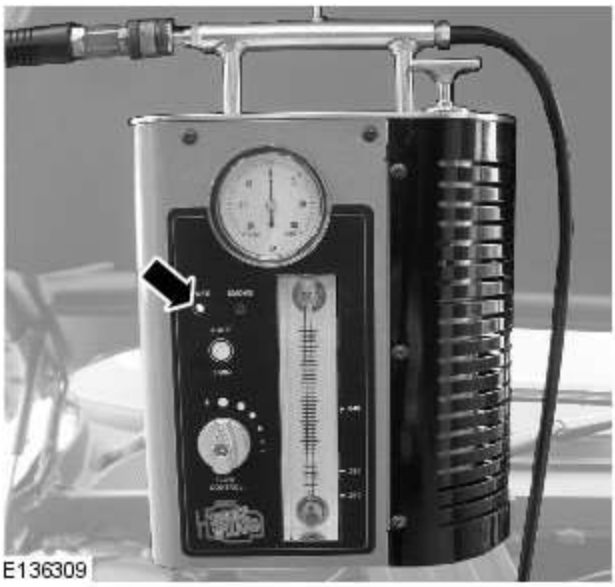
   Install the smoke test equipment to a suitable location under the hood.

2. Connect a suitable compressed air line to the smoke test equipment.

3. Connect the smoke test equipment positive power cable to the battery positive terminal.

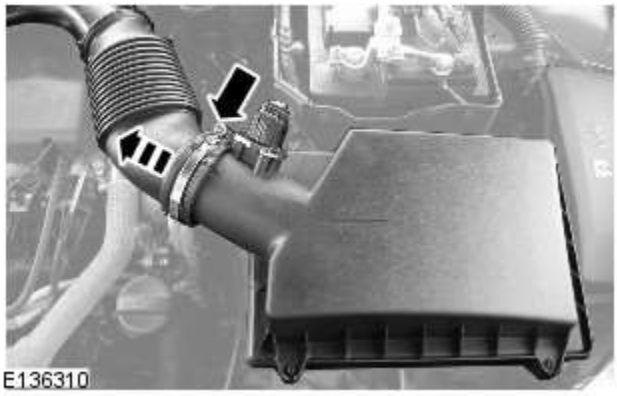
4. WARNING: Do not connect the smoke test equipment negative cable to the battery negative terminal.

   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.

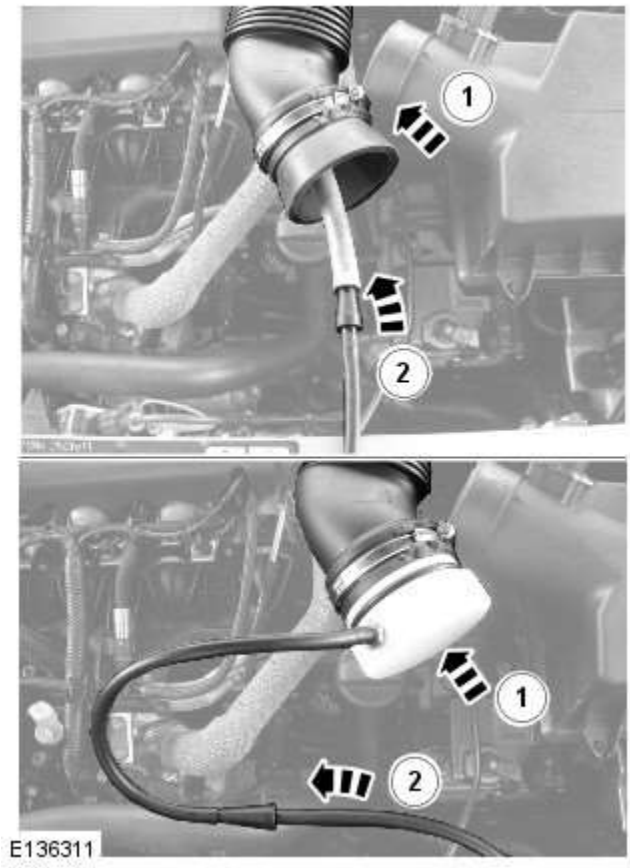


6. NOTES:

   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).



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.

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.

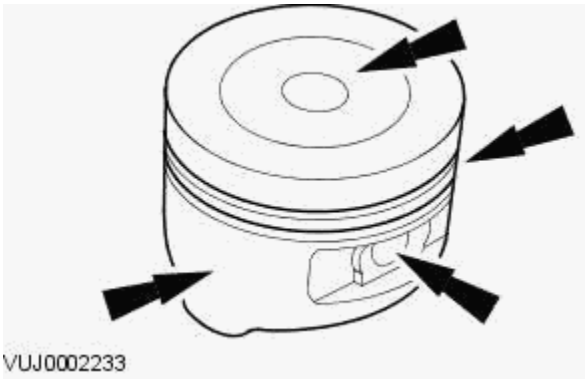
10. NOTE: The longer smoke is allowed to exit from a leak, the more fluorescent dye will be deposited at a leak location.

    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.

Published: 11-May-2011

Engine System - General Information - Piston Inspection

General Procedures


VUJ0002233

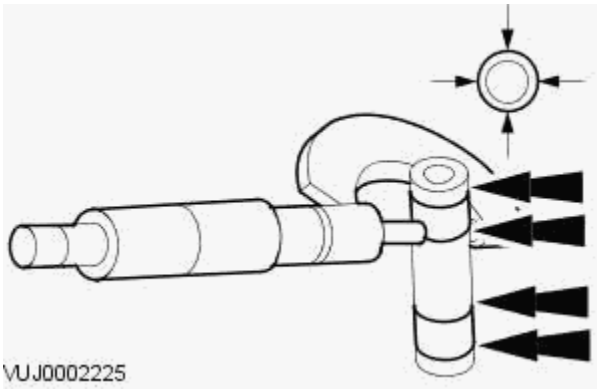
1. CAUTION: Do not use any aggressive cleaning fluid or a wire brush to clean the piston.

   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.

Published: 11-May-2011

Engine System - General Information - Piston Pin Diameter

General Procedures



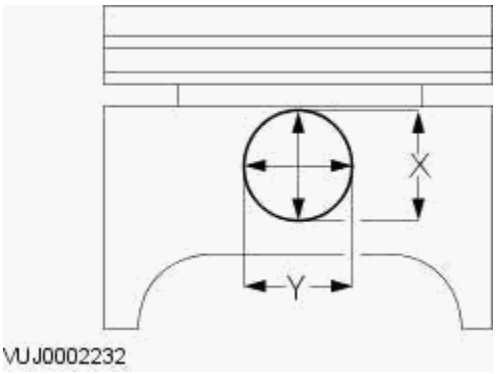
1. NOTE: The piston and piston pin are a matched pair. Do not mix up the components.

   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.

Published: 11-May-2011

Engine System - General Information - Piston Pin to Bore Diameter

General Procedures



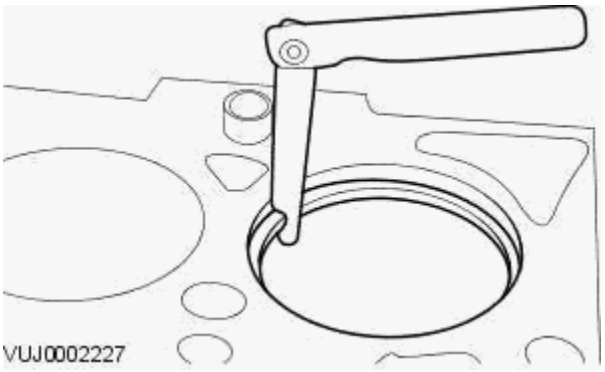
1. NOTE: The piston and piston pin form a matched pair. Do not mix up the components.

   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.

Published: 11-May-2011

Engine System - General Information - Piston Ring End Gap

General Procedures



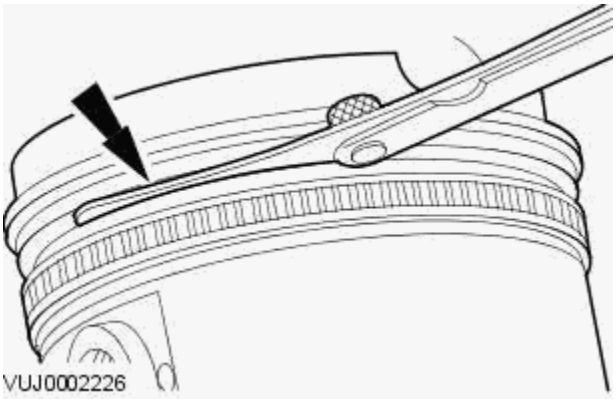
1. CAUTION: Do not mix up the piston rings. Install the piston rings in the same position and location.

   Using the Feeler Gauge, measure the piston ring gap.
   - The values given in the specification refer to a gauge ring used during production.

Published: 11-May-2011

Engine System - General Information - Piston Ring-to-Groove Clearance

General Procedures



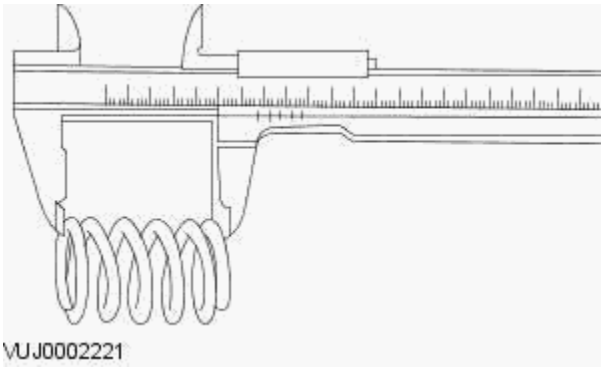
1. NOTE: The piston ring must protrude from the piston groove. To determine the piston ring clearance, insert the Feeler Gauge right to the back of the groove, behind the wear ridge.

   Using the Feeler Gauge, measure the piston ring clearance.

Published: 11-May-2011

Engine System - General Information - Valve Spring Free Length

General Procedures

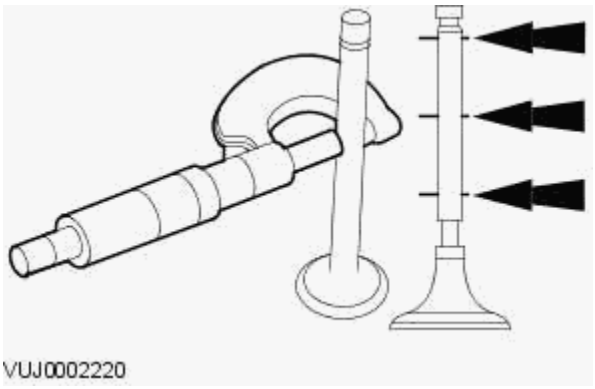


1. Using a vernier gauge, measure the free length of each valve spring. Verify the length is within specification.

Published: 11-May-2011

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.

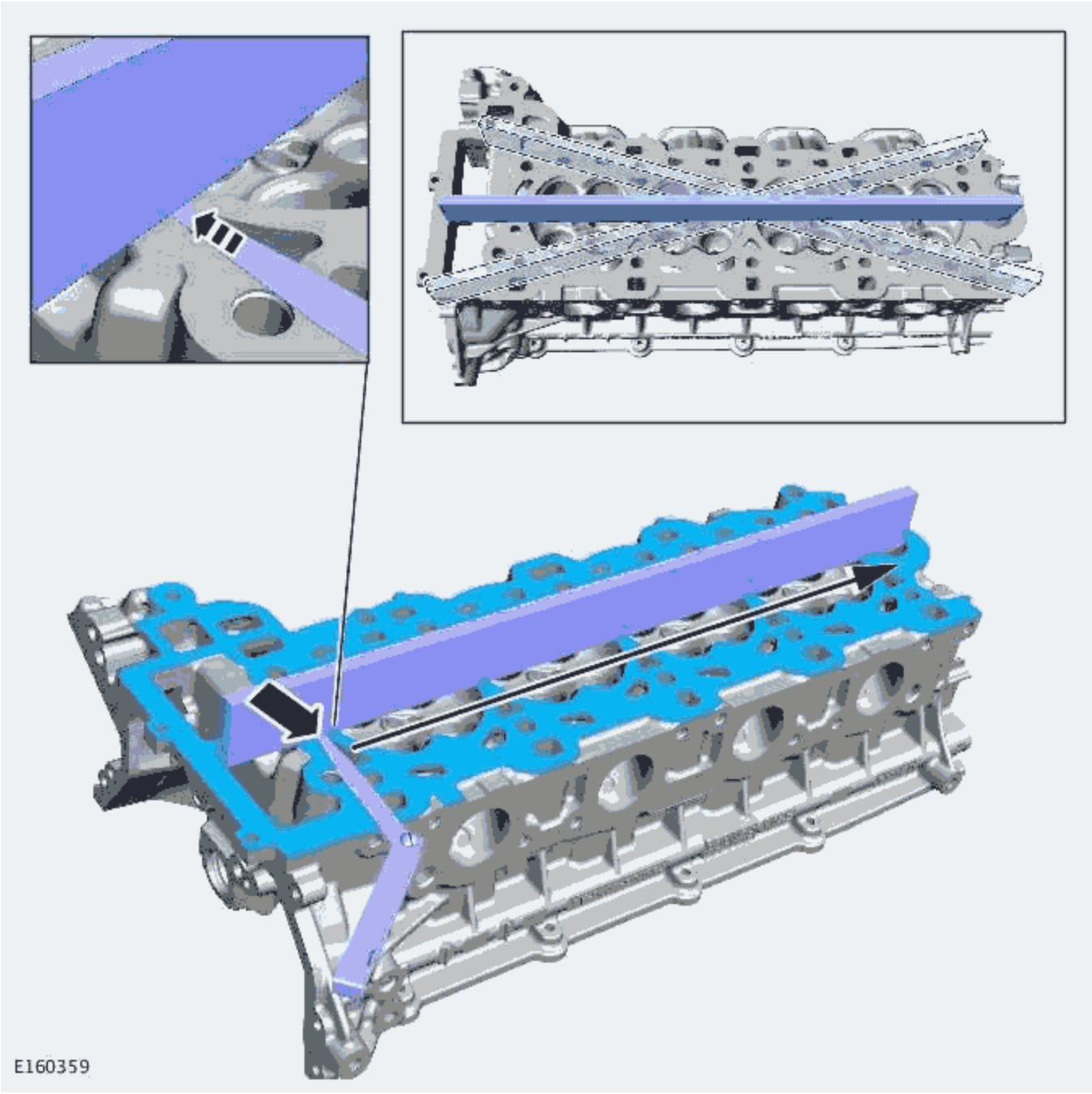
Published: 17-Jun-2014

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**.



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.

Published: 09-Apr-2014

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.

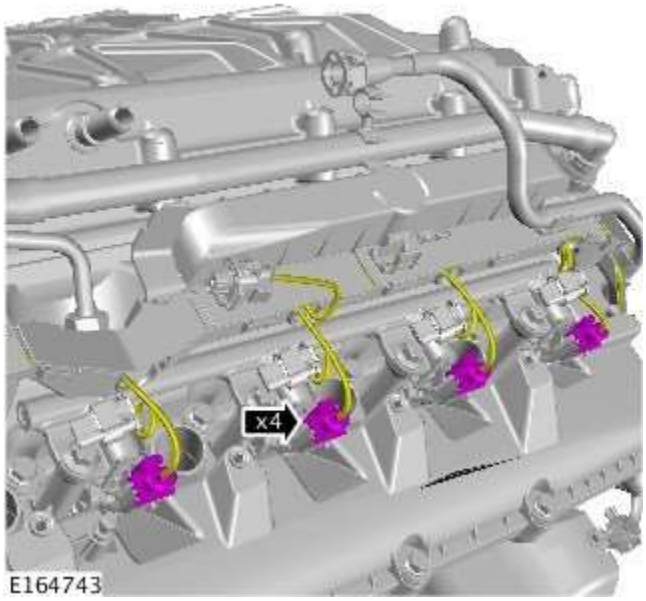
NOTES:

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.

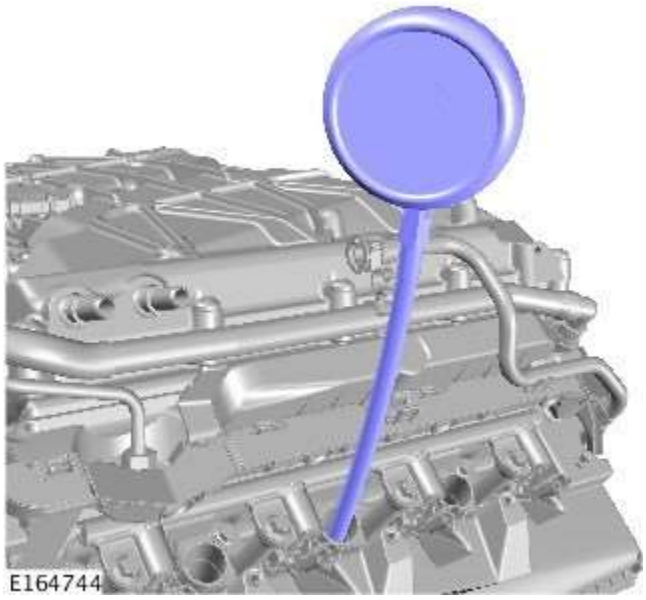
1. Refer to: Ignition Coil-On-Plug - V8 S/C 5.0L Petrol (303-07B Engine Ignition - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).



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.

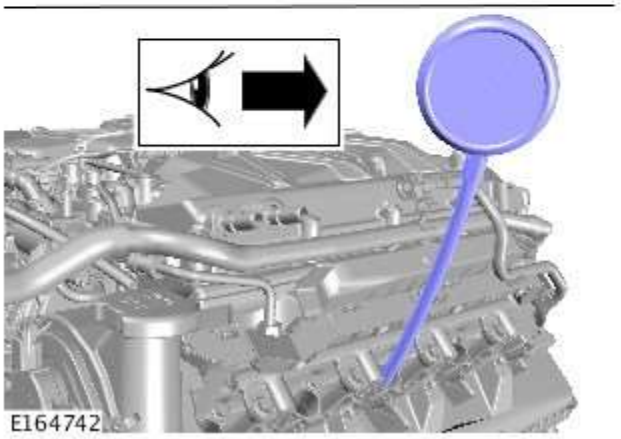
   Repeat procedure for the other side.

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:

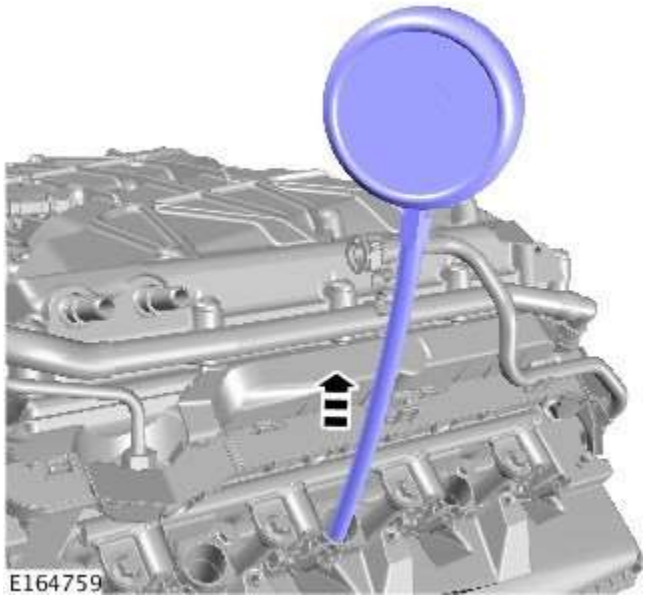
   This step requires the aid of another technician.

   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.

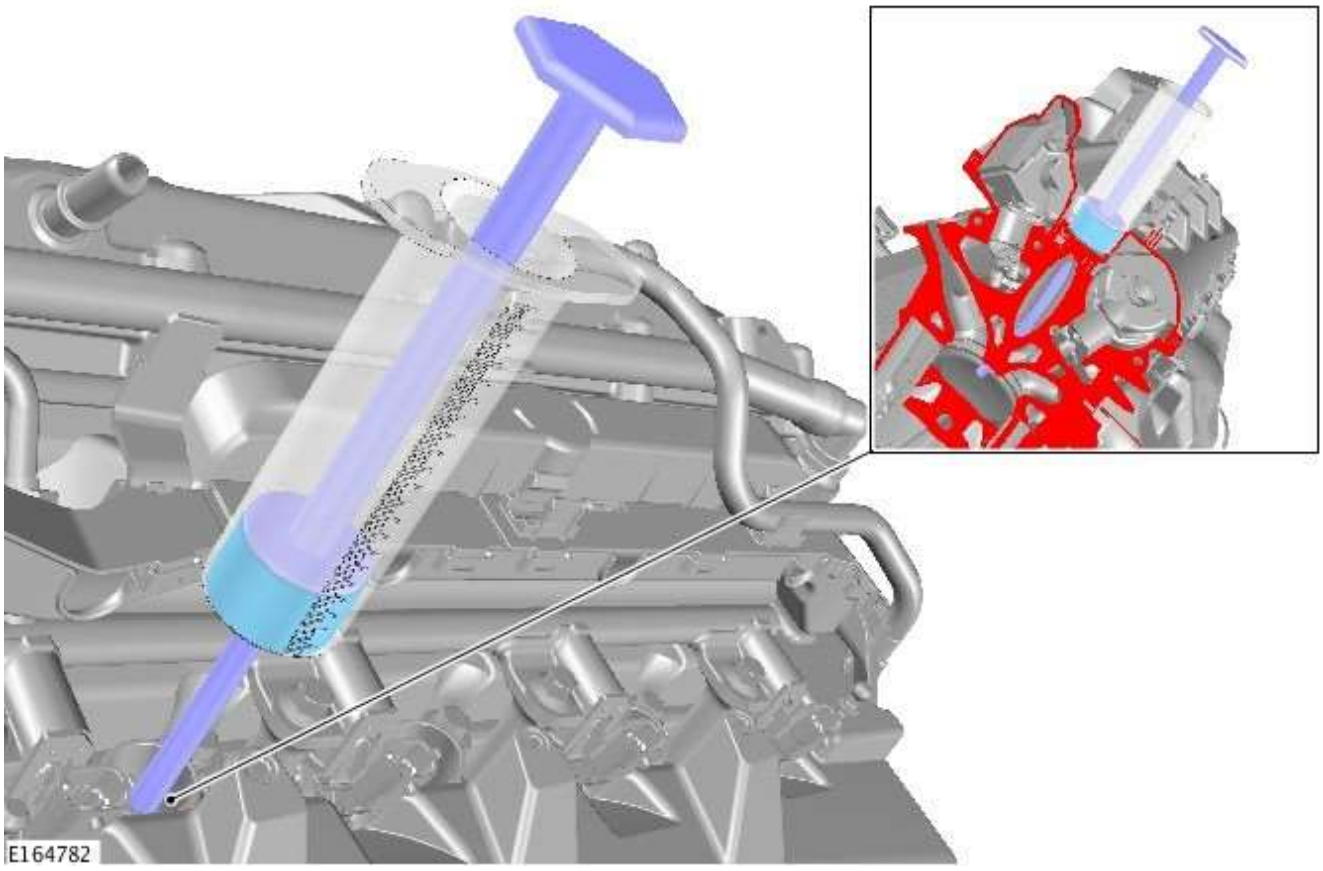
   Crank the engine for 10 seconds and record the figure displayed on the compression test gauge. Make sure the pressure is released from the compression test gauge after each cylinder recording. Repeat the process for all cylinders.

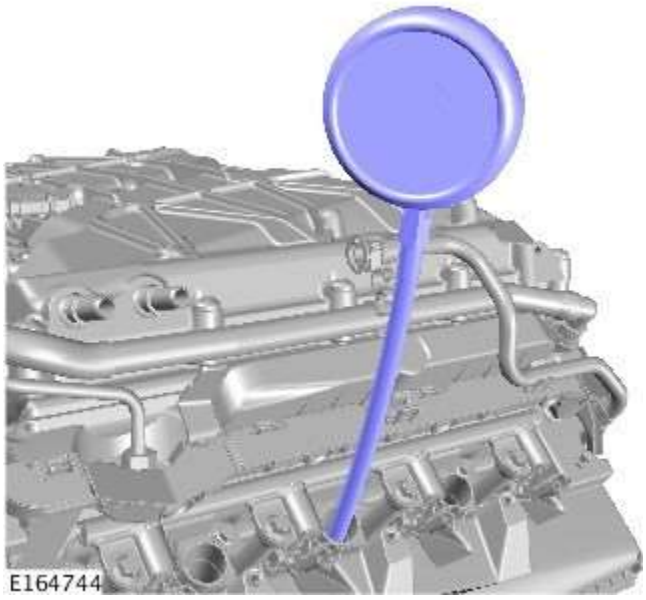
6. Remove the compression test gauge.



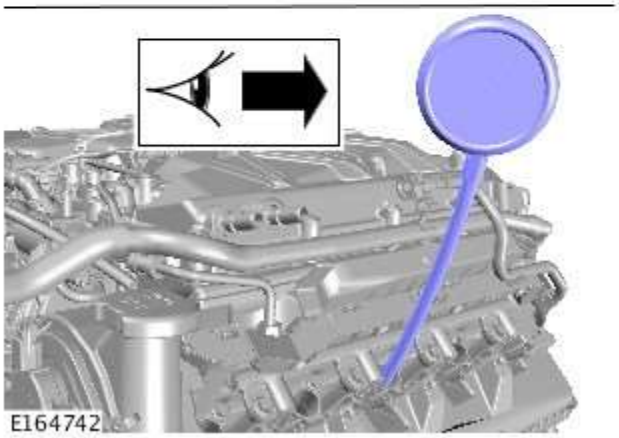
7. NOTE: Wet cylinder compression test.

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.

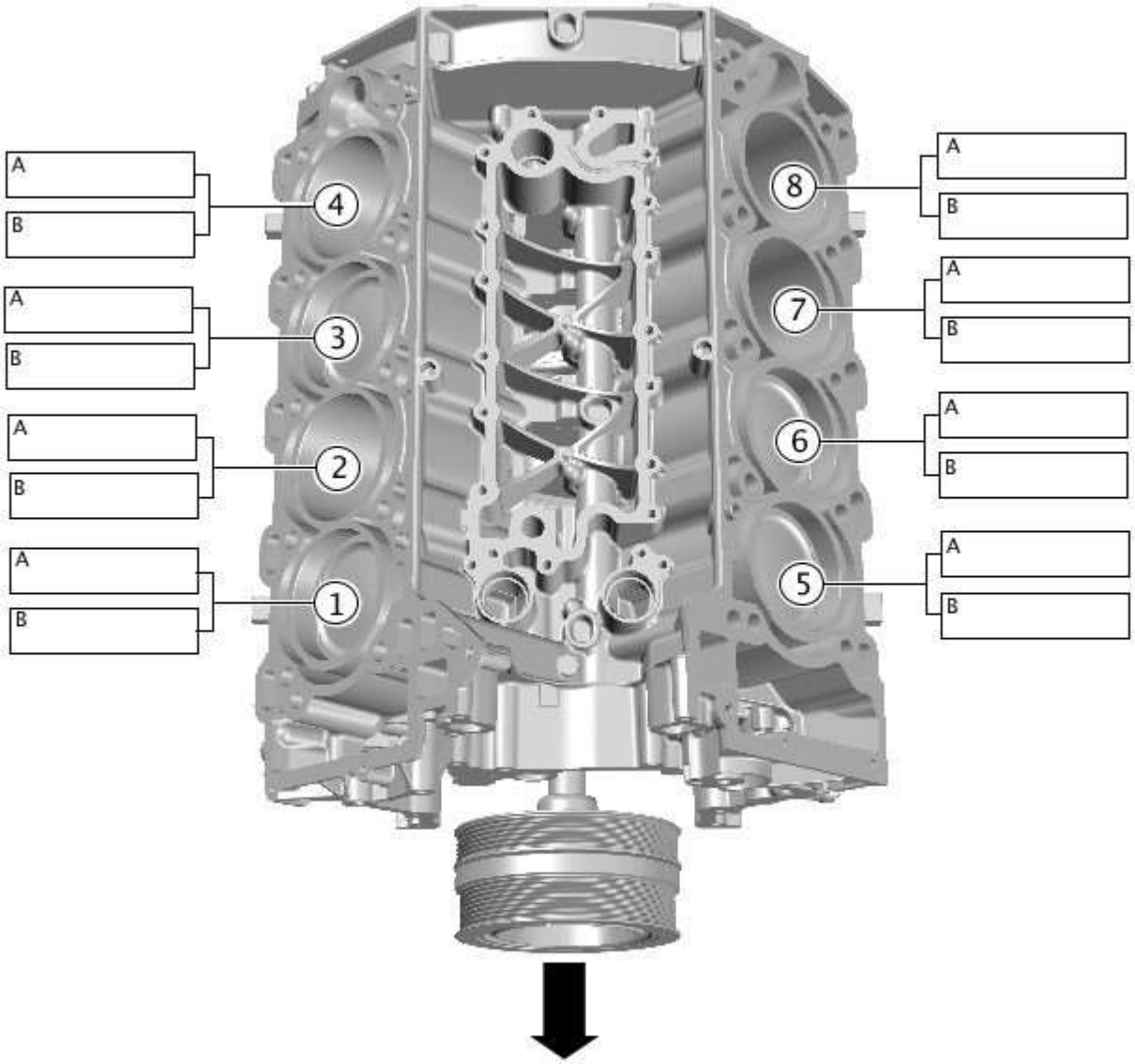
Crank the engine for 10 seconds and record the figure displayed on the compression test gauge. Make sure the pressure is released from the compression test gauge after each cylinder recording. Repeat the process for all cylinders.

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).

Published: 17-Jun-2014

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°	-

Published: 11-May-2011

Engine - V8 S/C 5.0L Petrol - Engine - Component Location

Description and Operation

EXTERNAL VIEW

E106721

Published: 11-May-2011

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

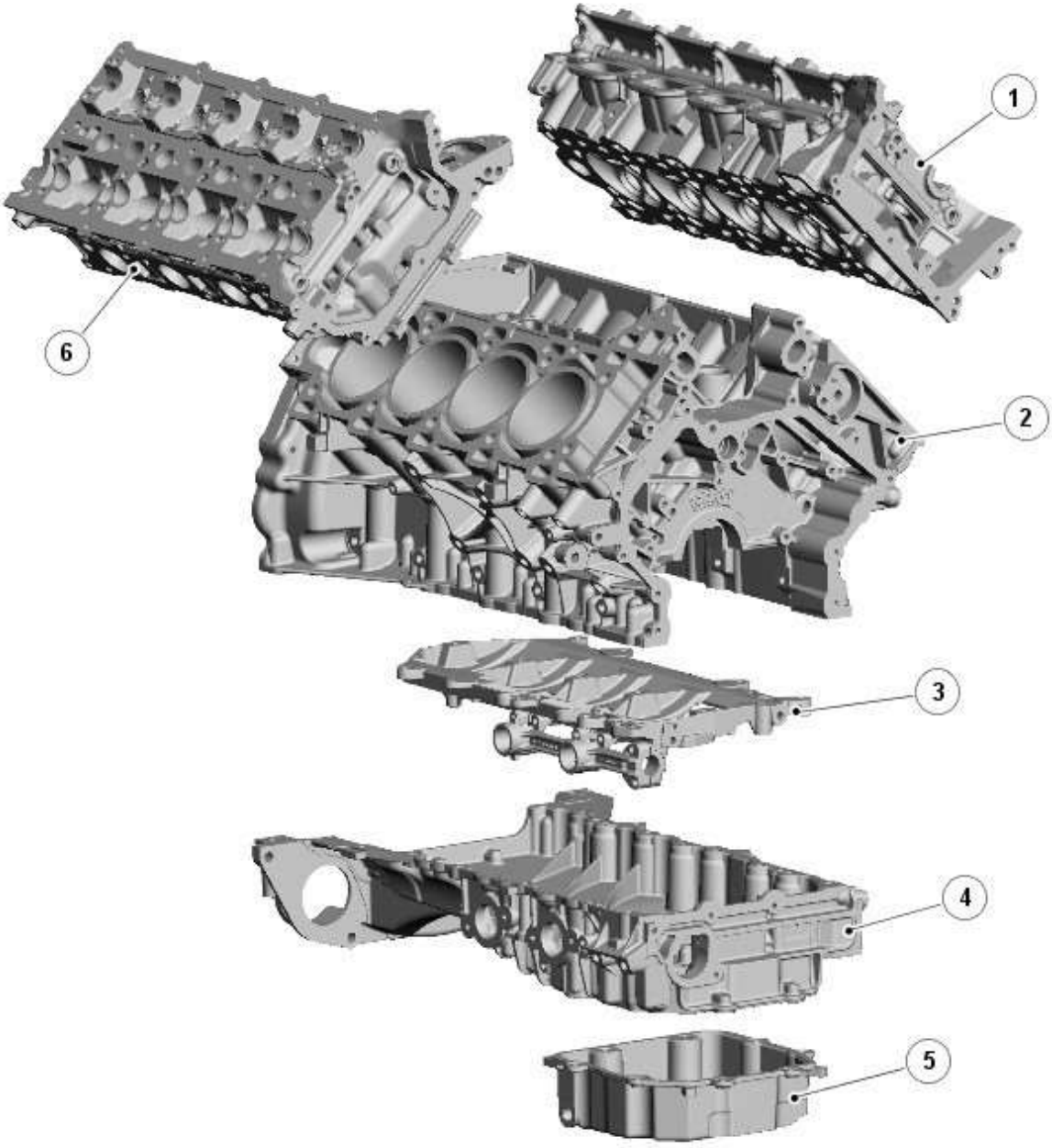
Description and Operation

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



E115618

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)

Published: 15-Feb-2014

Engine - V8 S/C 5.0L Petrol - Engine - System Operation and Component Description

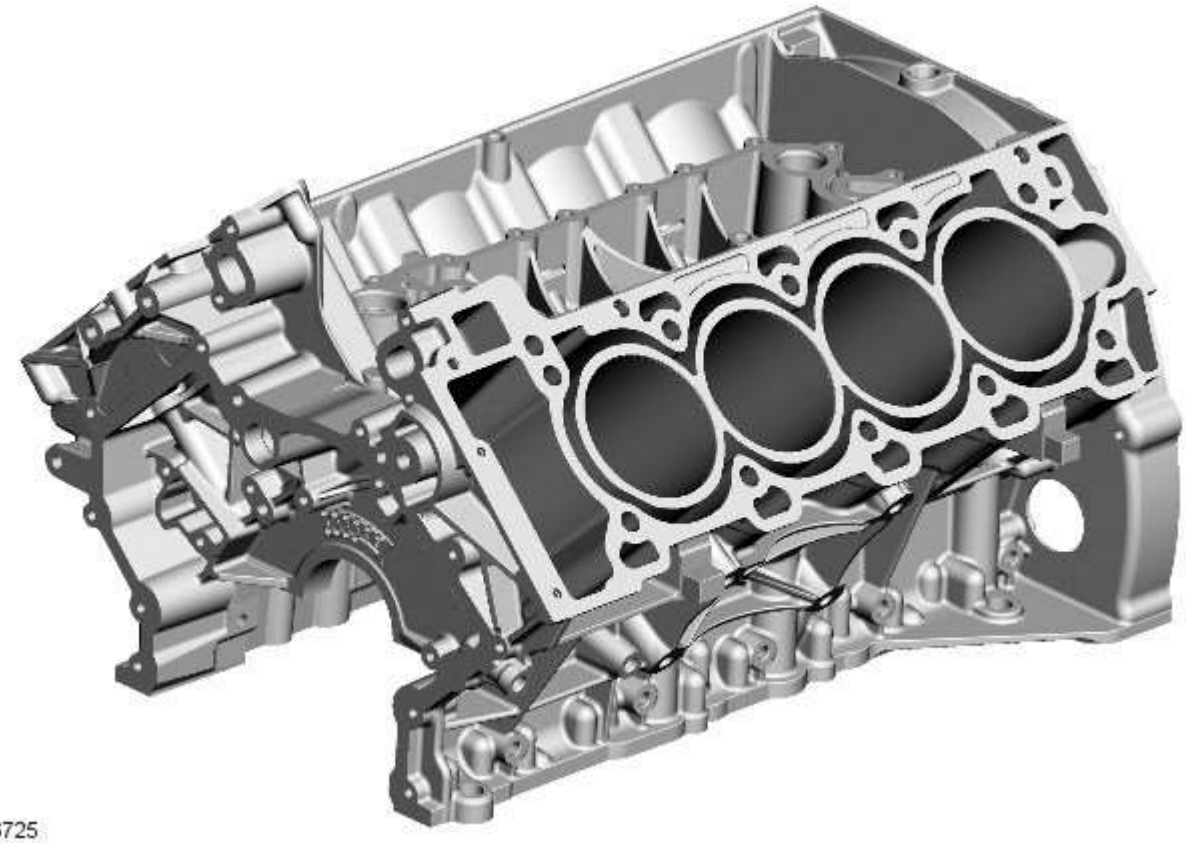
Description and Operation

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).

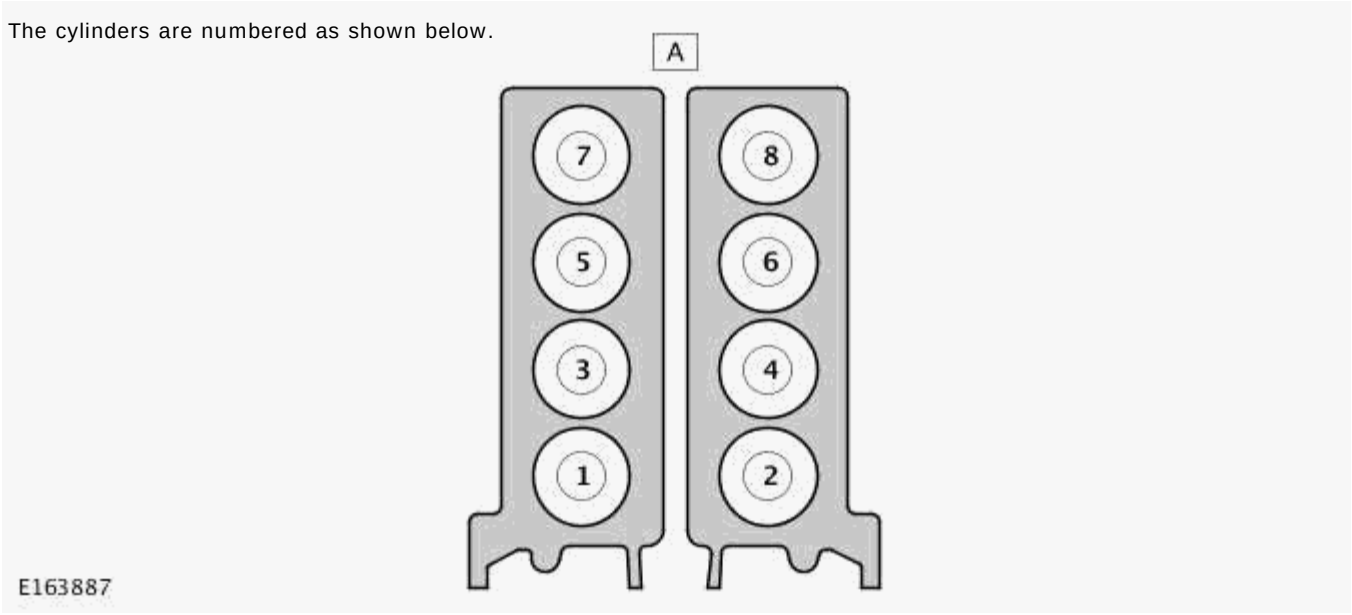
Component Description

CYLINDER BLOCK



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.

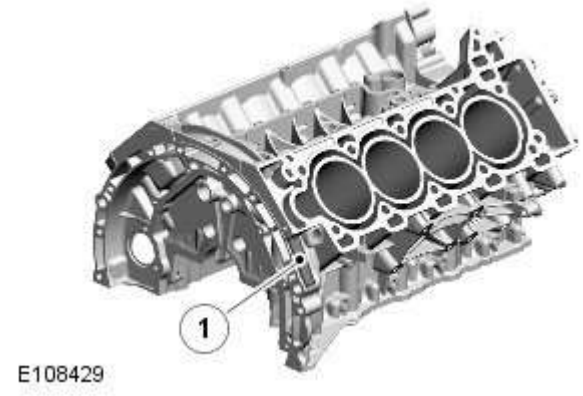
The cylinders are numbered as shown below.



Item	Description
A	ISO standard cylinder numbering

ISO cylinder firing order 1,2,7,3,4,5,6,8

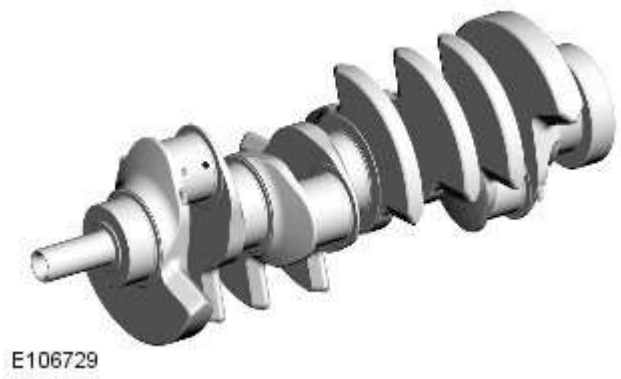
Engine Data Location



Item	Description
1	Engine data location

Engine data is marked on the cylinder block at the rear of the RH cylinder bank.

CRANKSHAFT

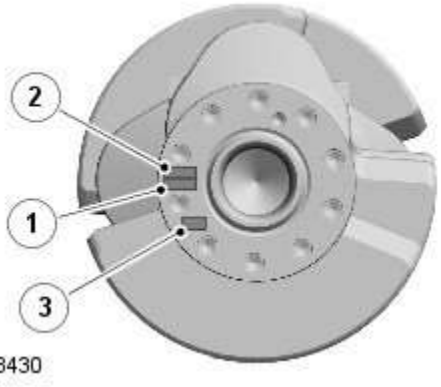


The crankshaft is made from spheroidal graphite cast iron, which, compared with grey cast iron, has higher mechanical strength, ductility and increased shock resistance. The undercut and rolled fillets also improve strength. Eight counter-balance

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

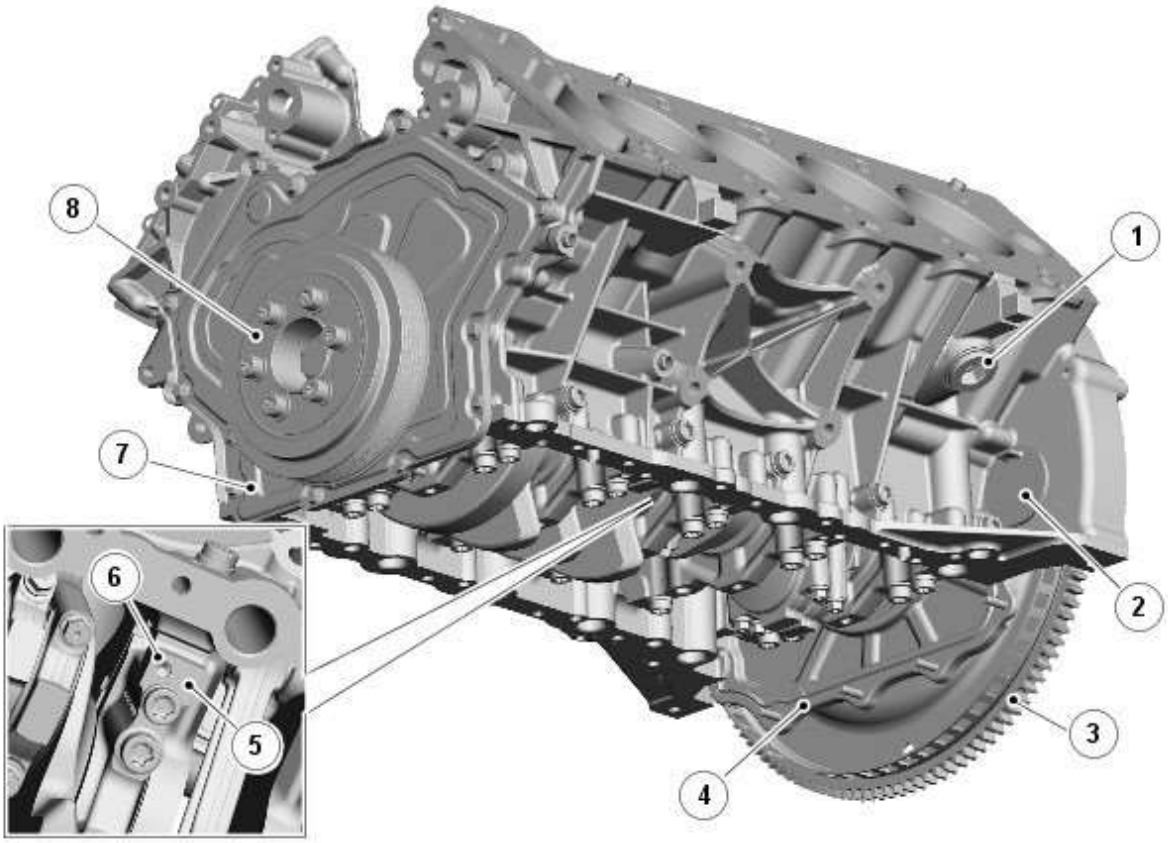


E108430

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

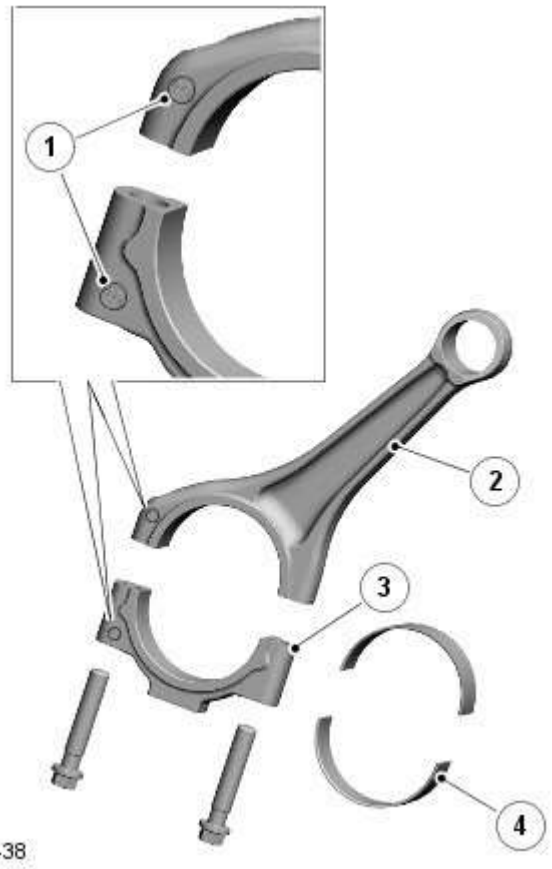
E116028

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.

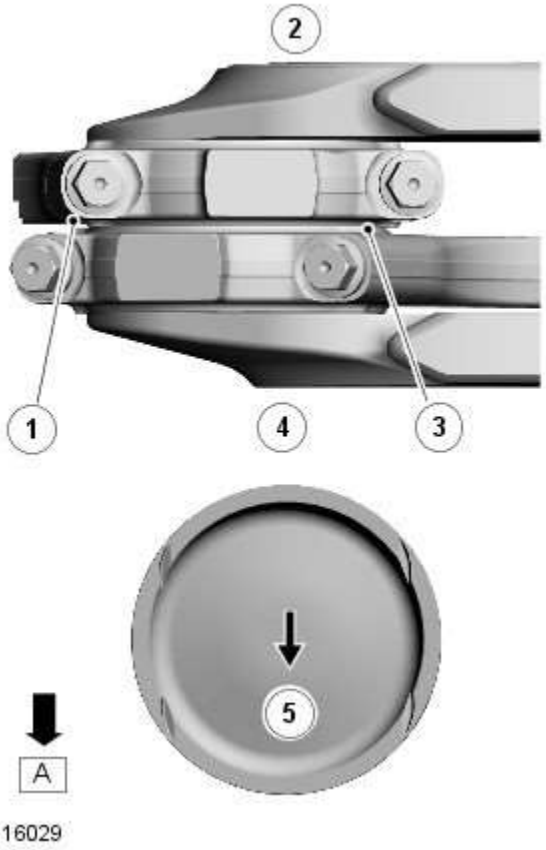
The pistons are cooled with engine oil from four piston cooling jets installed under the valley of the cylinder block. Each piston cooling jet sprays oil onto the underside of the two adjacent pistons, one from each cylinder bank.

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.



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.



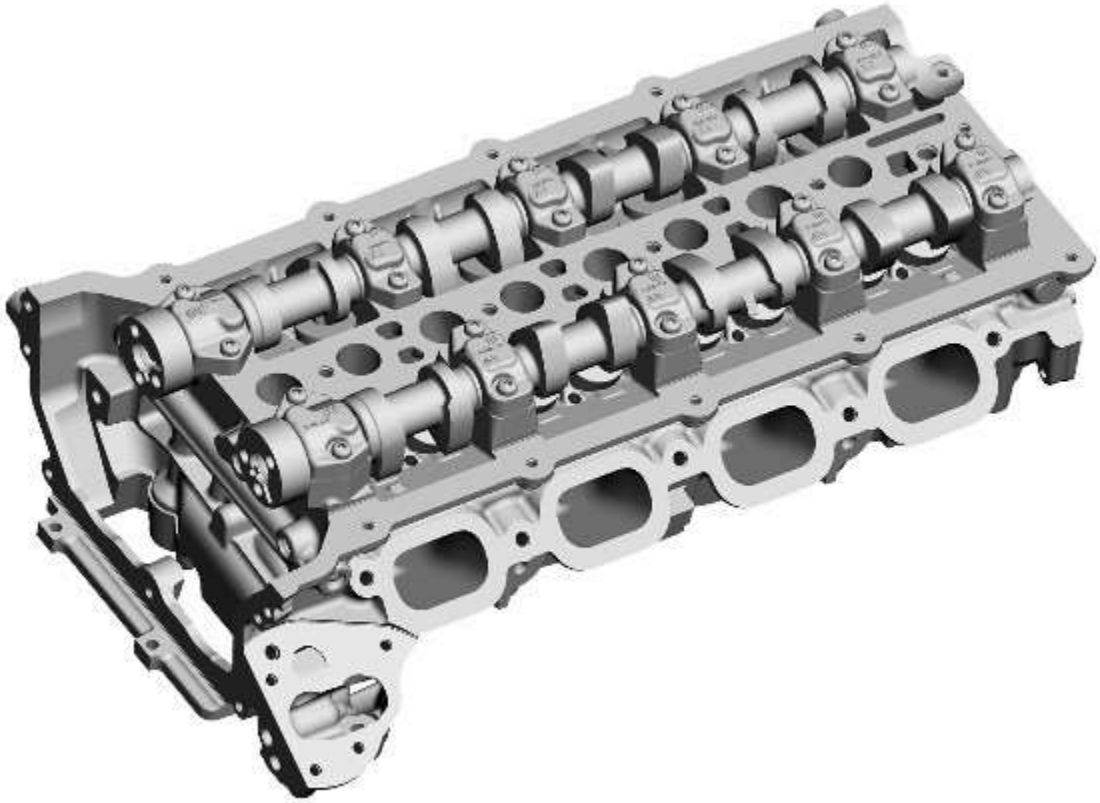
Item	Description
A	Front of engine
1	Alignment mark
2	LH side (bank B)
3	Alignment mark
4	RH side (bank A)
5	Piston orientation arrow

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

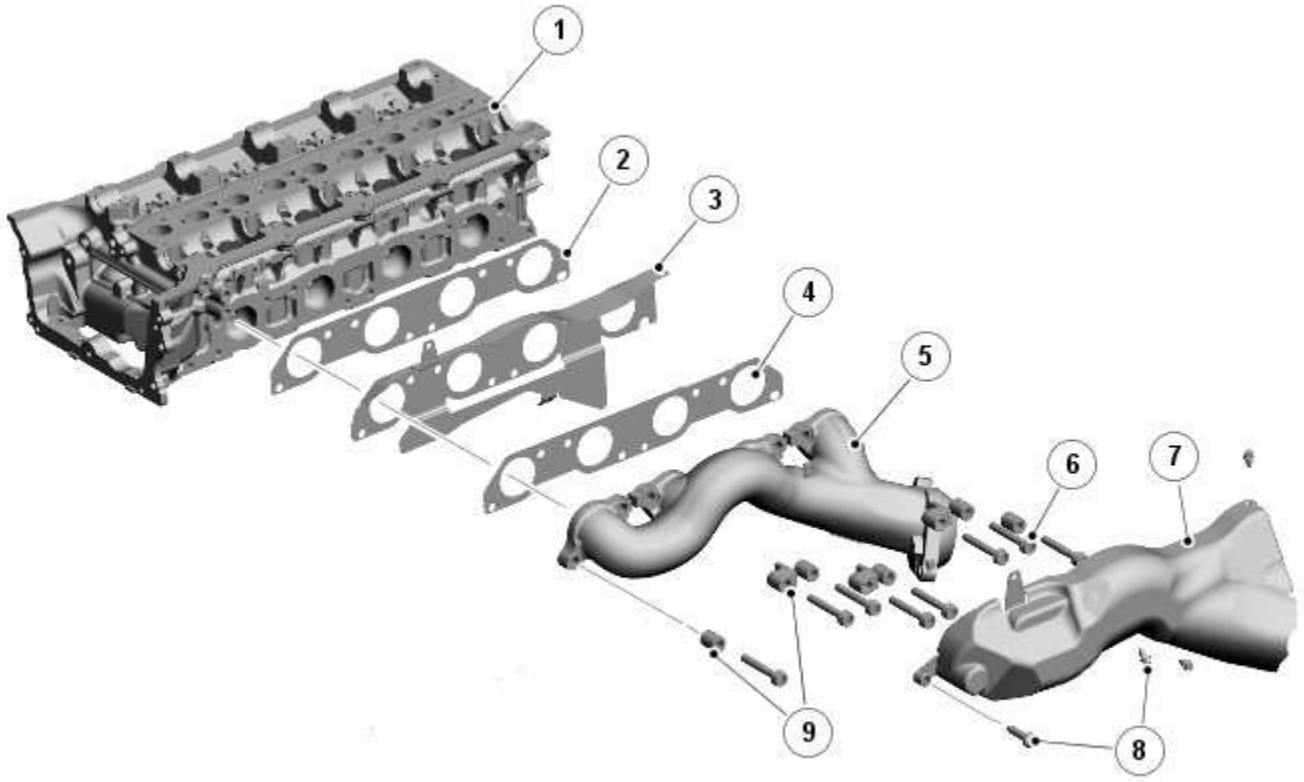
The cylinder heads are manufactured in gravity die cast aluminum alloy and are unique for each cylinder bank. Deep-seated bolts reduce distortion and secure the cylinder heads to the cylinder block.

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.

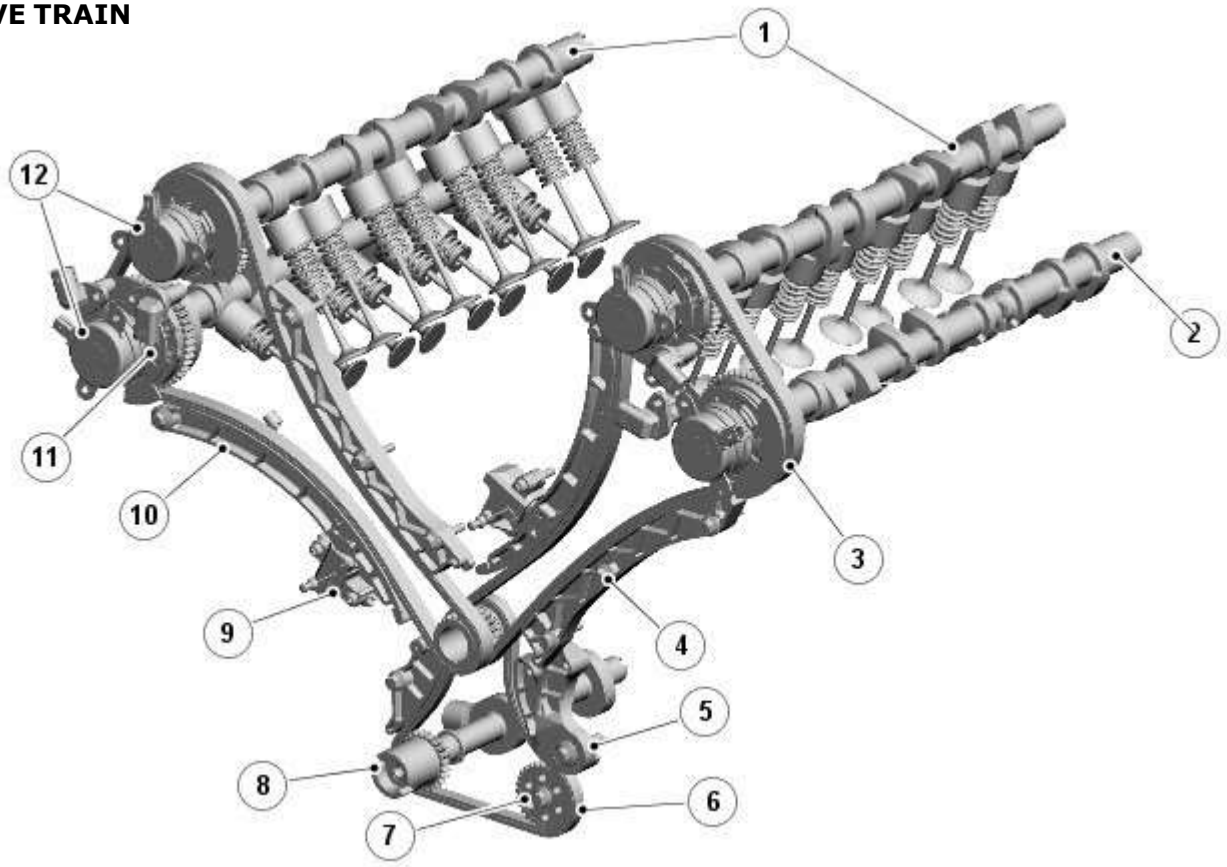


E115622

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



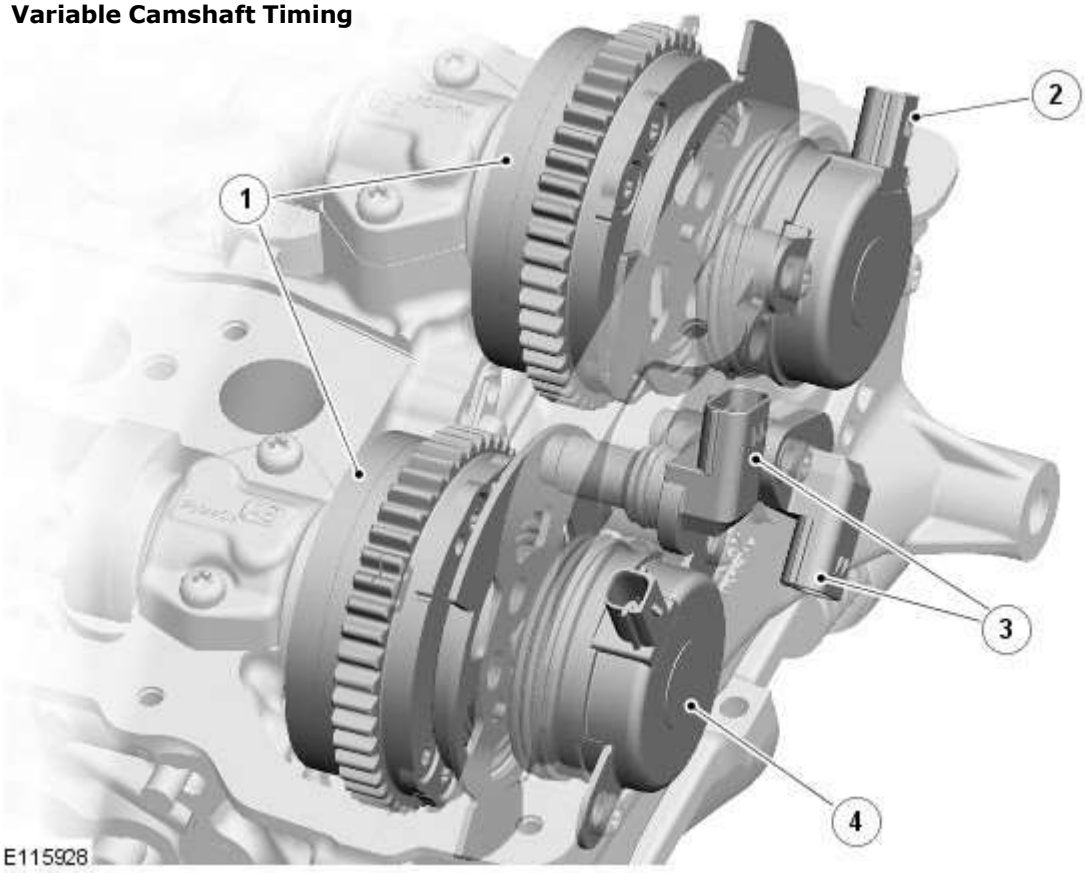
Item	Description
1	Inlet camshafts
2	Exhaust camshaft
3	Inverted tooth timing chain
4	Nylon chain guide
5	Auxiliary chain tensioner
6	Auxiliary drive chain
7	Oil pump drive
8	Auxiliary drive camshaft
9	Timing chain tensioner
10	Tensioner lever
11	VCT unit
12	VCT solenoids

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

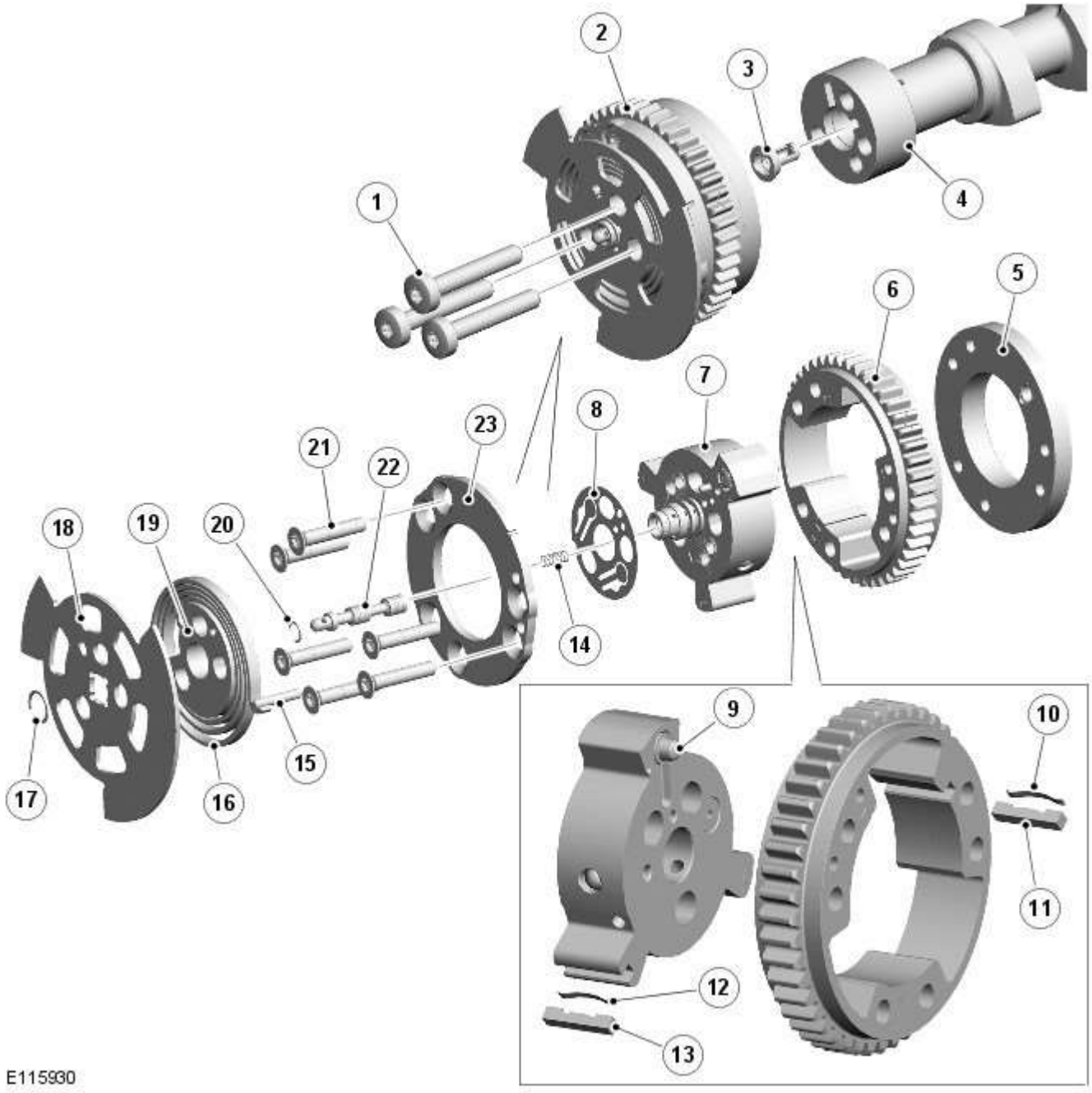
Camshaft	Valve Opens	Valve Closes
Intake	29 degrees BTDC (before top dead center) to 33 degrees ATDC (after top dead center)	207 to 269 degrees ATDC
Exhaust	244 to 194 degrees BTDC	6 to 56 degrees ATDC

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.



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.

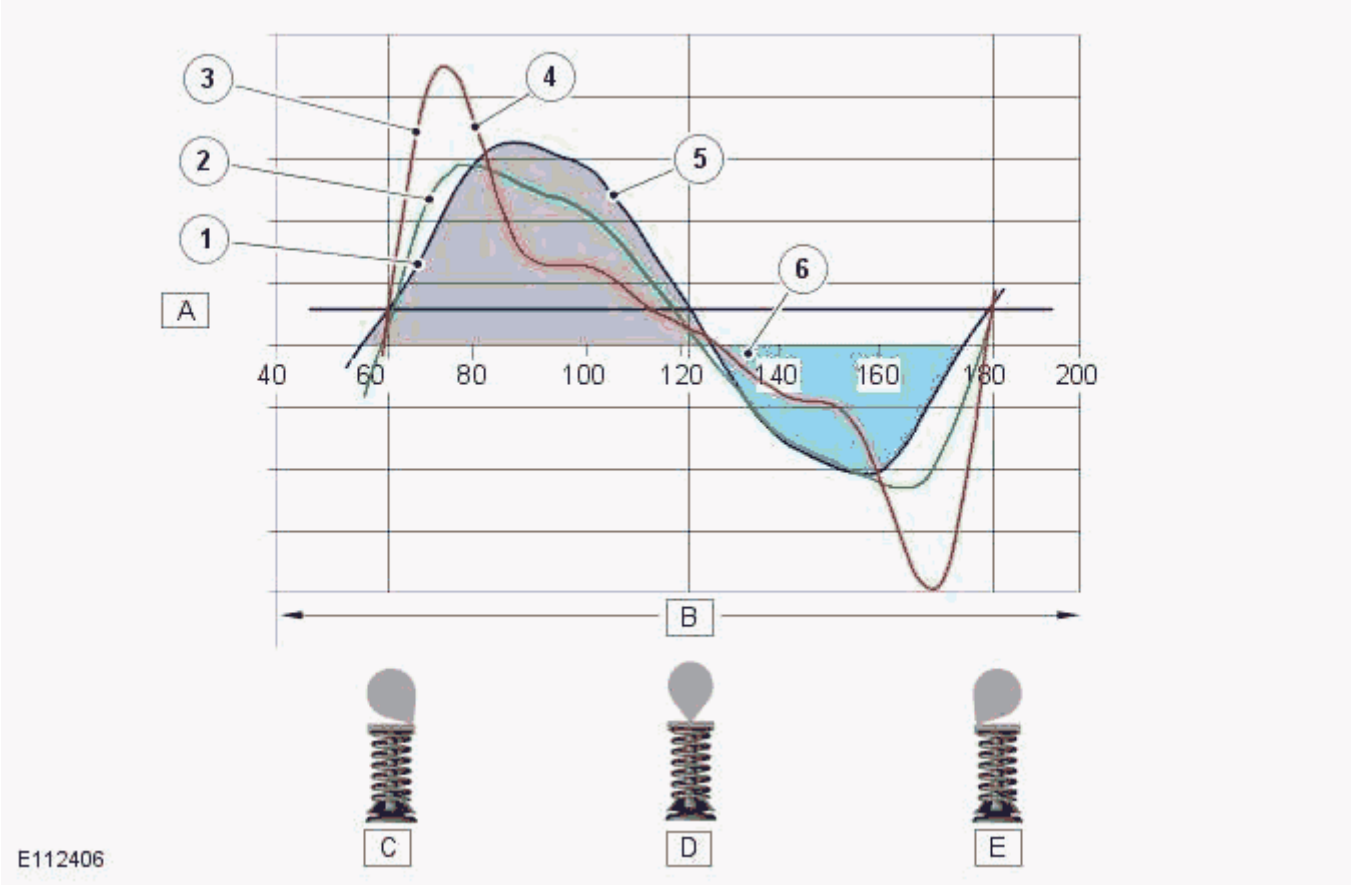
E115929

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

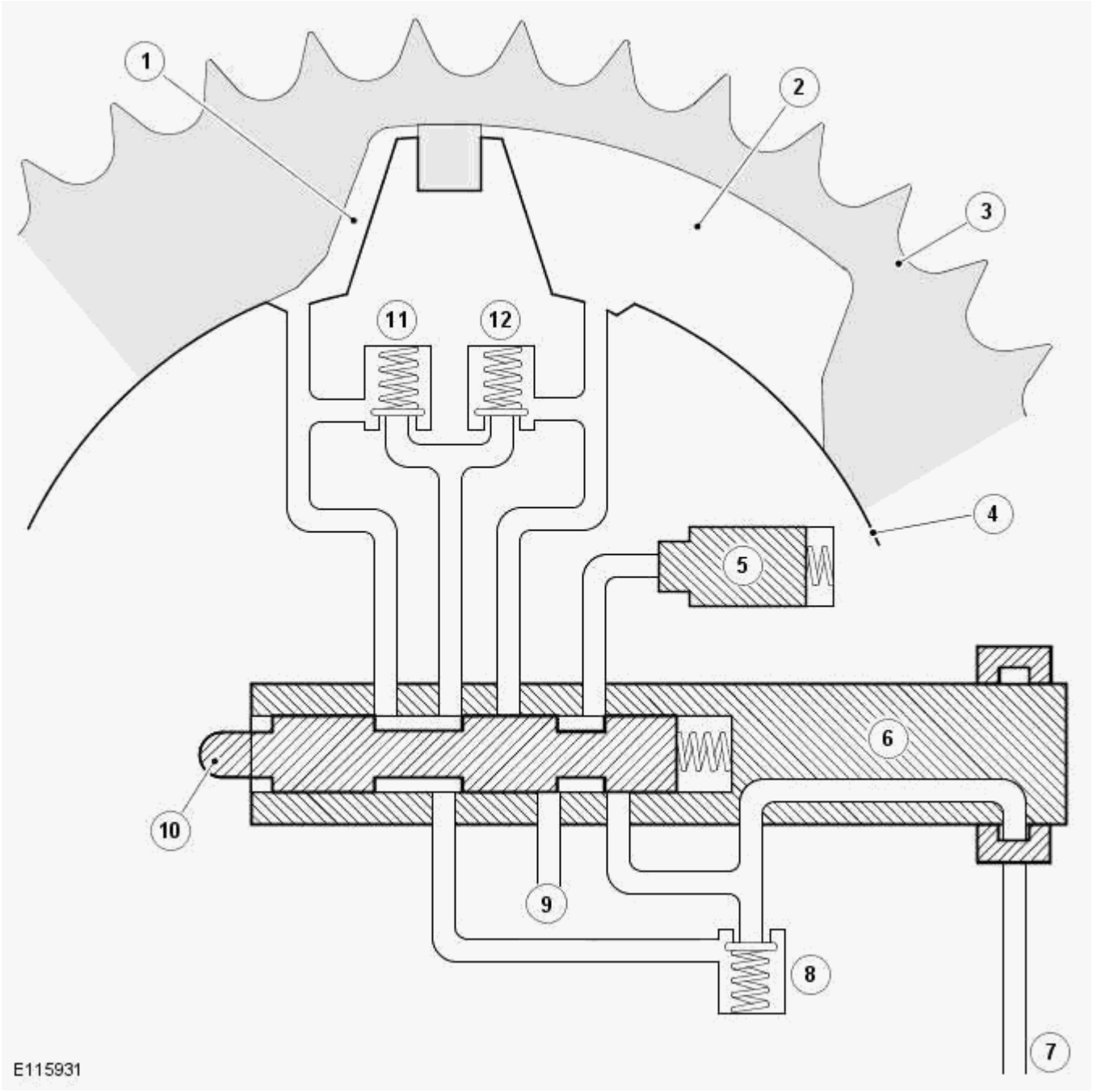
When the engine is running, the compression and expansion of the valve springs causes momentary increases and decreases in the torque acting on the camshafts. These momentary changes of torque are sensed in the VCT units and used to change the camshaft timing.



Item	Description
A	Camshaft torque
B	Camshaft rotation (degrees)
C	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



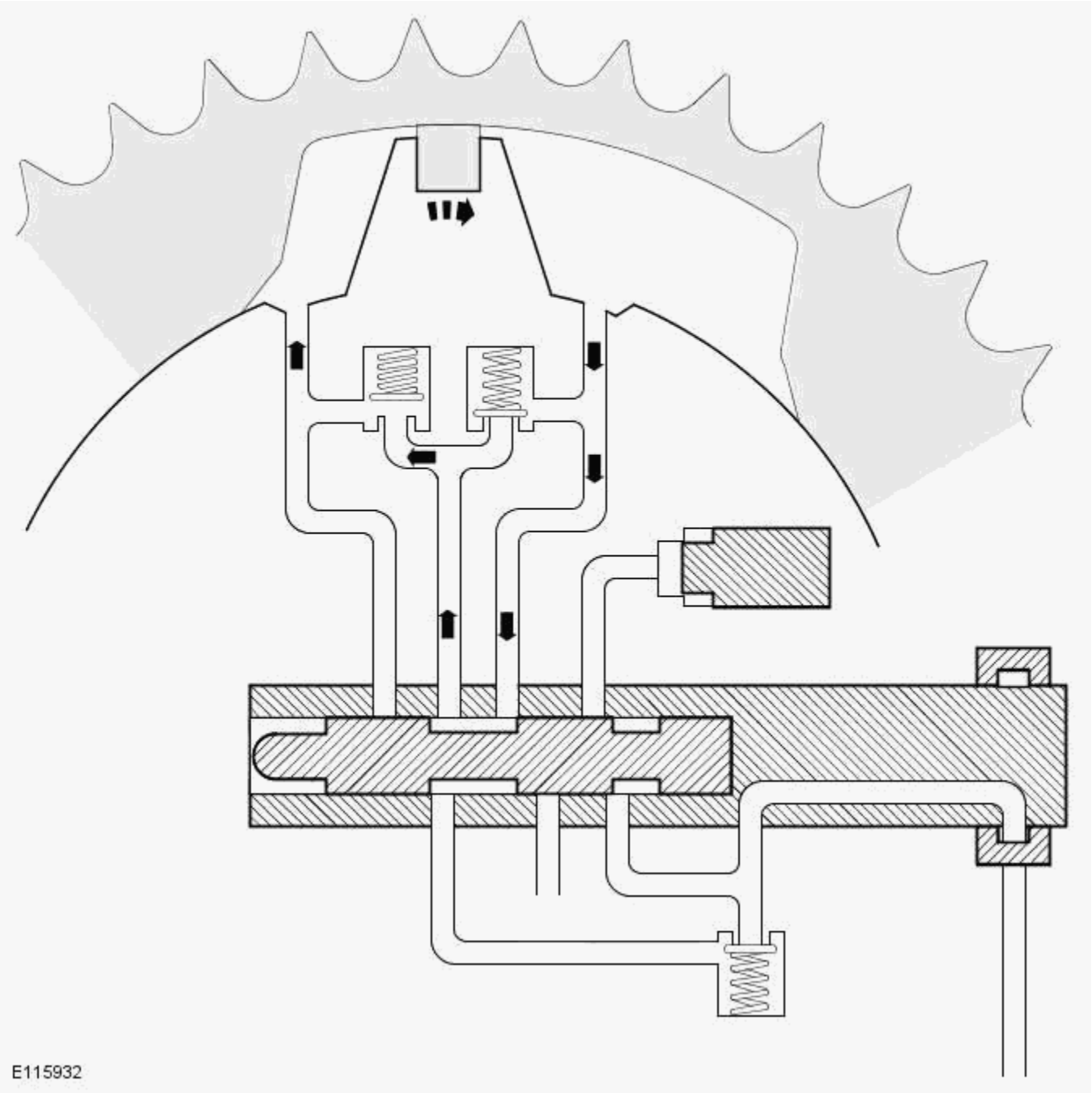
Item	Description
1	Advance chamber
2	Retard chamber
3	Sprocket housing
4	Rotor assembly
5	Lock pin
6	Sleeve
7	Engine oil supply from camshaft
8	Inlet check valve
9	Lock pin drain
10	Spool valve
11	Advance check valve
12	Retard check valve

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.

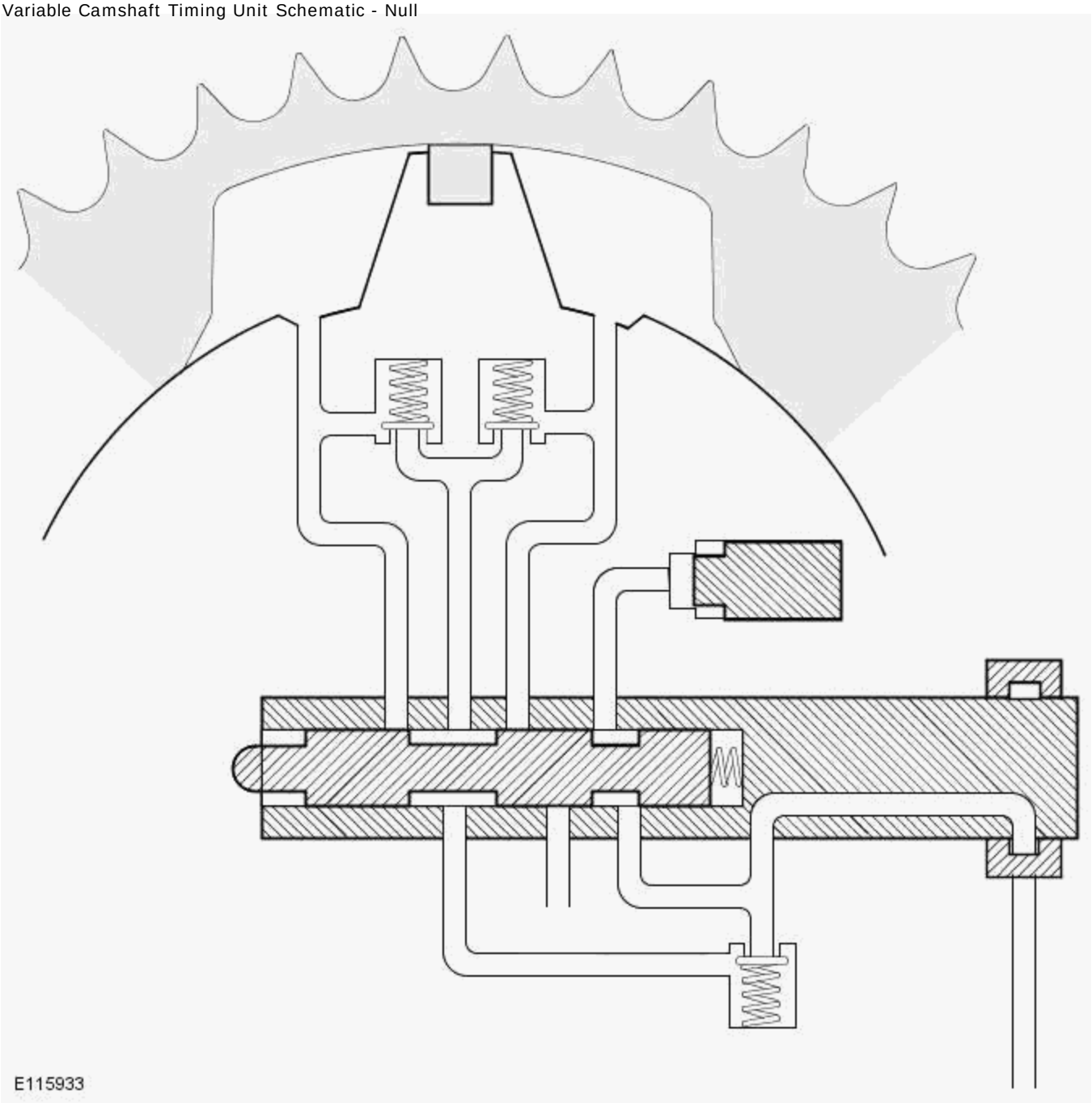
Variable Camshaft Timing Unit Schematic - Advance



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.

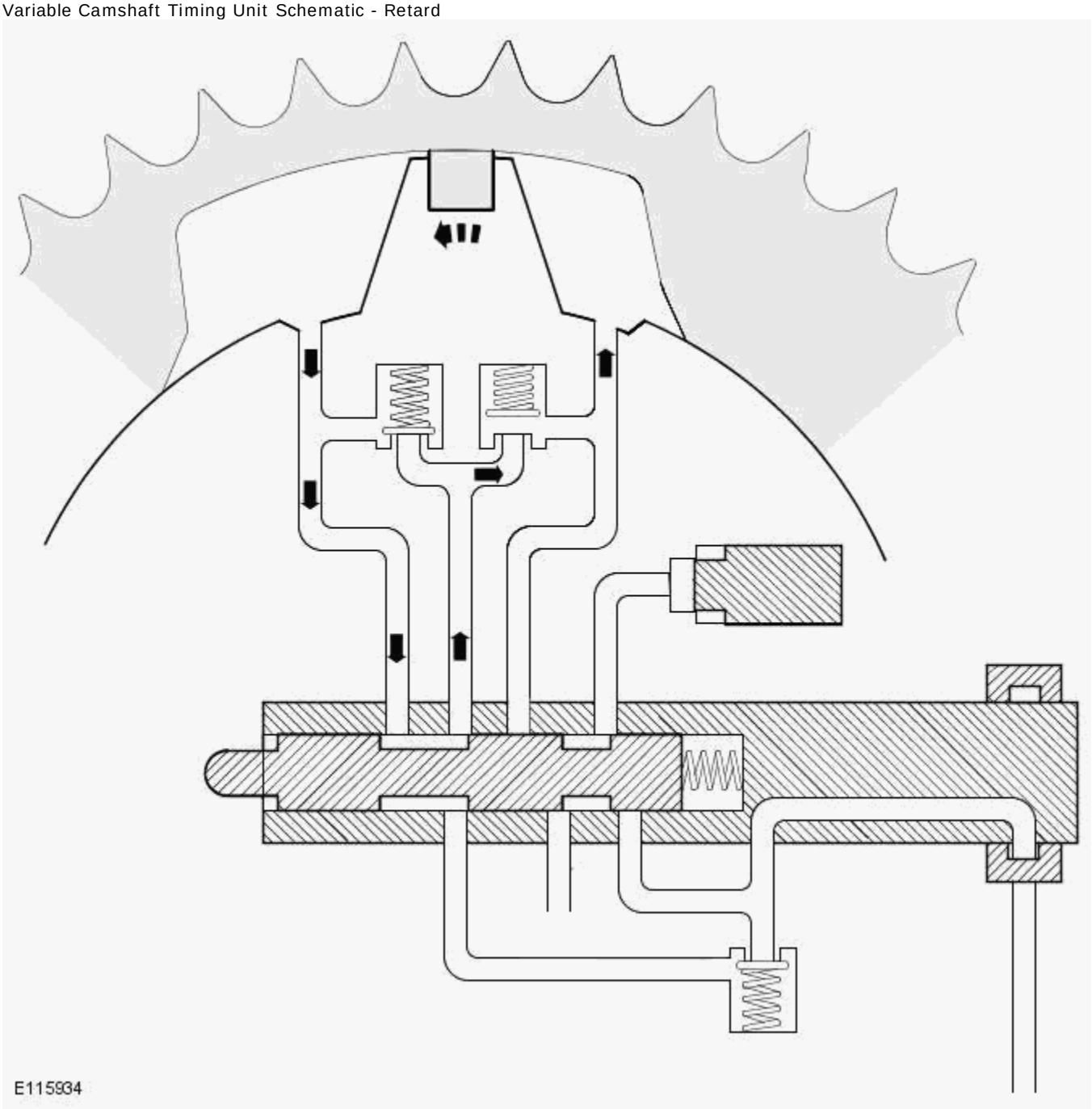
Each momentary increase of the torque acting on the camshaft generates a pressure pulse in the retard chamber. Oil moves from the retard chamber, through the spool valve and the advance check valve to the advance chamber, to equalize the pressures in the two chambers. The displacement of oil from the 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



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.

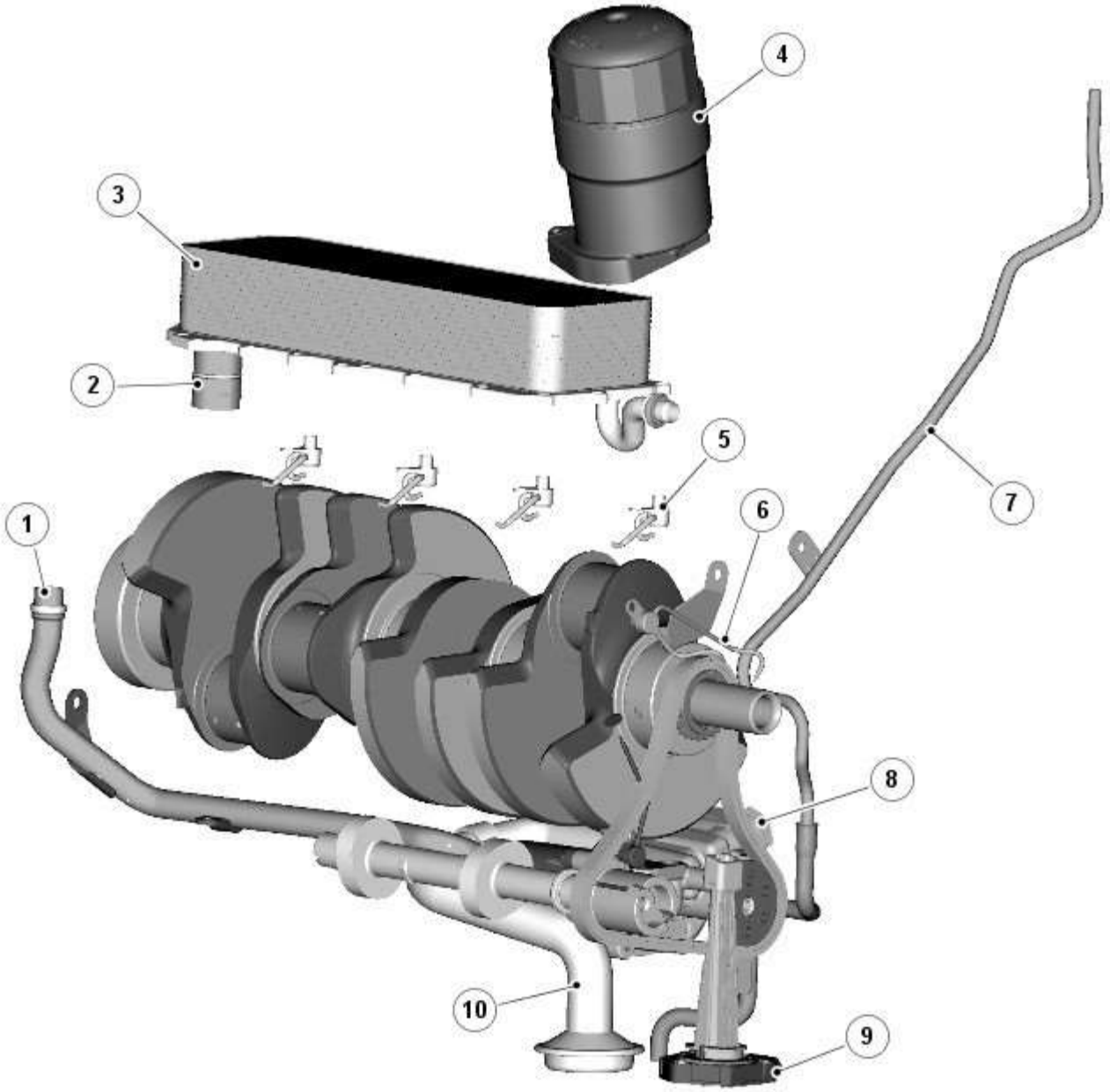
Variable Camshaft Timing Unit Schematic - Retard



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.)

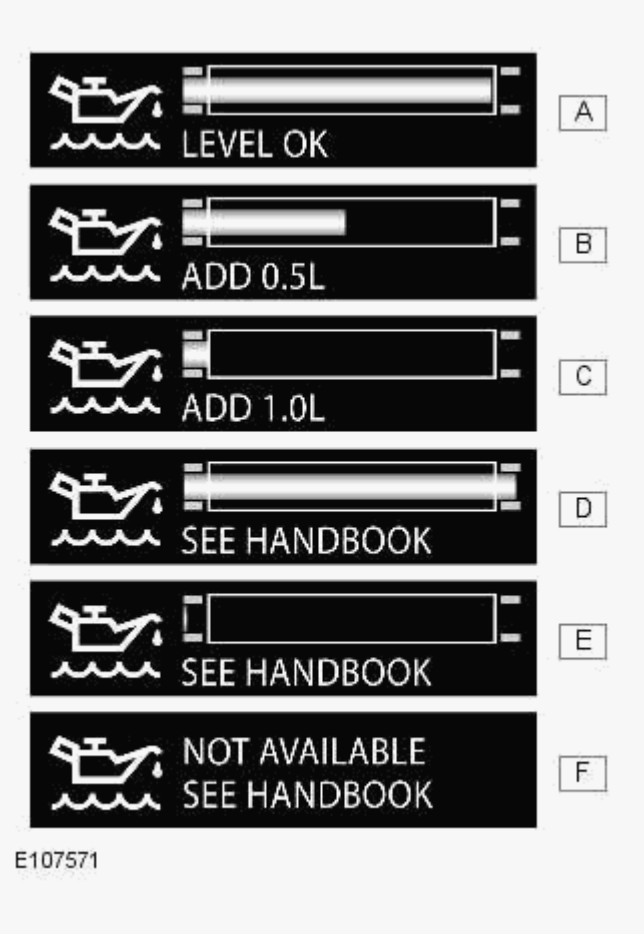
Feature	Details
Operating Temperature Range	-40 to 160 °C (-40 to 320 °F)

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:



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.

Published: 11-May-2011

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).

Published: 11-May-2011

Engine - V8 S/C 5.0L Petrol - Engine Oil Draining and Filling

General Procedures

Draining

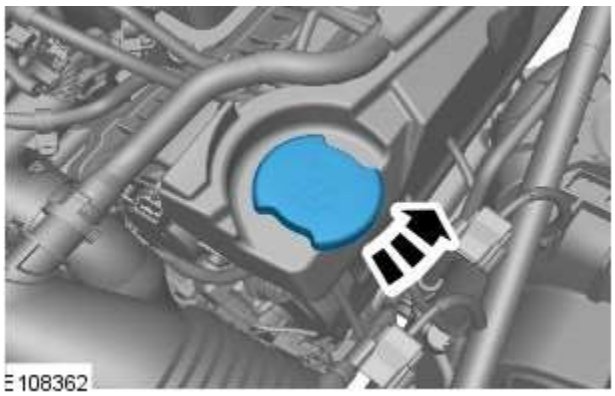
WARNING: The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.

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.

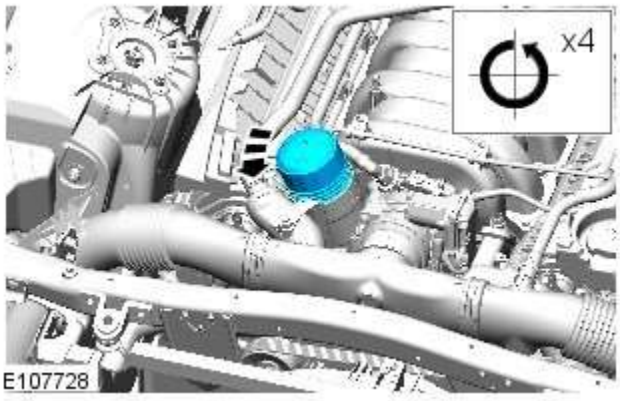
1. CAUTION: Make sure the engine is warm.

   Start the engine and allow to run for 10 minutes, stop the engine.



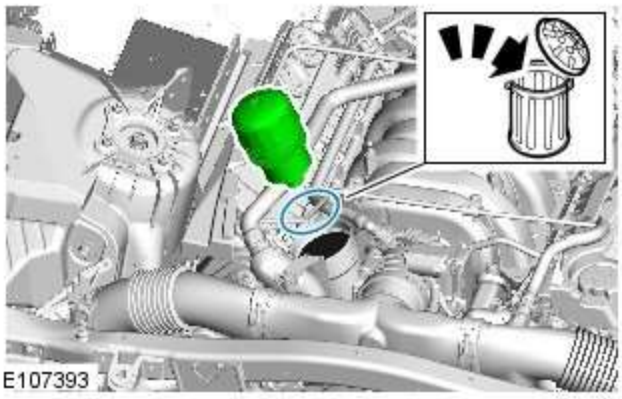
2.

3. Refer to: Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

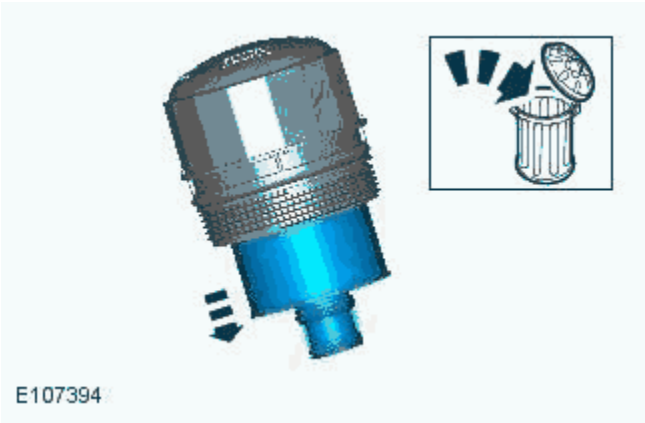


4.
   - Loosen the element cover 4 complete turns to allow engine oil to drain from the filter cover.
   - Make sure that the O-ring seal is exposed.

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.

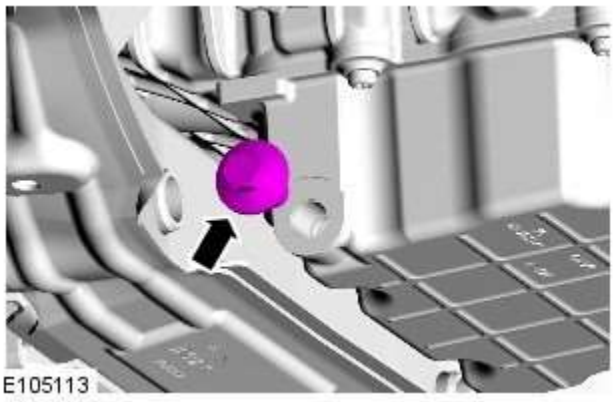


7. Remove and discard the oil filter element.

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).



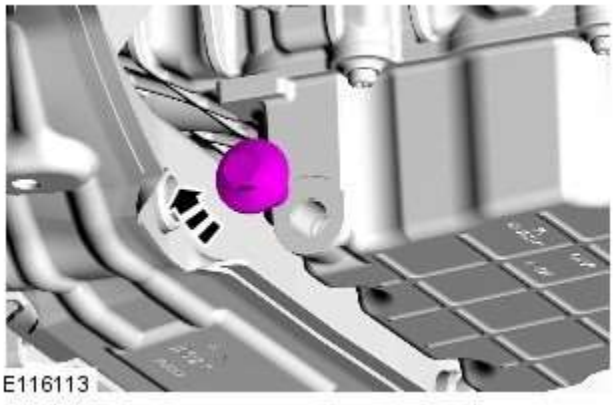
10. CAUTIONS:

    Be prepared to collect escaping oil.

    Allow at least 10 minutes for the engine oil to drain.

    NOTE: Discard the sealing washer.

Filling

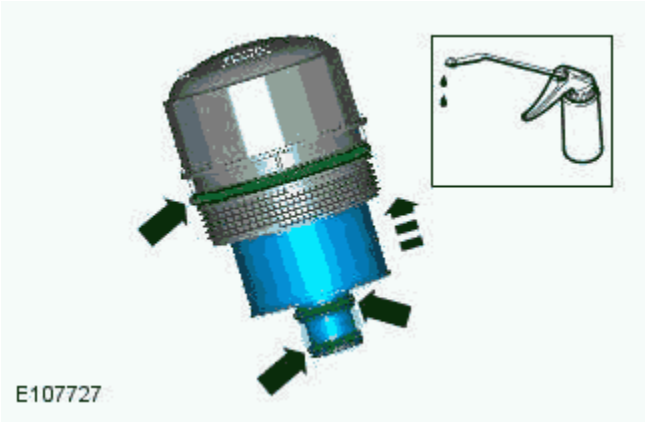


1. CAUTION: Make sure that the area around the component is clean and free of foreign material.

   NOTE: Install a new sealing washer.

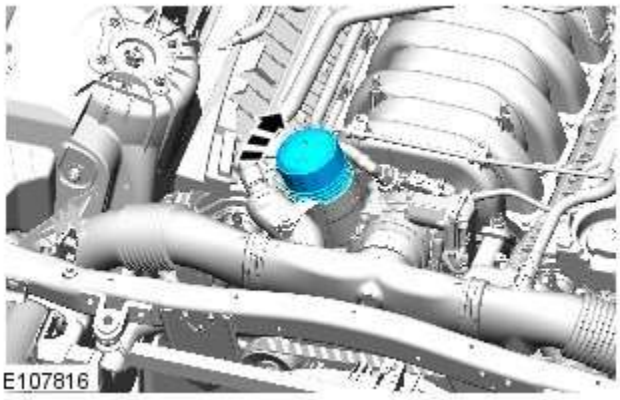
   Torque: 24 Nm

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.

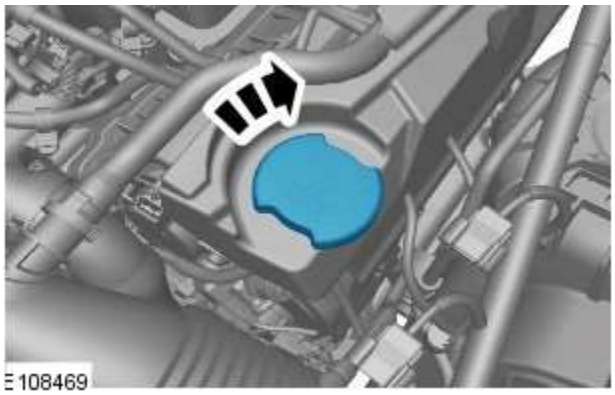


4. CAUTION: Tighten the component finger tight first.
   - *Torque:* 25 Nm

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.

10.

- Scroll through the trip menu to access the engine oil level display.

E115112

11.

- Press the cruise control cancel button twice within 2 seconds.


E111933

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.


E111933

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.

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

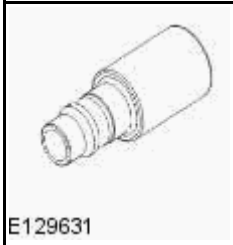
20. Refer to: Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

Published: 11-May-2011

Engine - V8 S/C 5.0L Petrol - Engine Oil Vacuum Draining and Filling

General Procedures

Special Tool(s)

 E129630	303-1484 Vacuum Pump, Oil Drain
 E129631	303-1484-01 Adapter for 303-1484

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.

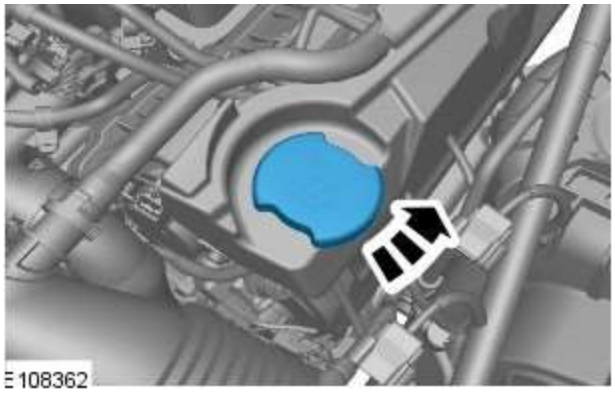
NOTES:

Make sure that the vehicle is parked on level ground.

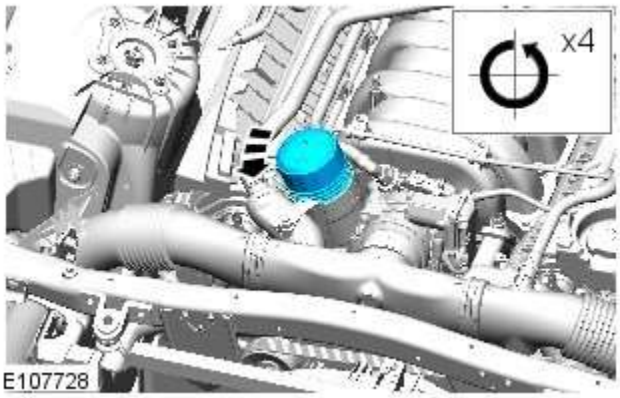
Clean the components general area prior to dismantling.

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.

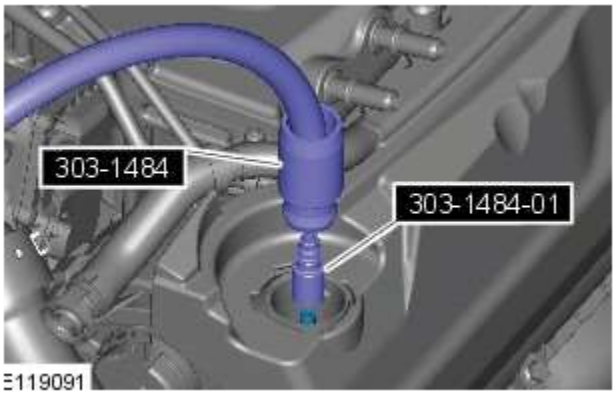

E108362

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.



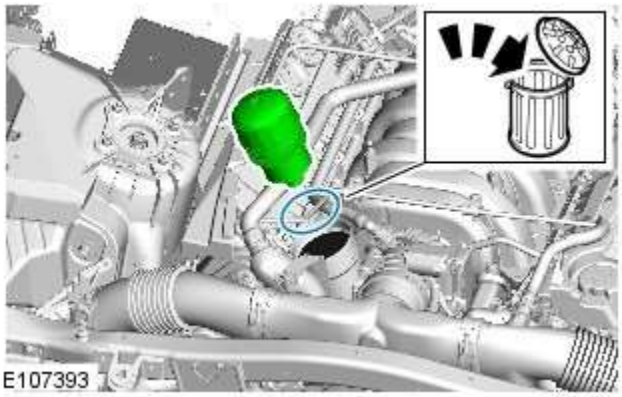
5.

- Using the oil vacuum pump drain the oil out through the oil extraction tube.

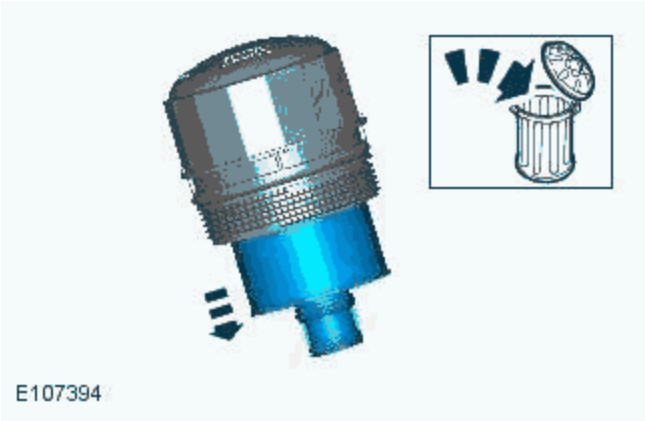
  Special Tool(s): 303-1484, 303-1484-01

6.

- Remove the oil vacuum pump.

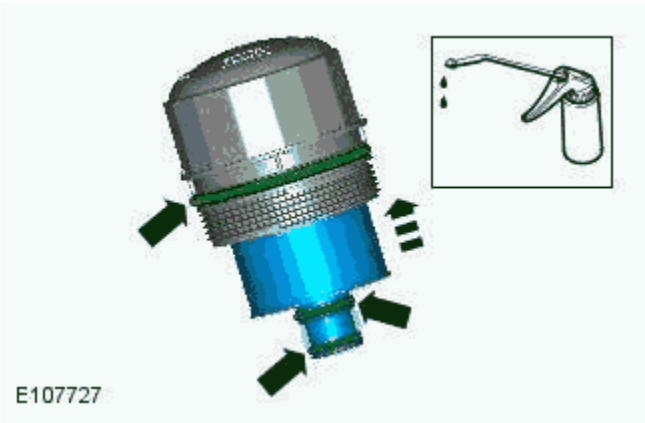


7.



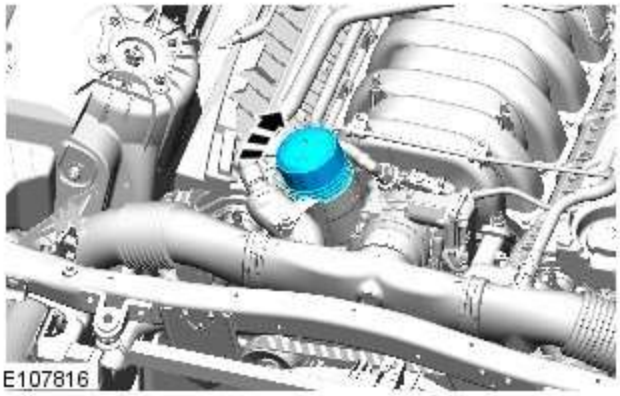
8. NOTE: Discard the O-ring seals.

Filling



1. NOTE: Install new O-ring seals.

   Lubricate the oil filter element O-ring seal with clean engine oil.



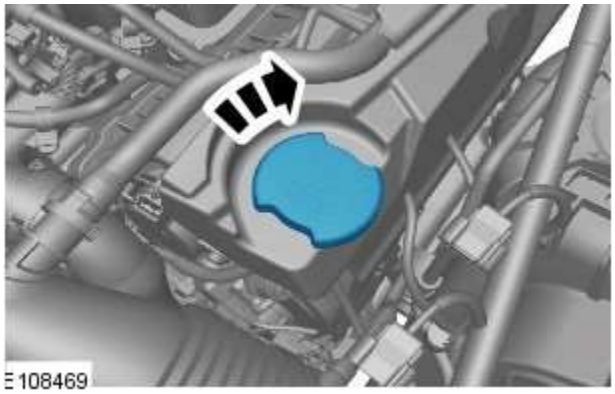
2. CAUTION: Tighten the component finger tight first.
   - *Torque:* 25 Nm

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.

8.

- Scroll through the trip menu to access the engine oil level display.

E115112

9.

- Press the cruise control cancel button twice within 2 seconds.


E111933

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.


E111933

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.

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).

Published: 16-Dec-2013

Engine - V8 S/C 5.0L Petrol - Fuel Pump Camshaft Timing Check

General Procedures

Special Tool(s)

 E115265	303-1447 Timing Tool
 E140377	JLR-303-1621 Alignment Tool, Fuel Pump Camshaft Timing

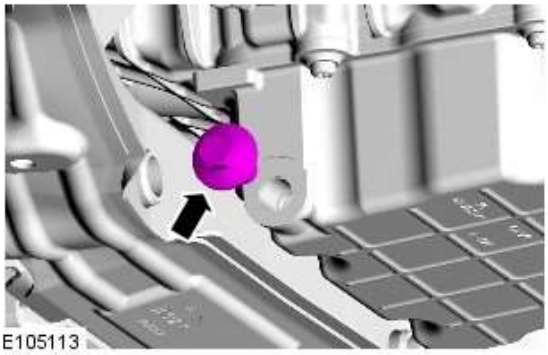
Check

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).


E105113

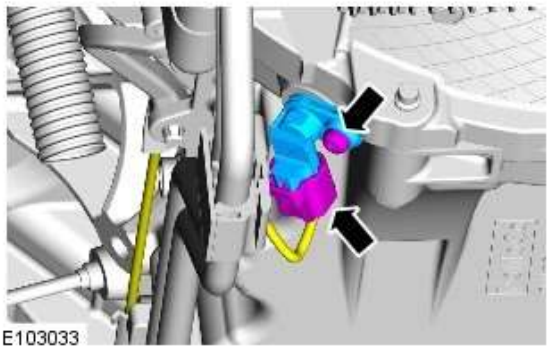
4. CAUTION: Be prepared to collect escaping oil.

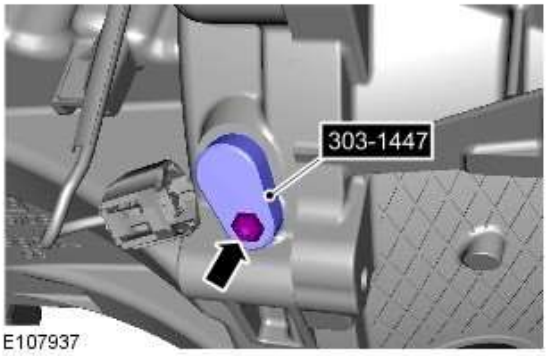
   NOTES:

   Discard the sealing washer.

   Collect the engine oil in a clean container.

5.


E103033



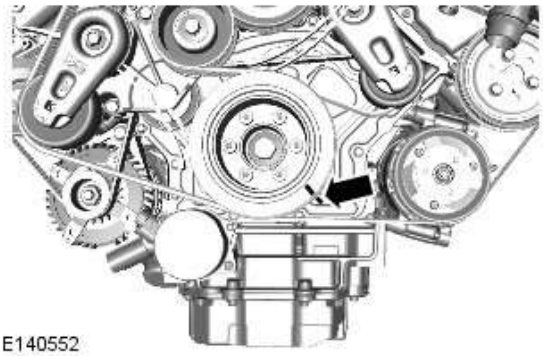
E107937

6. CAUTIONS:

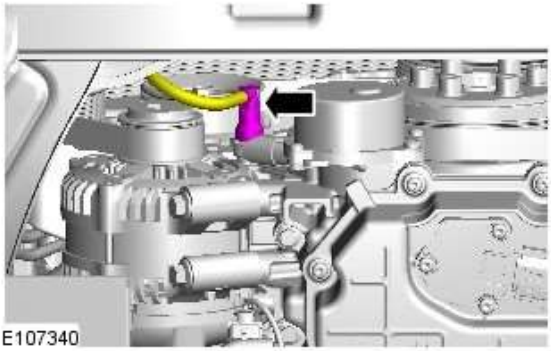
Only rotate the crankshaft clockwise.

Make sure that the crankshaft is fully locked.

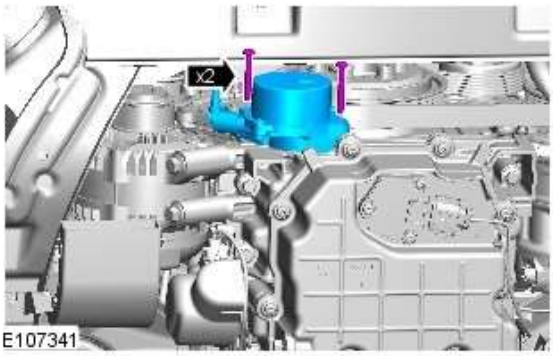
Install the Special Tool(s): 303-1447


E140552

7. Using a suitable marker, mark the position of the crankshaft pulley as illustrated.

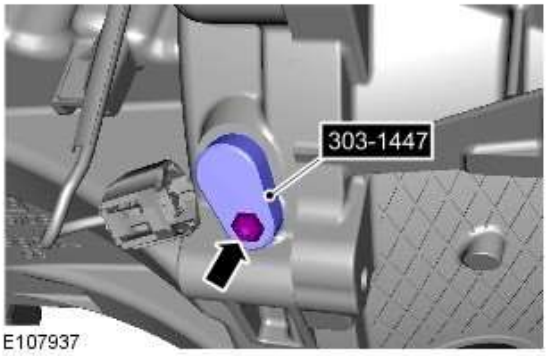

E107340

8.

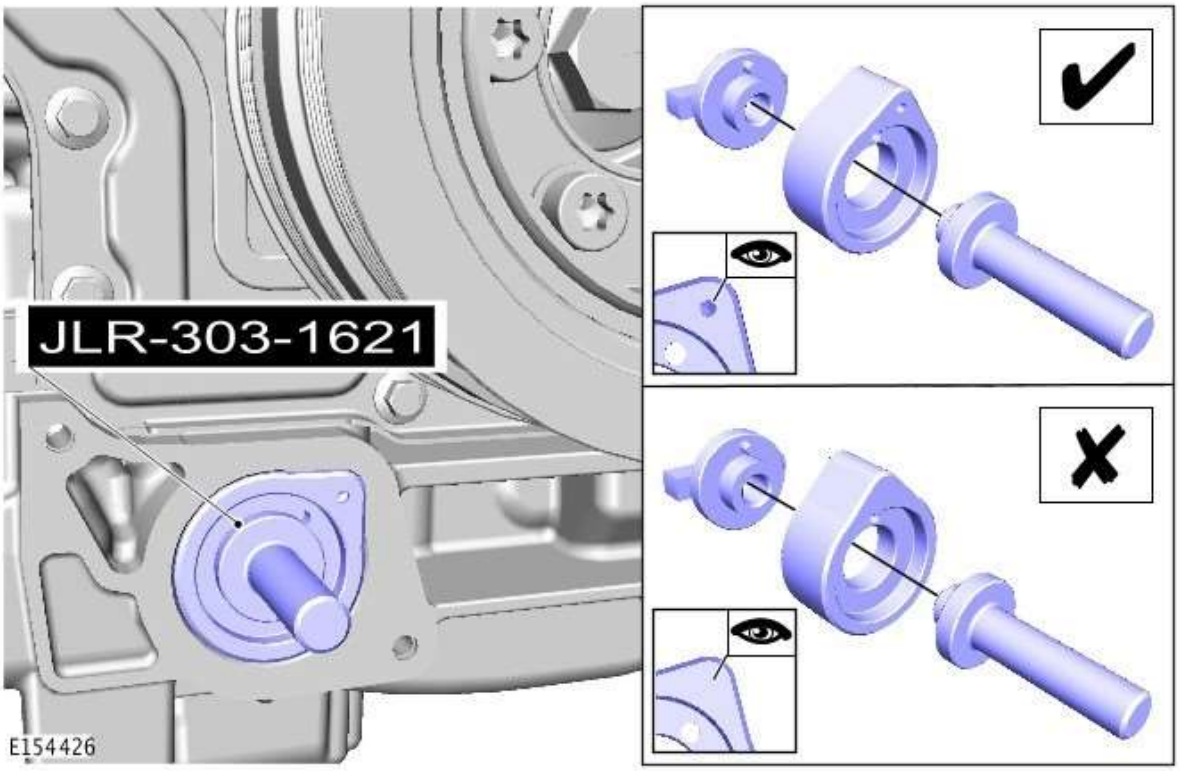


E107341

9. NOTE: Discard the seal.

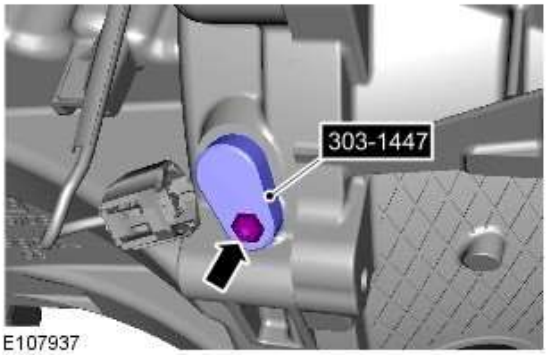


10. *Remove the Special Tool(s):* 303-1447



11. If required, carefully adjust the crankshaft position to allow correct installation of the special tool.

Install the Special Tool(s): JLR-303-1621



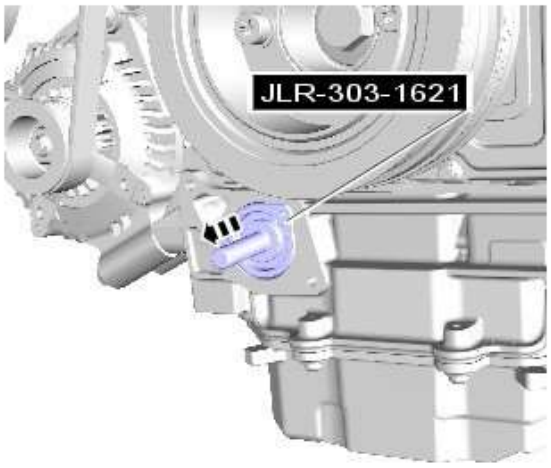
12. CAUTION: Do not use excessive force when adjusting the crankshaft position.

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.

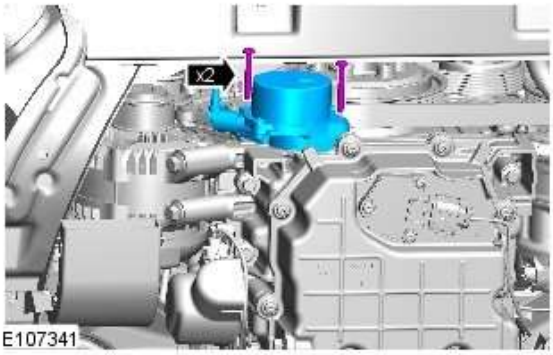
  Install the Special Tool(s): 303-1447
- If the crankshaft timing tool cannot be installed, adjustment of the fuel pump camshaft timing will be required.

  Refer to: Fuel Pump Camshaft Timing Adjustment (303-01C Engine - V8 5.0L Petrol, General Procedures).



E154428

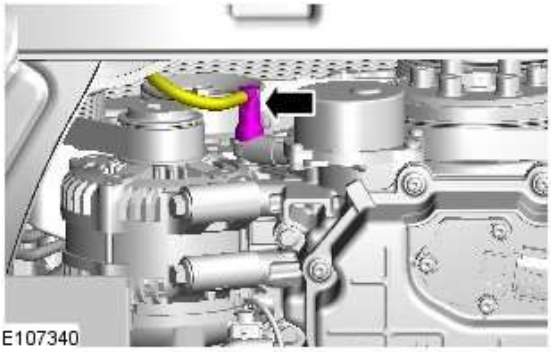
13. *Remove the Special Tool(s):* JLR-303-1621



E107341

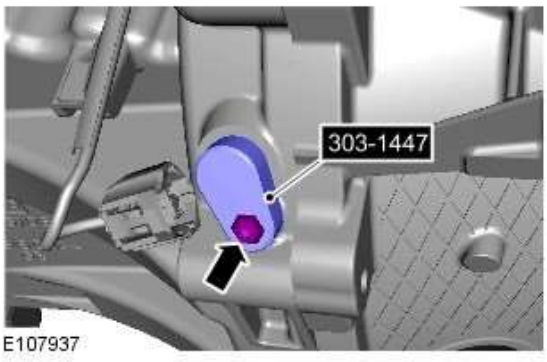
14. NOTE: Install a new seal.

Torque: 12 Nm



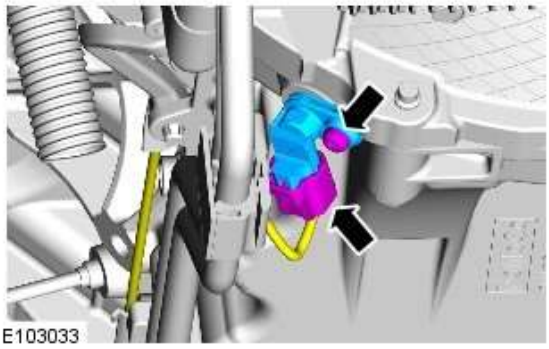
E107340

15.

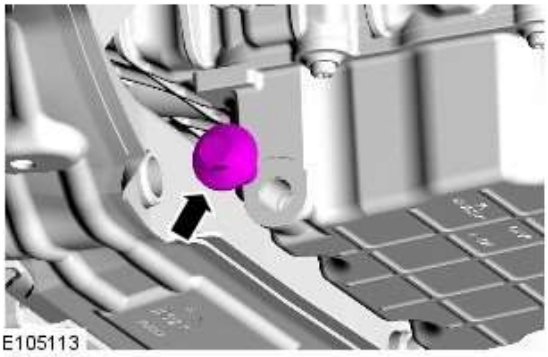


E107937

16. *Remove the Special Tool(s):* 303-1447



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.

24.

- Scroll through the trip menu to access the engine oil level display.

E115112

25.

- Press the cruise control cancel button twice within 2 seconds.


E111933

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.


E111933

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.

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).

Published: 21-Dec-2011

Engine - V8 S/C 5.0L Petrol - Fuel Pump Camshaft Timing Adjustment

General Procedures

Special Tool(s)

 E115265	303-1447 Timing Tool
 E140377	JLR-303-1613 Alignment Tool, Fuel Pump Camshaft Timing

Adjustment

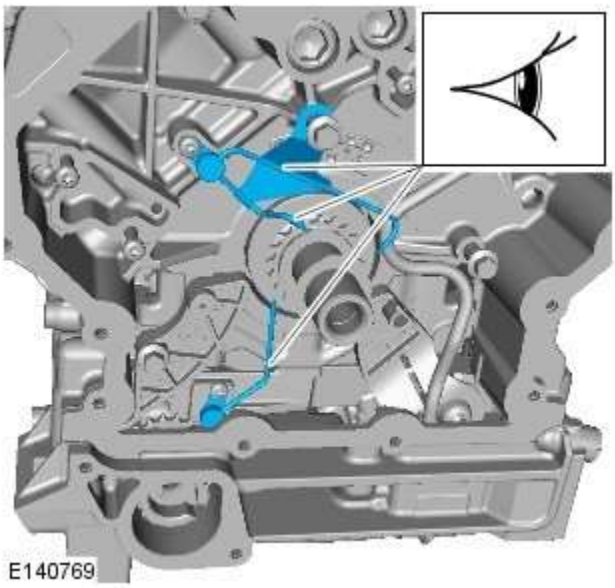
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

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).

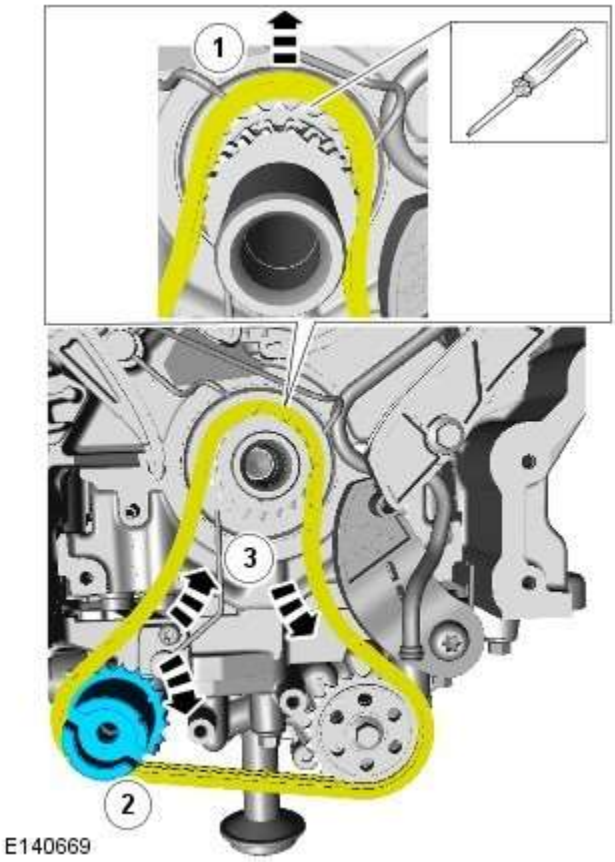
4. Refer to: Lower Timing Cover (303-01C Engine - V8 5.0L Petrol, Removal and Installation).
   Refer to: Lower Timing Cover (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).



5. CAUTIONS:

   Make sure that the area around the component is clean and free of foreign material.

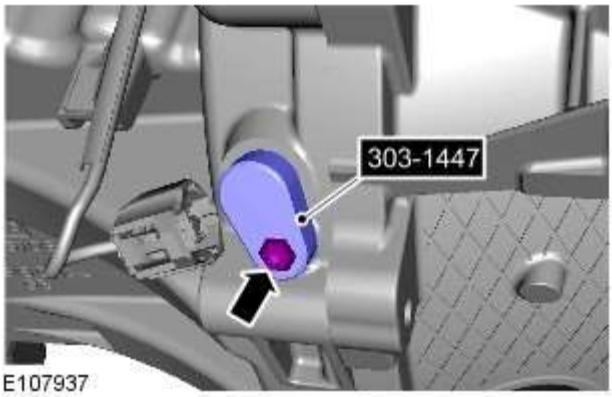
   Inspect the 3 timing chain oil nozzles for signs of damage, install as necessary.



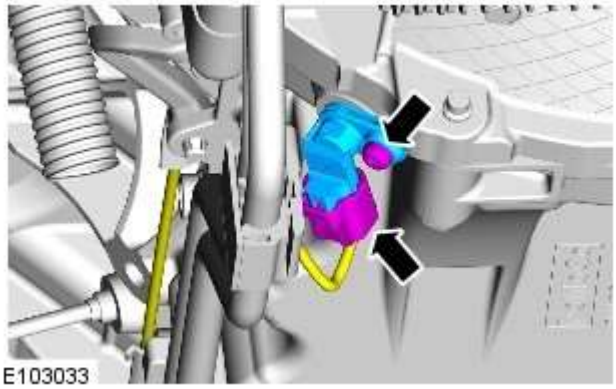
6. NOTE: **Using a suitable tie strap, position the tensioner to one side.**

   Special Tool(s): JLR-303-1613
   Torque: 12 Nm

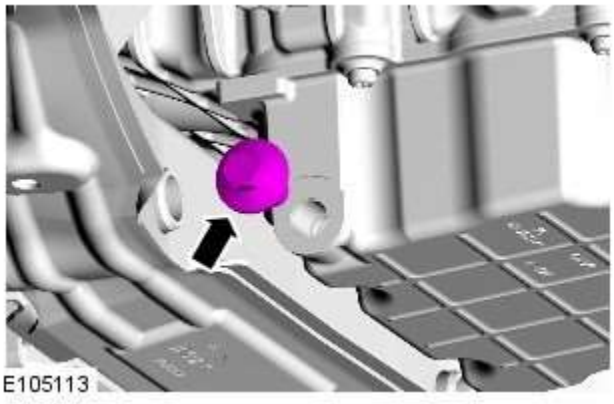
7. Refer to: Lower Timing Cover (303-01C Engine - V8 5.0L Petrol, Removal and Installation).
   Refer to: Lower Timing Cover (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).



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


E111933

17.

- Press the cruise control cancel button twice within 2 seconds.

E111932

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.


E111933

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.

E111932

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).

Published: 10-Jul-2013

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:

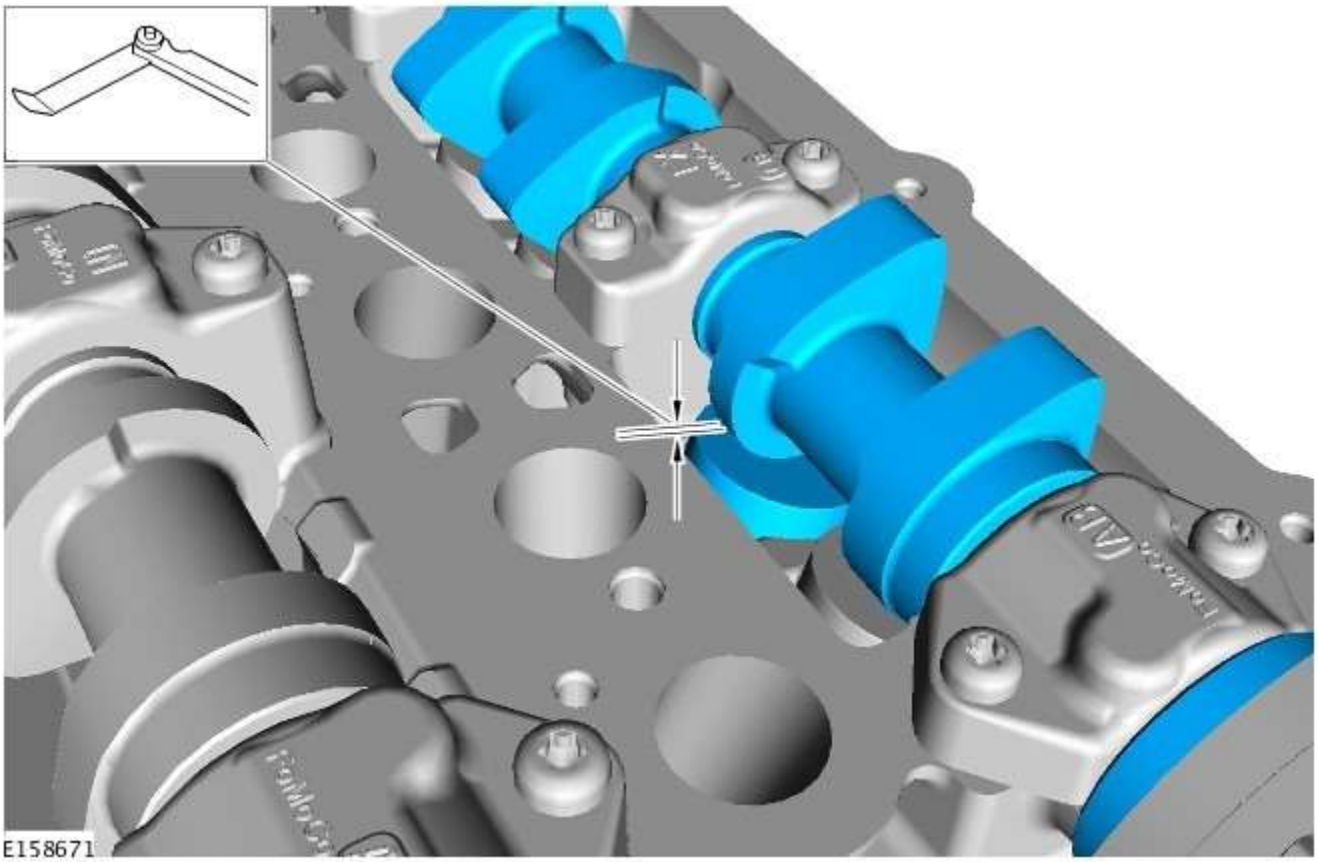
   Rotate the engine clockwise until the camshafts are positioned as shown.

   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.


E158671

Published: 10-Jul-2013

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

Published: 11-May-2011

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.

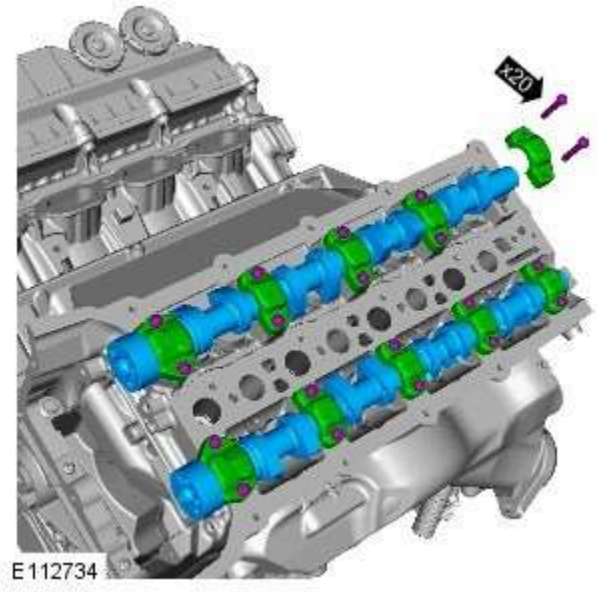
NOTE: Removal steps in this procedure may contain installation details.

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.



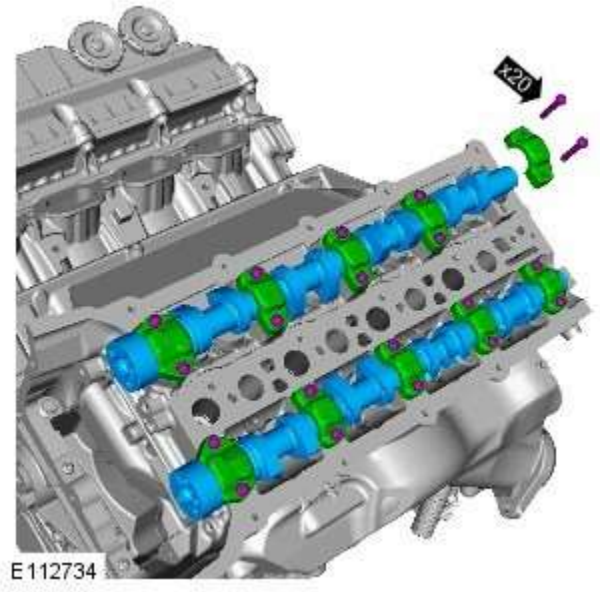
4. CAUTIONS:

   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).

Installation



1. CAUTIONS:

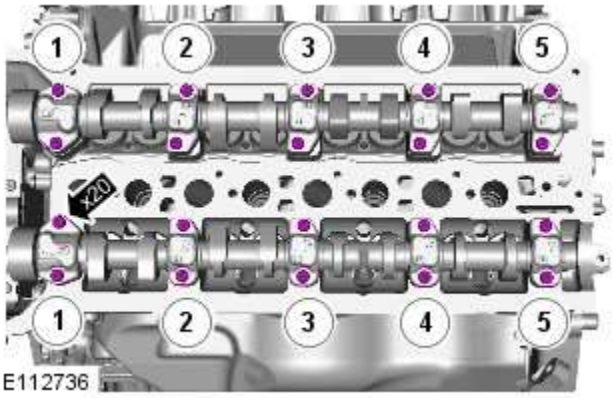
   Prior to installing the camshafts, position the crankshaft 45 degrees ATDC cylinder 1A to prevent valve/piston collision.

   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 untill 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).

Published: 11-May-2011

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.

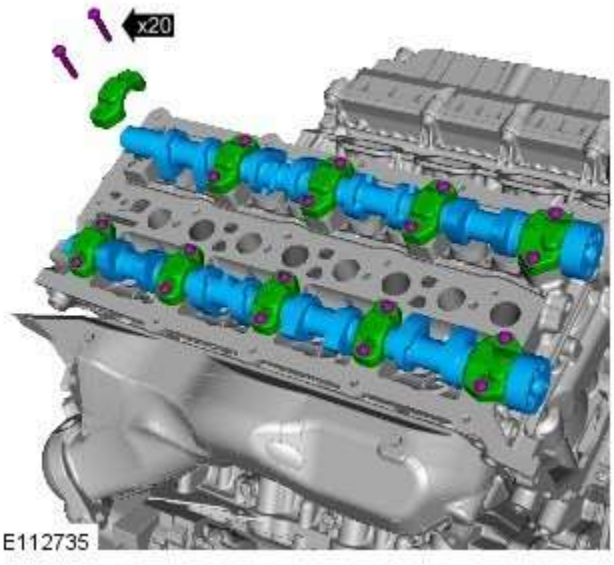
NOTE: Removal steps in this procedure may contain installation details.

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.



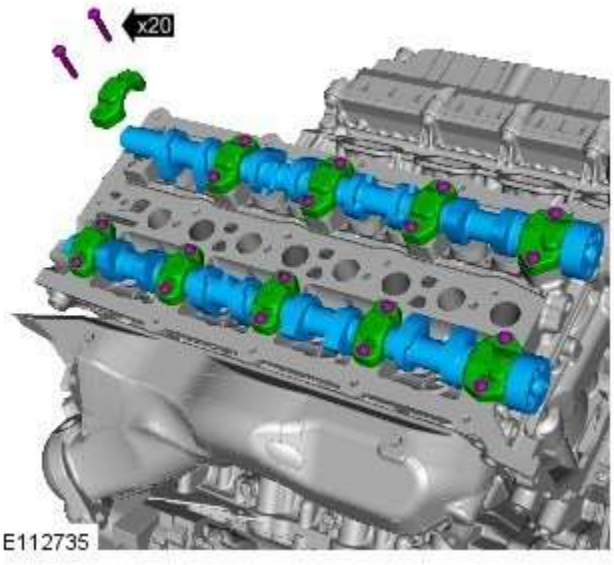
4. CAUTIONS:

   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).

Installation



1. CAUTIONS:

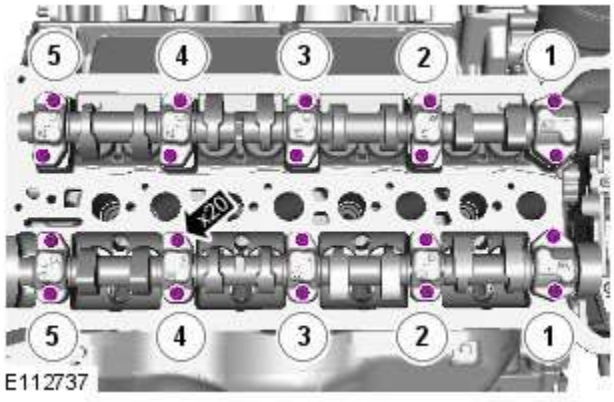
   Prior to installing the camshafts, position the crankshaft 45 degrees ATDC cylinder 1A to prevent valve/piston collision.

   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 untill 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.

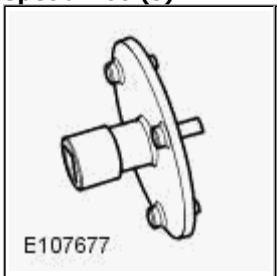
9. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 11-May-2011

Engine - V8 S/C 5.0L Petrol - Crankshaft Front Seal

Removal and Installation

Special Tool(s)

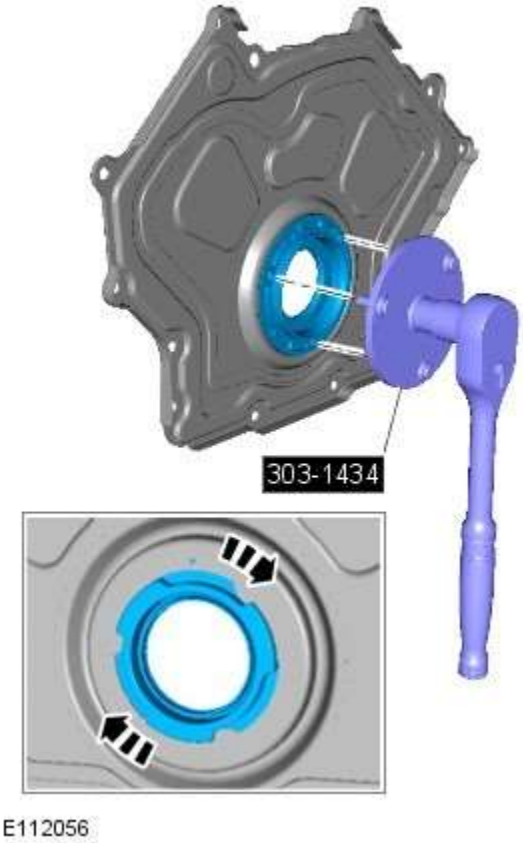
 E107677	303-1434 Remover/Installer, Front Crankshaft Seal

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).



E112056

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

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.

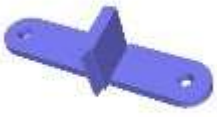
   To install, reverse the removal procedure.

Published: 05-Aug-2014

Engine - V8 S/C 5.0L Petrol - Crankshaft Pulley

Removal and Installation

Special Tool(s)

 E115256	303-1437 Crankshaft Damper Remover/Installer
 E115257	303-1438 Crankshaft Damper Bolt Remover/Installer
 E115258	303-1439 Crankshaft Damper Removal Plate
 E115259	303-1440 Crankshaft Damper Removal/Installation Stud
 E115260	303-1441 Crankshaft Damper Remover/Installer Body
 E115266	303-1448 Locking Tool

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).

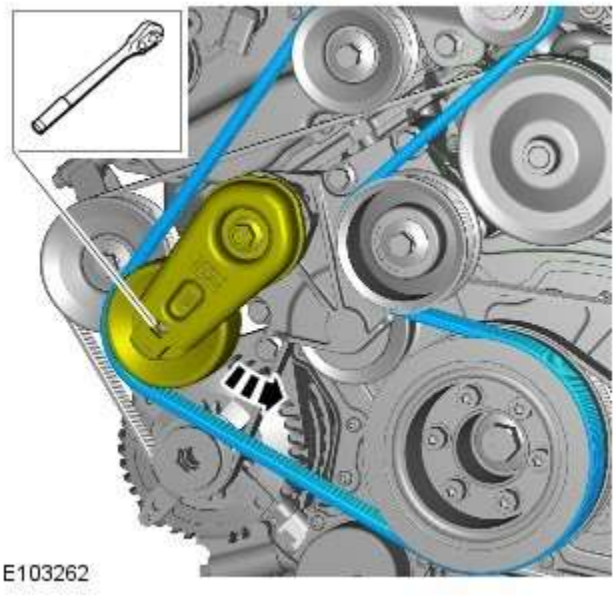
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

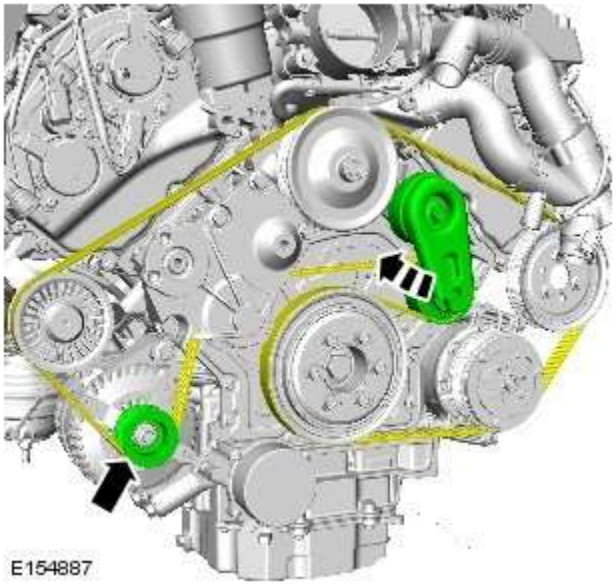
3. Refer to: Cooling Fan Motor and Shroud - Vehicles With: Supercharger (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

4. Refer to: Starter Motor (303-06C Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

5.

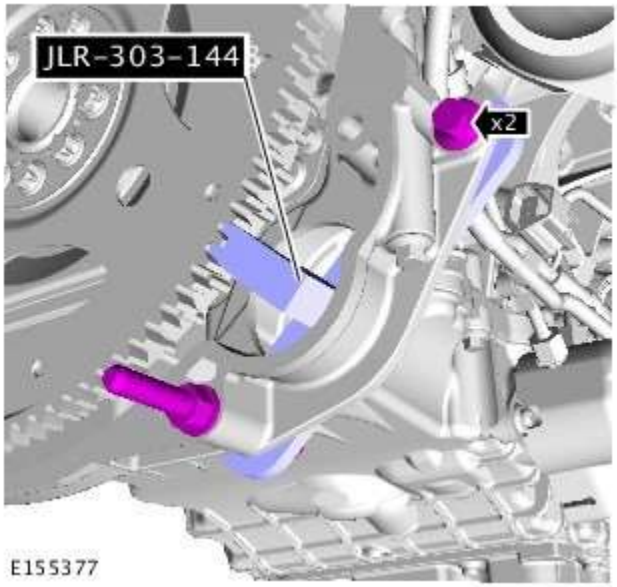


6.



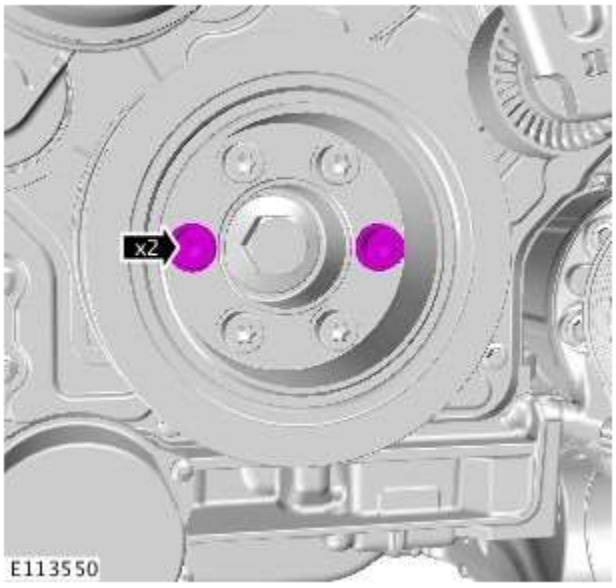
7. CAUTION: Before removing the crankshaft pulley bolt, note the numbers on the bolt head. If the bolt head shows 10.9, the bolt must be removed counter clockwise. If the bolt head shows 12.9, the bolt must be removed clockwise. Failure to follow this instruction may result in damage to the crankshaft.

   Note the markings on the crankshaft pulley bolt.

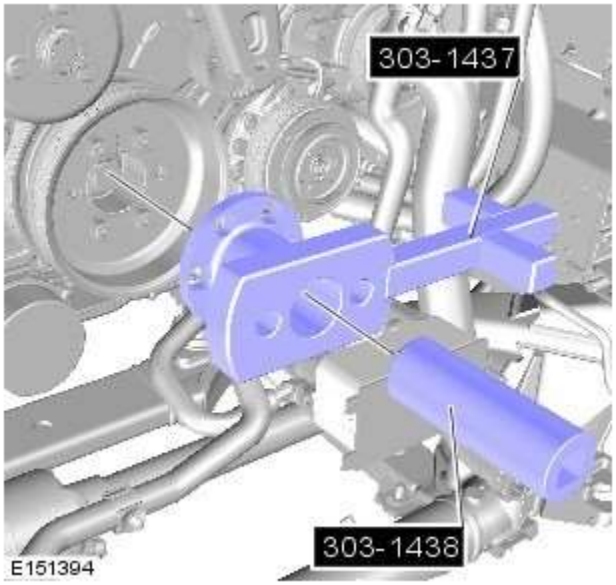


8. Install the special tool.

   Special Tool(s): 303-1448

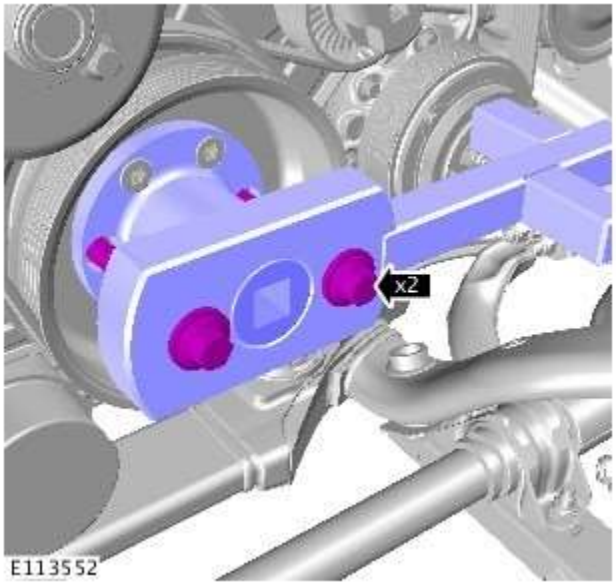


9.

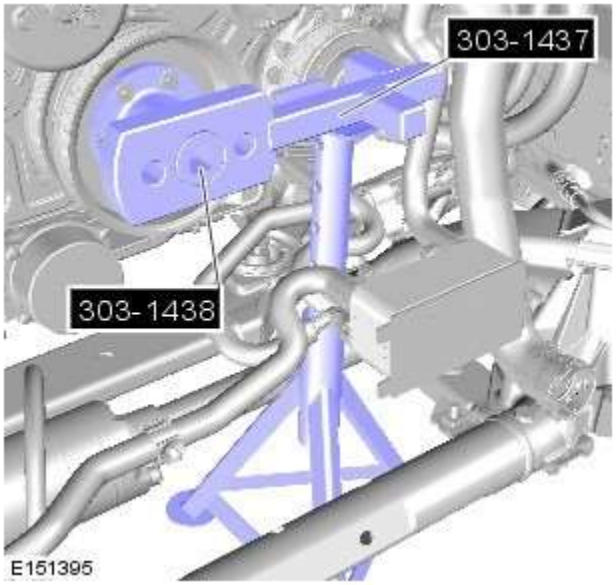


10. Install the special tool.

    Special Tool(s): 303-1438, 303-1437

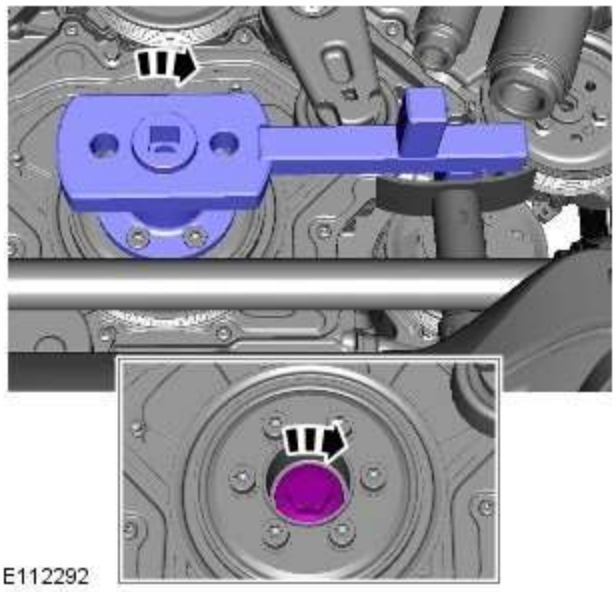


11. *Torque:* 25 Nm



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.



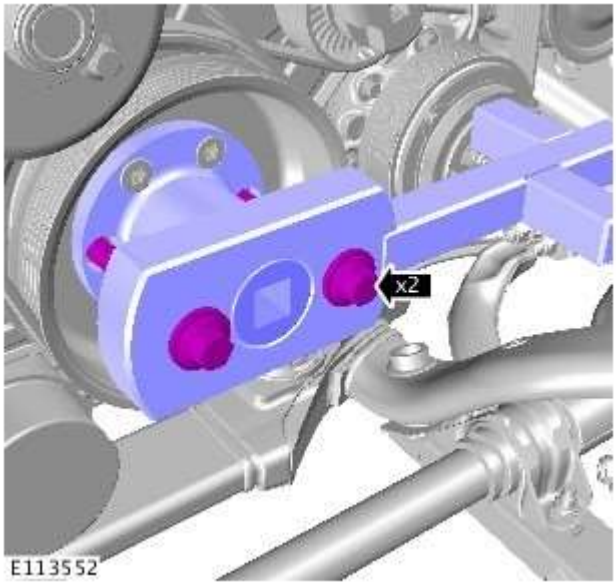
13. CAUTION: Discard the bolt.

    NOTES:

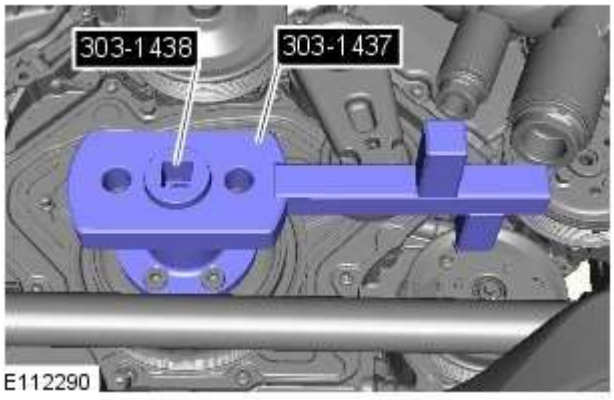
    The graphic shows the step for LH thread only, RH thread will be the opposite.

    The crankshaft pulley bolt will be very tight.

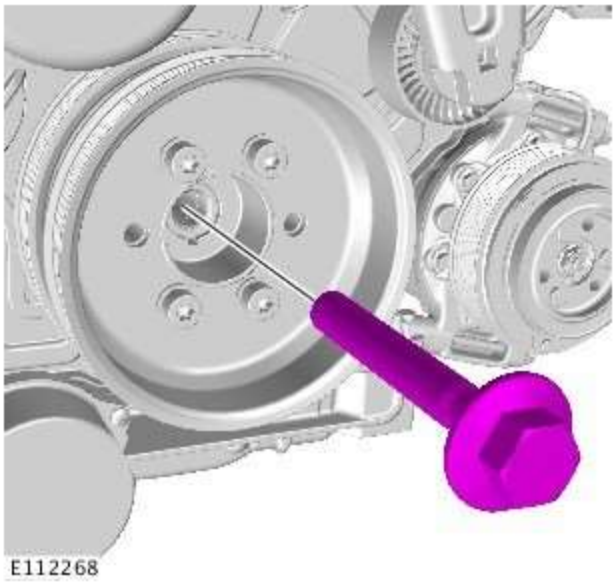
    The thread is left handed.



14.



15. Remove the special tool.

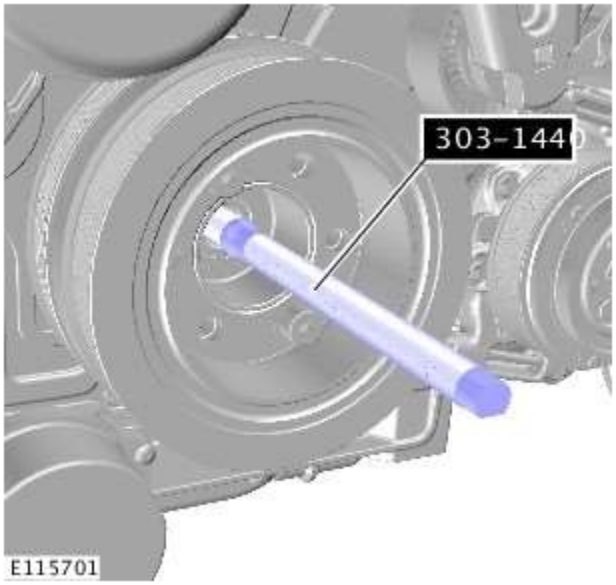


16. NOTES:

If the crankshaft damper is fitted with an early RH thread crankshaft bolt then the pulley can be removed with a standard puller.

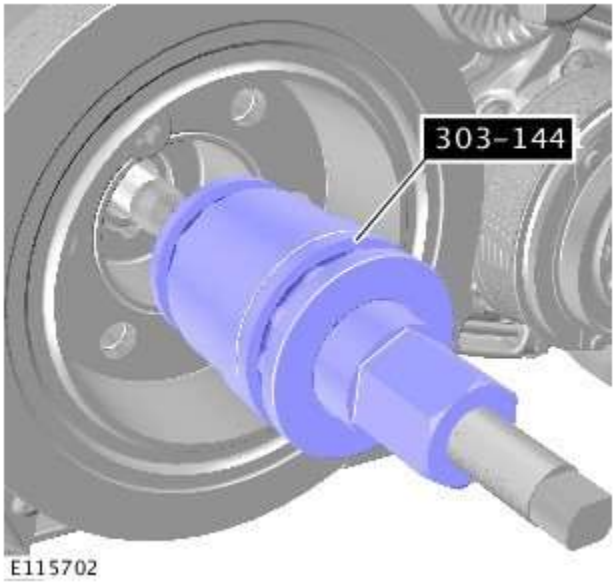
Discard the bolt after removal.

17.



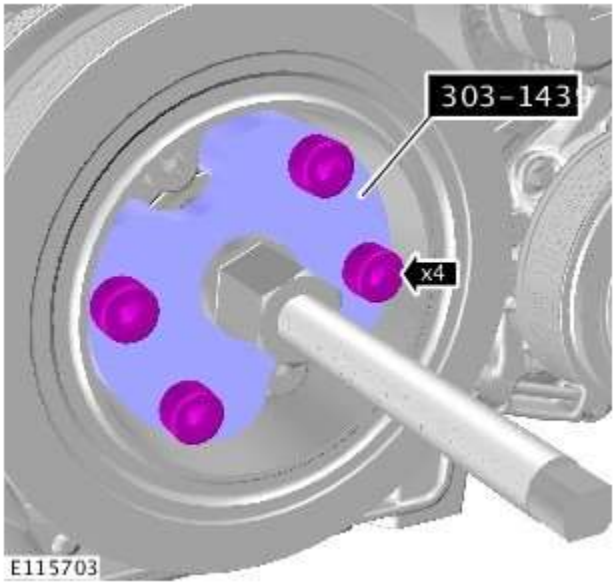
18. Install the special tool.

Special Tool(s): 303-1440



19. Install the special tool.

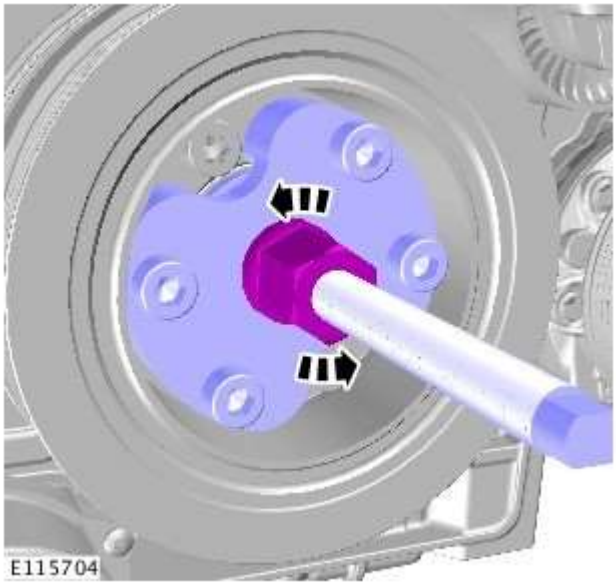
    Special Tool(s): 303-1441

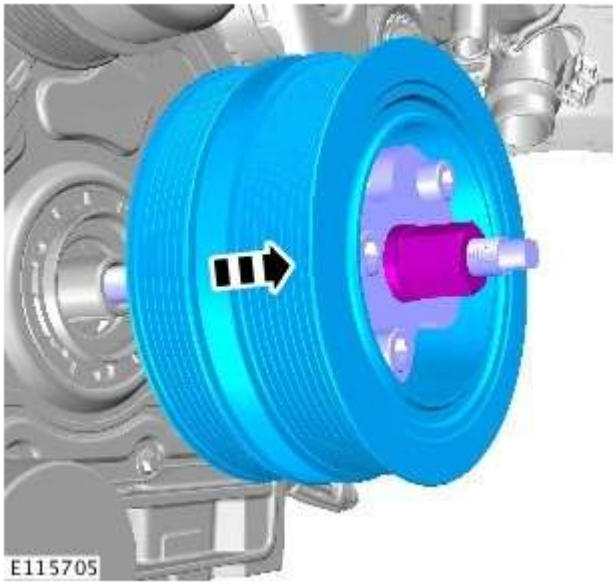


20. Install the special tool.

    Special Tool(s): 303-1439

21.

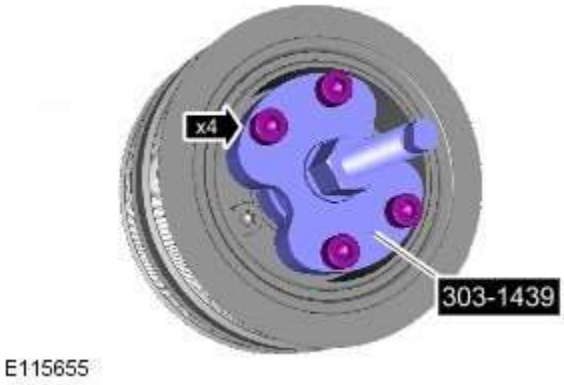




22. CAUTION: Discard the friction washer after removing the crankshaft pulley.

NOTE: Make sure to clean the threads in the end of the crankshaft and that the crank nose is free of any foreign materials.

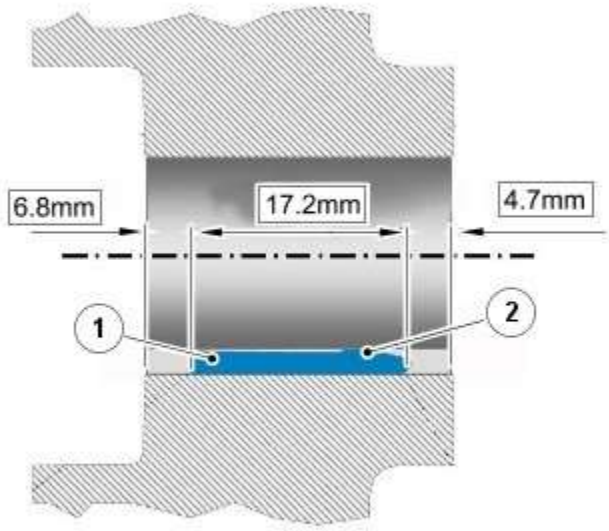
23.



24.

E115707

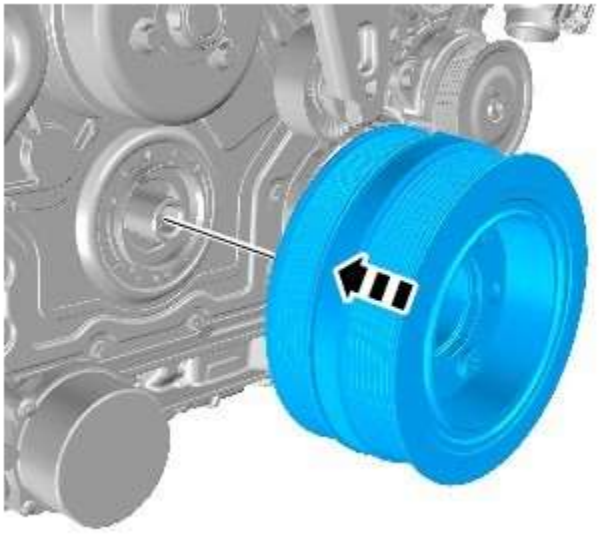
Installation



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.



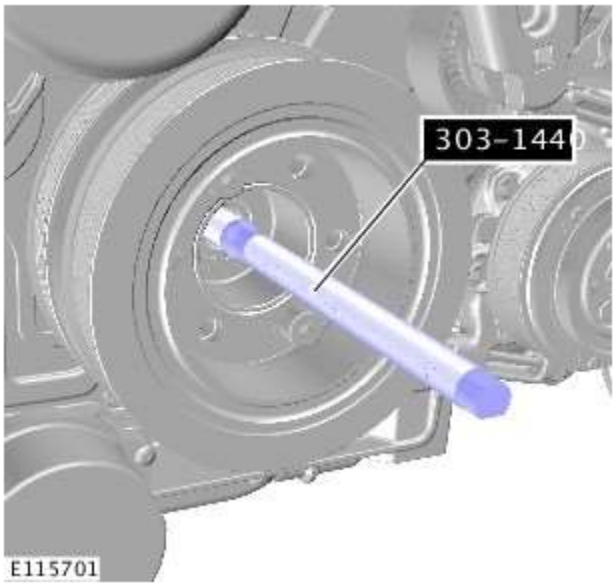
E112288

2. CAUTION: Install a new friction washer before installing the crankshaft pulley.

   NOTES:

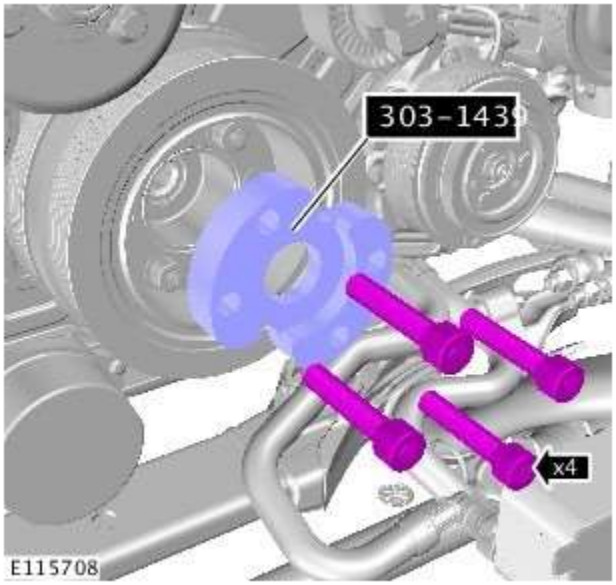
   Make sure to clean the threads in the end of the crankshaft and that the crank nose is free of any foreign materials.

   Skip to step 11 for engines fitted with early RH thread crankshaft bolt.

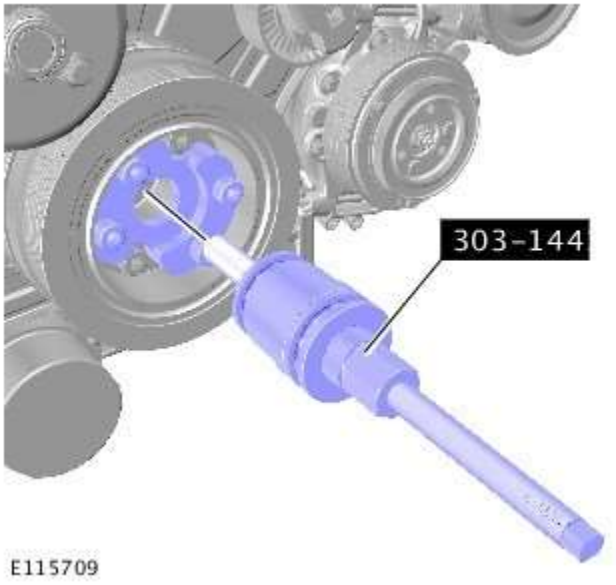


E115701

3. Install the special tool.

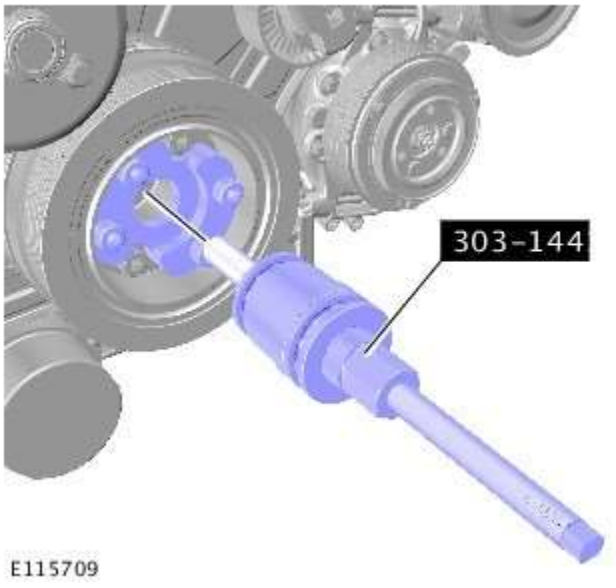


4. Install the special tool.

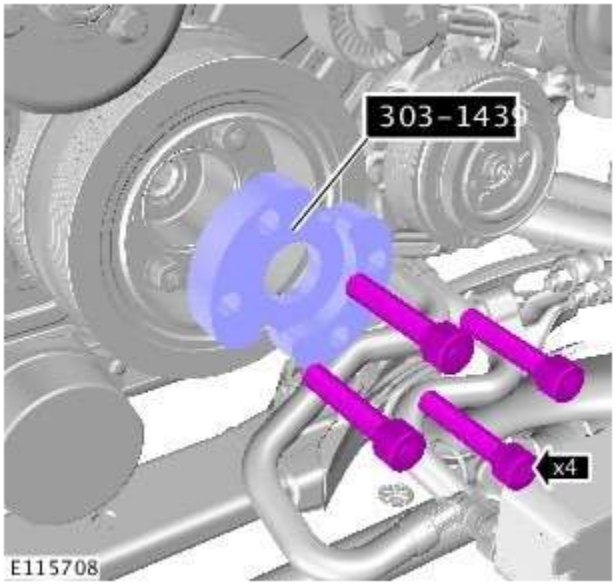


5. Install the special tool.

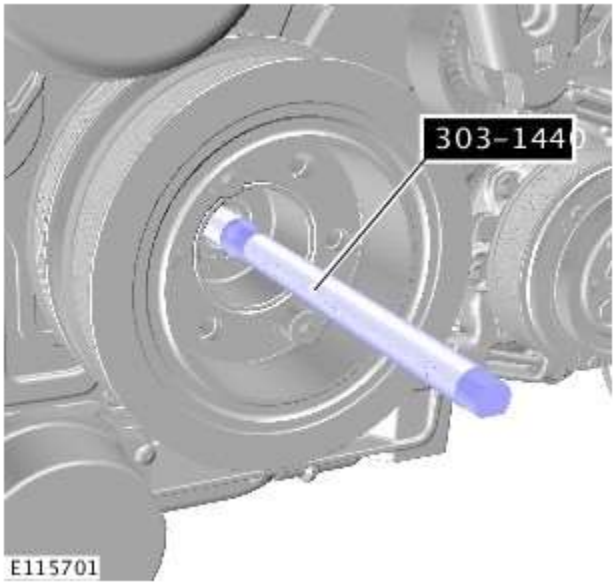
6. CAUTION: Rotate the crankshaft pulley installation tool anti-clockwise until the pulley is fully located, do not over tighten. Failure to do this may result in damge to the components.



7. Remove the special tool.

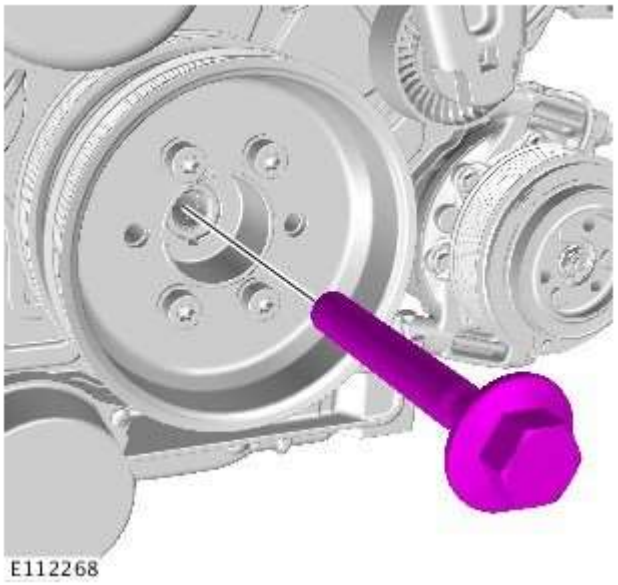


8. Remove the special tool.

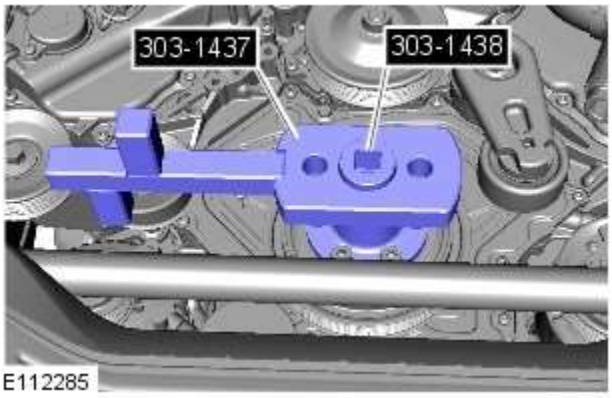


9. Remove the special tool.

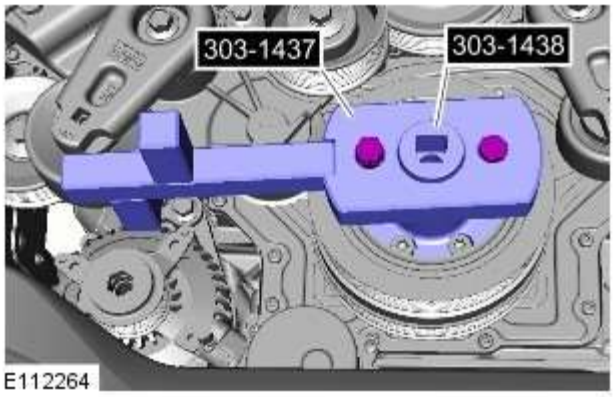
10. WARNING: Make sure that a new bolt is installed.
    - Apply loctite 270 to the thread of the bolts.
    - *Torque:* 65 Nm



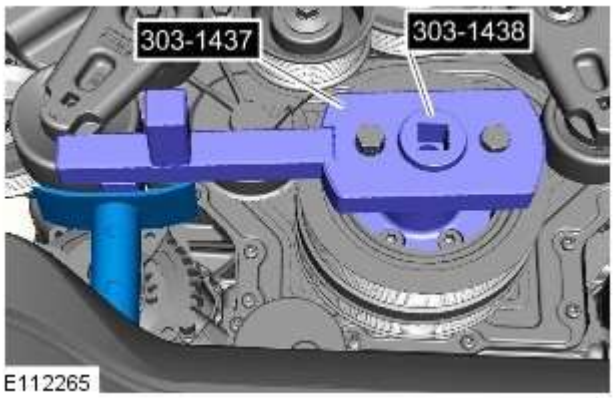
11. WARNING: Make sure that a new bolt is installed.



12. Install the special tool.

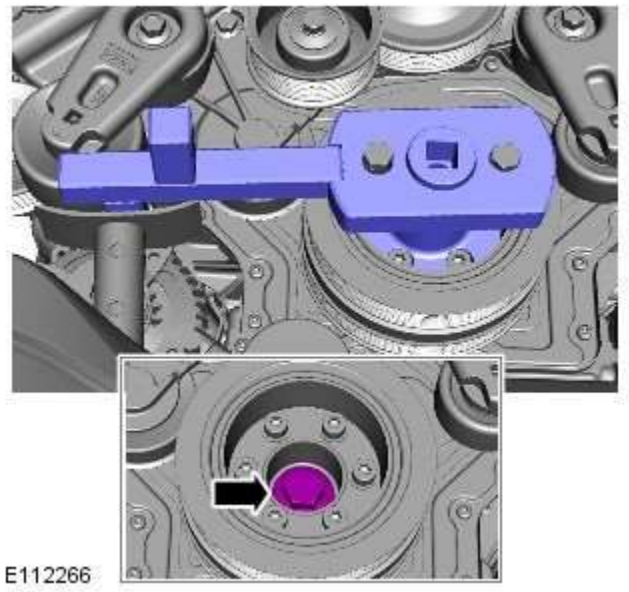


13. *Torque:* 65 Nm



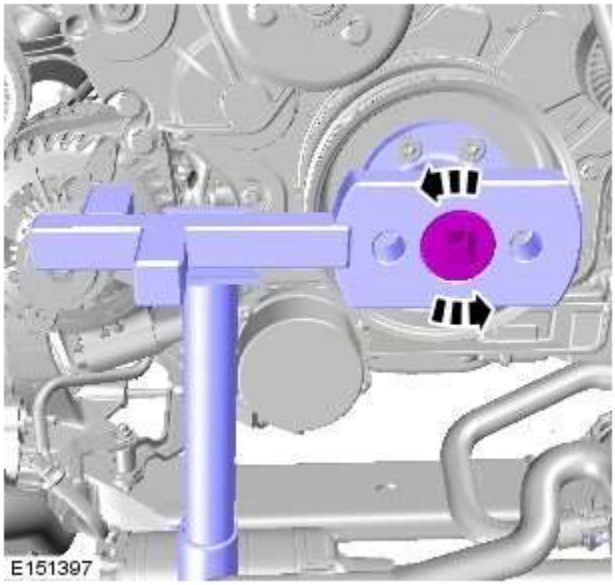
14. NOTE: The graphic shows the tool position for LH thread only, RH thread will be the opposite.

    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



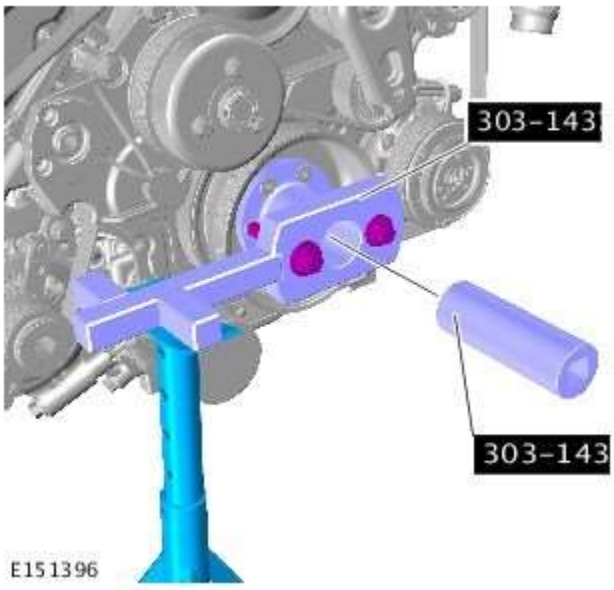
16. NOTES:

The graphic shows the step for LH thread only, RH thread will be the opposite.

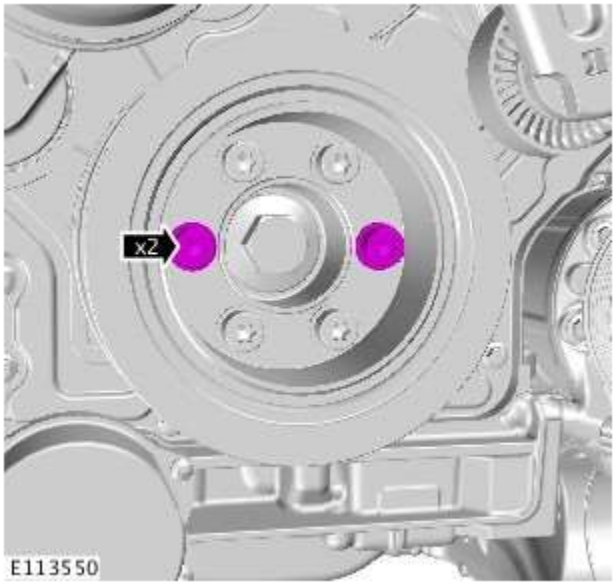
The use of a torque multiplyer capable of 600Nm will be required.

Make sure that the socket is turned through 270 degrees not the torque wrench.

- *Torque:* 270°



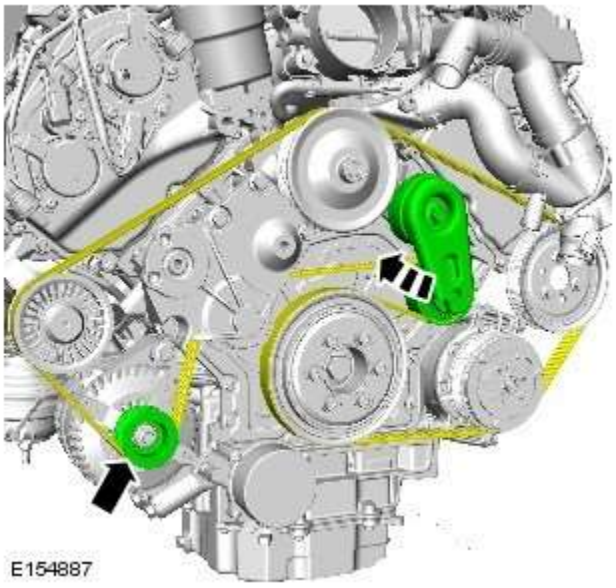
17. Remove the special tools.



18. WARNING: Make sure that a new bolt is installed.

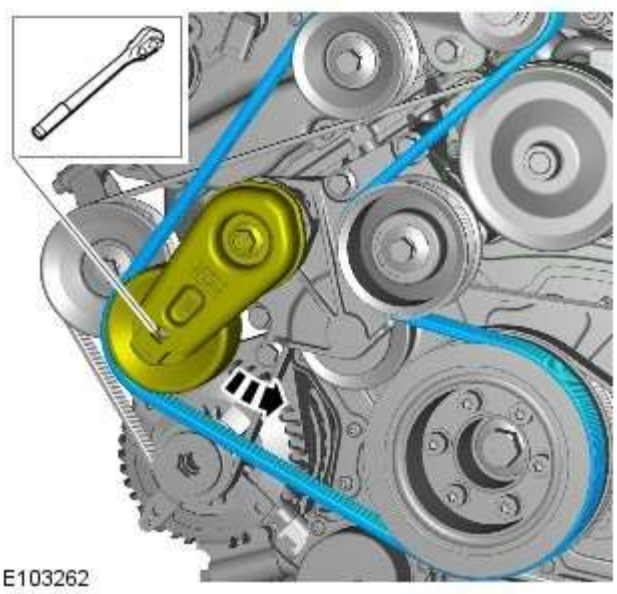
    Apply loctite 270 to the thread of the bolts.

    Torque: 65 Nm

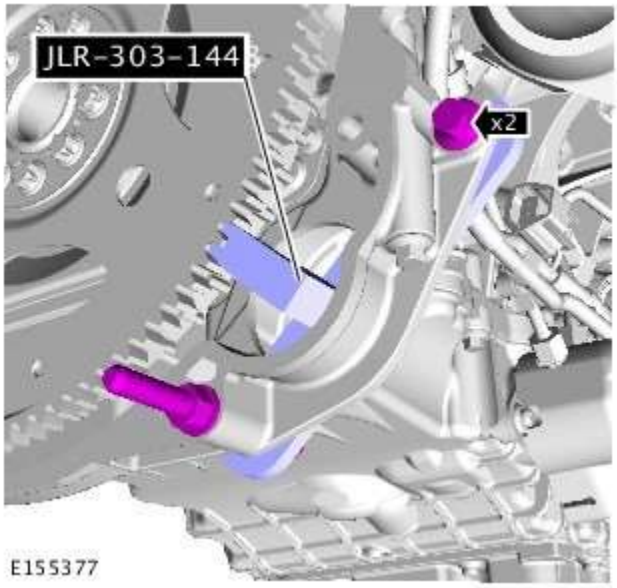


19.

20.



21. Remove the special tool.



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).

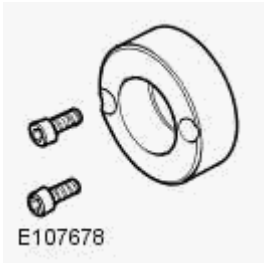
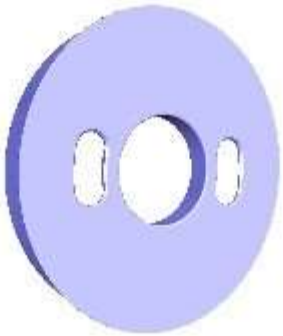
24. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 12-May-2014

Engine - V8 S/C 5.0L Petrol - Crankshaft Rear Seal

Removal and Installation

Special Tool(s)

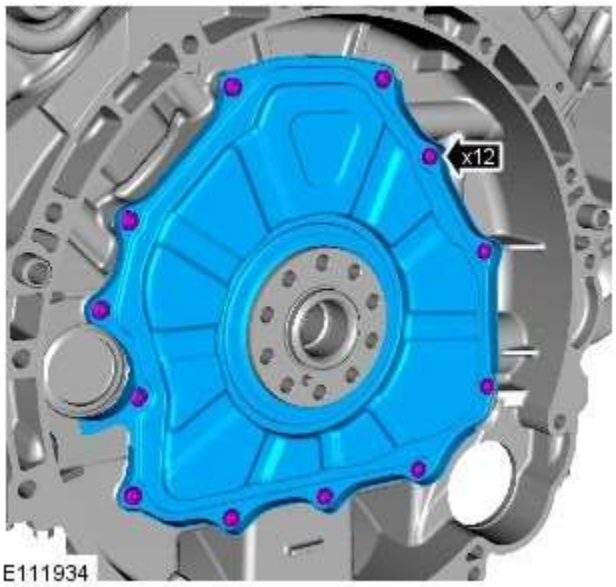
 E107678	303-1442 Rear Crankshaft Seal Installer
 E154431	JLR-303-1622 Alignment Tool, Engine Rear Oil Seal

Removal

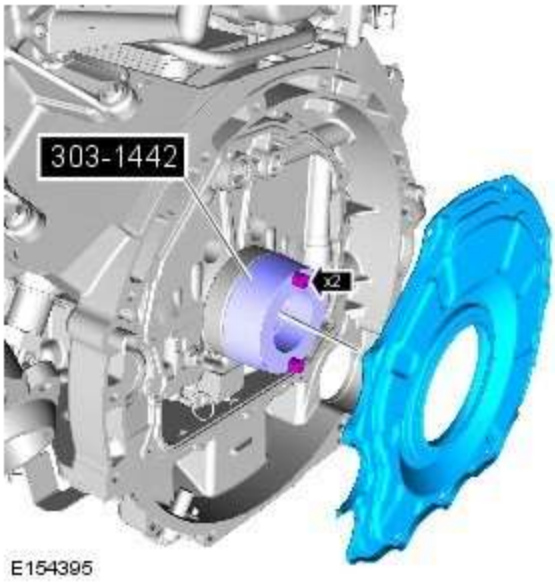
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Flexplate (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

2.



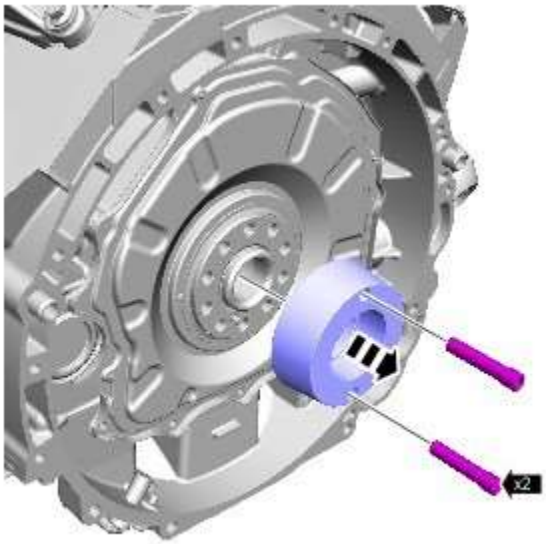
Installation



E154395

1. Install the special tool.

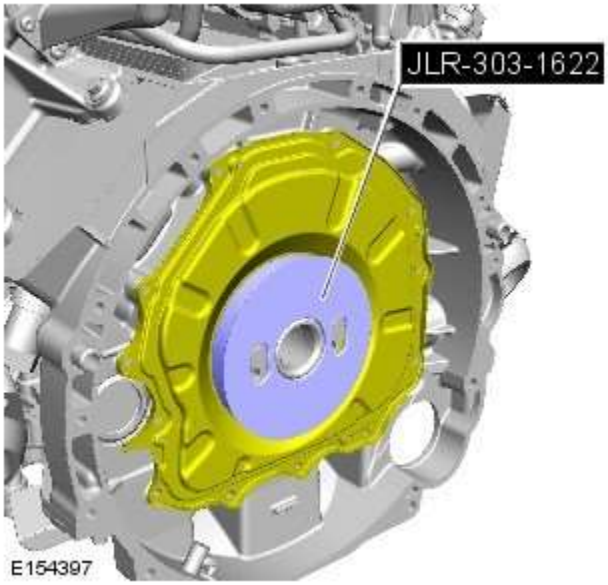
   Special Tool(s): 303-1442



E154396

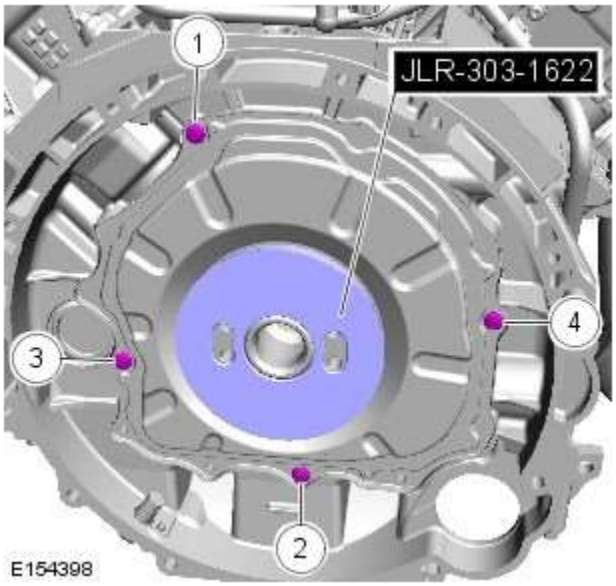
2. Remove the special tool.

   Special Tool(s): 303-1442



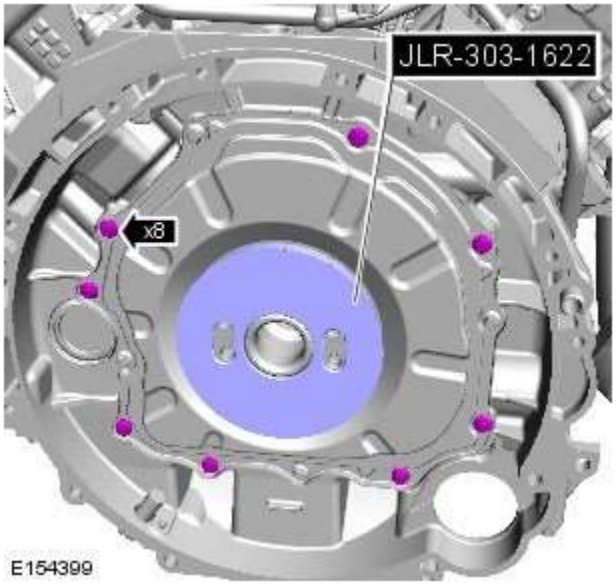
3. Install the special tool.

   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).

Published: 18-May-2012

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).

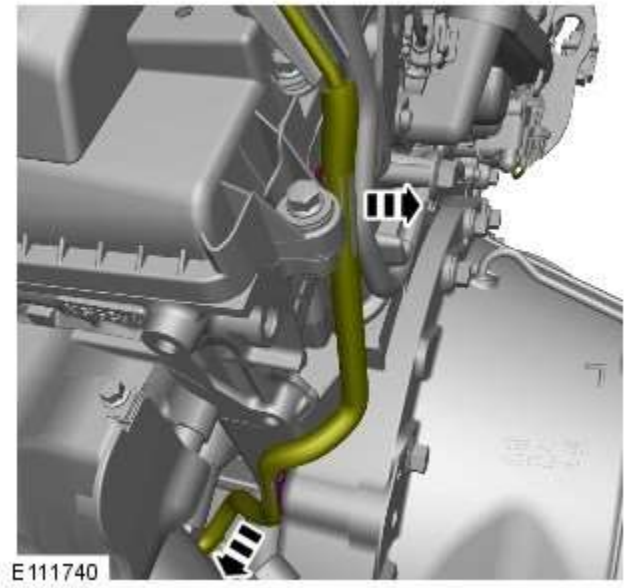
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

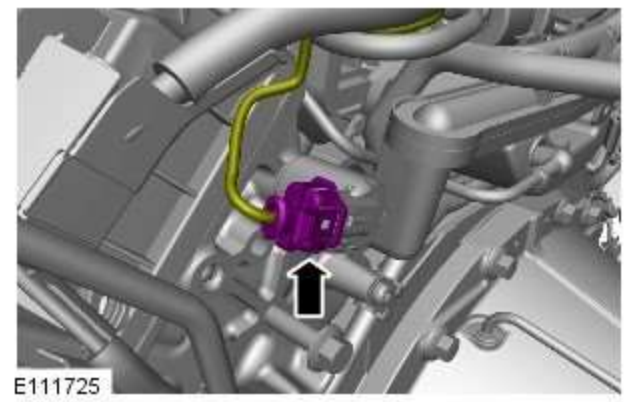
3. Refer to: Camshaft LH (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

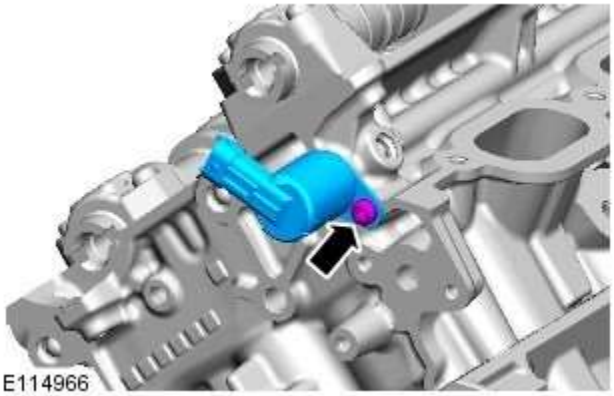
4. Refer to: Exhaust Manifold LH (303-01C Engine - V8 5.0L Petrol, Removal and Installation).

5.



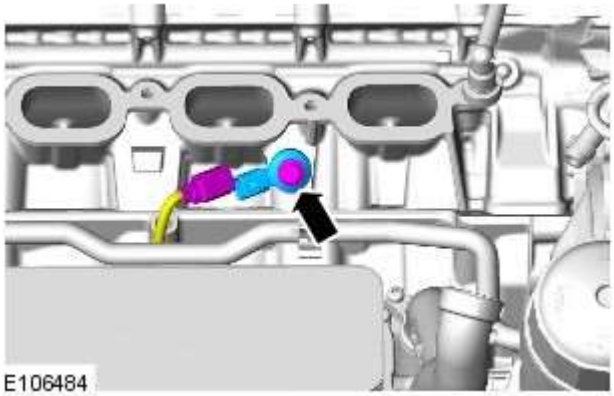
6.



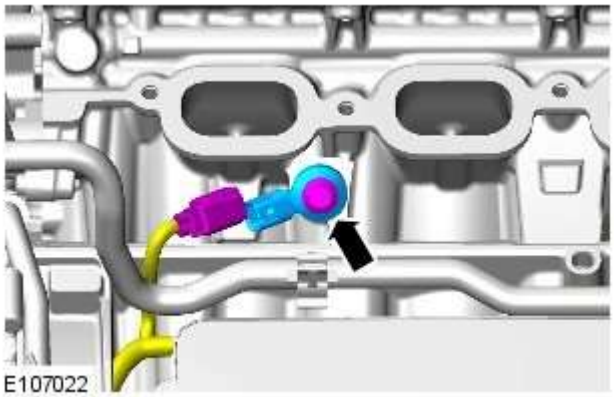


7. CAUTION: Discard the seal.

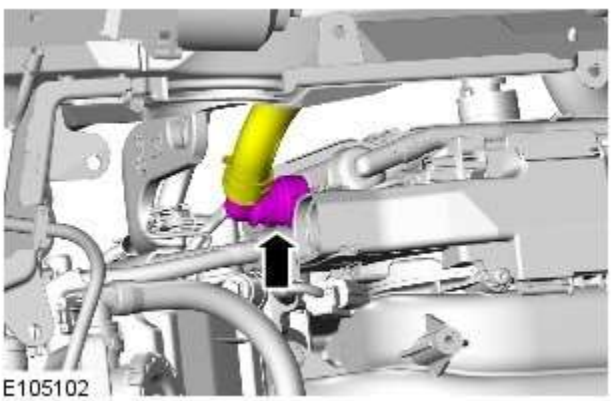
NOTE: Engine shown removed for clarity.



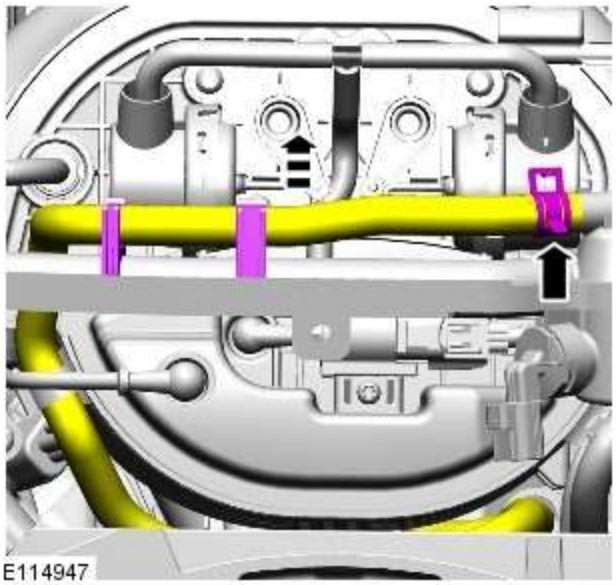
8.



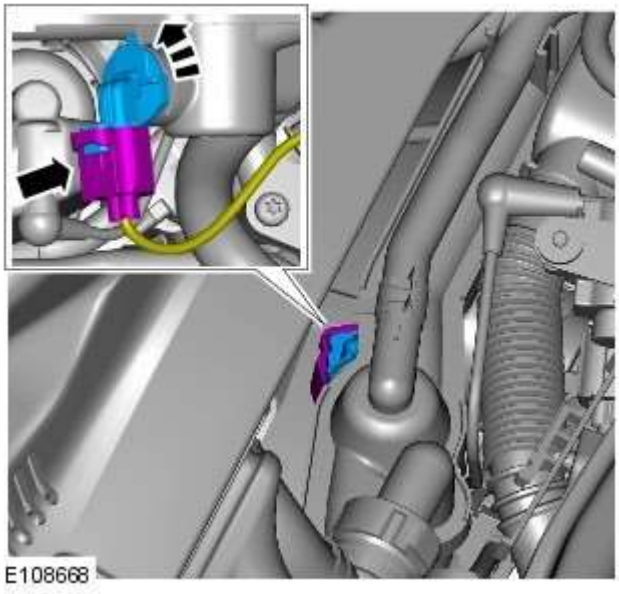
9.



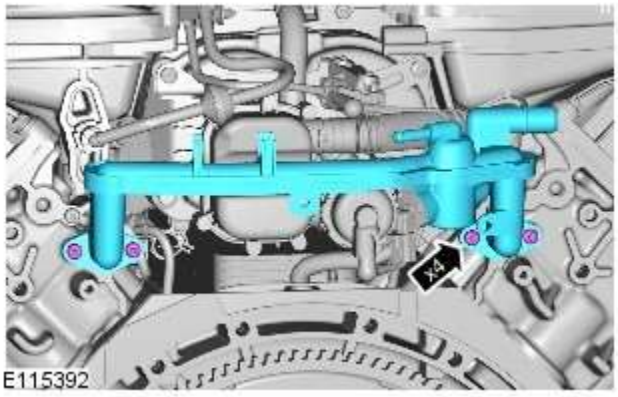
10. NOTE: Clamp the hose to minimize coolant loss.



11. NOTE: Clamp the hose to minimize coolant loss.

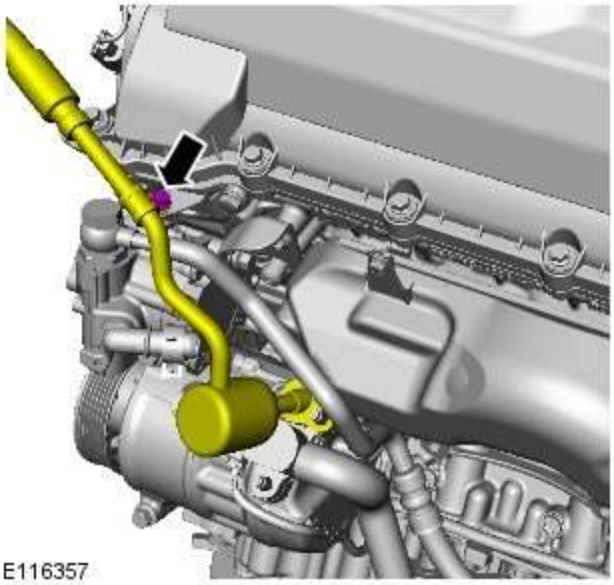


12.



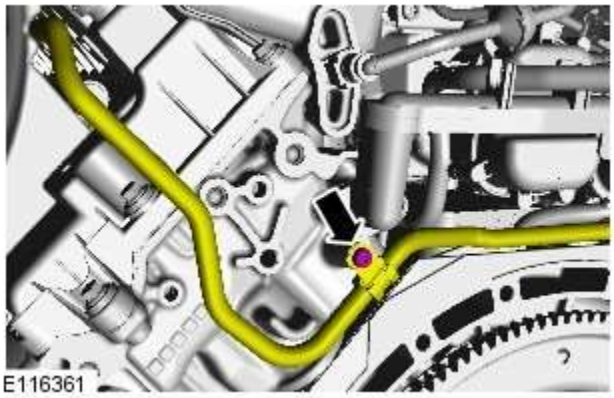
13. CAUTION: Discard the seals.

14.



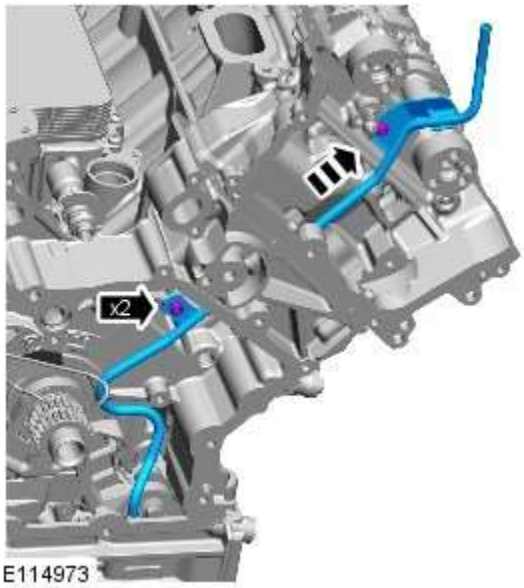
E116357

15.

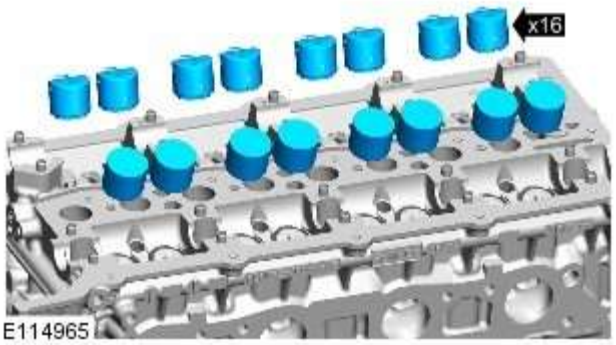


E116361

16.



E114973

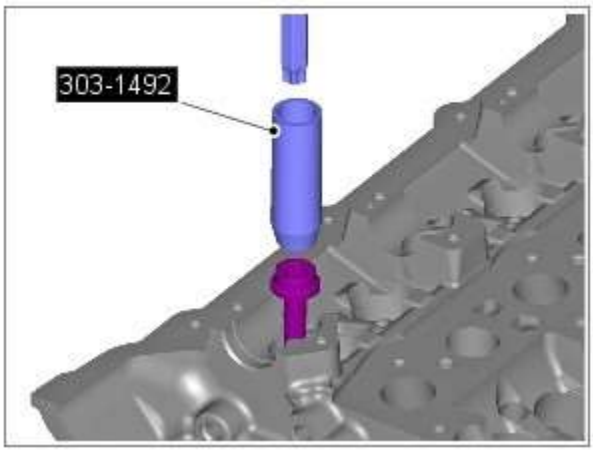


17. CAUTIONS:

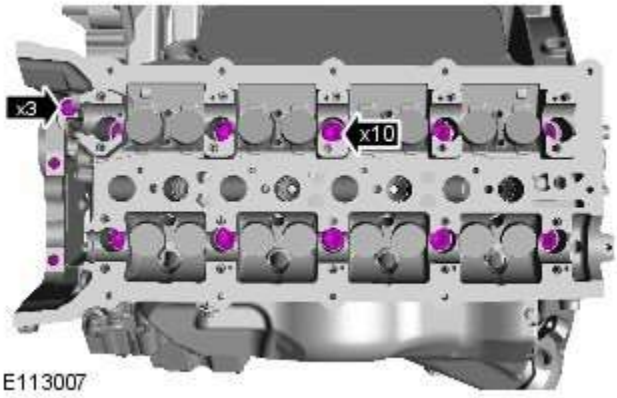
If a new cylinder head has been installed then new tappets must be installed.

If the cylinder head is being removed without a new component being installed, the tappets must be installed in their original positions.

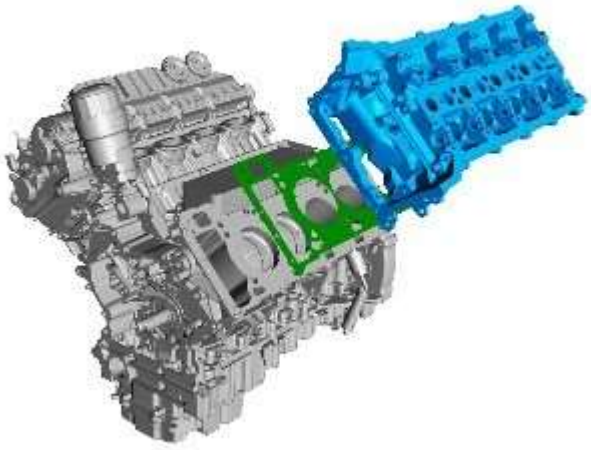
NOTE: Left-hand shown, right-hand similar.



18.

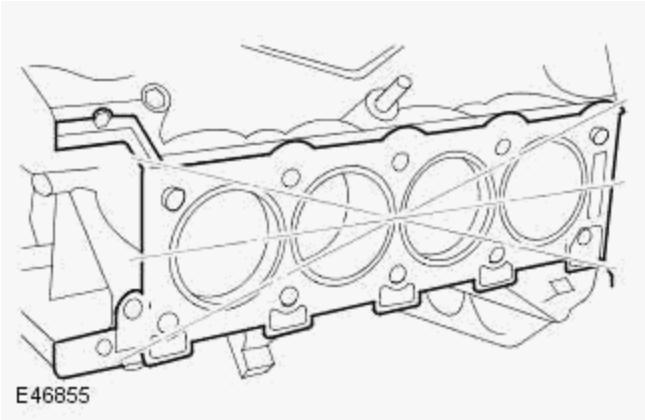


19.



E113006

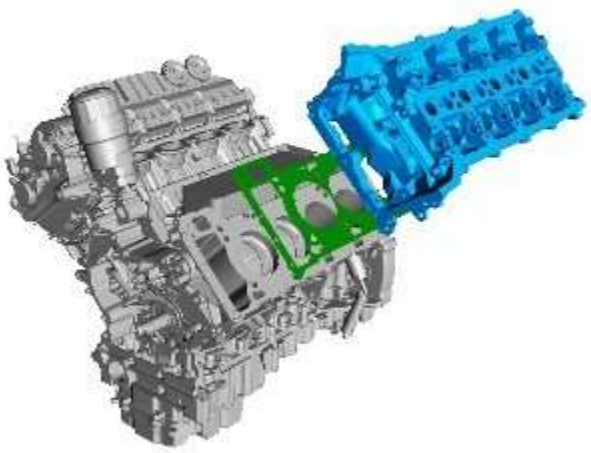
Installation



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.



E113006

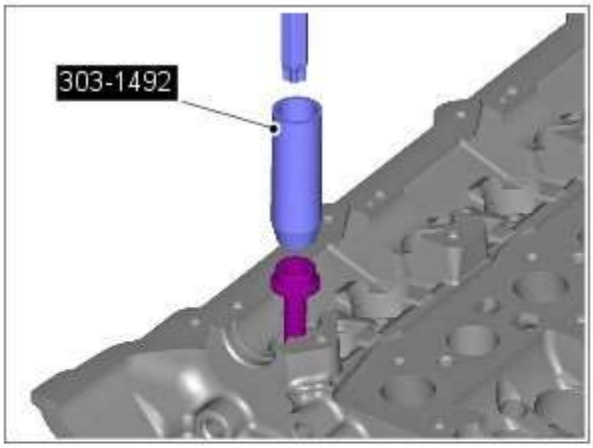
2. WARNING: Make sure care is taken when handling the cylinder head gasket.

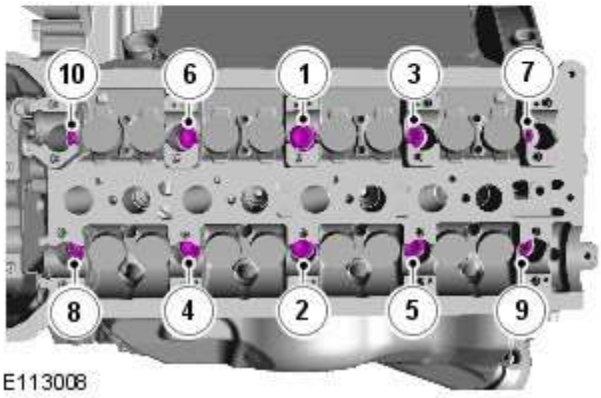
   CAUTIONS:

   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.



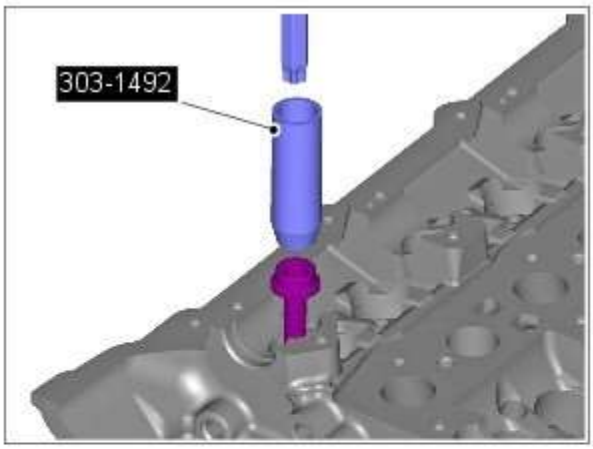


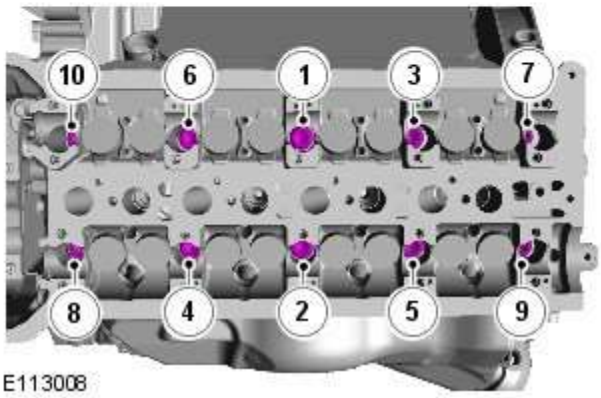
E113008

3. CAUTION: Make sure that new cylinder head bolts are installed.

NOTE: Tighten the bolts in the indicated sequence.

Torque: 20 Nm

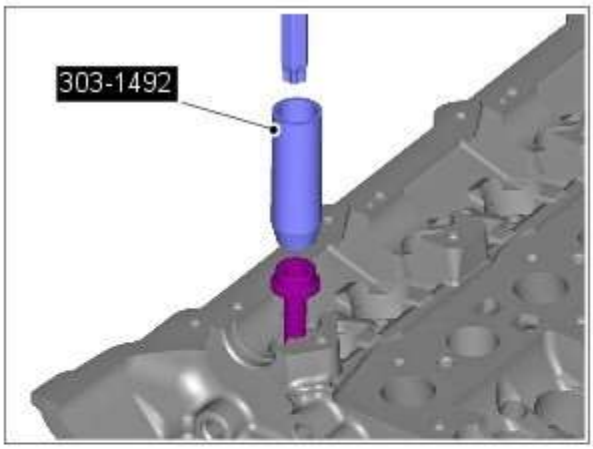


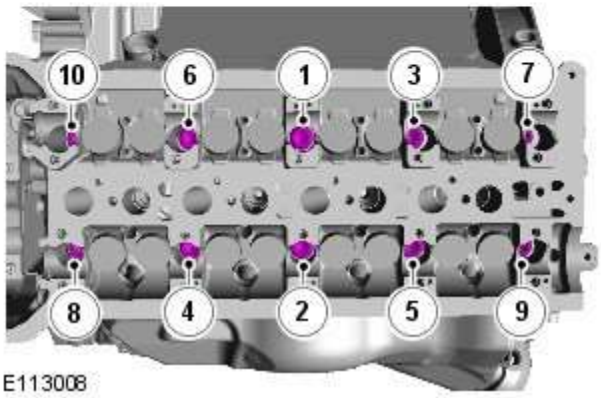


E113008

4. NOTE: Tighten the bolts in the indicated sequence.

Torque: 35 Nm

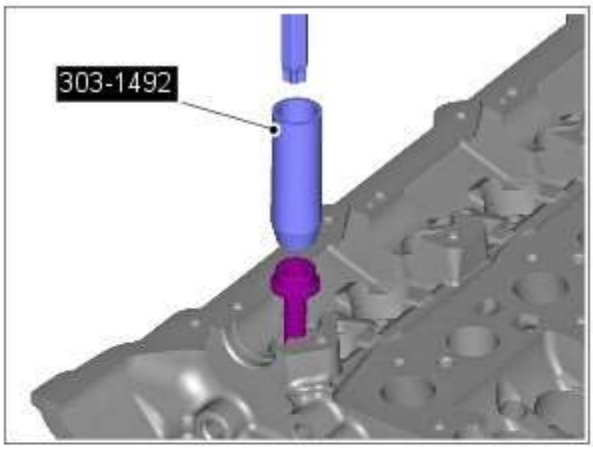


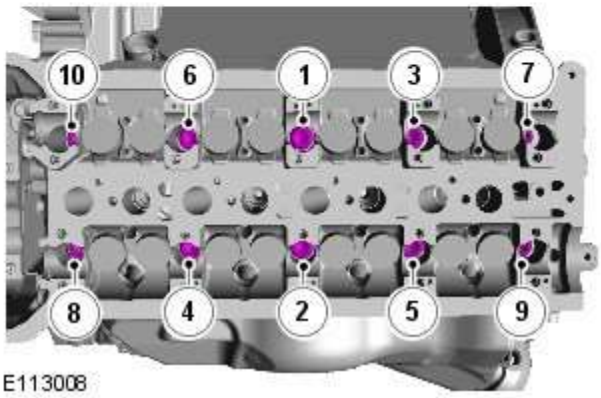


E113008

5. NOTE: Tighten the bolts in the indicated sequence.

Tighten the bolts 1 to 10, a further 90 degrees.

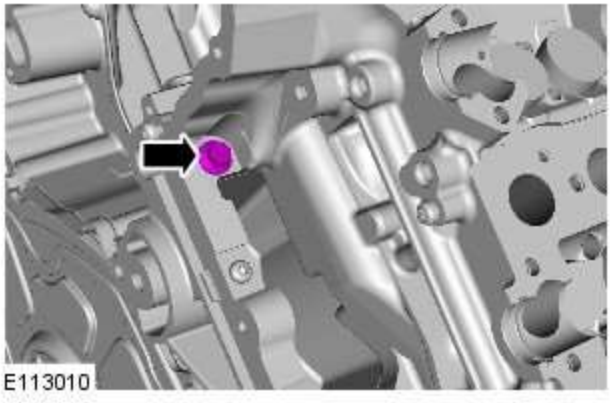




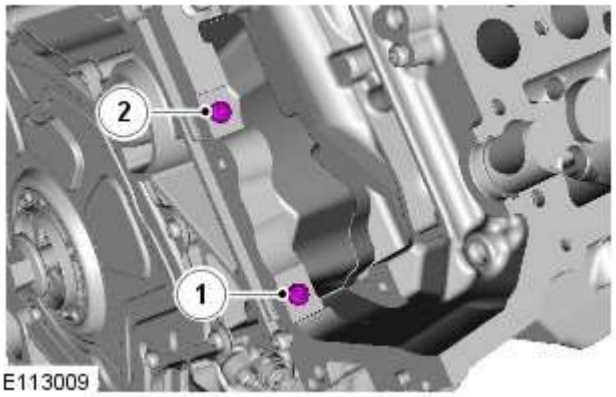
E113008

6. NOTE: Tighten the bolts in the indicated sequence.

Tighten the bolts 1 to 10, a further 120 degrees.

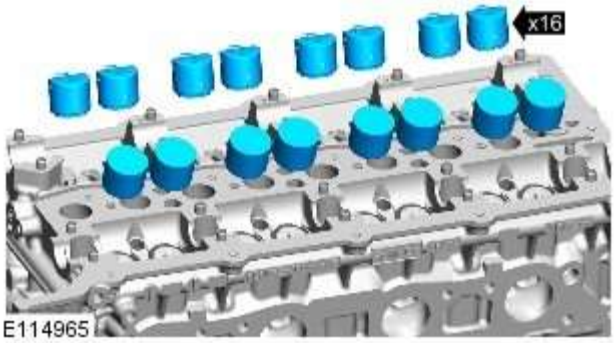


7. *Torque:* 25 Nm



8. NOTE: Tighten the bolts in the indicated sequence.

   Torque: 12 Nm

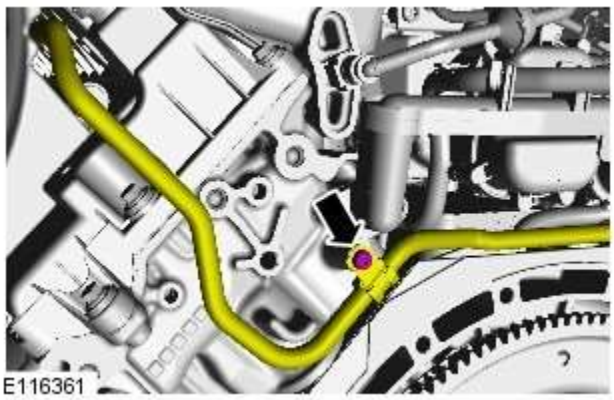


9. CAUTIONS:

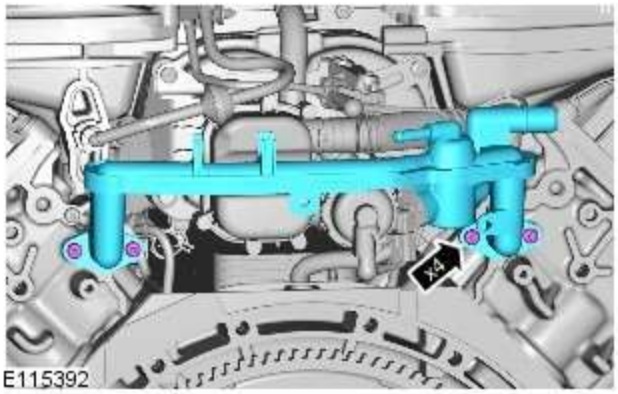
   If a new cylinder head has been installed then new tappets must be installed.

   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.

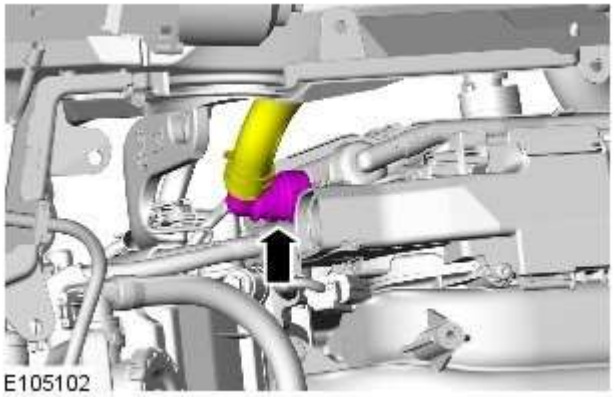


10. *Torque:* 10 Nm

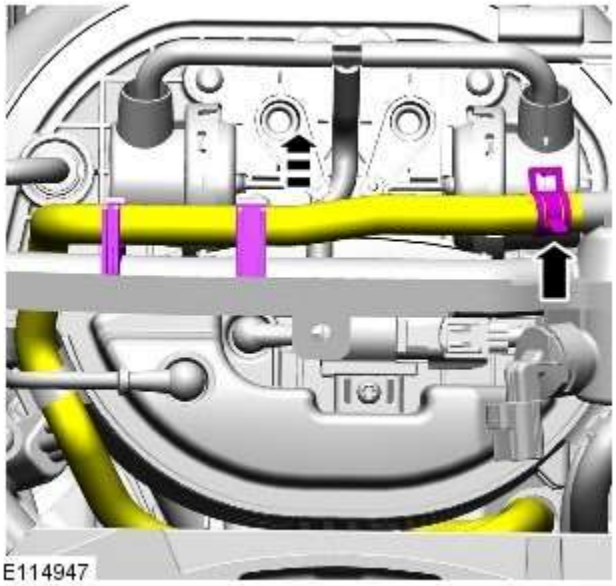


11. CAUTION: Install the new seals.

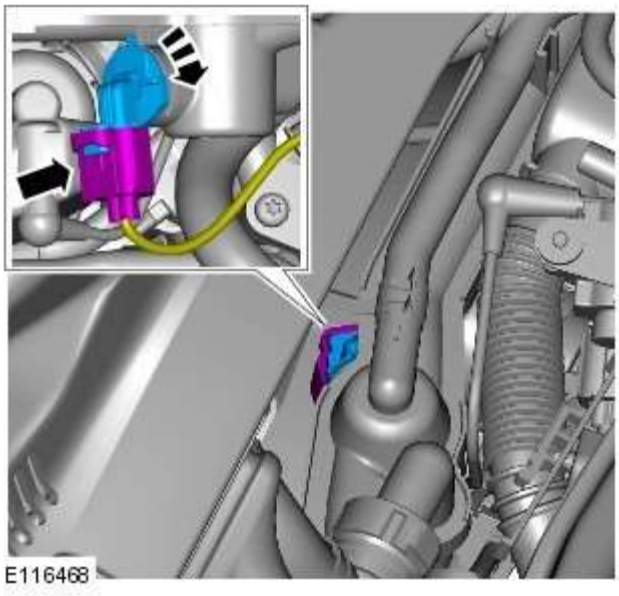
Torque: 10 Nm



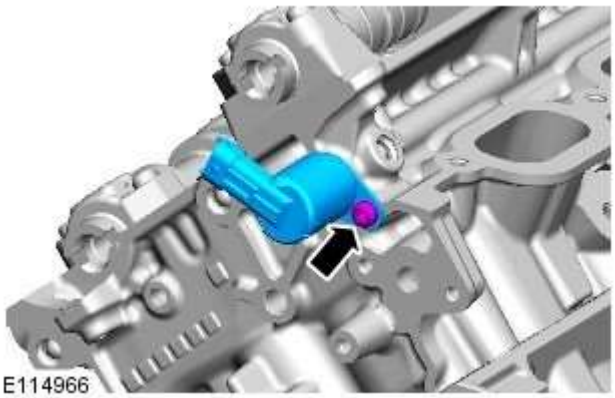
12.



13.



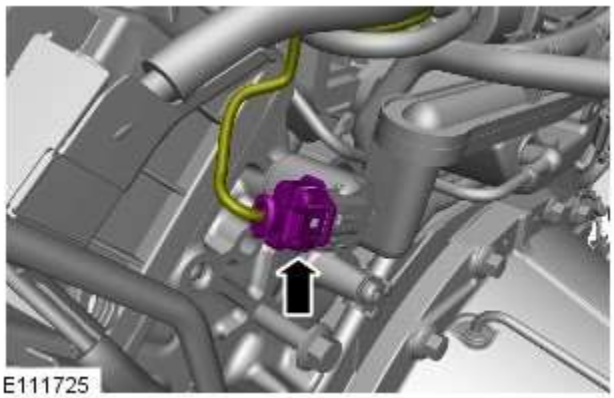
14.



15. CAUTION: Install a new seal.

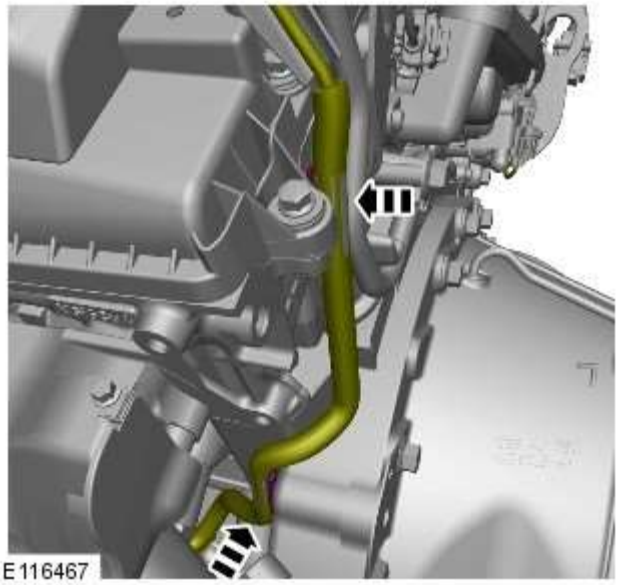
NOTE: Engine shown removed for clarity.

Torque: 12 Nm

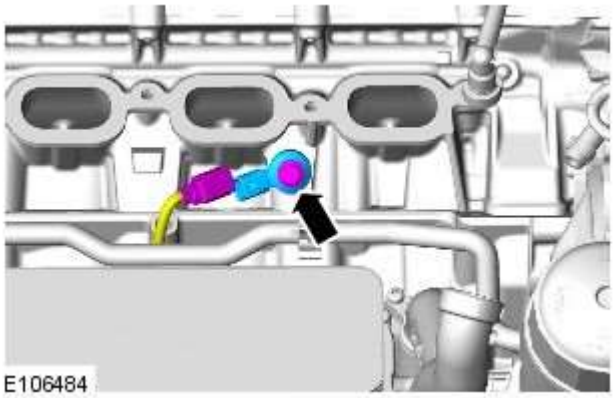


16.

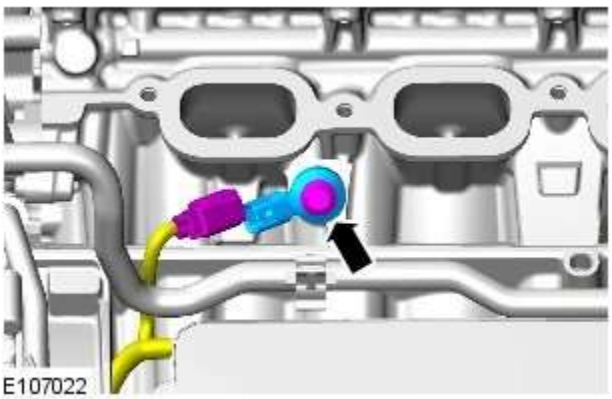
17.

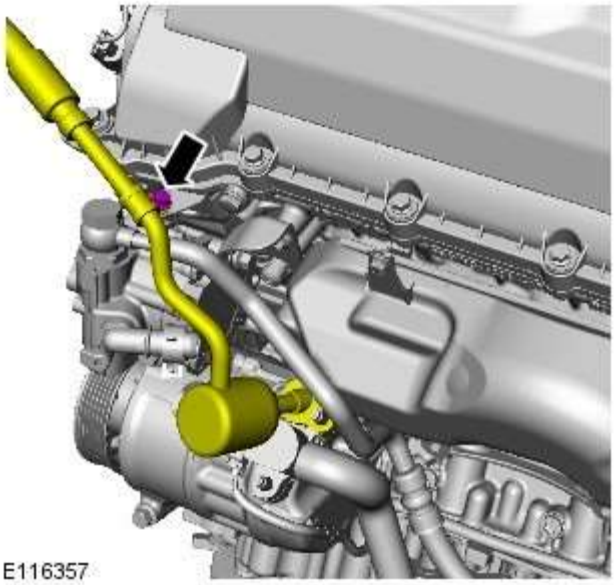


18. *Torque:* 20 Nm

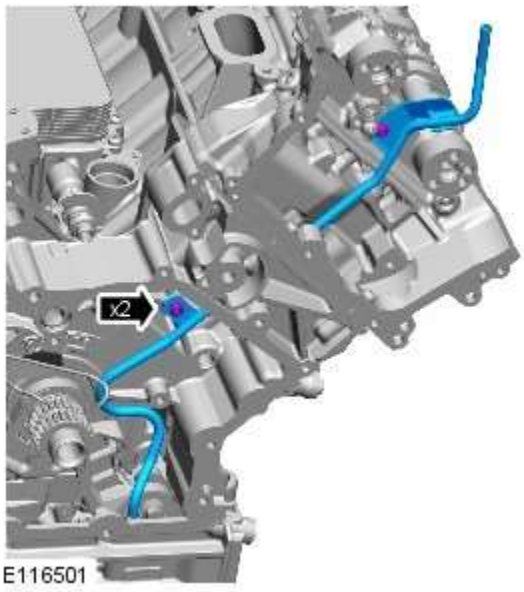


19. *Torque:* 20 Nm




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).

Published: 11-May-2011

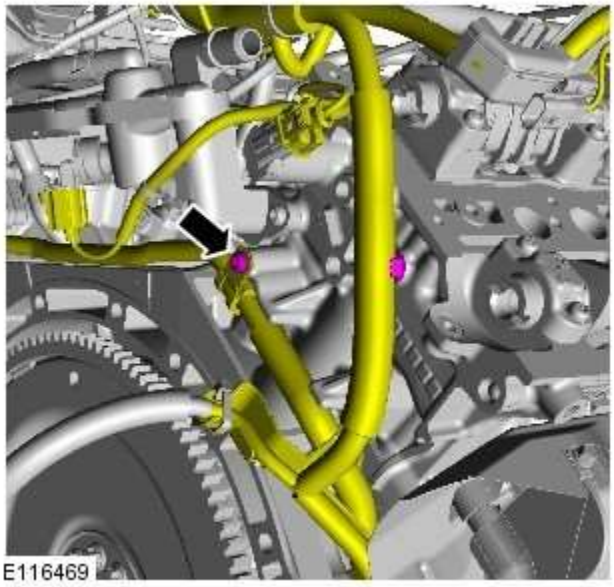
Engine - V8 S/C 5.0L Petrol - Cylinder Head RH

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.



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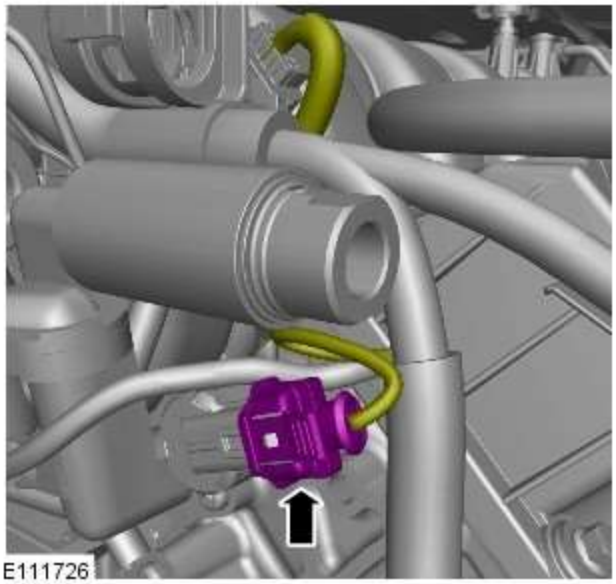
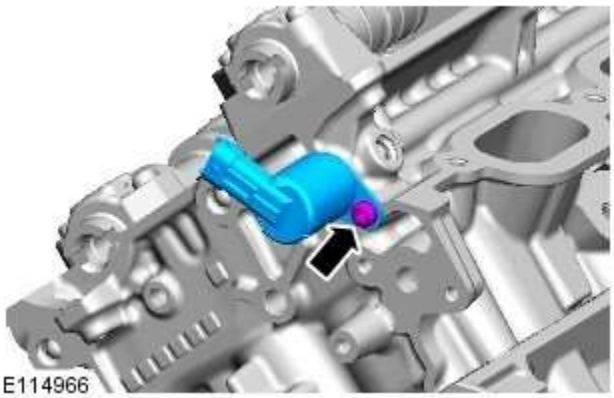


8. CAUTIONS:

Discard the seal.

LH illustration shown, RH is similar.

NOTE: Engine shown removed for clarity.



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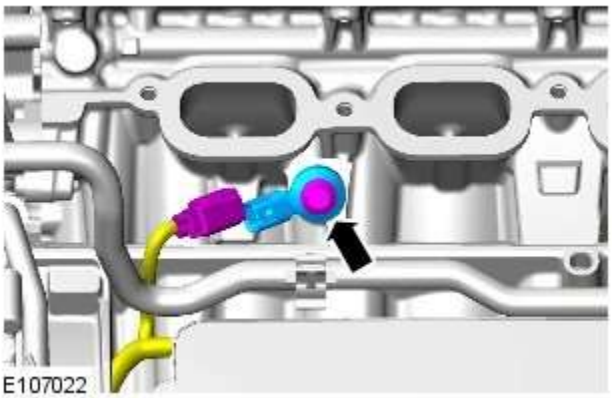

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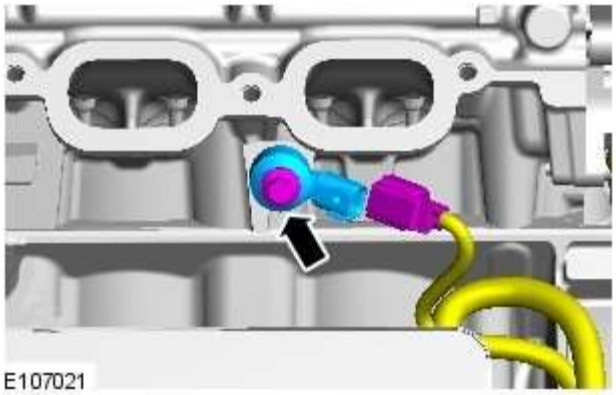
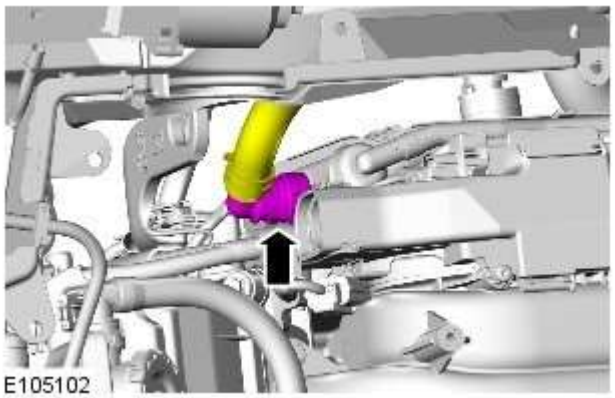
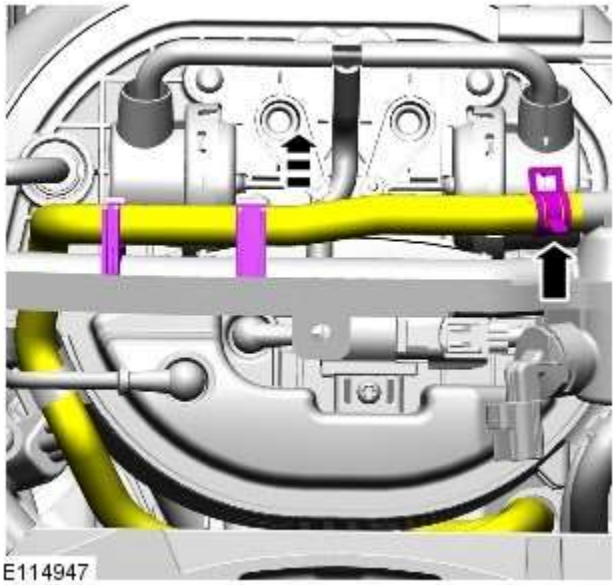


11. NOTE: Clamp the hose to minimize coolant loss.



12. NOTE: Clamp the hose to minimize coolant loss.



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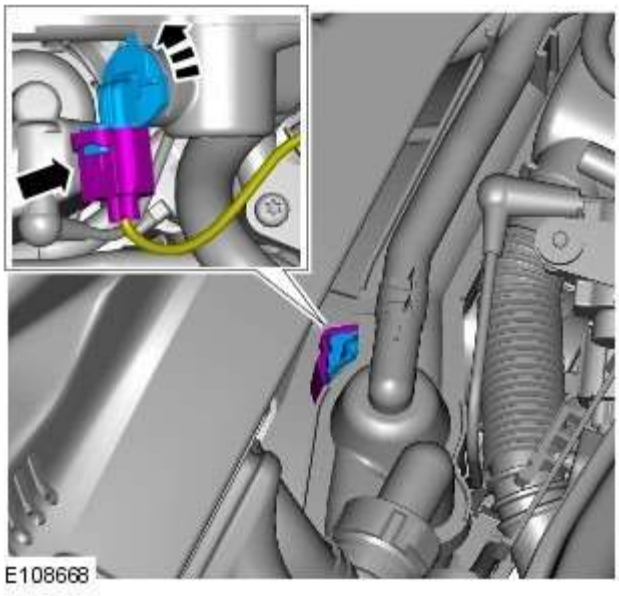
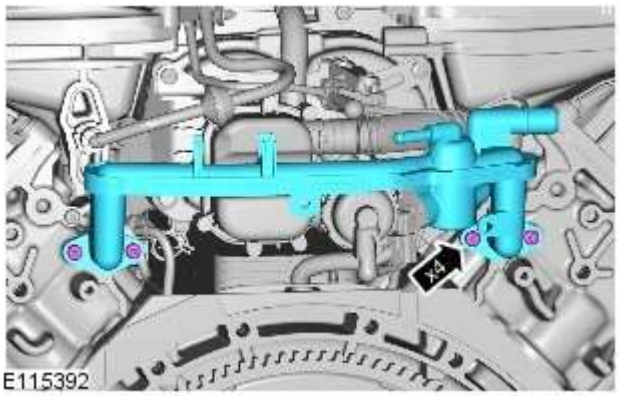


14. CAUTION: Discard the seals.



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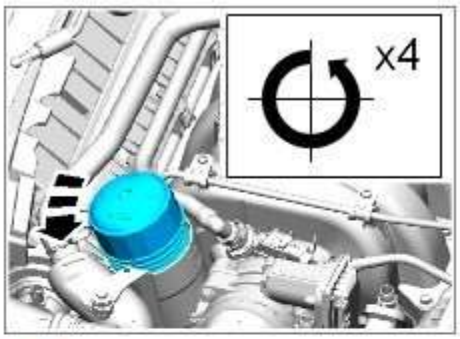
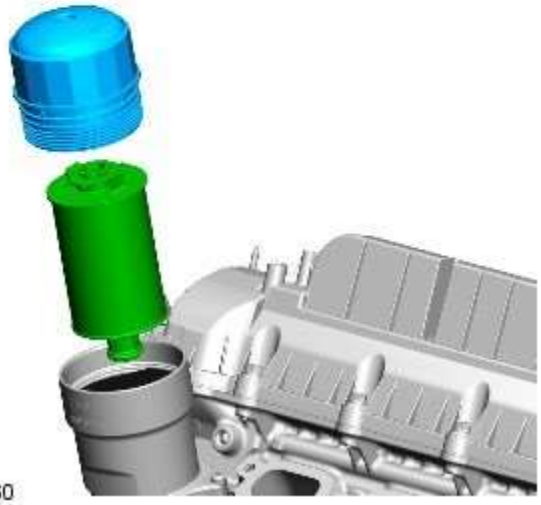
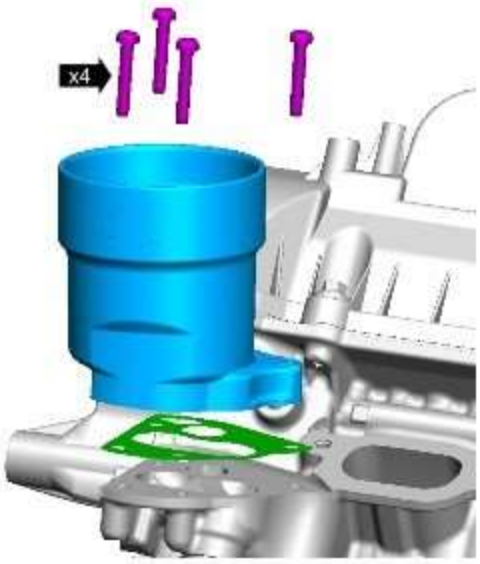


16. NOTE: Remove and discard the O-ring seal.

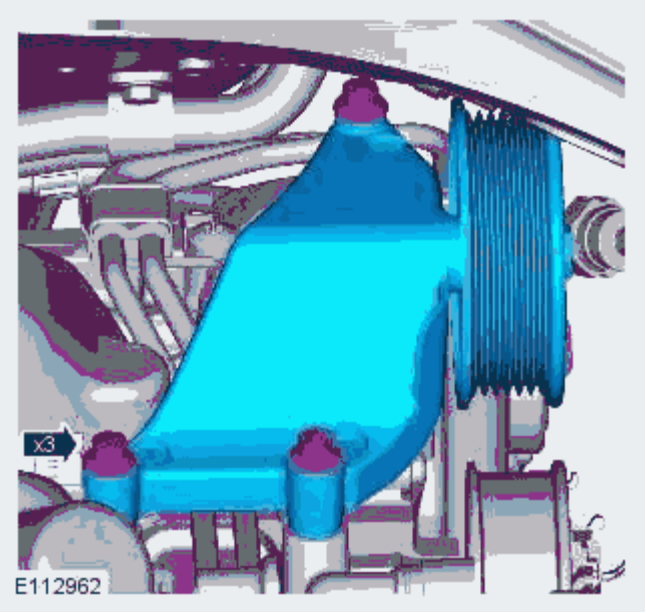


E114960



17. NOTE: Discard the gasket.

E114959

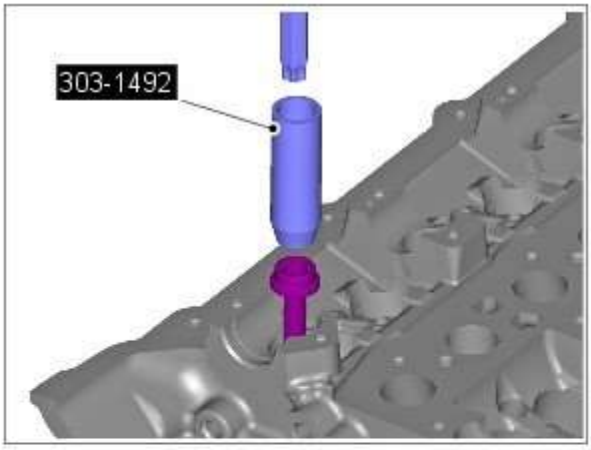


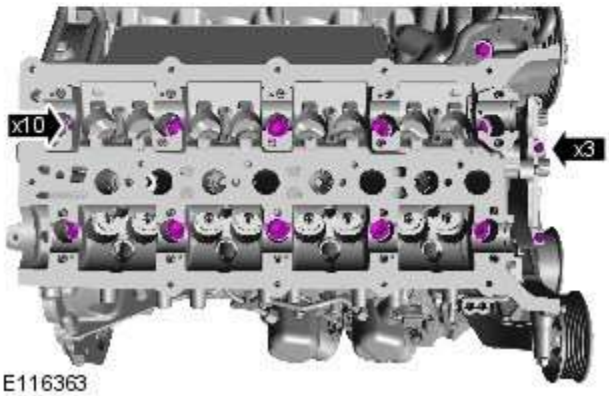
18.

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.

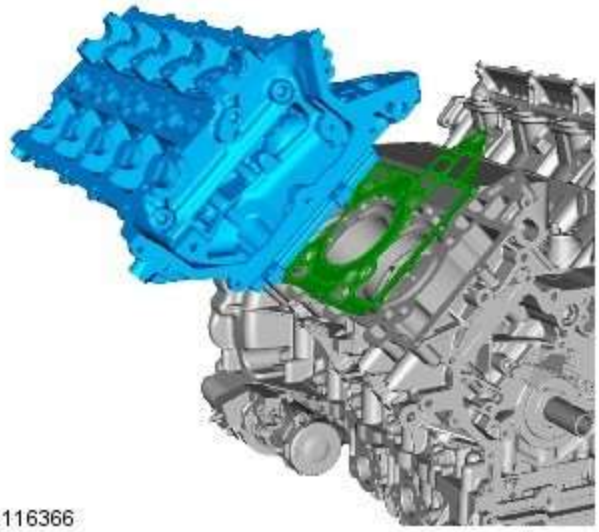




E116363

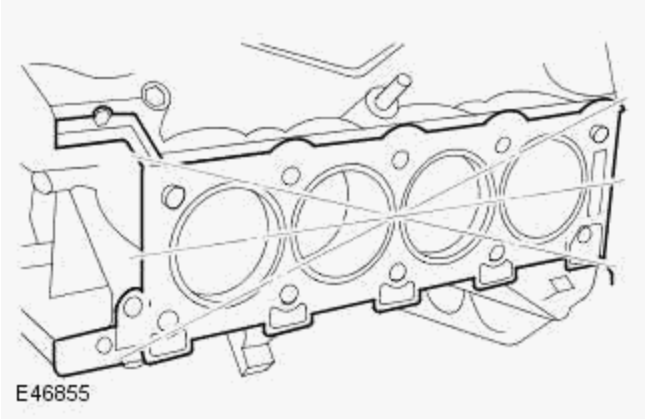
20. CAUTION: Discard the bolts.

21. NOTE: Discard the gasket.



E116366

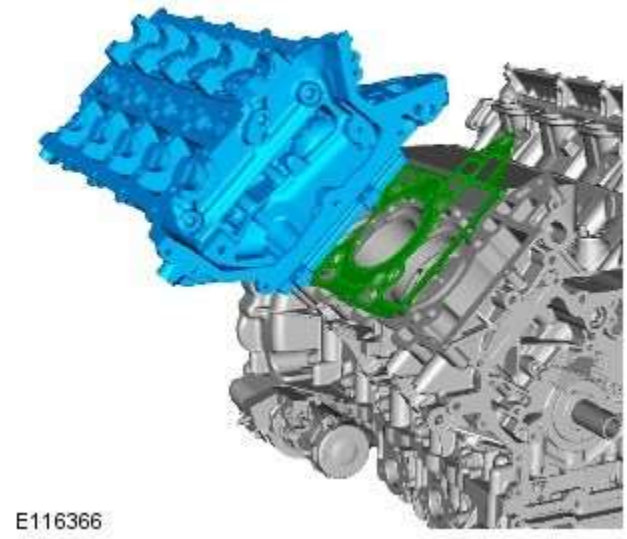
Installation



1. CAUTION: An acceptable flatness of the cylinder head is 0.1mm.

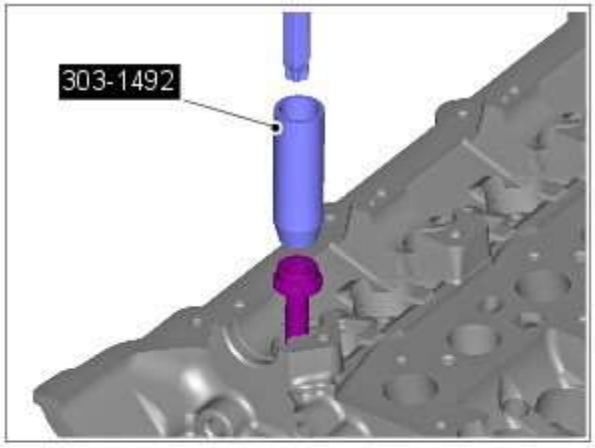
   NOTE: For cylinder head with distortion above the maximum allowance, the cylinder head material must be measured.

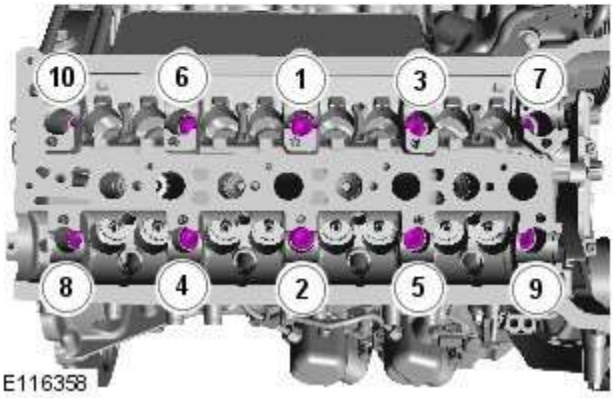
   Check cylinder head face for distortion, across the center and from corner to corner.



2. WARNING: Make sure care is taken when handling the cylinder head gasket.

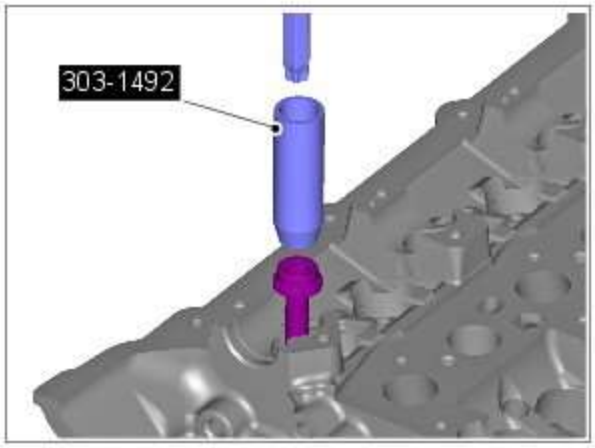
   NOTE: Install a new gasket.

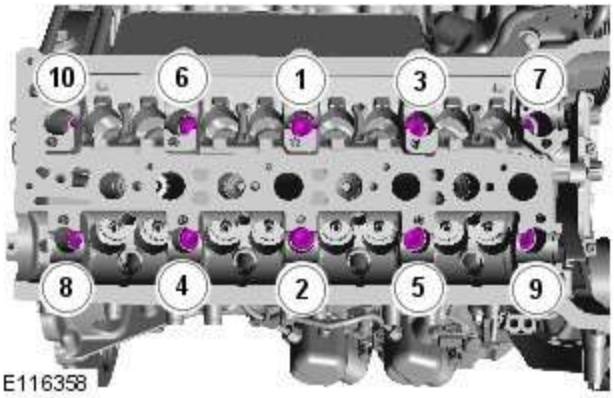




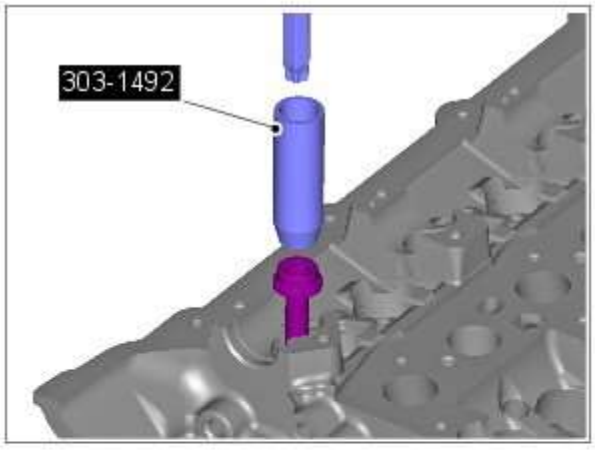
3. CAUTION: Make sure that new cylinder head bolts are installed.

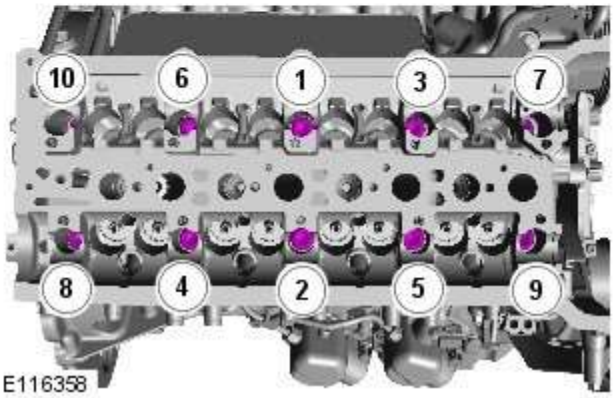
   Torque: 20 Nm



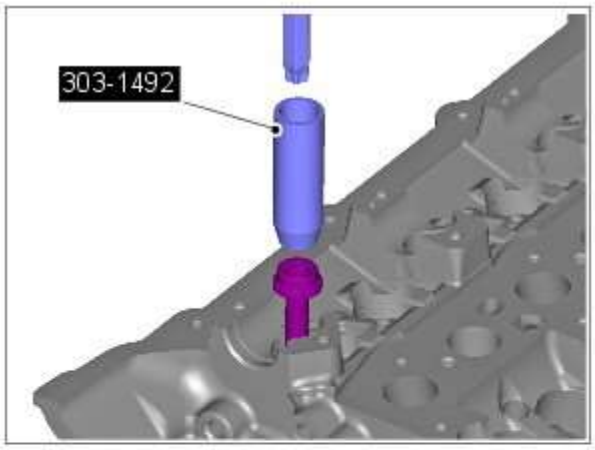


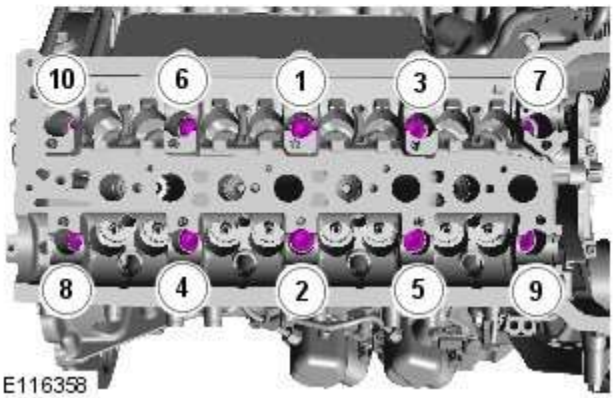
4. *Torque:* 35 Nm



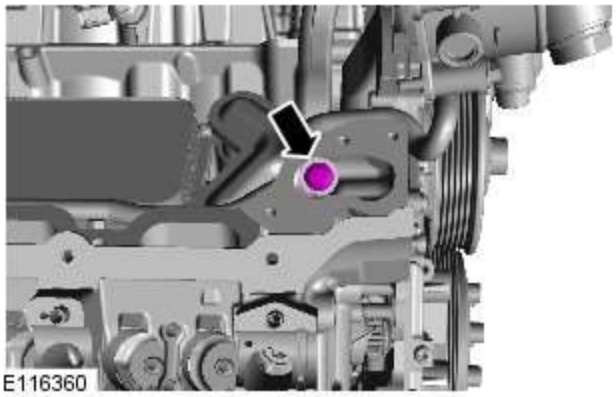


5. Tighten the bolts 1 to 10, a further 90 degrees.

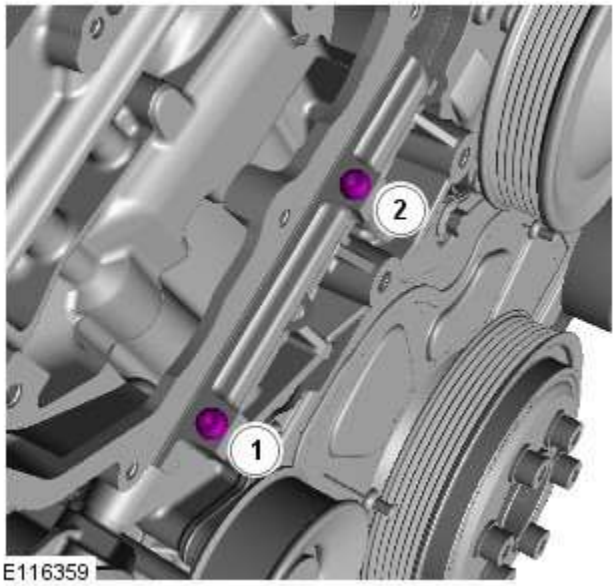




6. Tighten the bolts 1 to 10, a further 120 degrees.



7. *Torque:* 25 Nm



8. *Torque:* 12 Nm

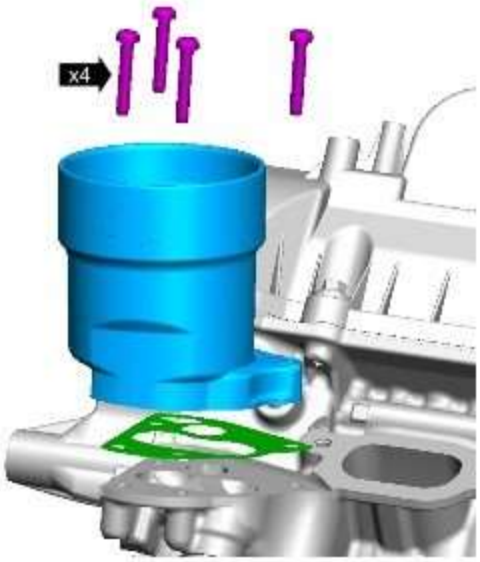
9. CAUTIONS:

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.

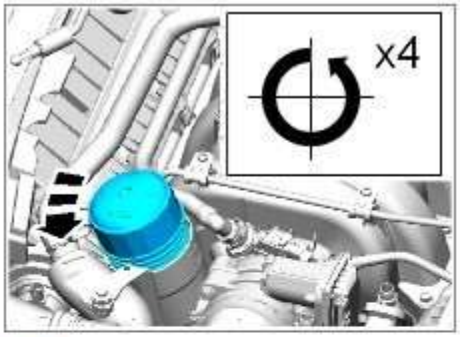
10. NOTE: Install a new gasket.

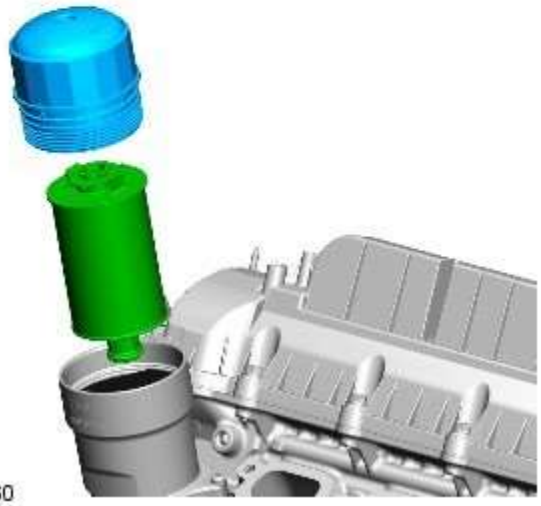


E114959

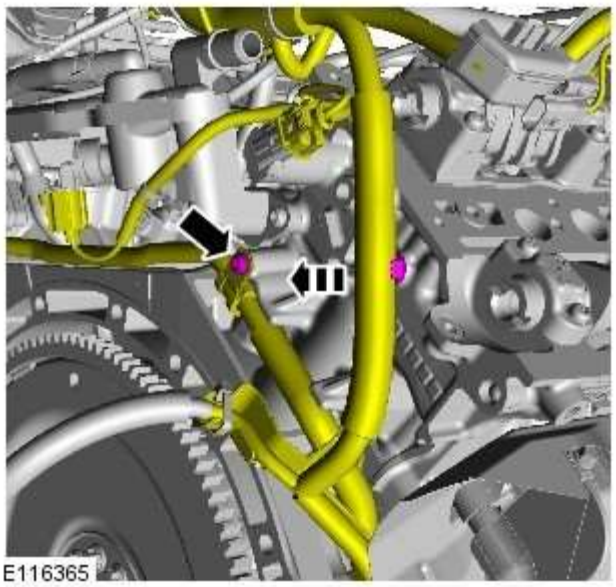
11. CAUTION: A new O-ring seal is to be installed.

NOTE: Install a new engine oil filter.

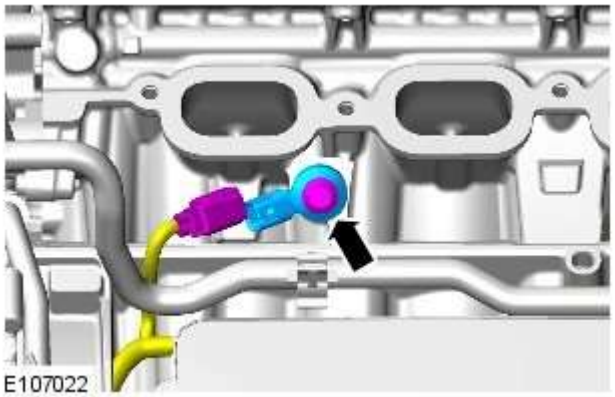




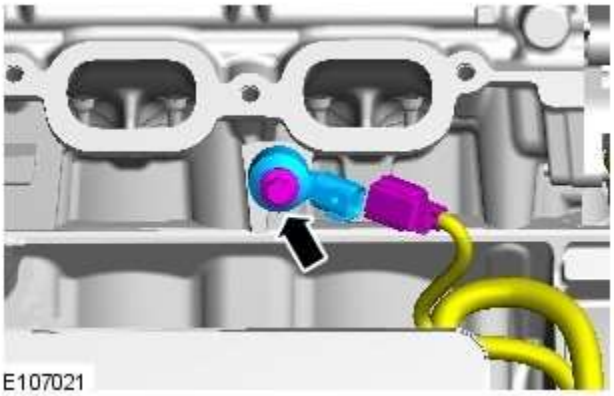
E114960



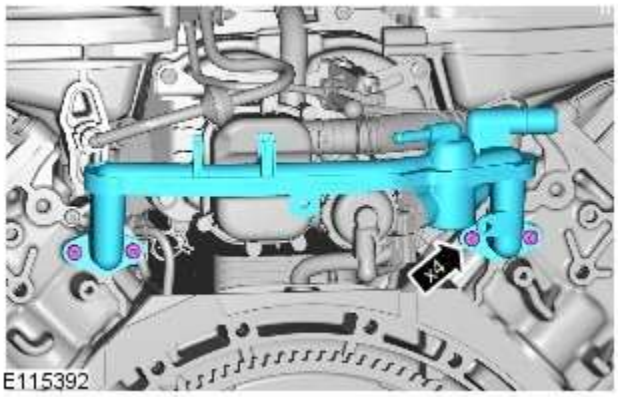
12. *Torque:* 12 Nm



13. *Torque:* 20 Nm

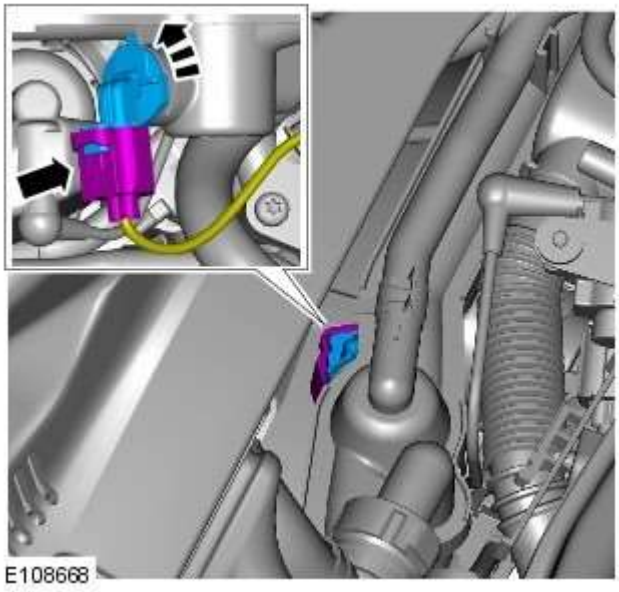


14. *Torque:* 20 Nm



15. CAUTION: Install the new seals.

Torque: 10 Nm



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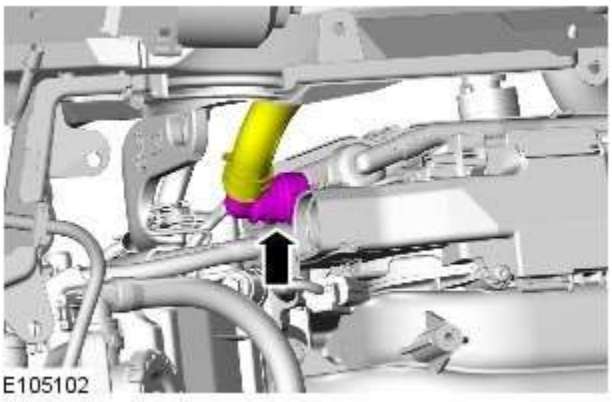
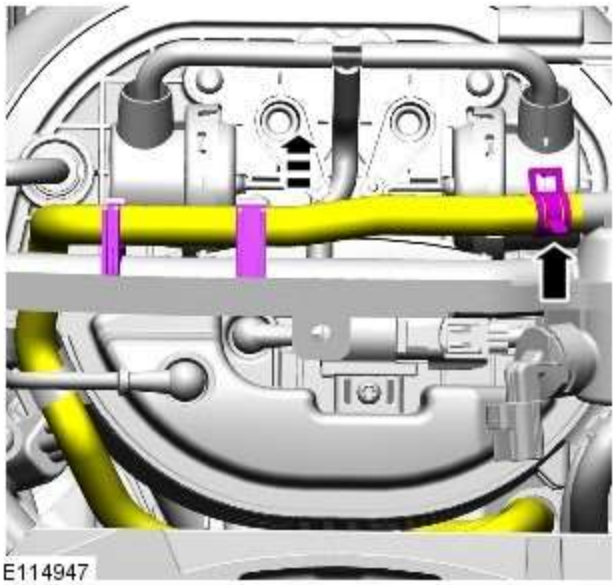
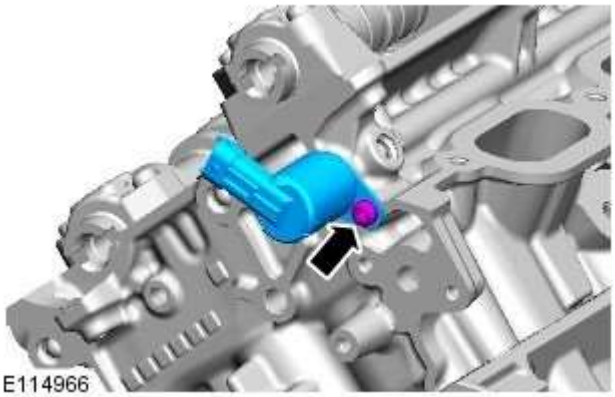


17. NOTE: Clamp the hose to minimize coolant loss.

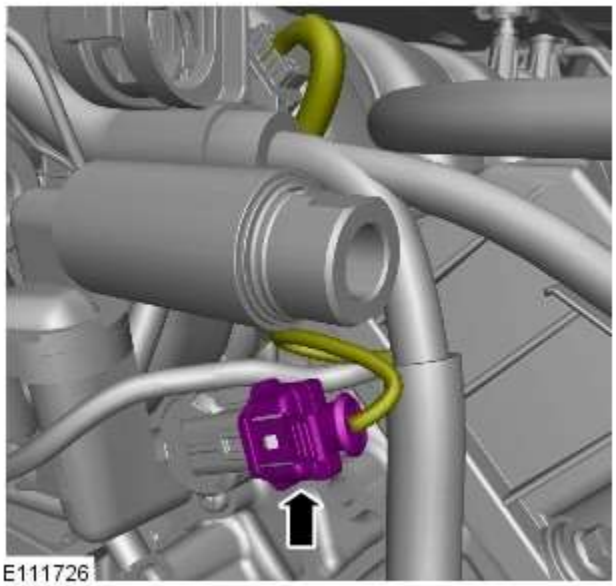


18. NOTE: Clamp the hose to minimize coolant loss.



19. CAUTION: Install a new seal.

Torque: 12 Nm



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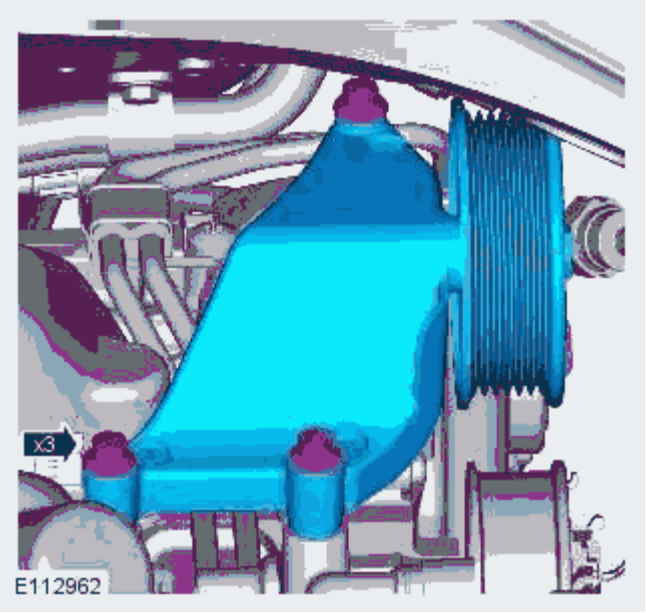
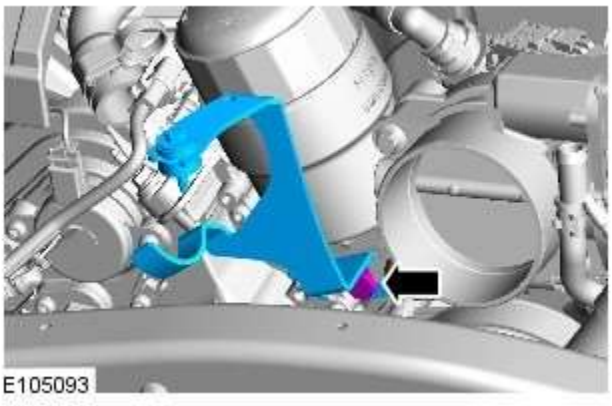


21. *Torque:* 25 Nm



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).

Published: 11-May-2011

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.

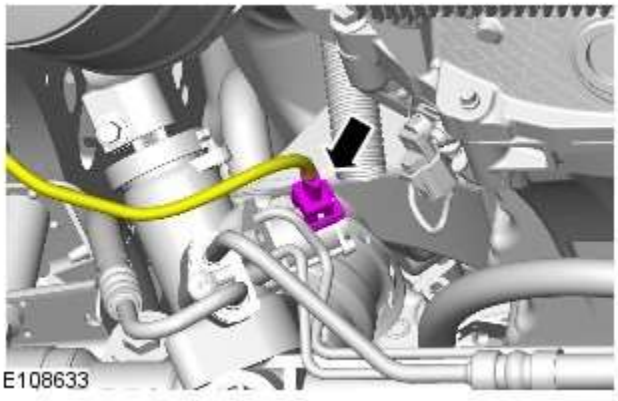
   Raise and support the vehicle.

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).

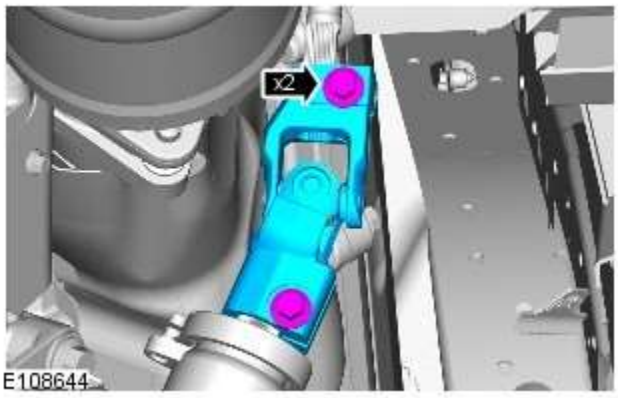
4. CAUTION: Support the engine on a jack. The angle may need to be adjusted during this procedure.

   Support the engine with the lifting equipment.

Left-hand drive vehicles

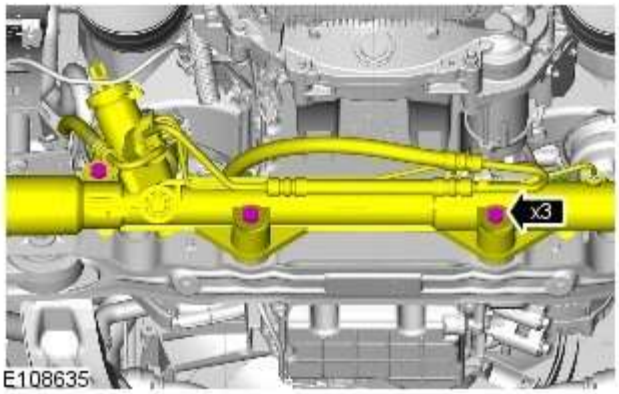


5.



6. NOTE: Note the fitted position.

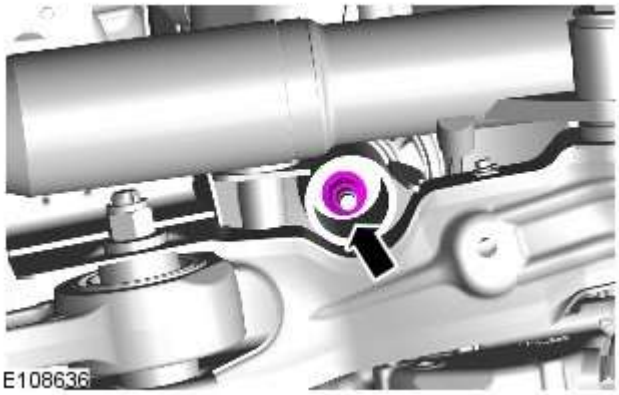
   - *Torque:* 35 Nm
   - Right-hand side shown, left-hand side similar.



7.

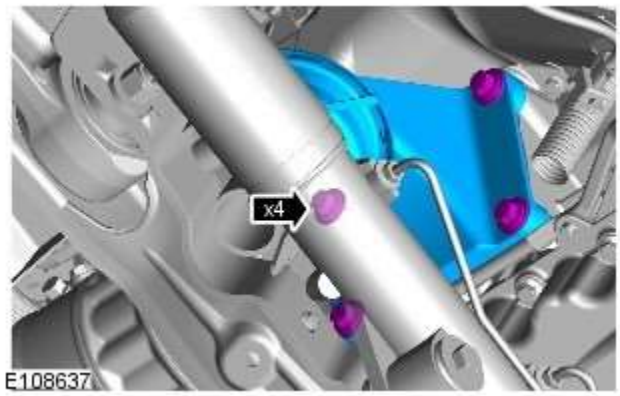
- *Torque:* 100 Nm
- Support and release the power steering rack.

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.

Published: 11-May-2011

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).

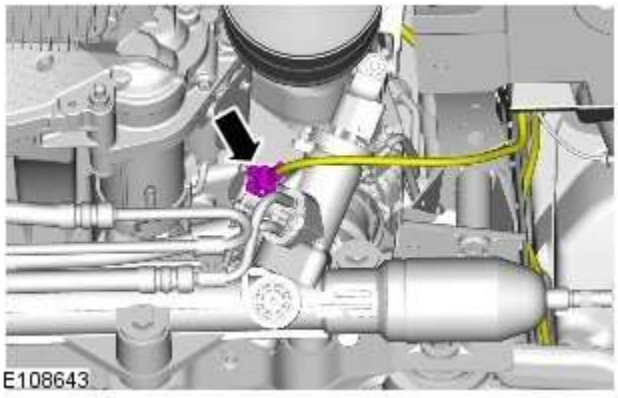
All vehicles

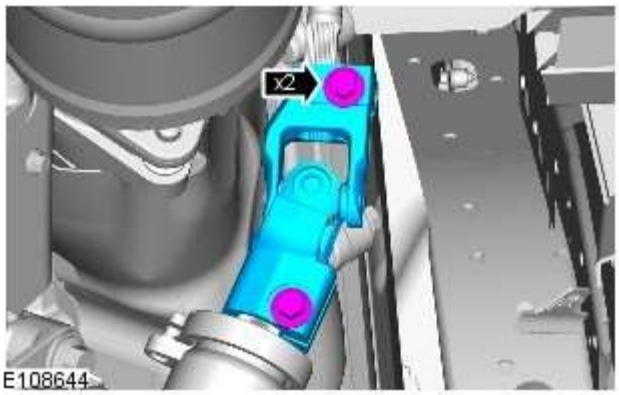
4. CAUTION: Support the engine on a jack. The angle may need to be adjusted during this procedure.

   Support the engine with the lifting equipment.

Right-hand drive vehicles

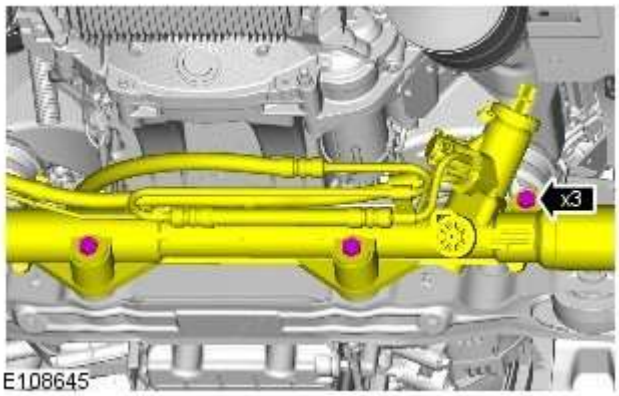
5.





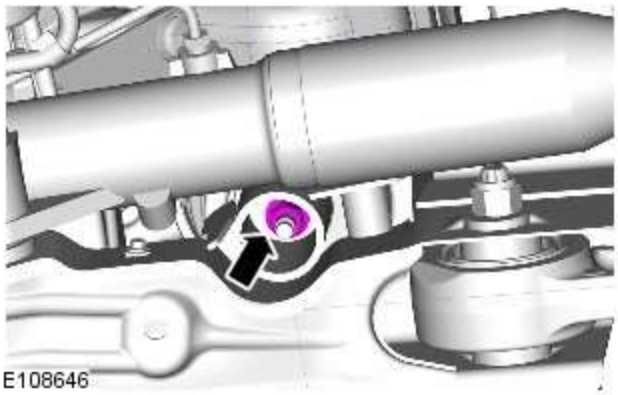
6. NOTE: Note the fitted position.

   Torque: 35 Nm

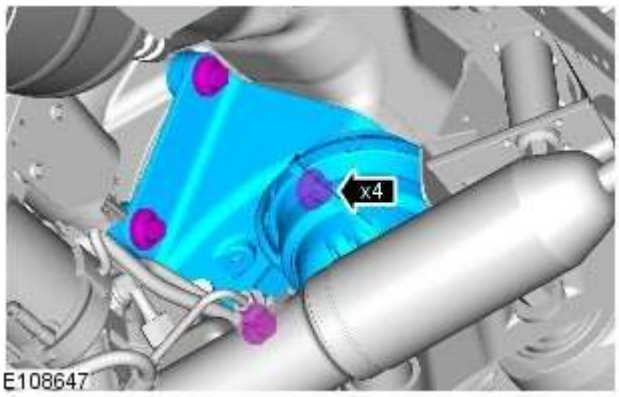


7. *Torque:* 100 Nm

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.

Published: 11-May-2011

Engine - V8 S/C 5.0L Petrol - Exhaust Manifold LH

Removal and Installation

Special Tool(s)

 E115261	303-1444-01 Exhaust Manifold Installation Guide Pins - Threaded
 E115262	303-1444-02 Exhaust Manifold Installation Guide Pins - Unthreaded

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).

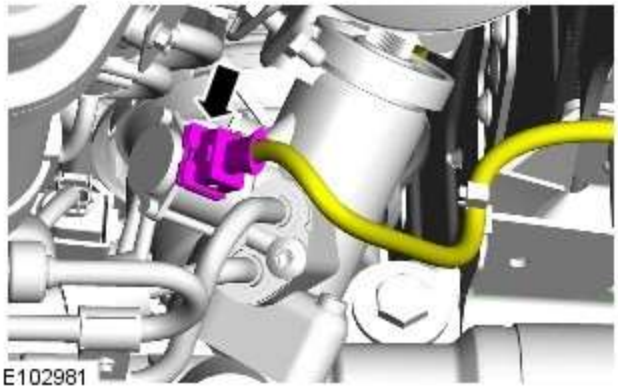
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   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).

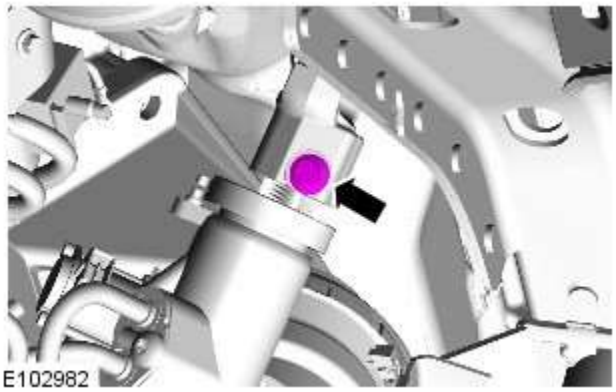
4. Refer to: Catalytic Converter LH (309-00C Exhaust System - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

5.

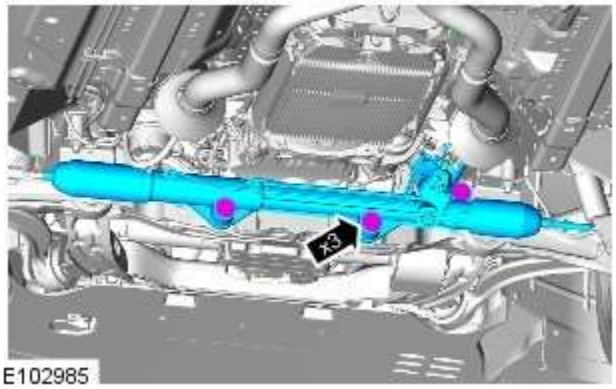

E102981

6. CAUTION: Discard the bolt.

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

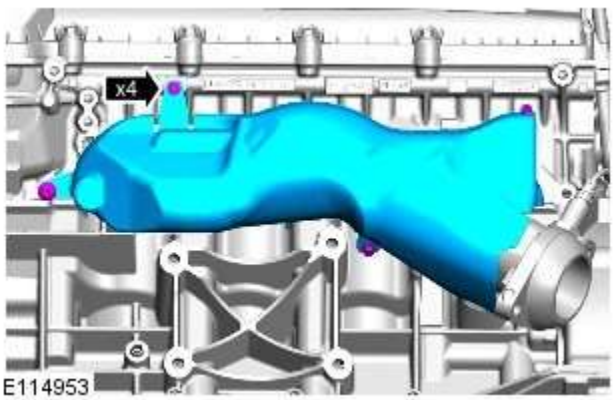

E102982

7.

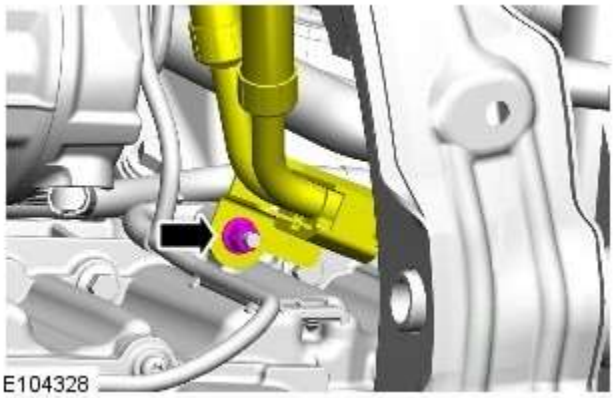


E102985

8.

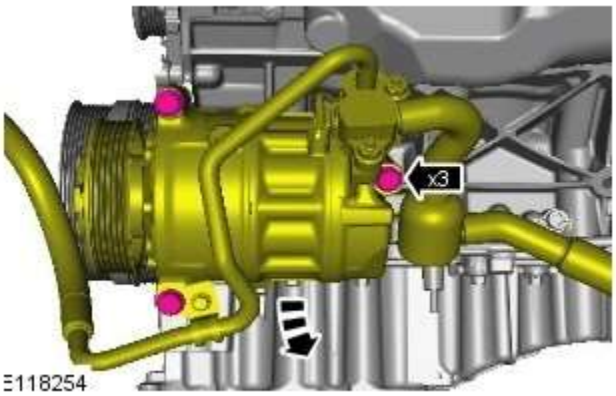


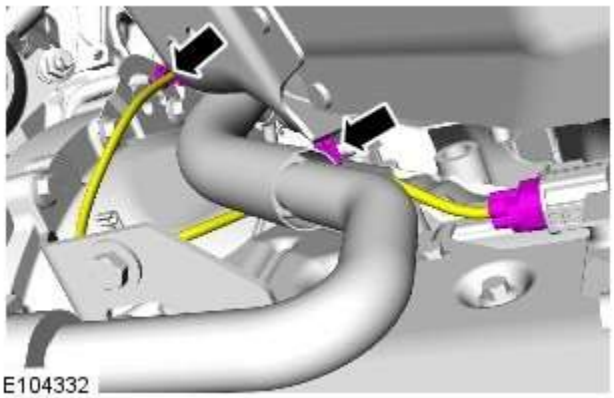
E114953



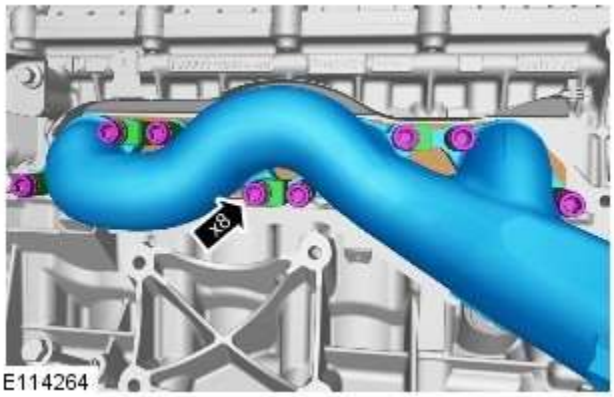
9.

10.





11.



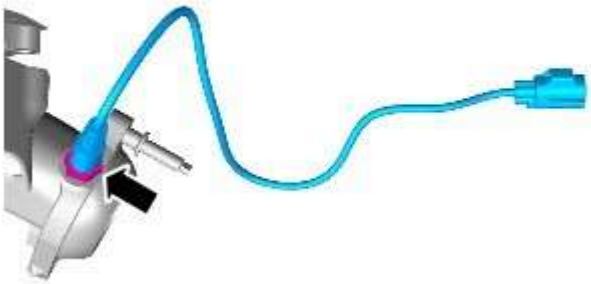
CAUTION: Discard the bolts.

12. NOTES:

Discard the gasket.

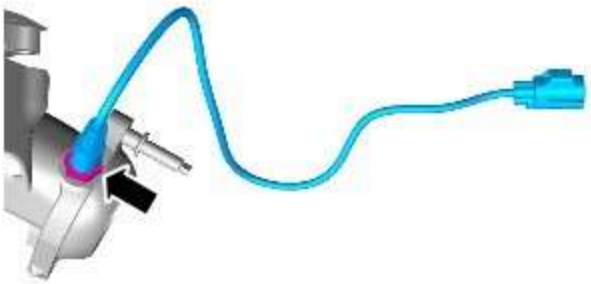
Make sure that the position of the spacers is noted before removal of the manifold.

13. NOTE: Do not disassemble further if the component is removed for access only.


E104334

Installation

1. CAUTIONS:


E104334

Make sure that the mating faces are clean and free of foreign material.

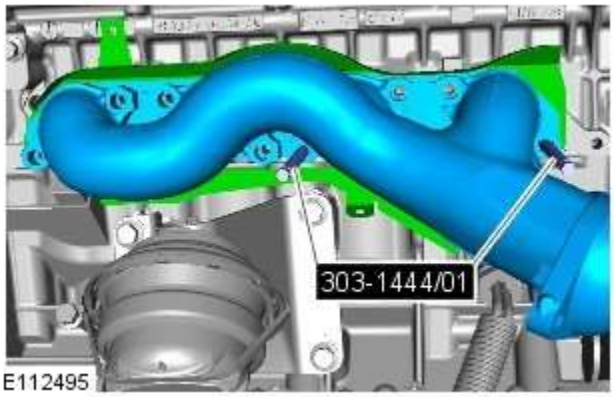
Make sure the anti-seize compound does not contact the catalyst monitor sensor tip.

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.

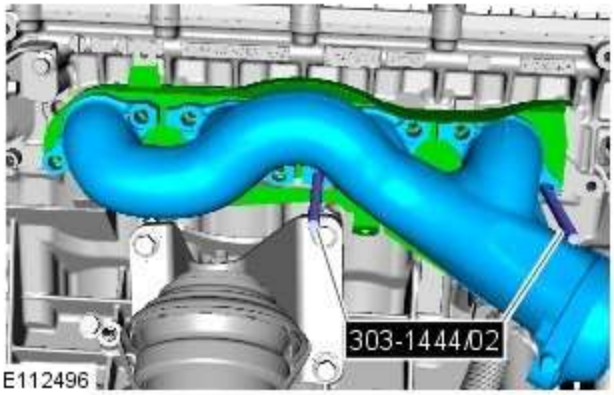
Torque: 45 Nm



E112495

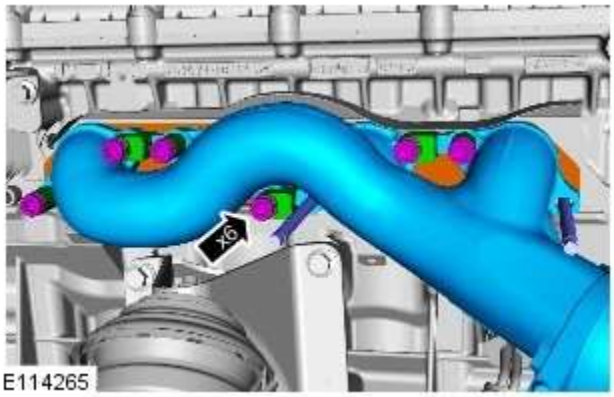
2. NOTE: Install a new gasket.

Special Tool(s): 303-1444-01



3. NOTE: If a new cylinder head is installed use the special tools in the illustration.

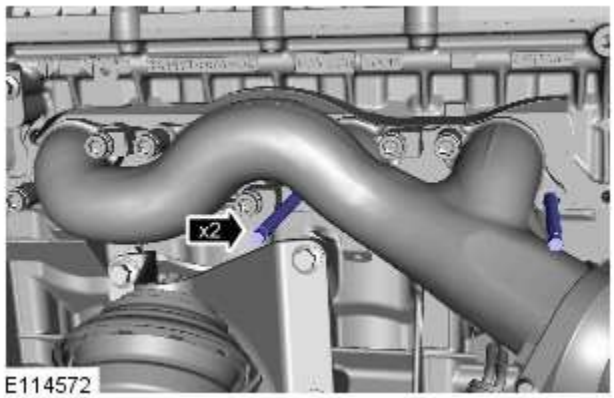
   Special Tool(s): 303-1444-02



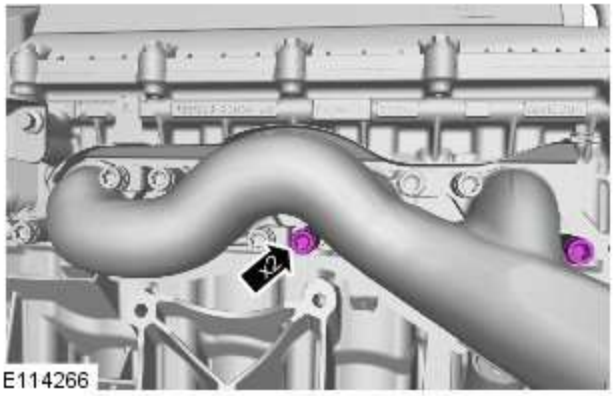
4. CAUTION: Make sure that new bolts are installed.

   NOTE: Install the spacers in the noted position.

   Torque: 10 Nm



5. Remove the special tool.

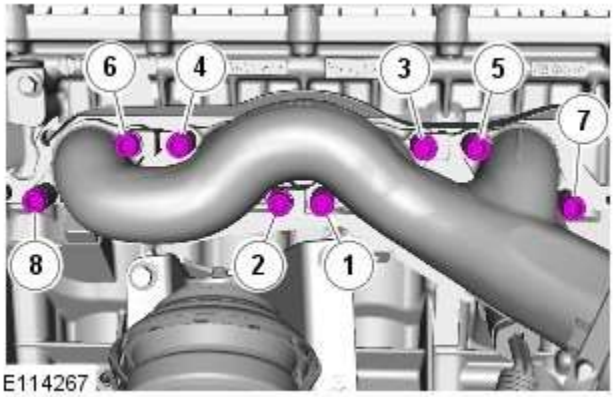


6. CAUTION: Make sure that new bolts are installed.

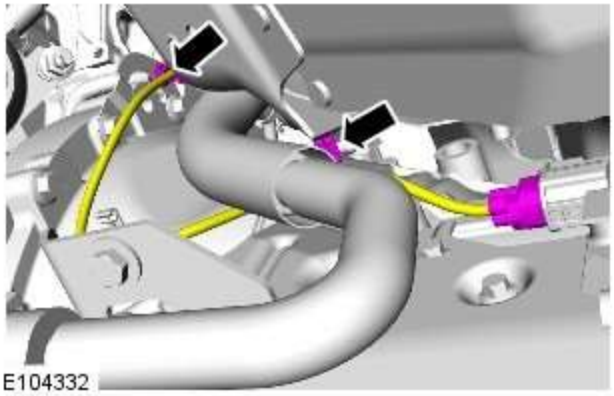
   NOTE: Install the spacers in the noted position.

   Torque: 10 Nm

Torque: 18 Nm

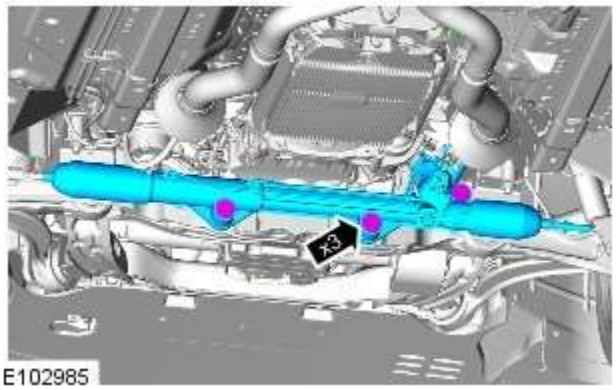


7.



8.

Torque: 100 Nm

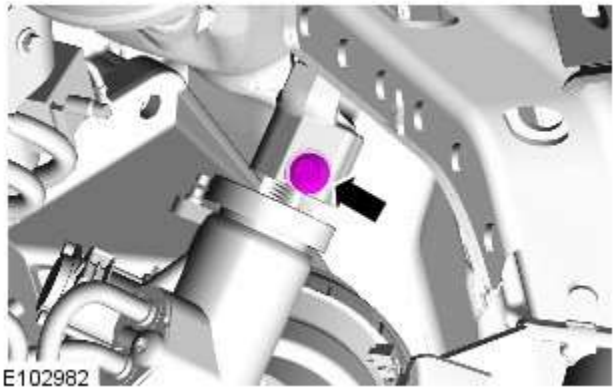


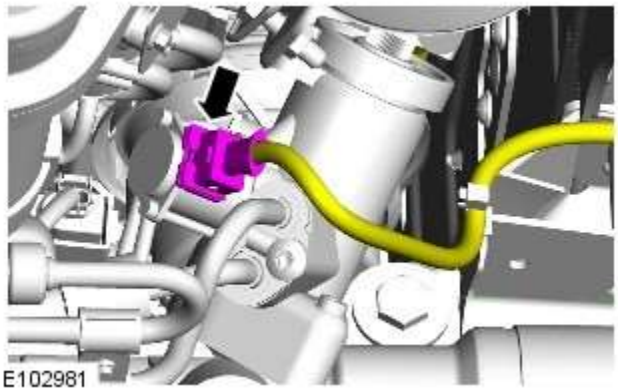
9.

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

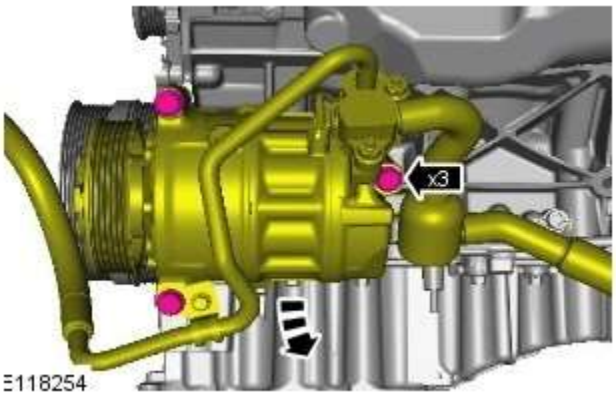




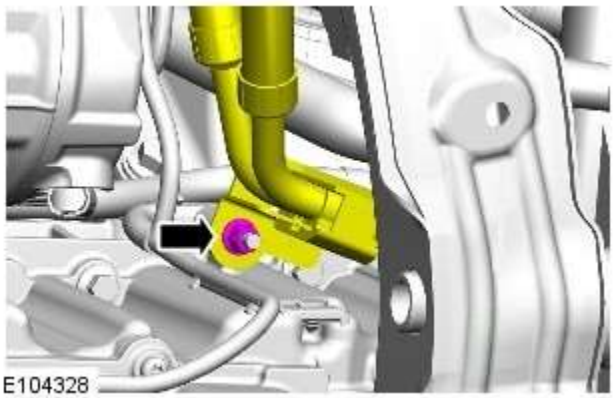
11.

Torque: 25 Nm

12.



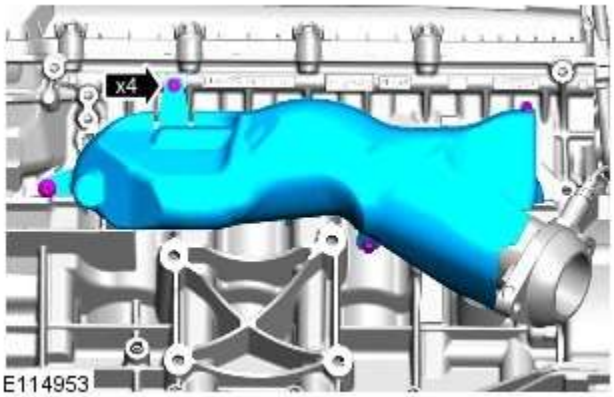
Torque: 10 Nm



13.

Torque: 3 Nm

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).

Published: 11-May-2011

Engine - V8 S/C 5.0L Petrol - Exhaust Manifold RH

Removal and Installation

Special Tool(s)

 E115261	303-1444-01 Exhaust Manifold Installation Guide Pins - Threaded
 E115262	303-1444-02 Exhaust Manifold Installation Guide Pins - Unthreaded

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).

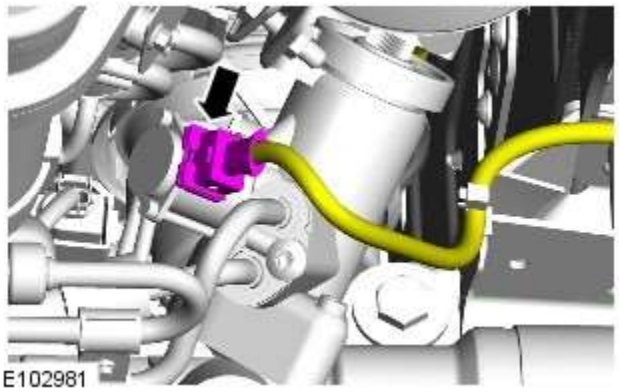
2. NOTE: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

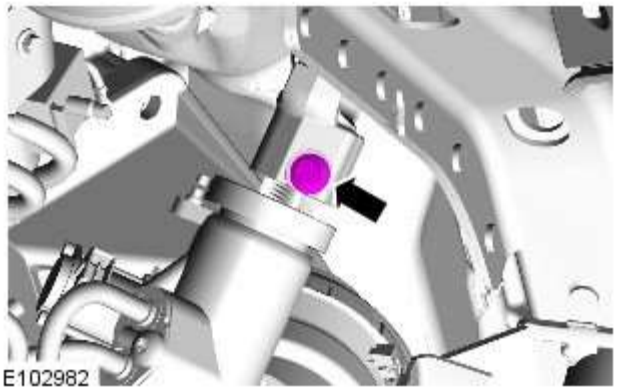
   Raise and support the vehicle.

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

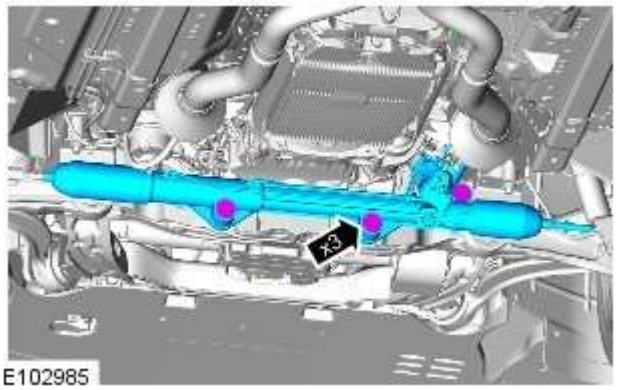
4.


E102981



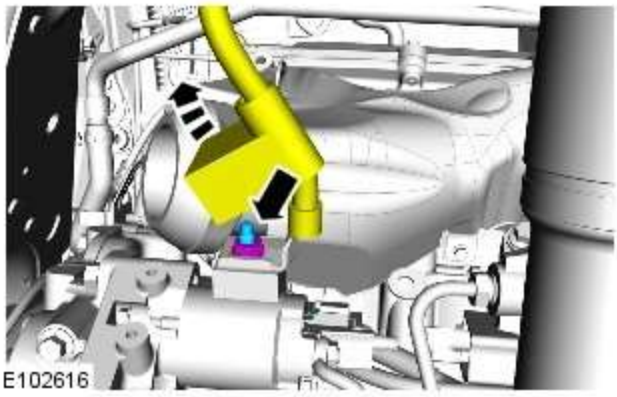
5. CAUTION: Discard the bolt.

   Torque: 35 Nm



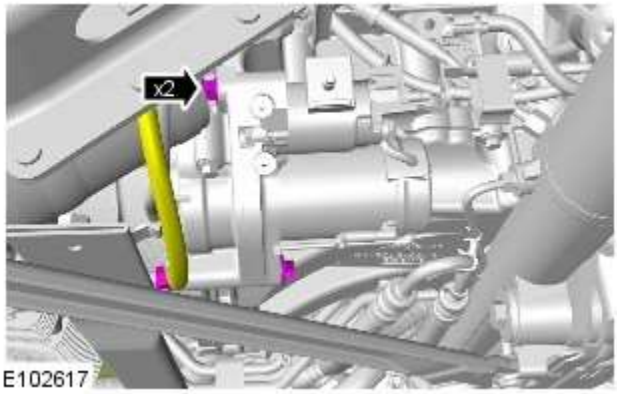
6. *Torque:* 100 Nm

All vehicles

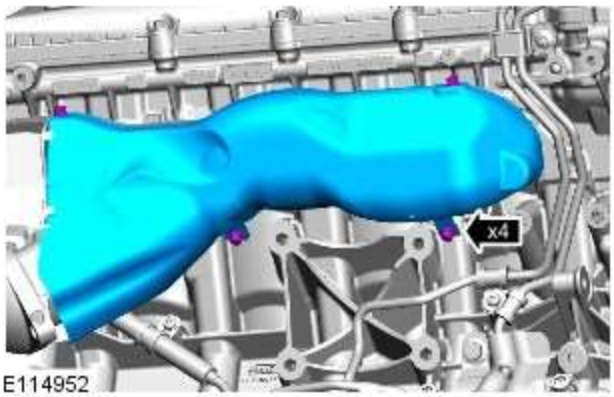


7. *Torque:* 12 Nm

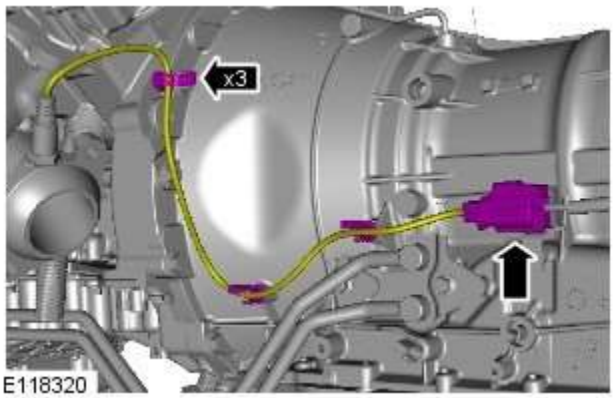
Torque: 48 Nm



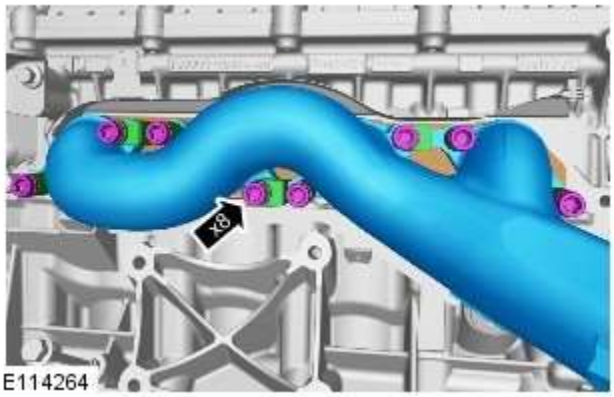
8.



9.



10.



CAUTIONS:

11. Discard the bolts.

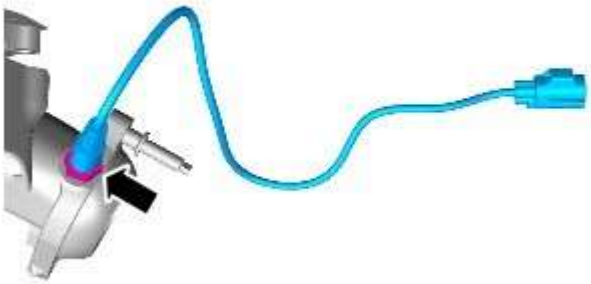
LH illustration shown, RH is similar.

NOTES:

Discard the gasket.

Make sure that the position of the spacers is noted before removal of the manifold.

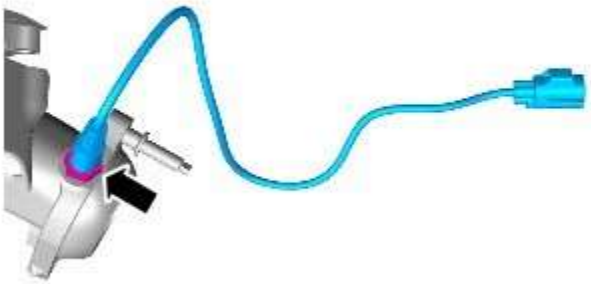
12. NOTE: Do not disassemble further if the component is removed for access only.

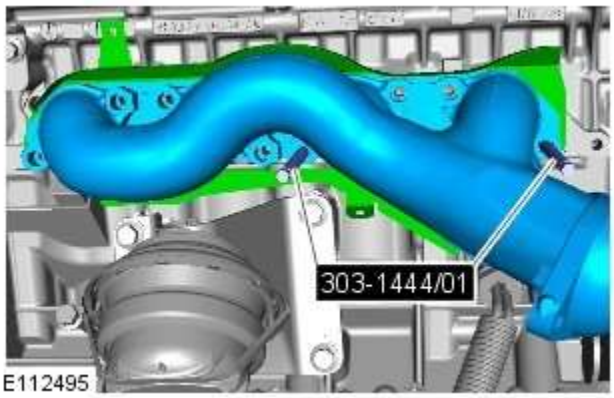

E104334

Installation

All vehicles

1. *Torque:* 45 Nm


E104334



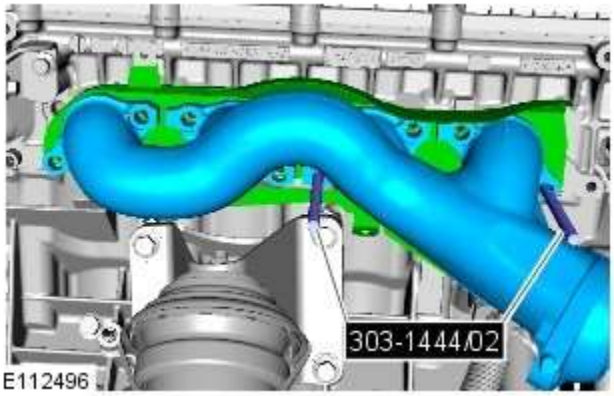
E112495

2. CAUTION: LH illustration shown, RH is similar.

   NOTE: Install a new gasket.

   Install the special tool.

   Special Tool(s): 303-1444-01

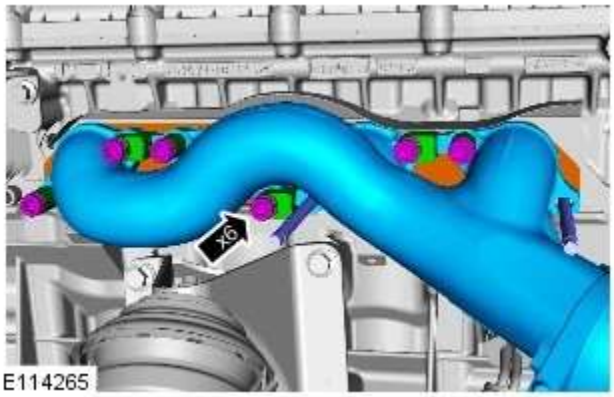


3. CAUTION: LH illustration shown, RH is similar.

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



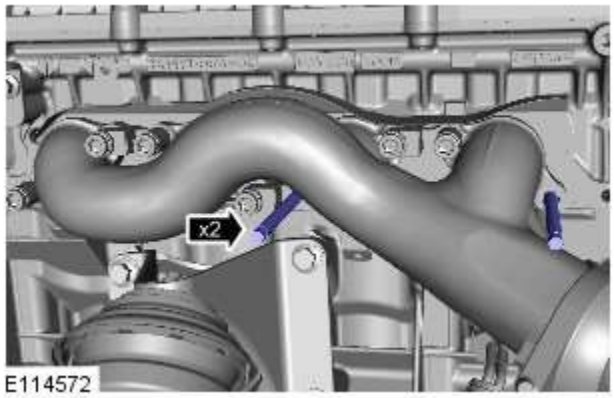
4. CAUTIONS:

Make sure that new bolts are installed.

LH illustration shown, RH is similar.

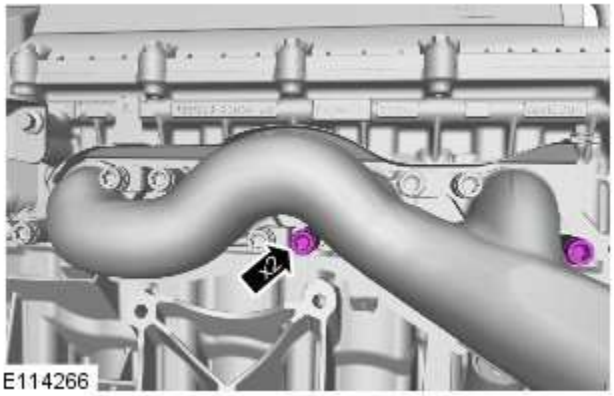
NOTE: Install the spacers in the noted position.

Torque: 10 Nm



5. CAUTION: LH illustration shown, RH is similar.

Remove the special tool.



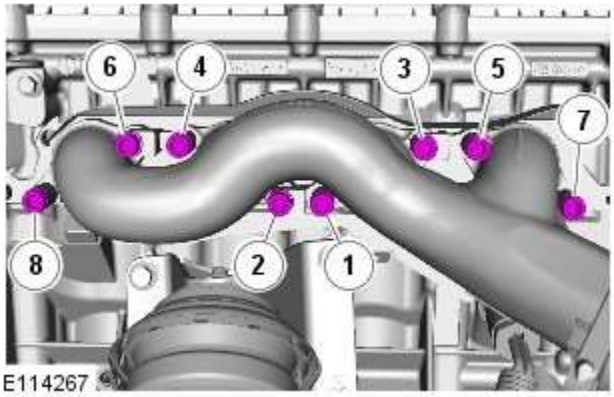
6. CAUTIONS:

Make sure that new bolts are installed.

LH illustration shown, RH is similar.

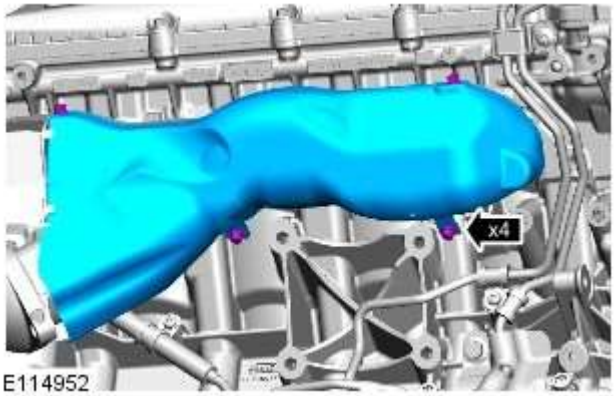
NOTE: Install the spacers in the noted position.

Torque: 10 Nm

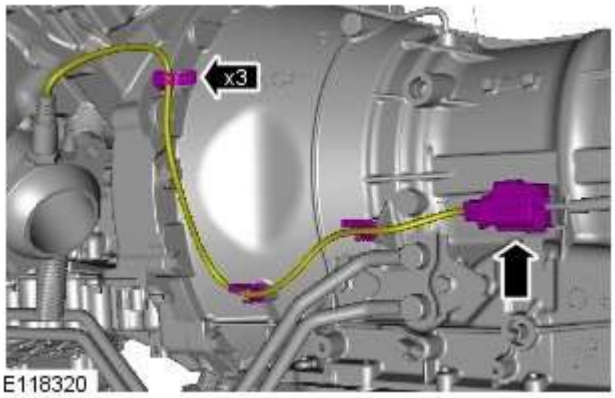


7. CAUTION: LH illustration shown, RH is similar.

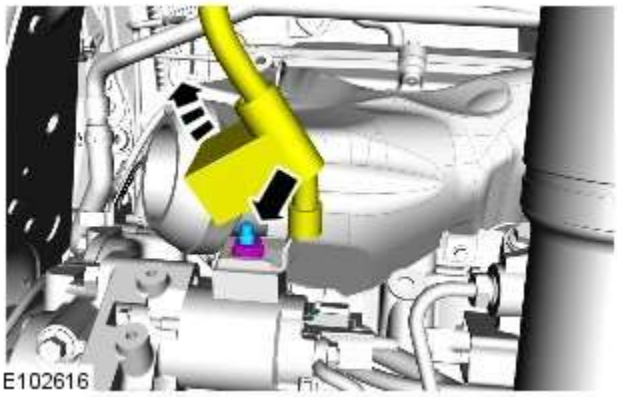
   Torque: 18 Nm



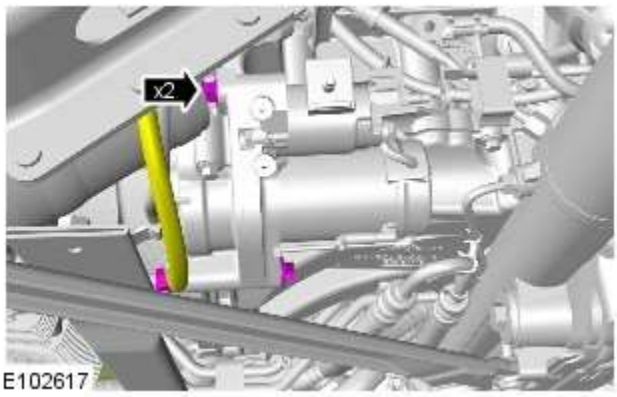
8.



9.

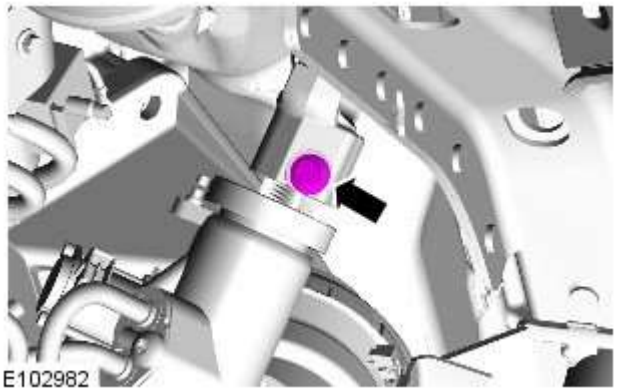


10. *Torque:* 12 Nm



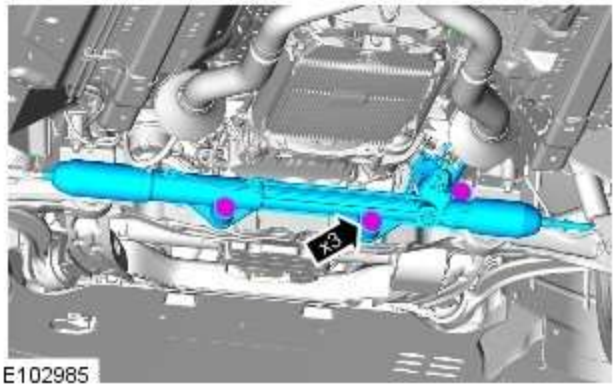
11. *Torque:* 48 Nm

Right-hand drive vehicles



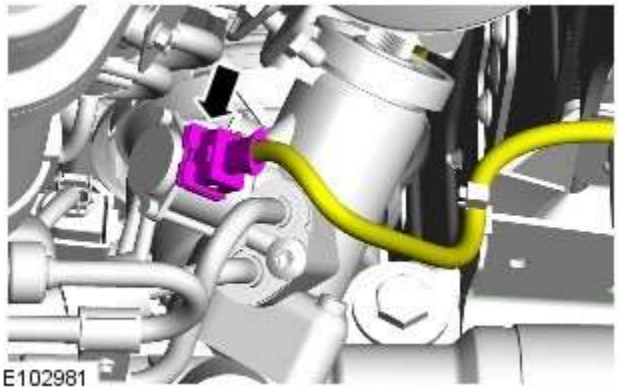
12. CAUTION: Discard the bolt.

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).

Published: 11-May-2011

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.

Published: 19-Nov-2013

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).

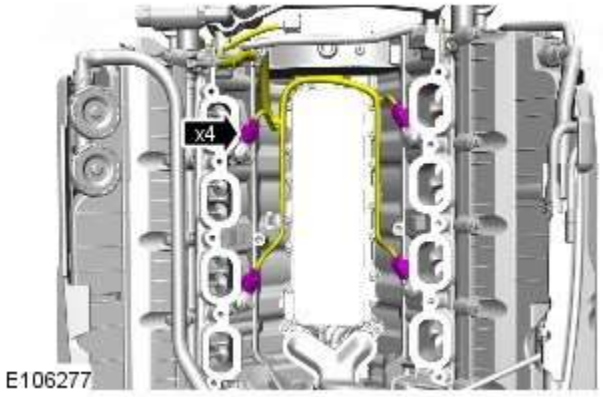
2. WARNING: Make sure to support the vehicle with axle stands.

   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.



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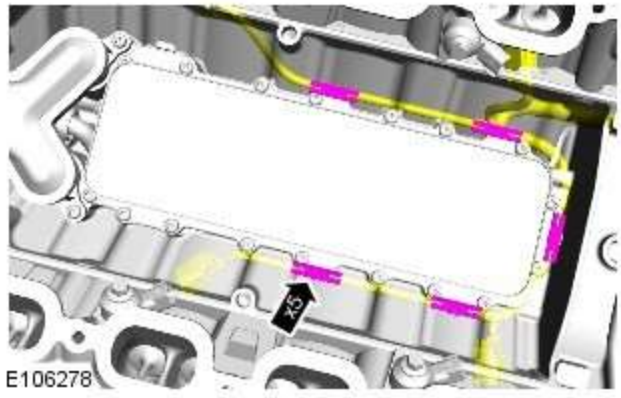
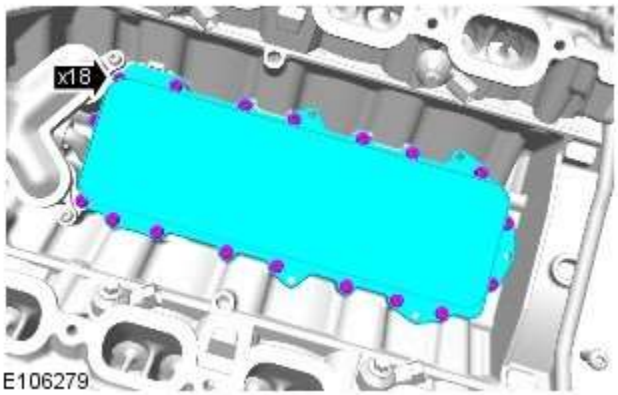


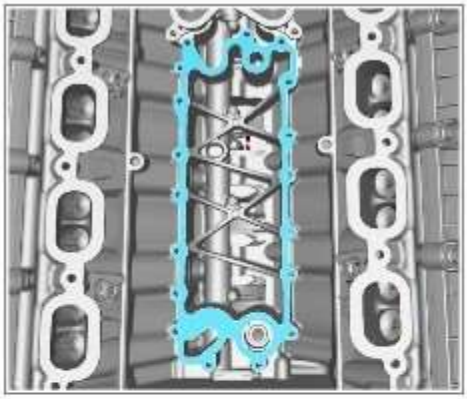


7. CAUTIONS:

   Be prepared to collect escaping oil.

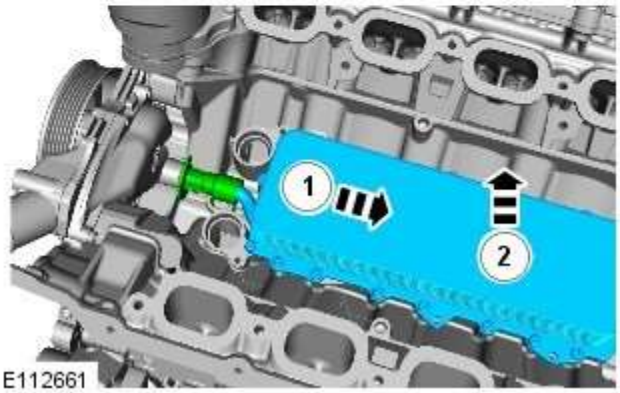
   Be prepared to collect escaping coolant.

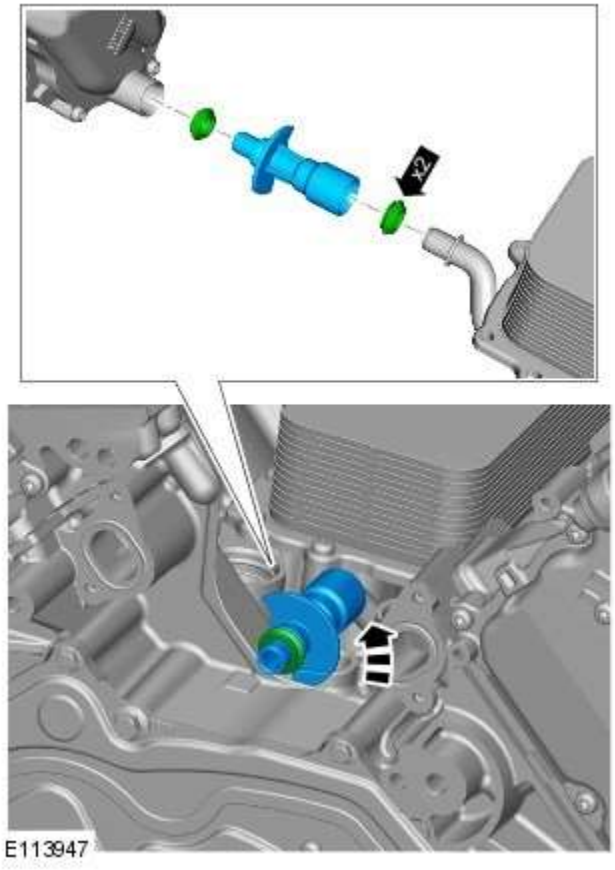
   Torque: 13 Nm



8. CAUTION: Make sure that these components are installed to the noted removal position.

   NOTE: Install a new gasket.



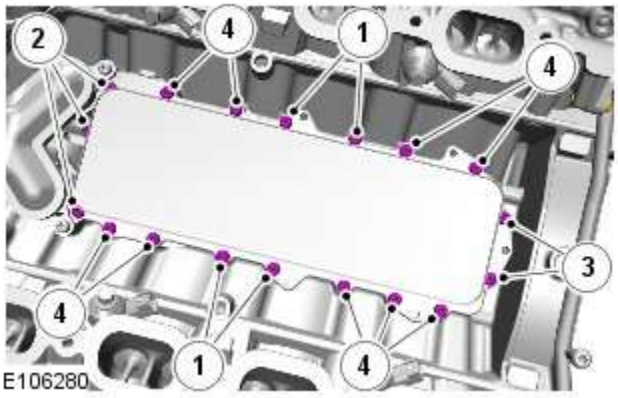


9. CAUTIONS:

Make sure that these components are installed to the noted removal position.

Install new o-ring seals

Installation



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.

Published: 11-May-2011

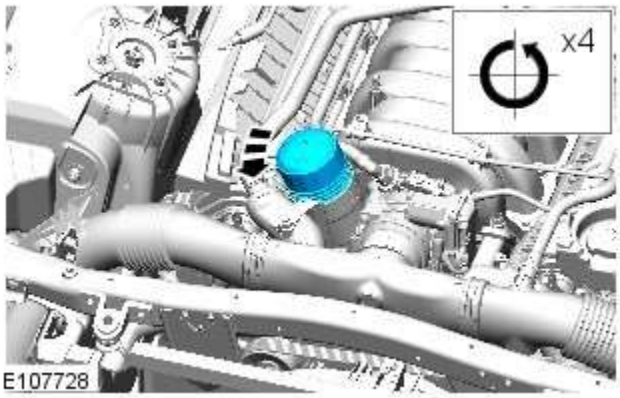
Engine - V8 S/C 5.0L Petrol - Oil Filter Element

Removal and Installation

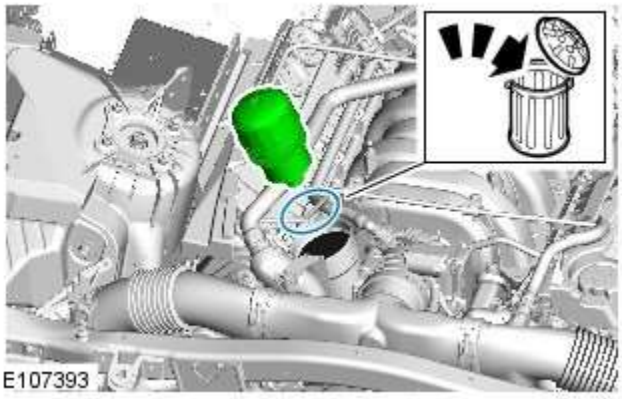
Removal

NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

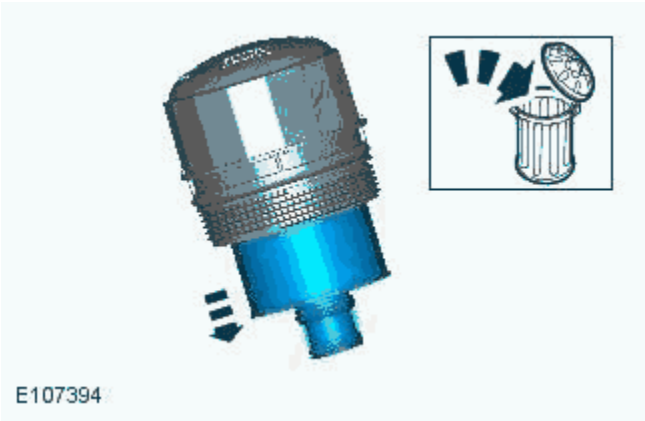
1. Refer to: Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).



2.
- Allow the engine oil to drain from the oil filter element housing for two minutes.

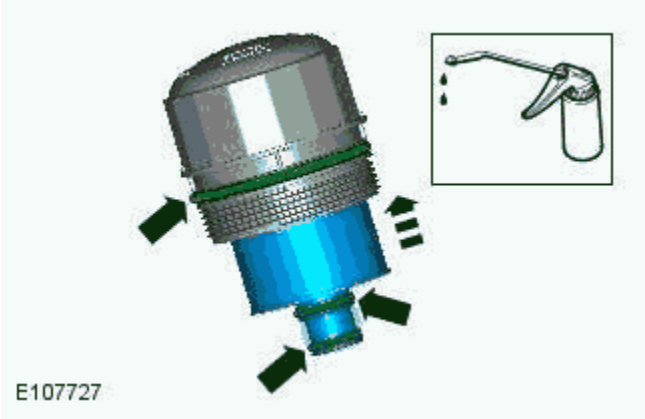


3.

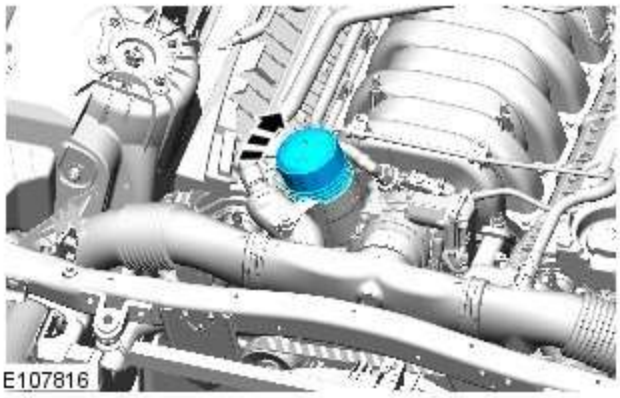


4.

Installation



1.



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).

Published: 11-May-2011

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).

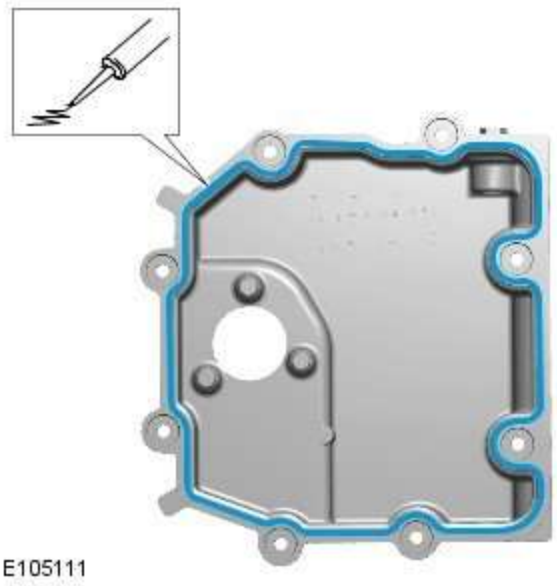
2. WARNING: Make sure to support the vehicle with axle stands.

   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.

Installation


E105111

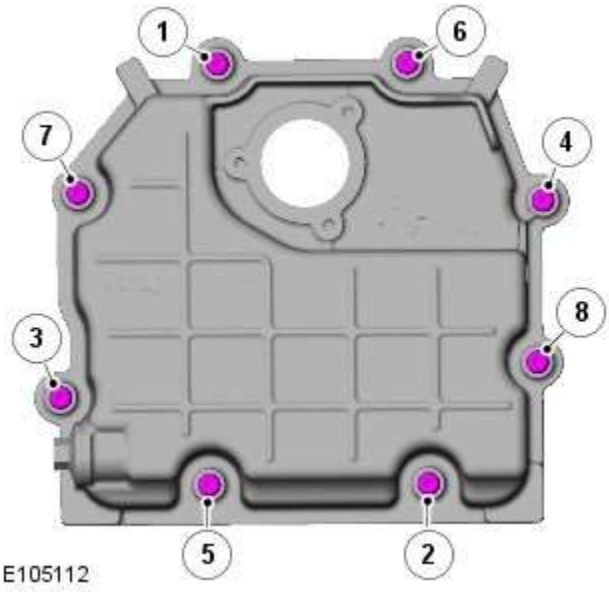
1. CAUTIONS:

   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.



E105112

2. NOTE: Tighten the bolts in the sequence shown.

   Torque: 12 Nm

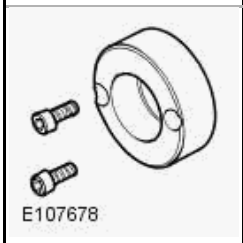
3. Refer to: Engine Oil Level Sensor (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Removal and Installation).

Published: 03-Dec-2011

Engine - V8 S/C 5.0L Petrol - Oil Pan Extension

Removal and Installation

Special Tool(s)

 E107676	303-1433 Lower Timing Cover Alignment tool
 E107678	303-1442 Rear Crankshaft Seal Installer
 E107679	303-1443 Rear Crankshaft Cover Alignment Tool

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:

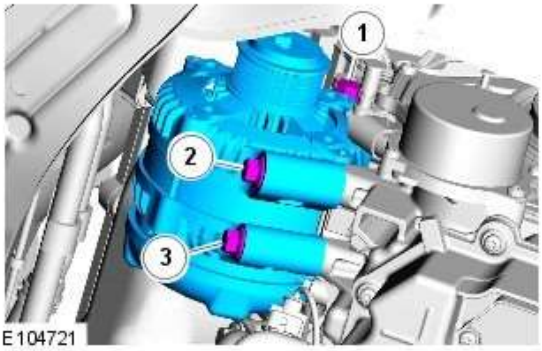
The bolts can only be used 3 times, mark the bolts with a center punch. If 2 punch marks are visible, discard the bolts.

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.



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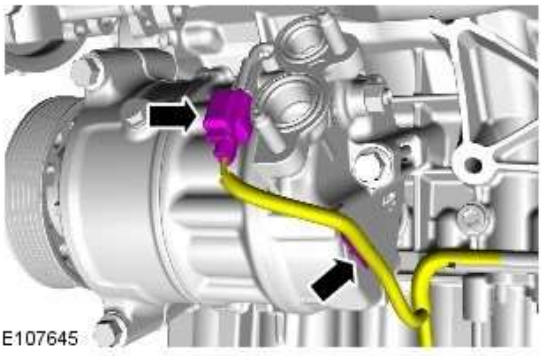

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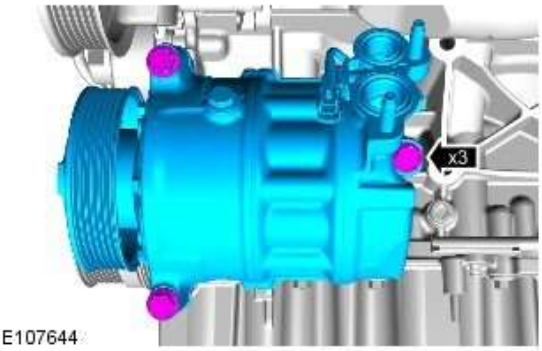
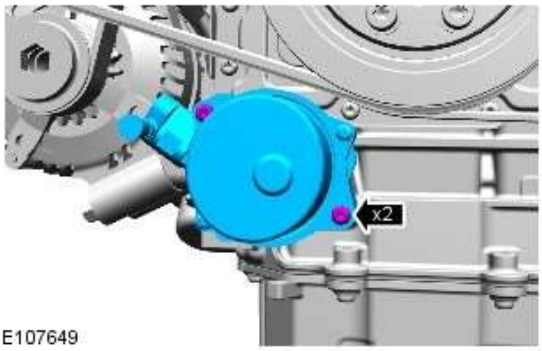


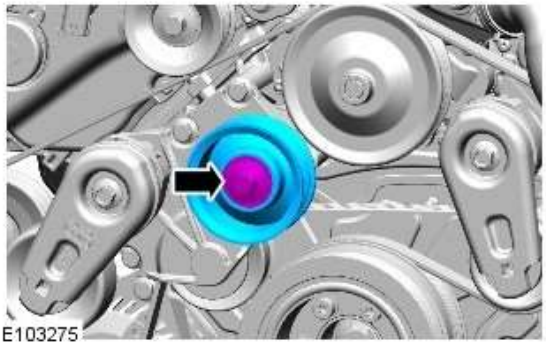
8.

9.

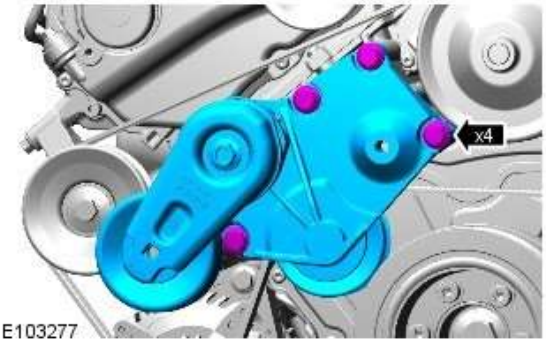


E107649

10.

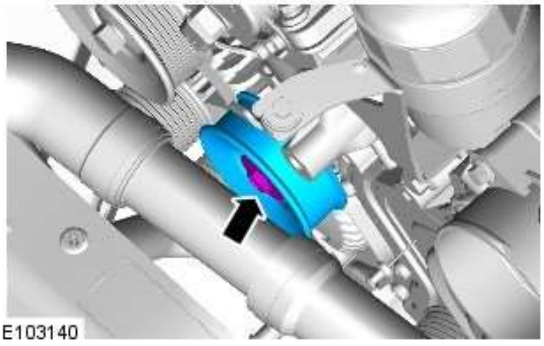

E103275

11.

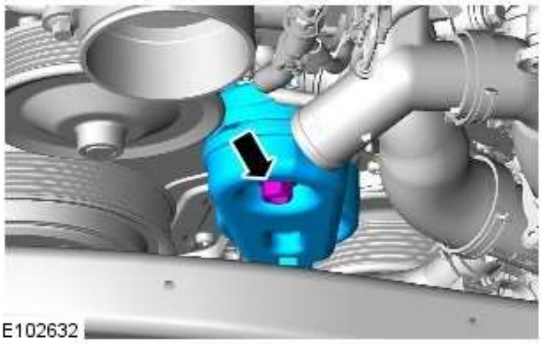


E103277

12.


E103140

13.



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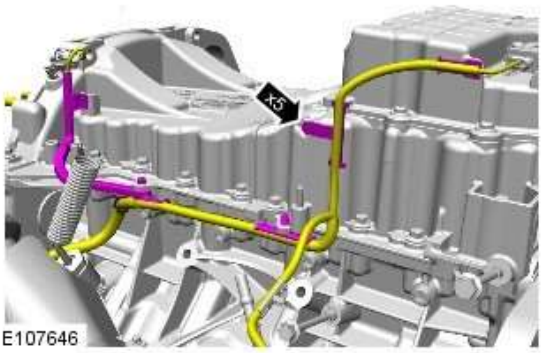
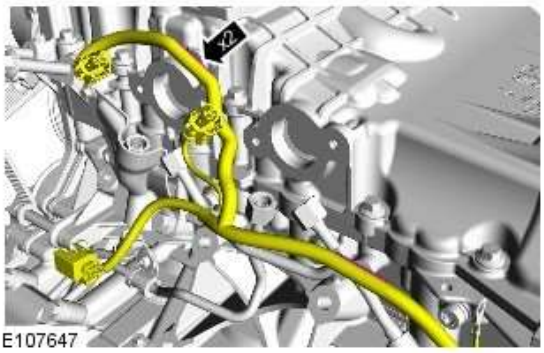
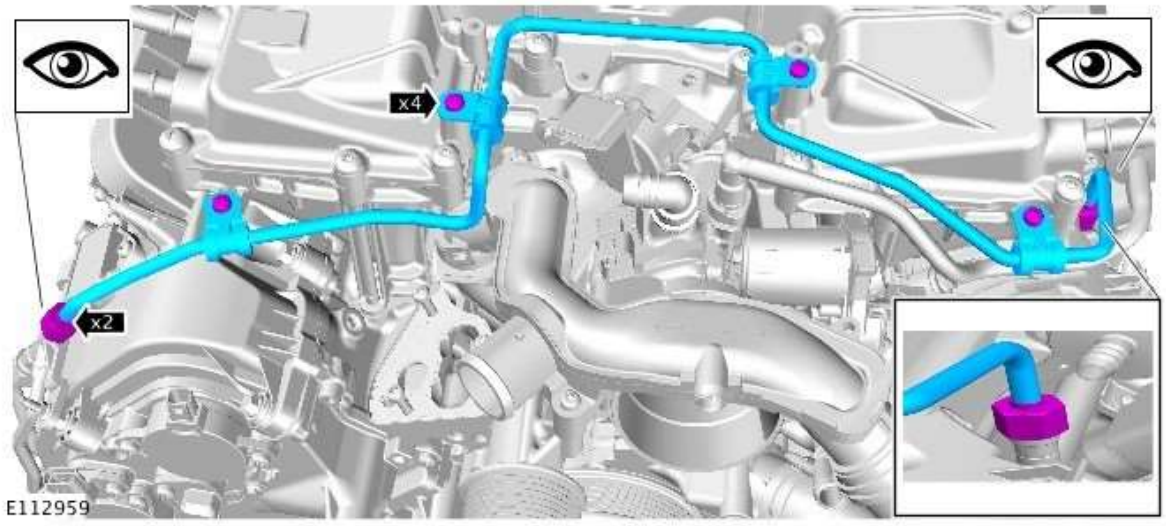




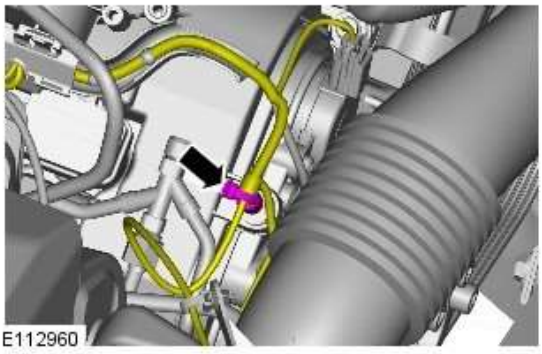
15. NOTE: The high-pressure fuel pumps are removed from the illustration for clarity.



16. CAUTIONS:

Be prepared to collect escaping fluids.

Make sure that all openings are sealed. Use new blanking caps.



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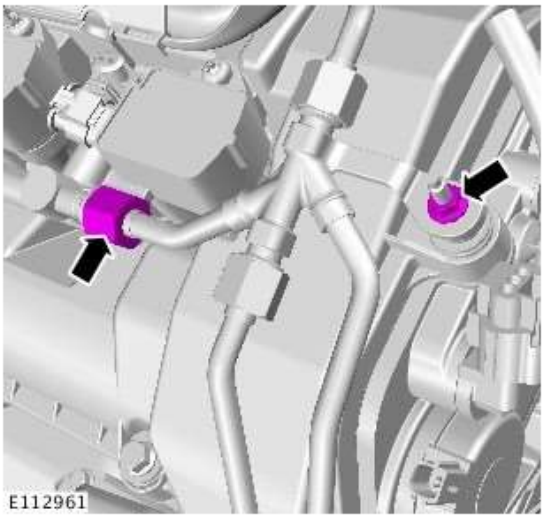
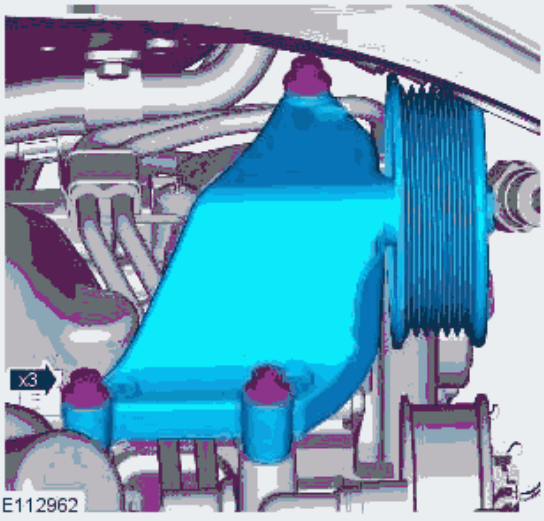


18. CAUTIONS:

Be prepared to collect escaping fluids.

Make sure that all openings are sealed. Use new blanking caps.



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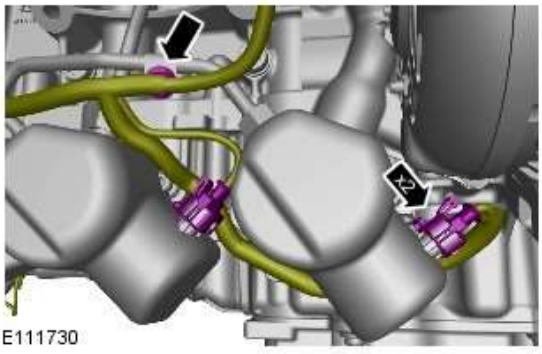

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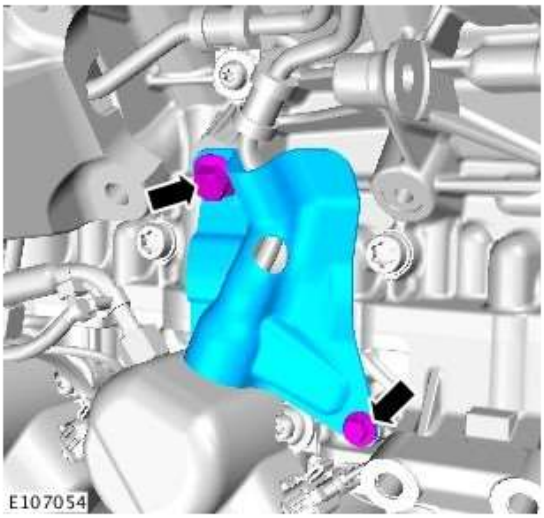

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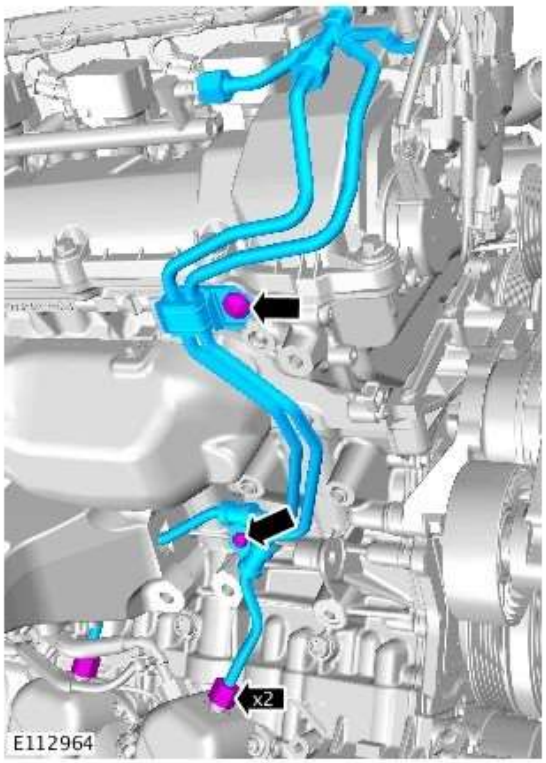
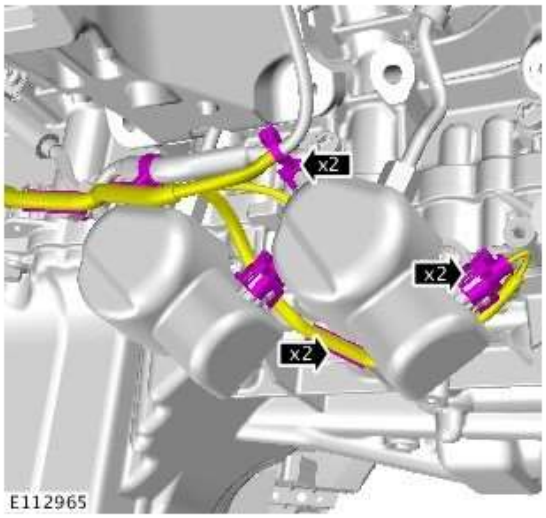


22. CAUTIONS:

Be prepared to collect escaping fluids.

Make sure that all openings are sealed. Use new blanking caps.

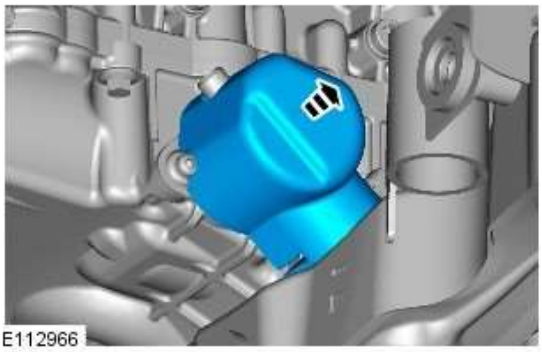
Discard the fuel pipes.



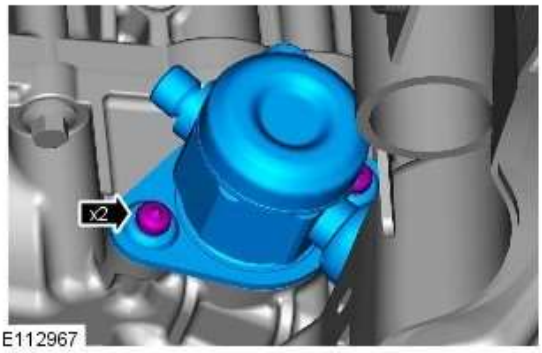
23. CAUTIONS:

Be prepared to collect escaping fluids.

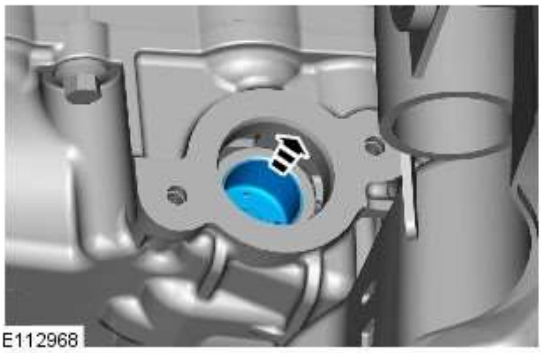
Make sure that all openings are sealed. Use new blanking caps.



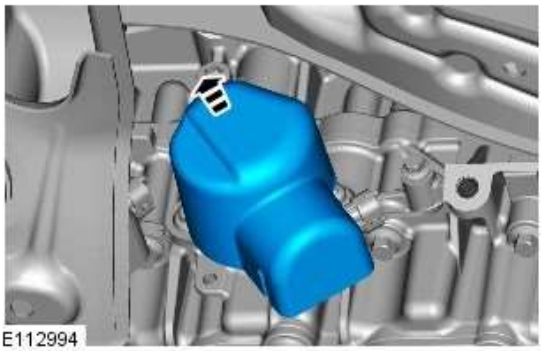
24.



25. CAUTION: Be prepared to collect escaping fluids.



26. CAUTION: Be prepared to collect escaping fluids.



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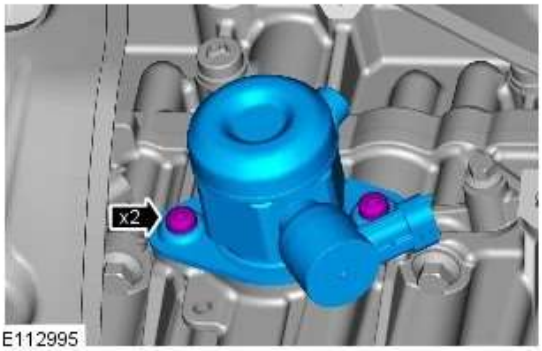
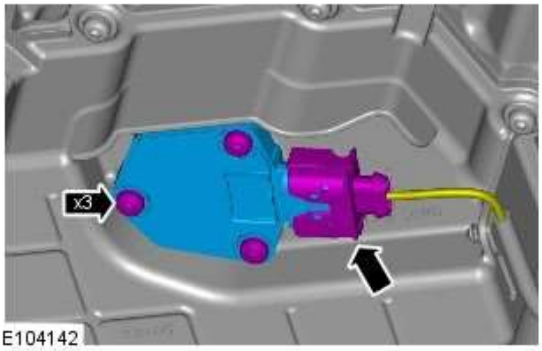


28. CAUTION: Be prepared to collect escaping fluids.

29. CAUTION: Be prepared to collect escaping fluids.

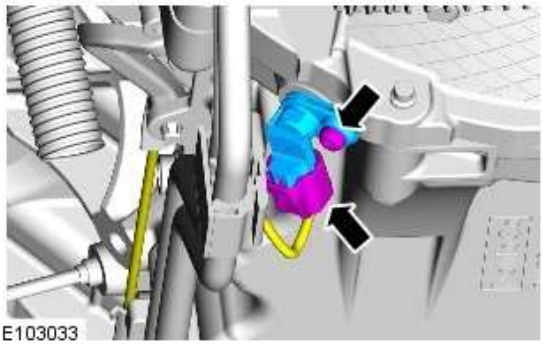


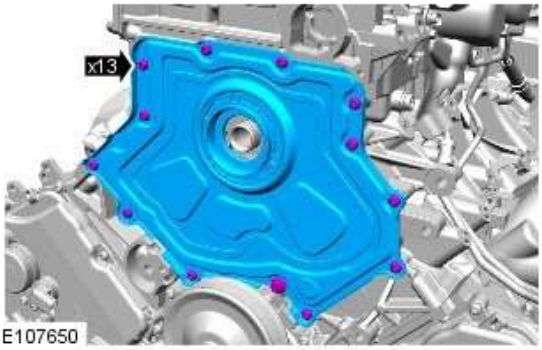
30. CAUTION: Be prepared to collect escaping fluids.

31.

32.

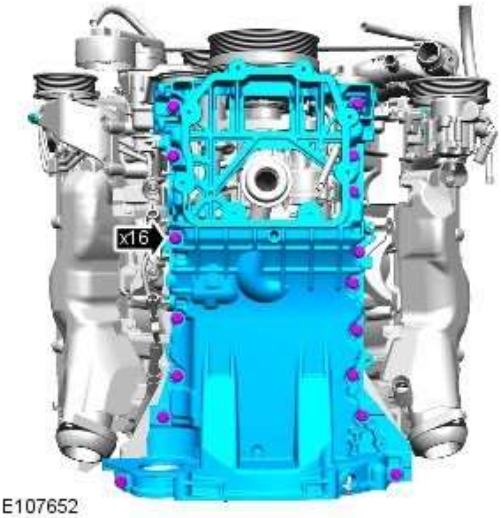
33. NOTE: Clean the components general area prior to dismantling.





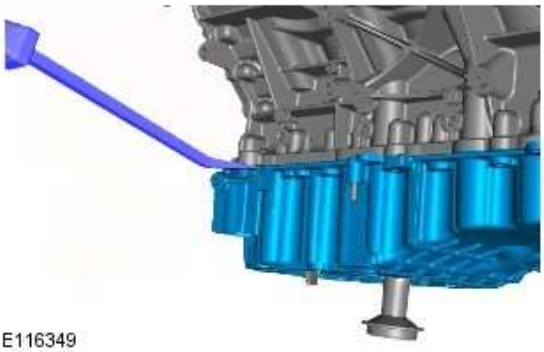
E107650

34. NOTE: Discard component.

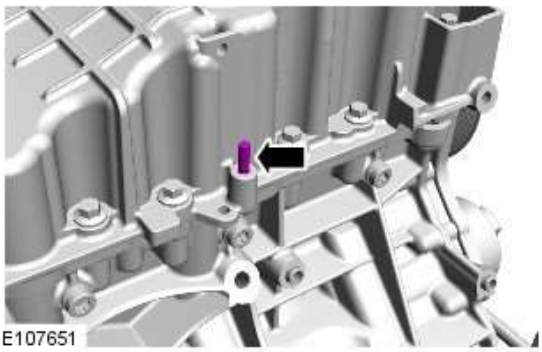


E107652

35.

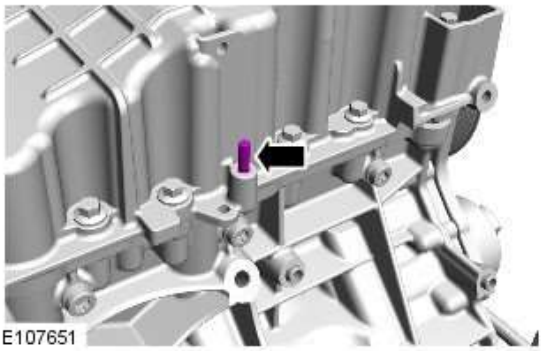

E116349

36. NOTE: Make sure to use the aluminium lug provided on the oil pan extension to lever against.

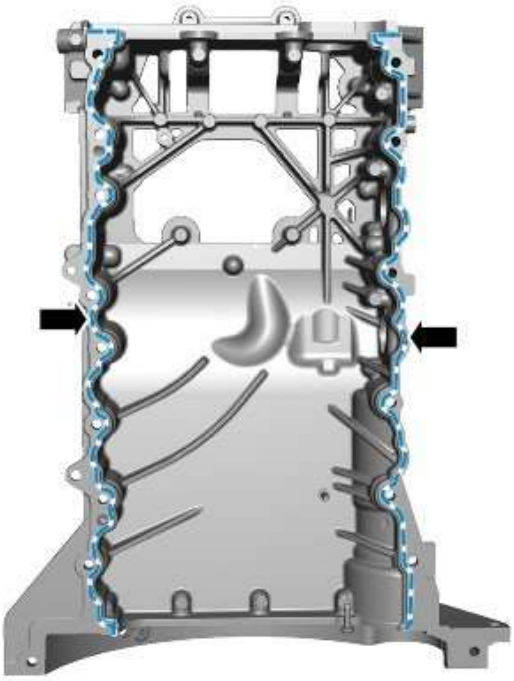

E107651

37. NOTE: Do not disassemble further if the component is removed for access only.

Installation


E107651

1. *Torque:* 8 Nm

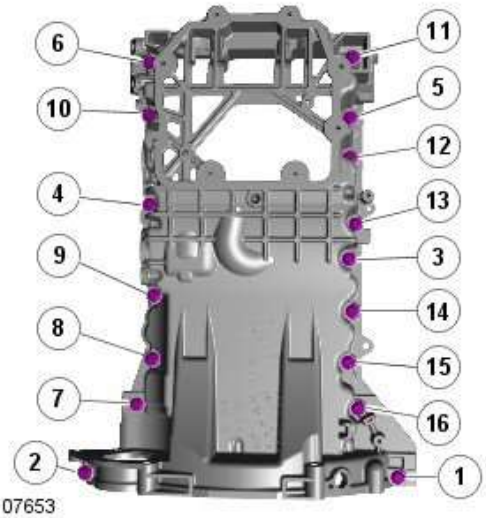

E107654

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.

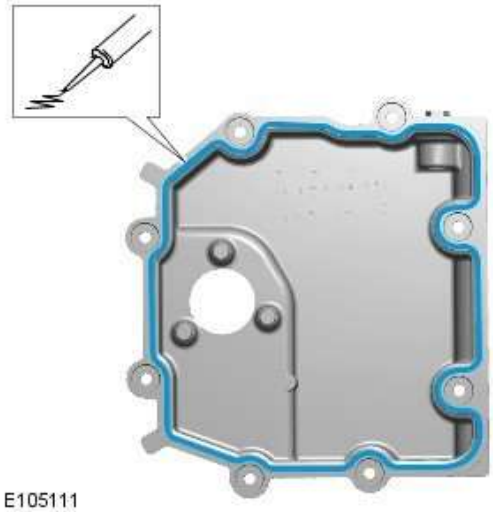
   - Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.



E107653

3. NOTE: Tighten the bolts in the indicated sequence.

   Torque: 25 Nm

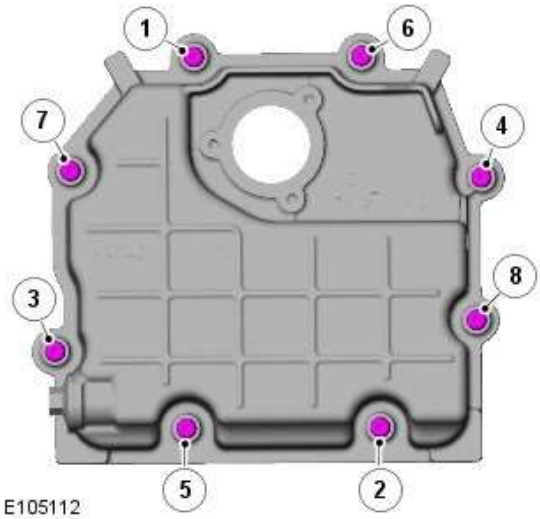

E105111

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.

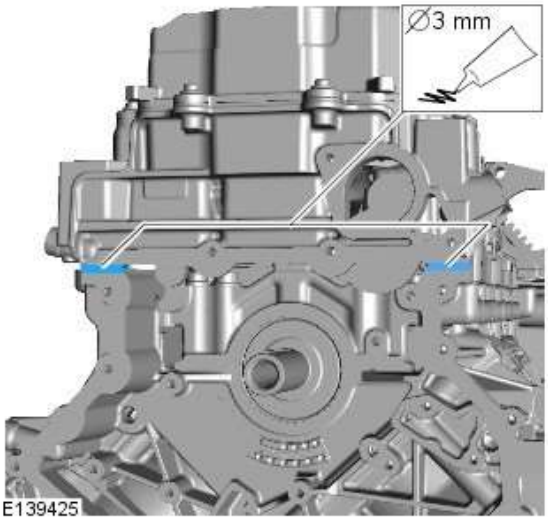
   - Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.



E105112

5. NOTE: Tighten the bolts in the indicated sequence.

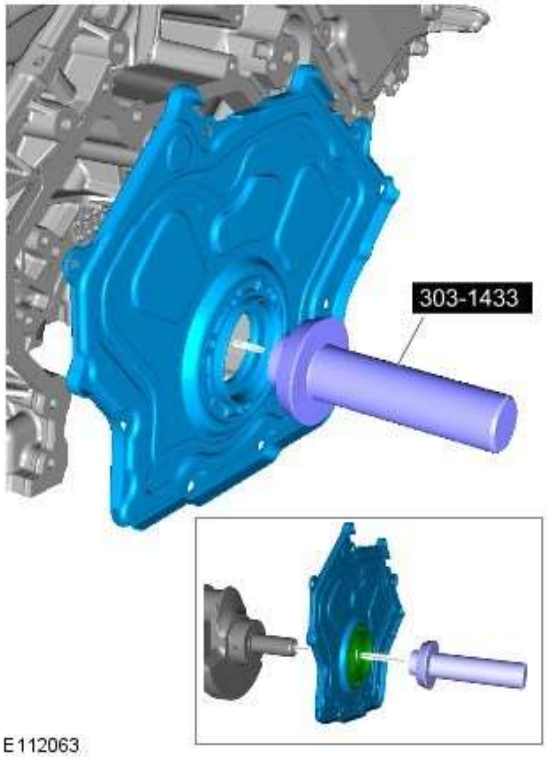
   Torque: 12 Nm



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.



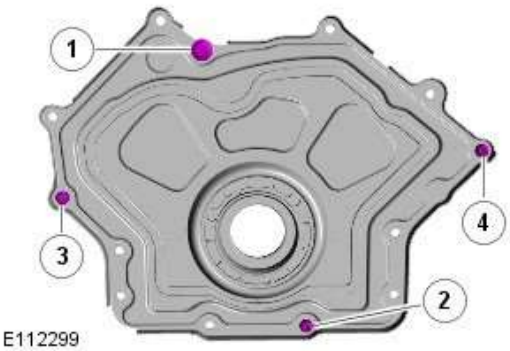
E112063

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

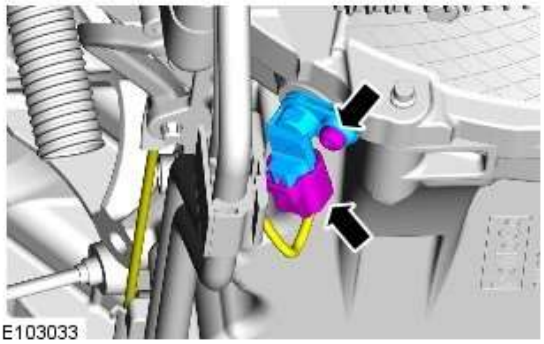
8. NOTE: Tighten the bolts in the indicated sequence.

Torque:
M6 12 Nm
M8 20 Nm

9. Remove the special tool.

10. *Torque:* 12 Nm

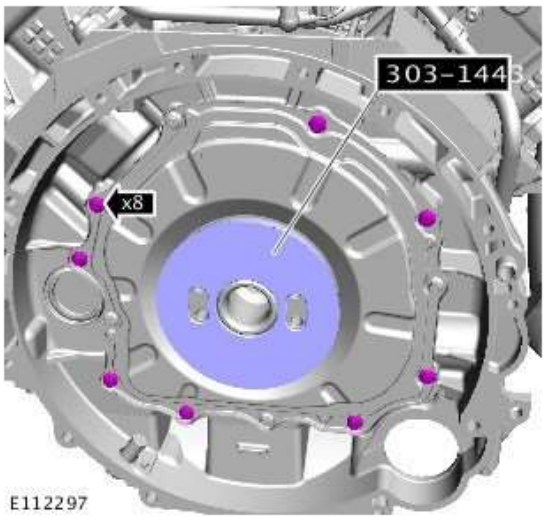
E112300



11. *Torque:* 10 Nm

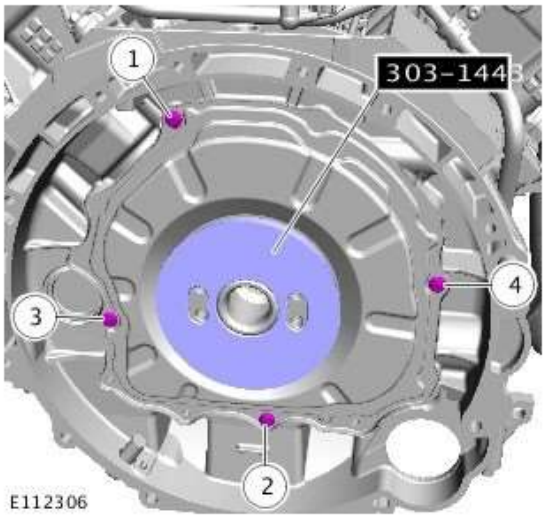
12. *Special Tool(s):* 303-1442, 303-1443

13. Remove the special tools.

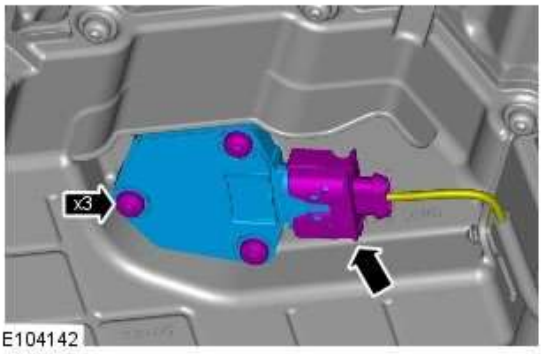


14. NOTE: Tighten the bolts in the indicated sequence.

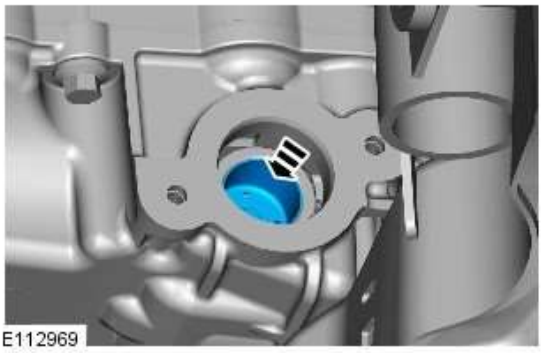
Torque: 11 Nm



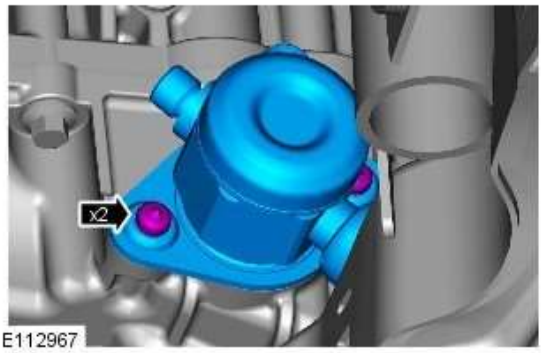
15. *Torque:* 11 Nm



16.
- *Torque:* 11 Nm



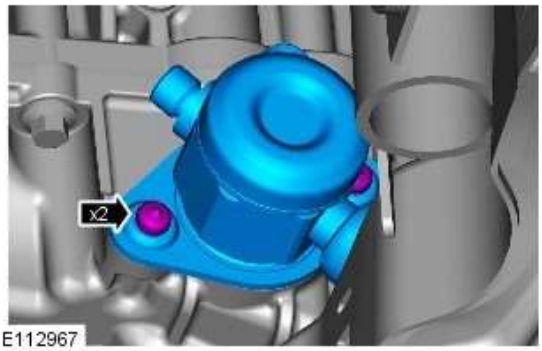
17. NOTE: Lubricate the fuel rail high-pressure fuel pump bucket with clean engine oil.



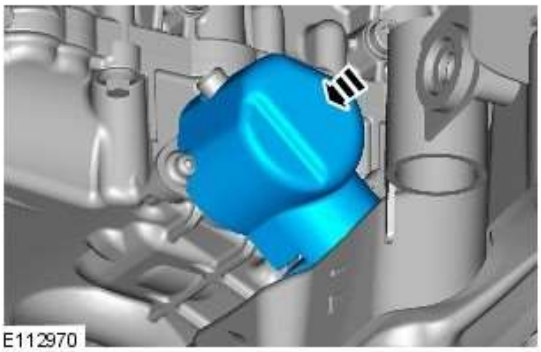
18. CAUTION: Tighten the Torx screws a turn at a time until the correct torque is achieved.

NOTE: Lubricate the fuel rail high-pressure fuel pump O-ring seal with clean engine oil.

- *Torque:* 11 Nm

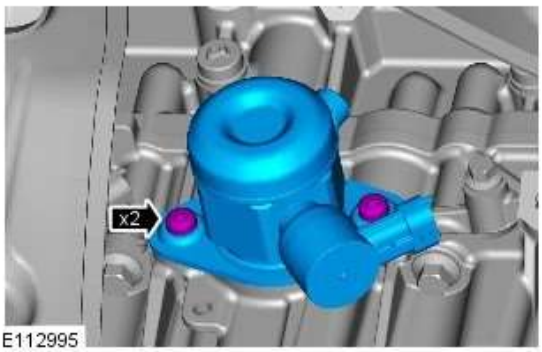


19. Loosen the Torx screws half a turn each.



20.

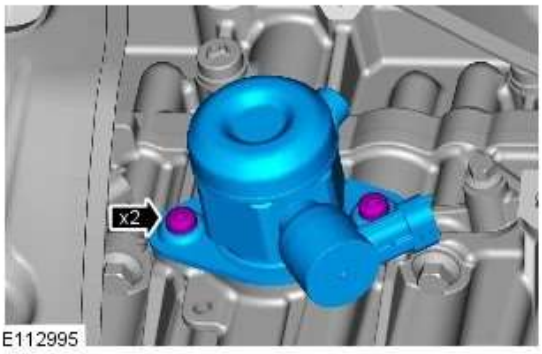
21. NOTE: Lubricate the fuel rail high-pressure fuel pump bucket with clean engine oil.



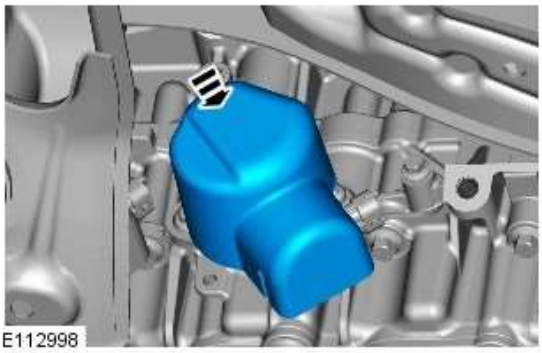
22. CAUTION: Tighten the Torx screws a turn at a time until the correct torque is achieved.

NOTE: Lubricate the fuel rail high-pressure fuel pump O-ring seal with clean engine oil.

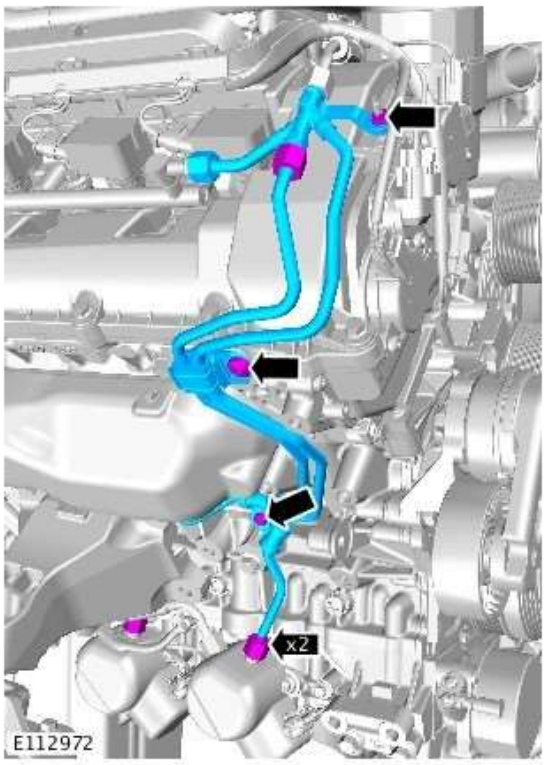
- *Torque:* 11 Nm



23. Loosen the Torx screws half a turn each.



24.



25. CAUTIONS:

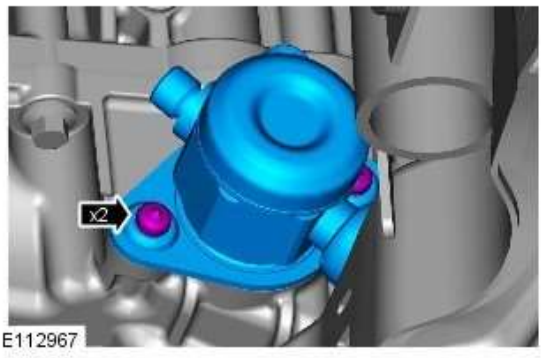
Install new high-pressure fuel supply lines.

Lubricate only the union threads with clean engine oil.

NOTES:

Remove and discard the blanking caps.

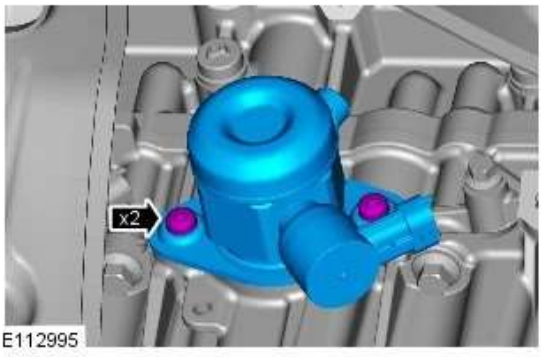
Install the bolt and unions fully finger tight before final tightening.



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.

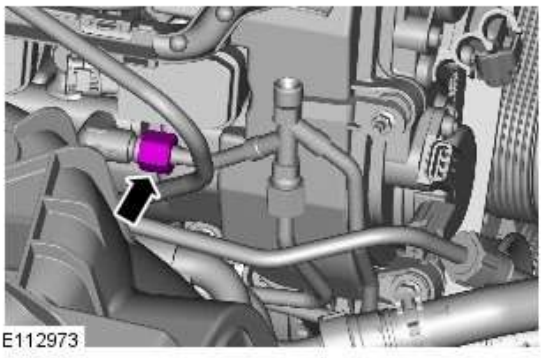
- *Torque:* 11 Nm



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.

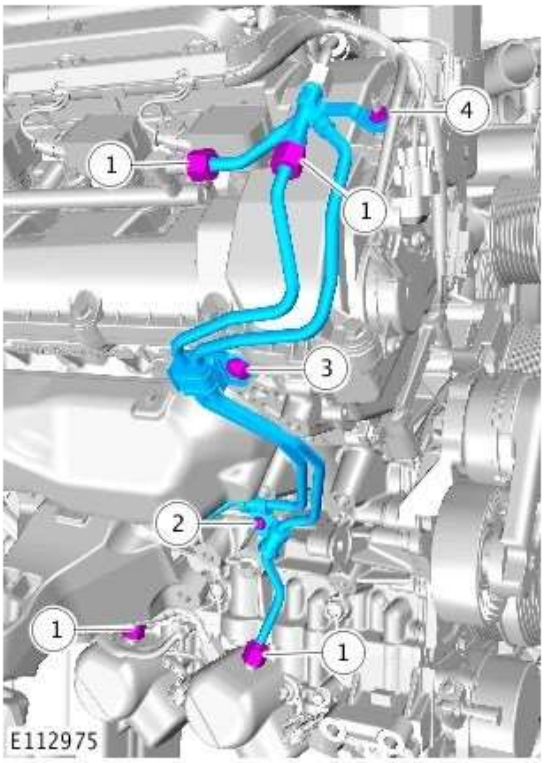
- *Torque:* 11 Nm



28. NOTES:

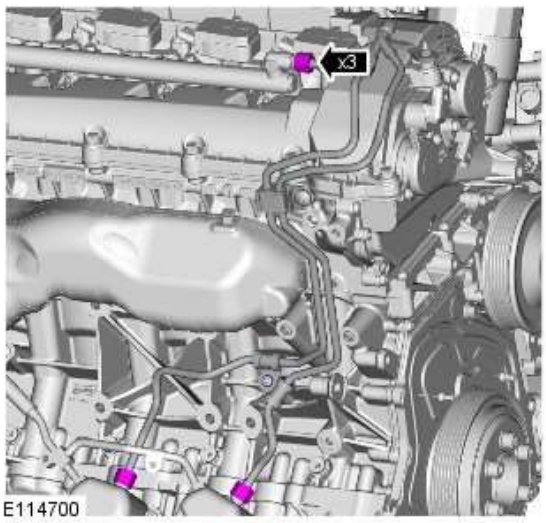
Do not tighten at this stage.

Remove and discard the blanking caps.



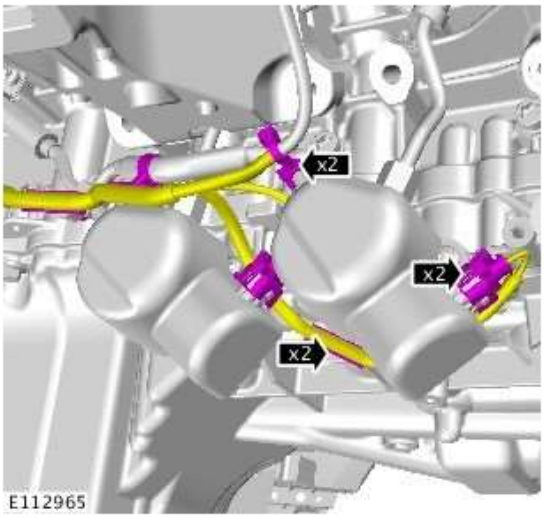
29.

- *Torque:*
  Unions (1) 21 Nm
  M6 (2) 11 Nm
  M8 (3) 25 Nm
  M5 nut (4) 6 Nm



30.

- *Torque:*
  Unions 21 Nm

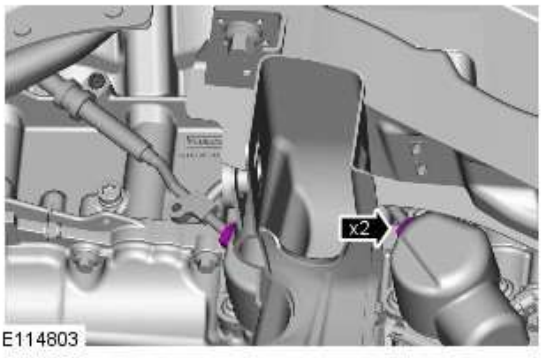


31. NOTES:

Install the bolt and unions finger tight before final tightening.

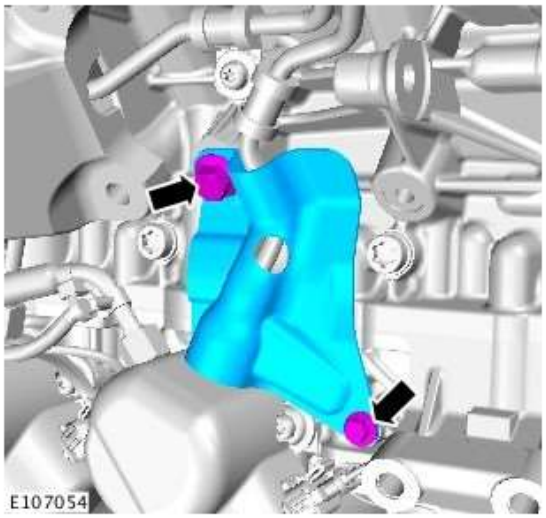
Remove and discard the blanking caps.

- *Torque:*
  Unions 21 Nm
  M6 11 Nm

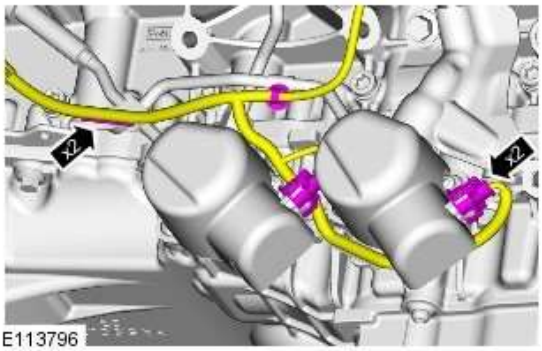


32.

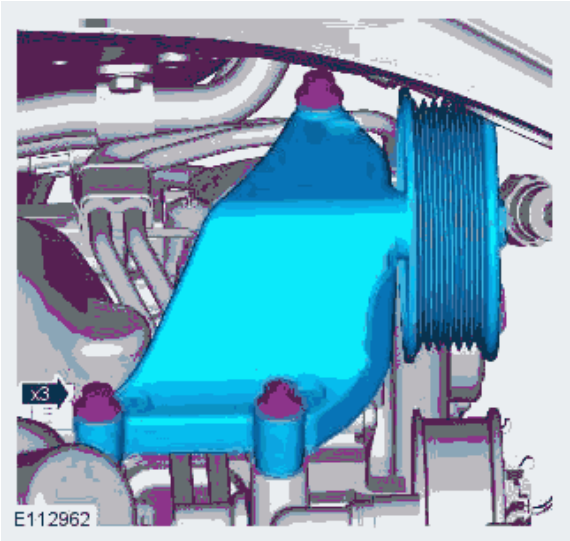
- *Torque:*
  Unions 21 Nm



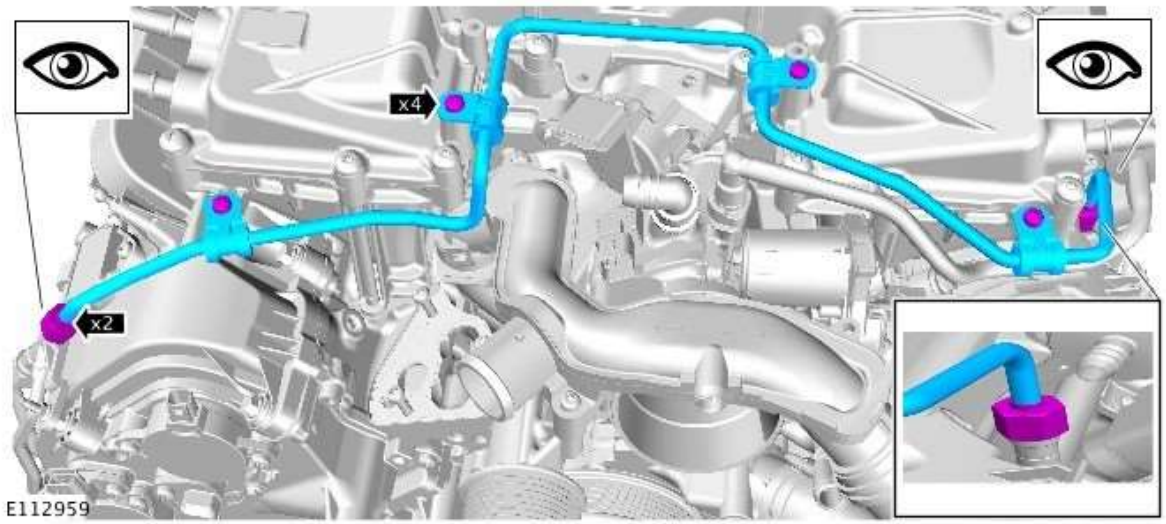
33. *Torque:*
M10 29 Nm
M6 11 Nm



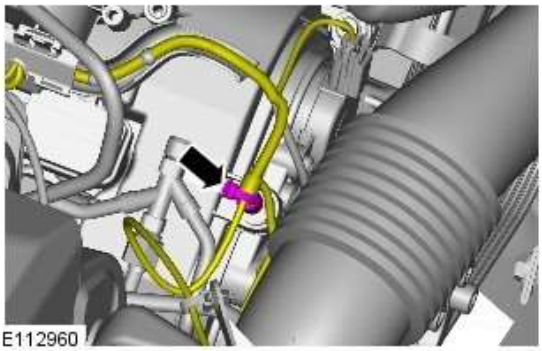
34.



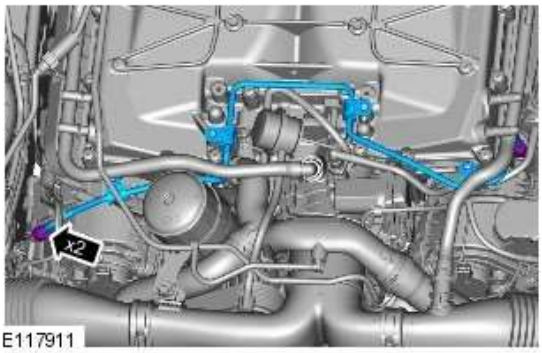
35. *Torque:* 25 Nm



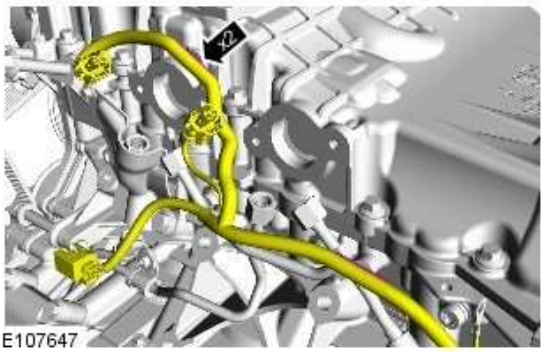
36. *Torque:*
Unions 21 Nm
M6 11 Nm



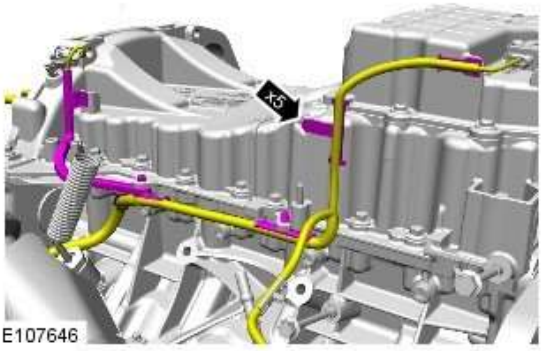
37.



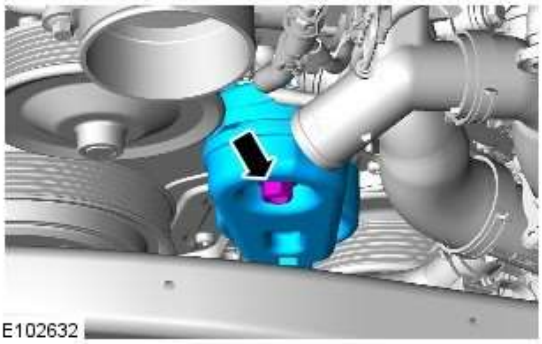
38. *Torque:*
Unions 21 Nm



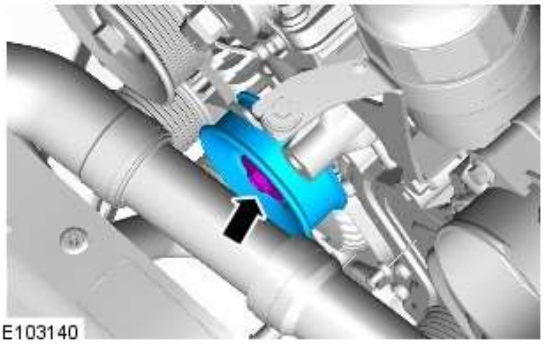
39. NOTE: The high-pressure fuel pumps are removed from the illustration for clarity.



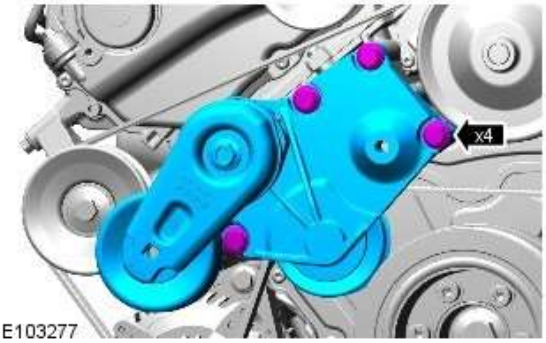
40.



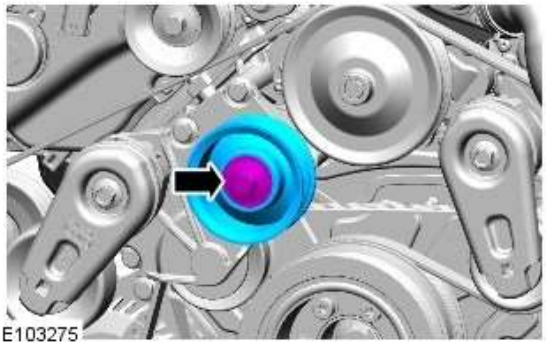
41. *Torque:* 40 Nm



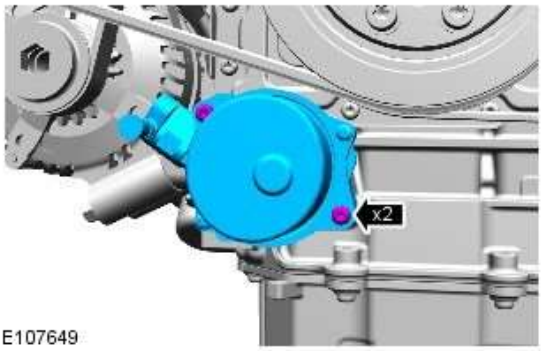
42. *Torque:* 25 Nm



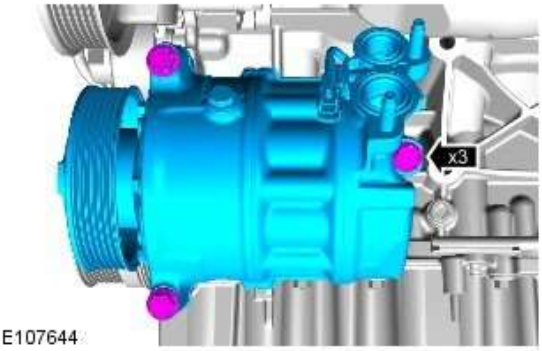
43. *Torque:* 25 Nm



44. *Torque:* 55 Nm

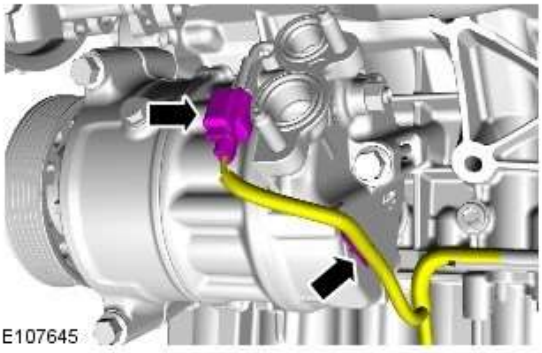


45. *Torque:* 12 Nm

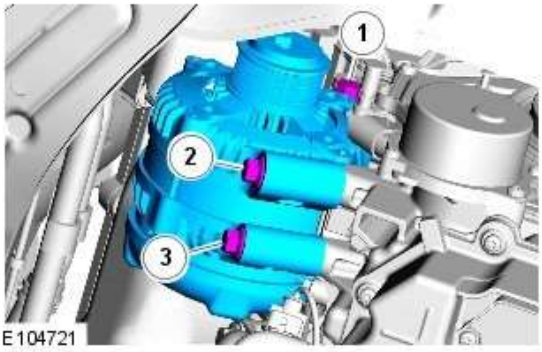


46. CAUTION: Install all the bolts finger tight before final tightening.

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).

Published: 07-Oct-2011

Engine - V8 S/C 5.0L Petrol - Oil Pump

Removal and Installation

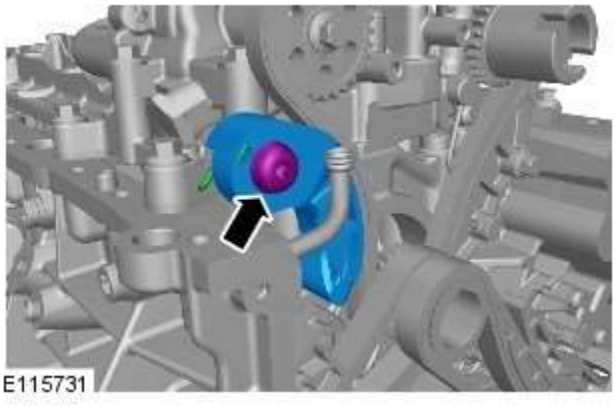
Removal

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

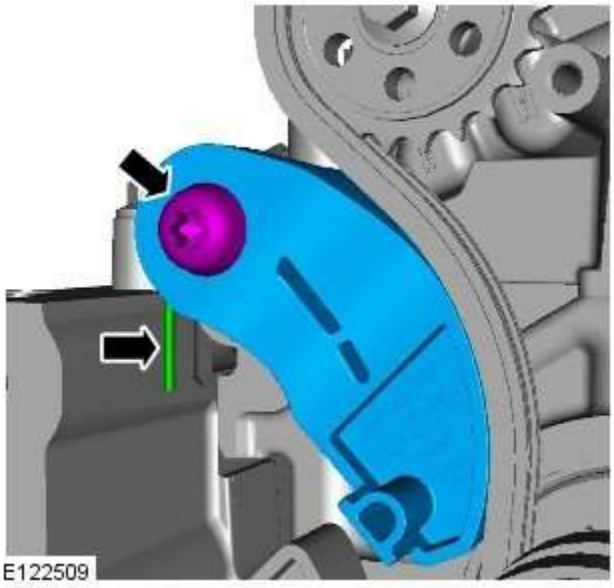
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Oil Pan Extension (303-01C Engine - V8 5.0L Petrol, Removal and Installation).

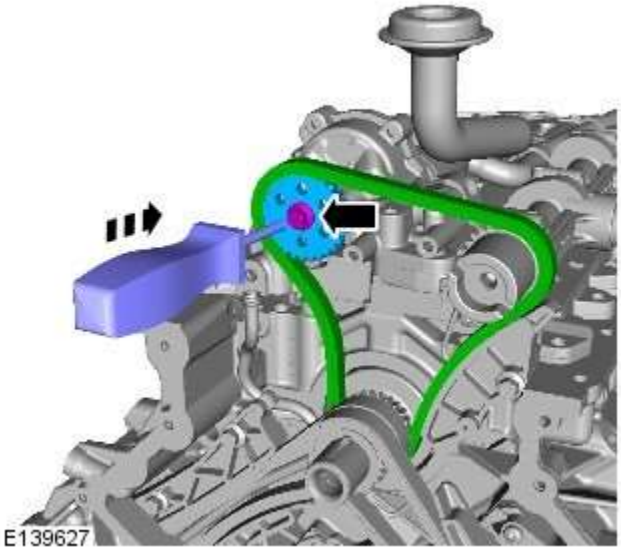


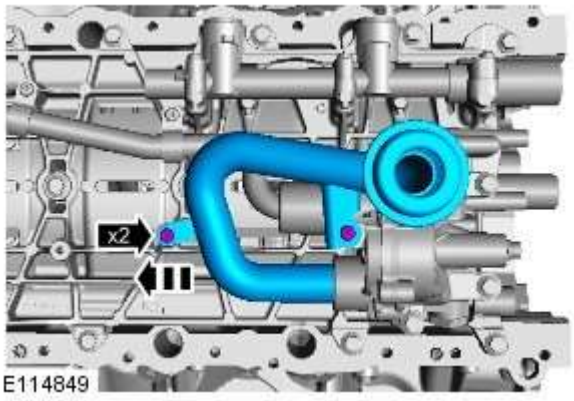
4. NOTE: Tsubaki timing drive only.



5. NOTE: INA timing drive only.

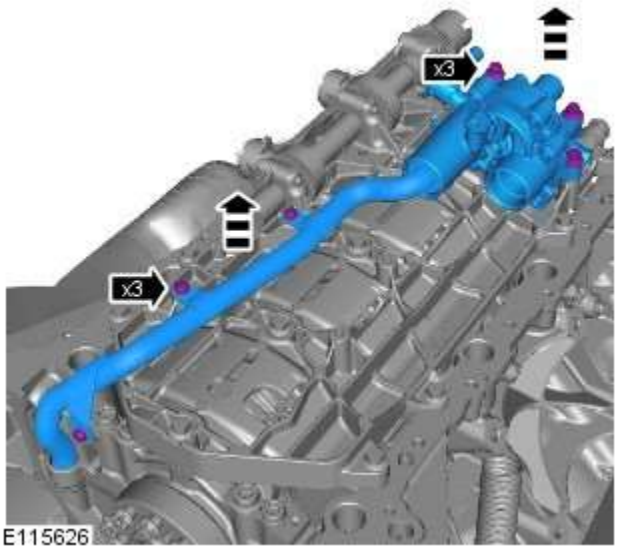
6.

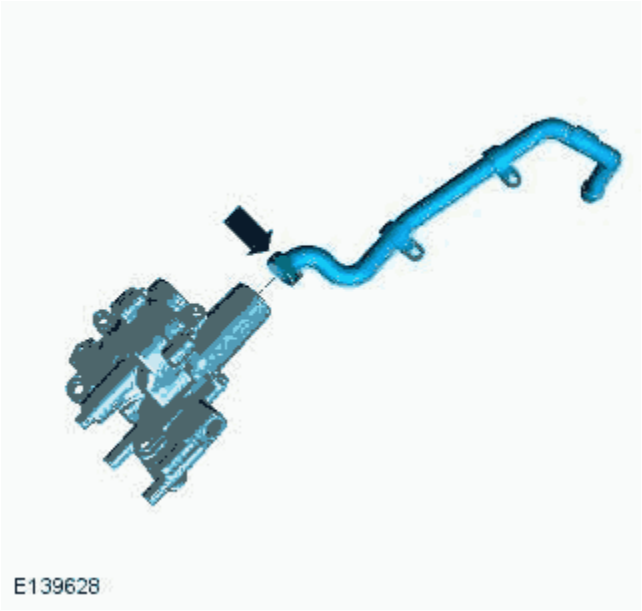




7. CAUTION: Remove and discard the O-ring seal.

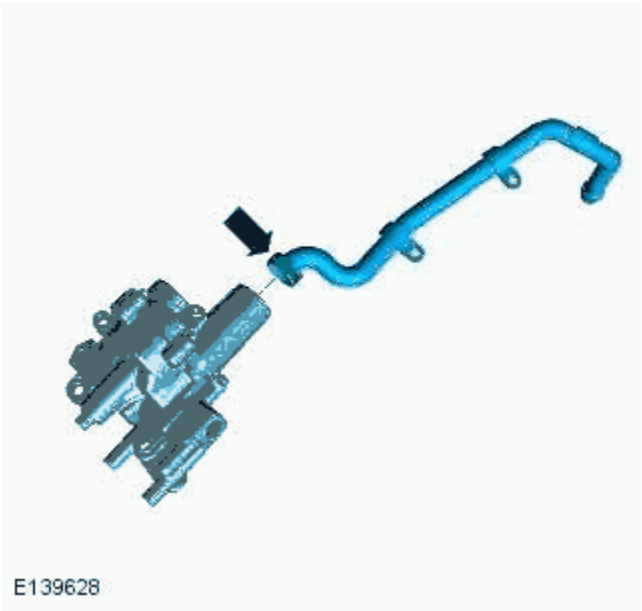
8. CAUTION: Remove and discard the O-ring seals.



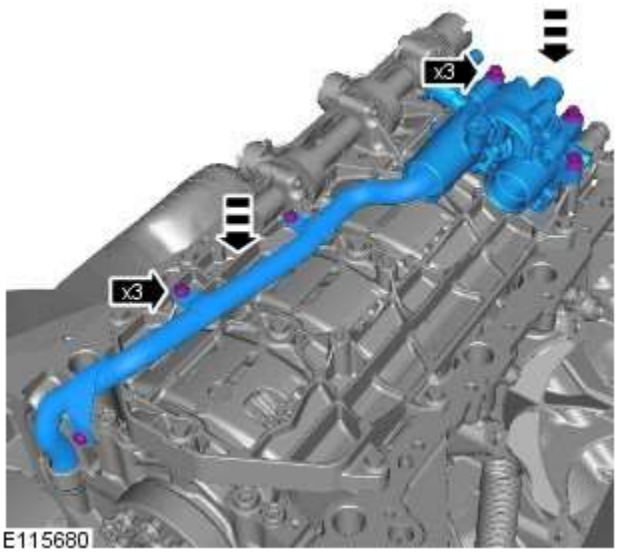


9. CAUTION: Remove and discard the O-ring seal.

Installation

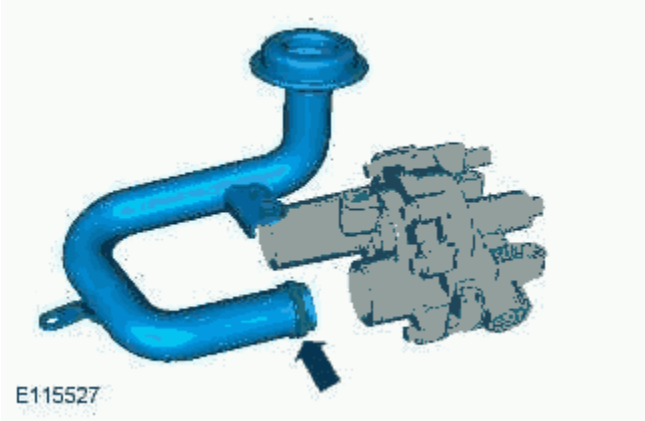


1. NOTE: Lubricate and install the new O-ring seals.

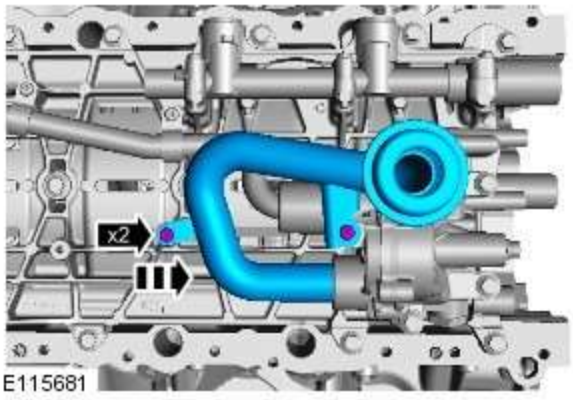


2. NOTE: Lubricate and install the new O-ring seals.

   Torque:
   M8 25 Nm
   M6 12 Nm

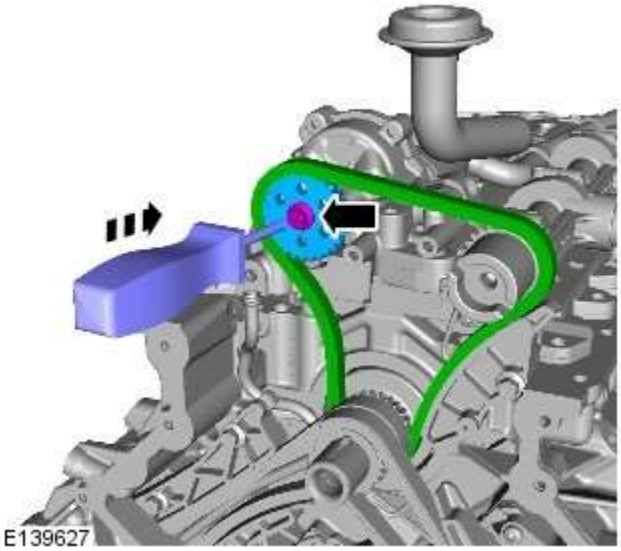


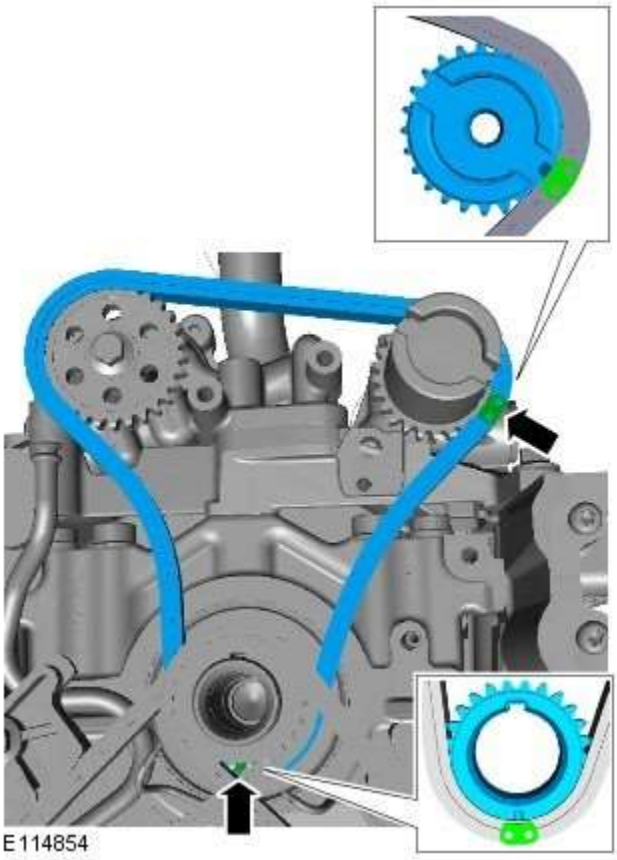
3. NOTE: Lubricate and install the new O-ring seals.



4. *Torque:* 12 Nm

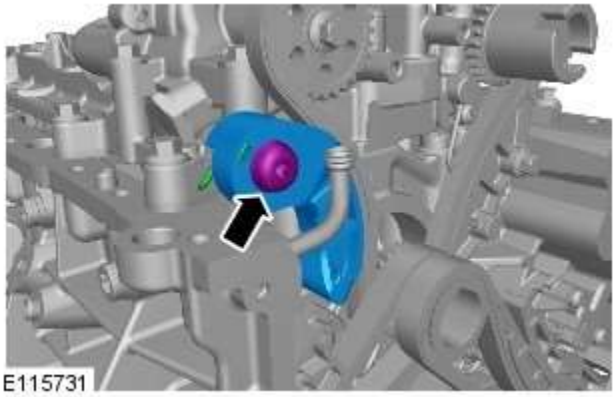
5. *Torque:* 21 Nm





6. NOTE: Tsubaki timing drive only.

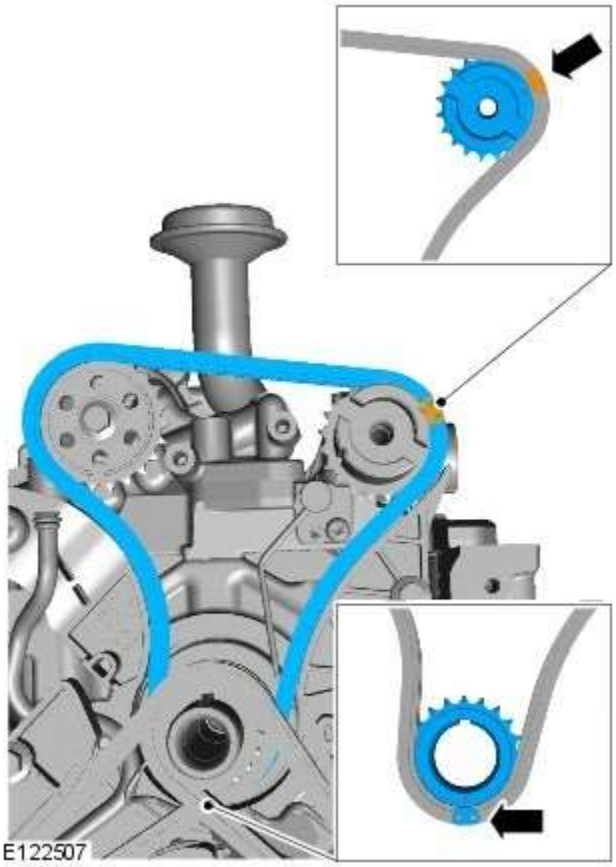
   Install the lower timing chain making sure the coloured chain links align correctly with the fuel rail high-pressure fuel pumps camshaft and crankshaft sprocket markings.



7. CAUTION: Make sure that the tensioner spring is correctly located.

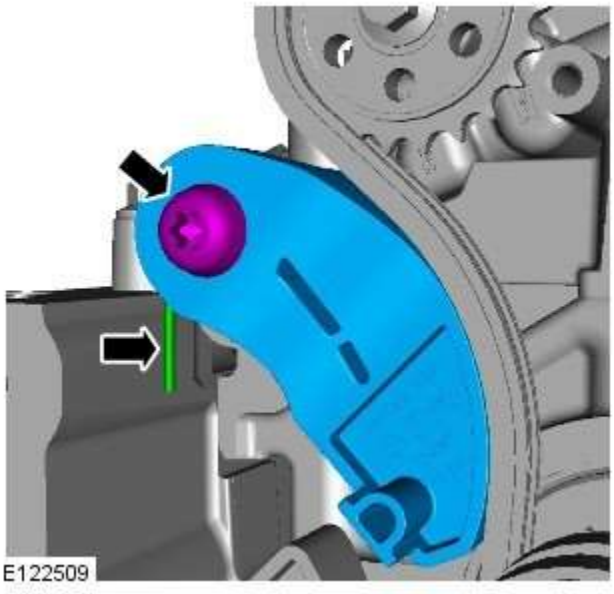
   NOTE: Tsubaki timing drive only.

   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).

Published: 12-Sep-2011

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).

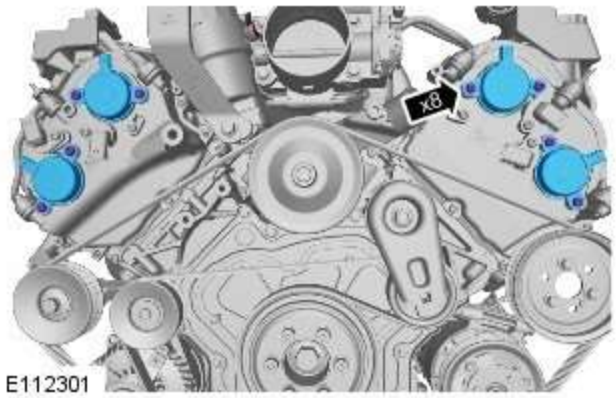
4. Refer to: Accessory Drive Belt Tensioner (303-05D Accessory Drive - V8 S/C 5.0L Petrol, Removal and Installation).

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).

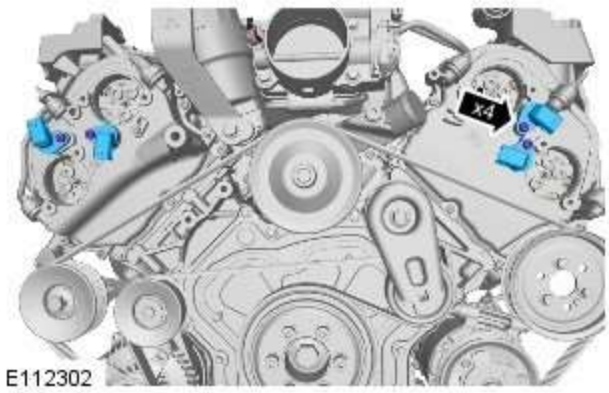
6. Refer to: Valve Cover LH (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

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.

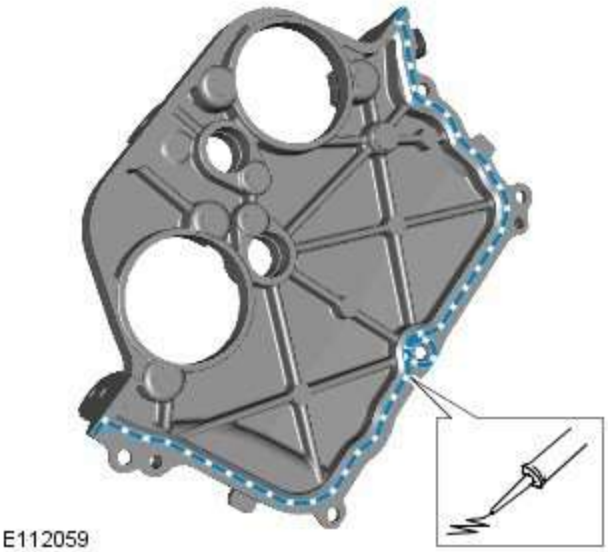


10. NOTE: Engine shown removed for clarity.

11. NOTE: Engine shown removed for clarity.

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.

E112061

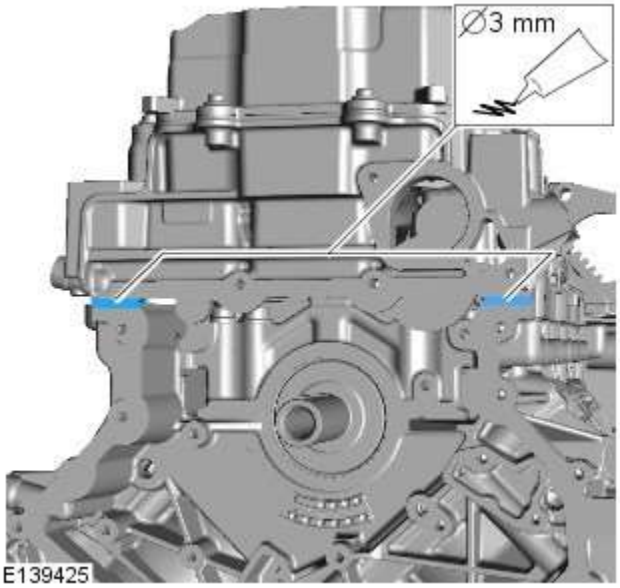
3. NOTE: Tighten the bolts in the indicated sequence.

Torque: 12 Nm

E112062

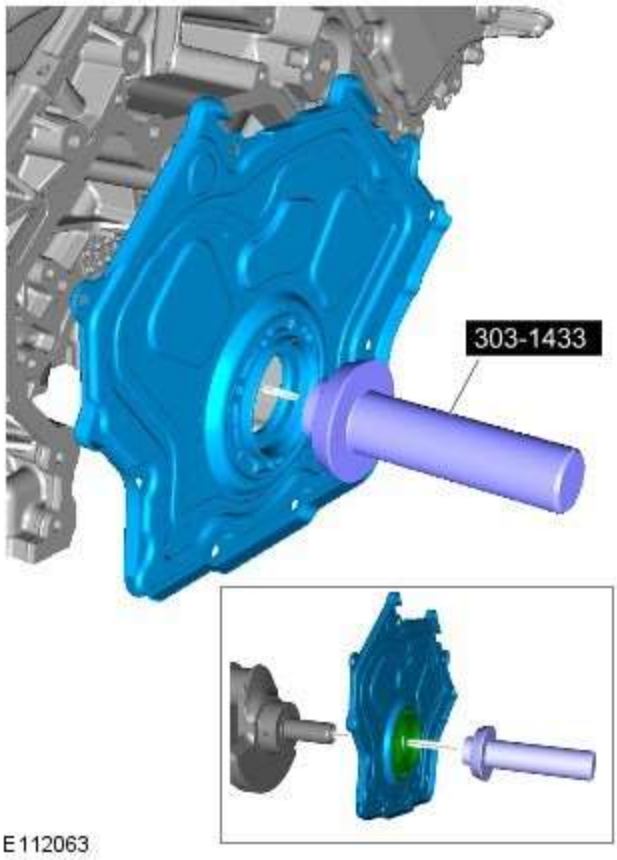
4. NOTE: Tighten the bolts in the indicated sequence.

Torque: 12 Nm



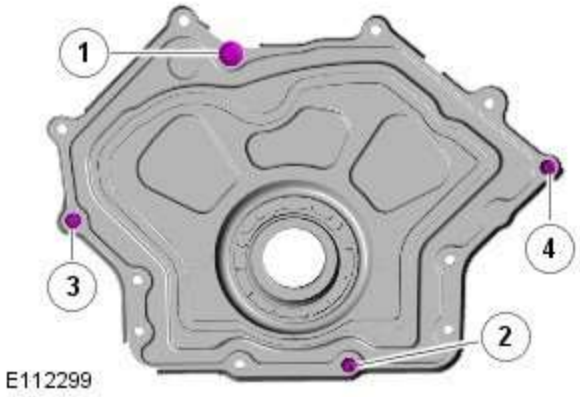
5. CAUTION: Make sure that the mating faces are clean and free of foreign material.

   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.



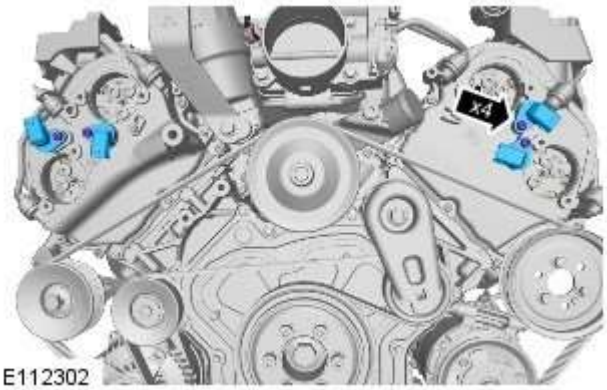
E112299

7. NOTE: Tighten the bolts in the indicated sequence.

   Torque: 12 Nm

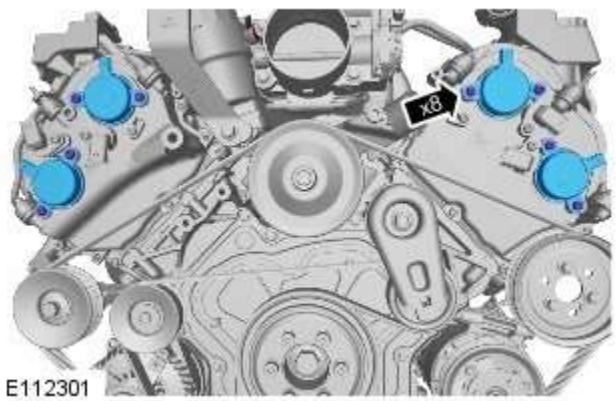
E112300

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).

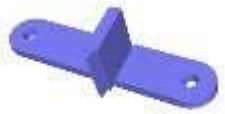
18. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 12-Jun-2014

Engine - V8 S/C 5.0L Petrol - Timing Drive Components

Removal and Installation

Special Tool(s)

 E115263	303-1445 Timing Tool – Camshaft Alignment
 E115265	303-1447 Timing Tool
 E115266	303-1448 Locking Tool
 E115270	303-1452 Camshaft Rotating Tool
 E115271	303-1482 Tensioner Tool

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.

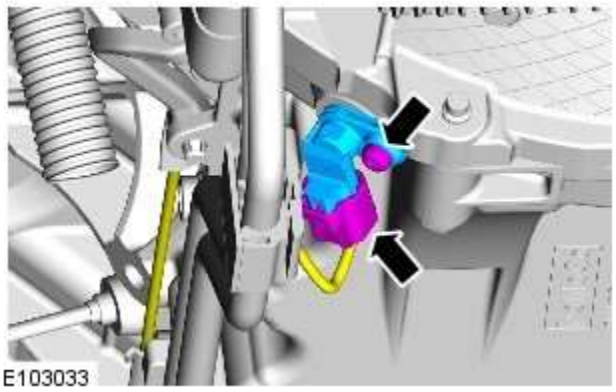
   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

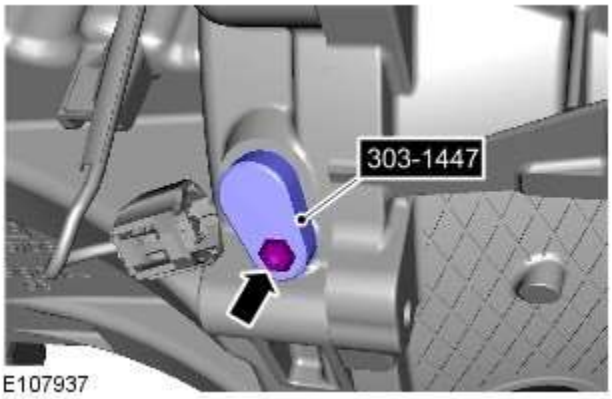
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Timing Cover (303-01C Engine - V8 5.0L Petrol, Removal and Installation).

4.

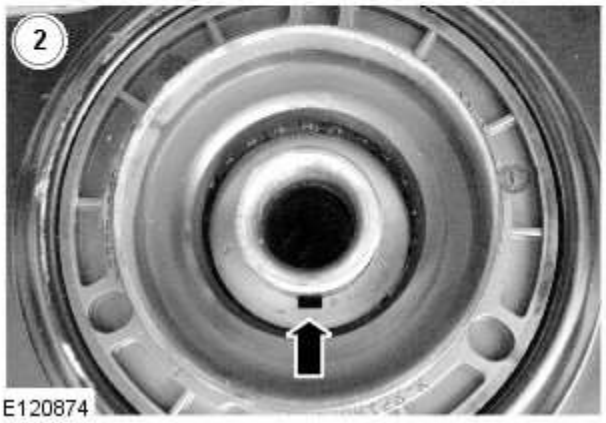




5. CAUTION: Only rotate the crankshaft clockwise.

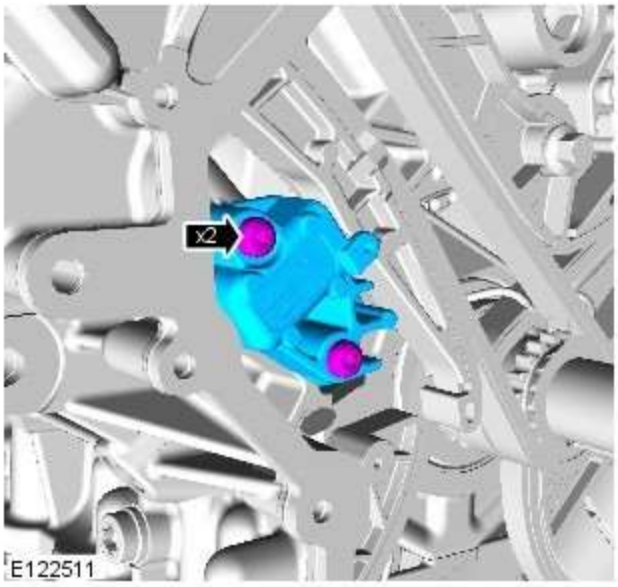
   Install the special tool.

   Special Tool(s): 303-1447



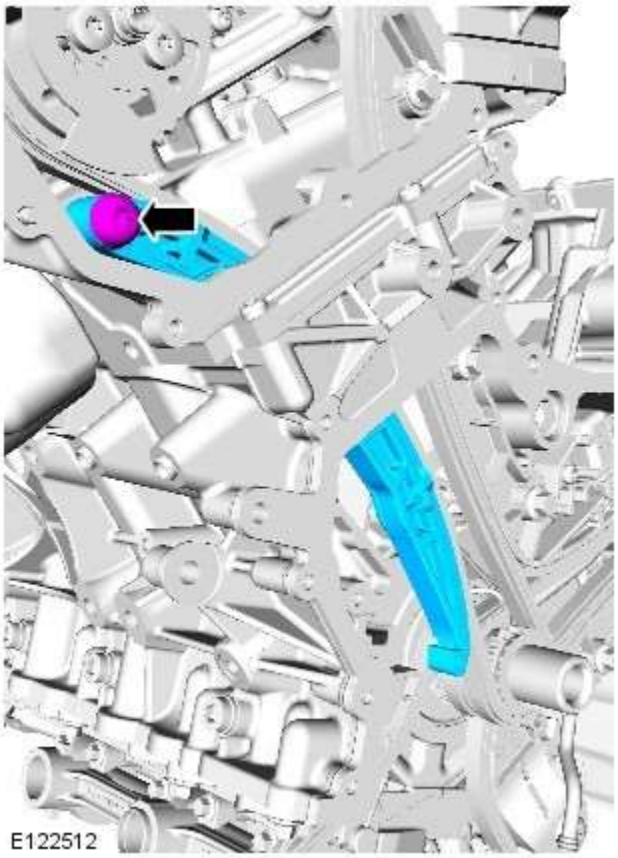
6. CAUTION: If the noted postion of the woodruff key is at the 9 o'clock position, then a new flexplate must be installed. If the woodruff key is in the 6 o'clock position then proceed with the next step.

   Note the position of the crankshaft woodruff key.

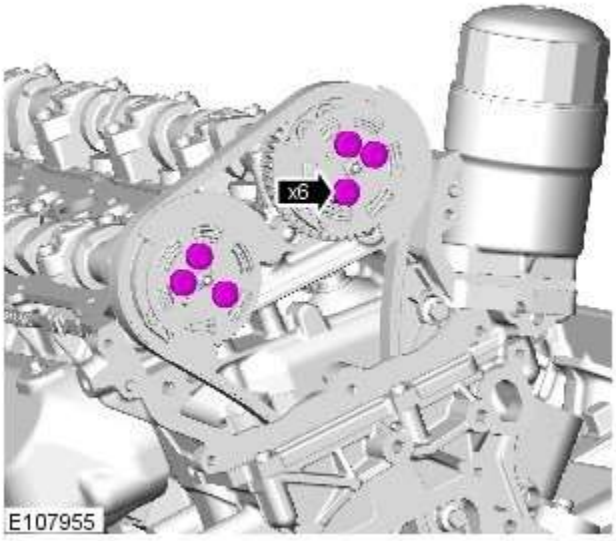


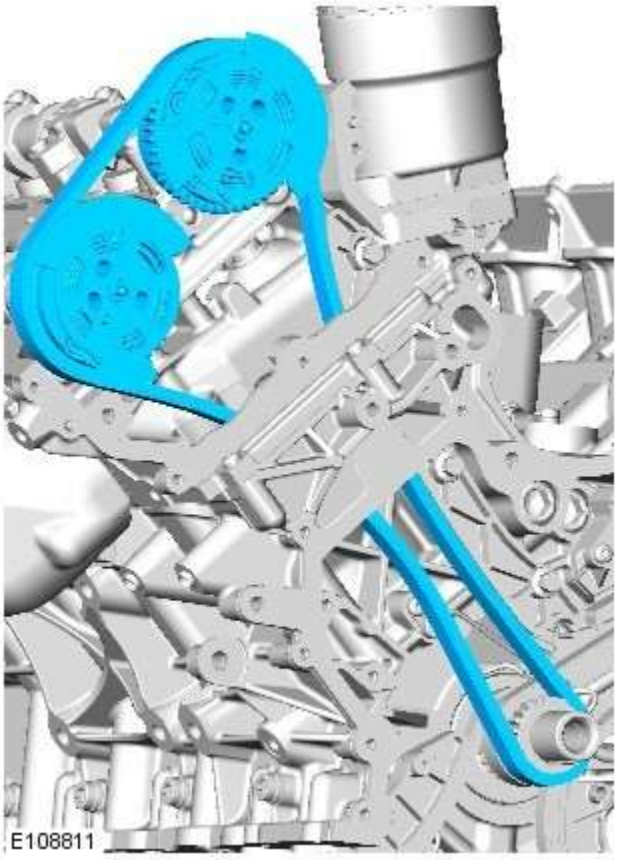
7.

8.



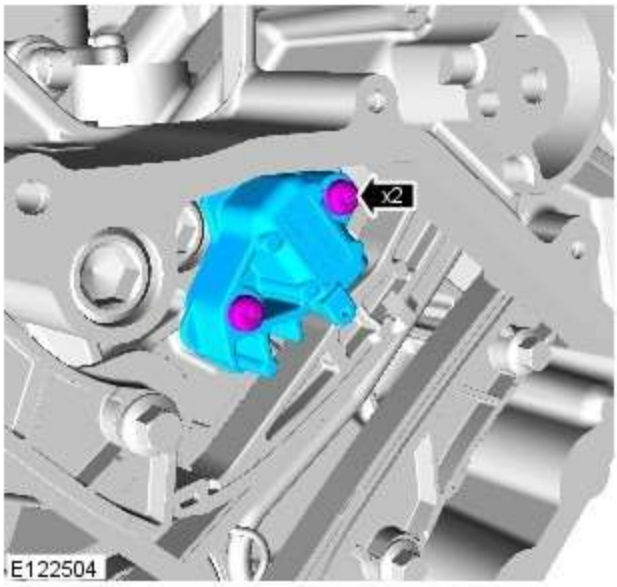
9.





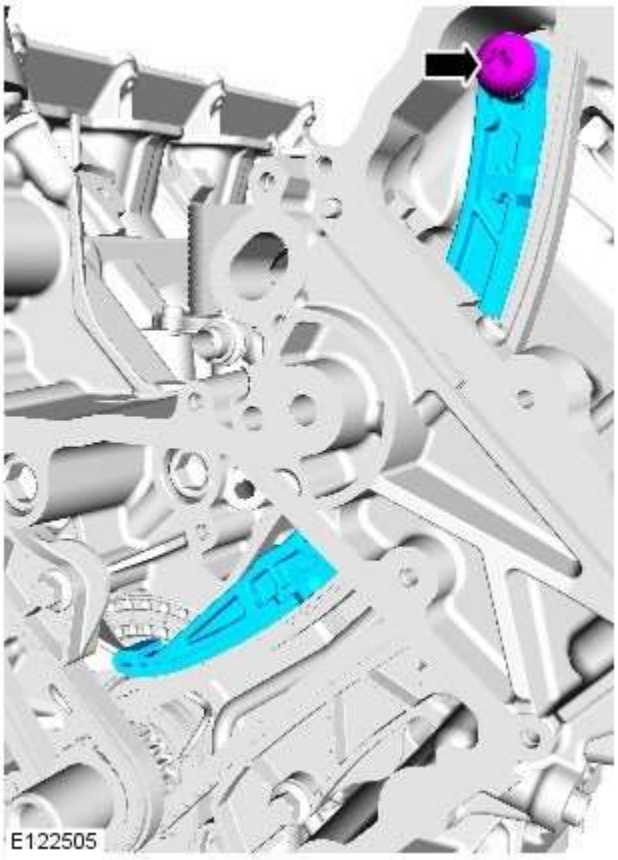
10. CAUTION: If the variable valve timing (VVT) units are knocked or dropped then the VVT must be replaced.

    Remove the timing chain with the VVT units.

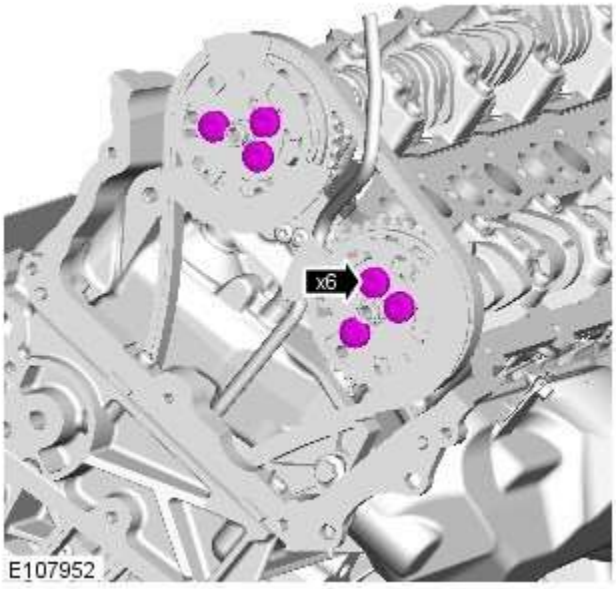


11.

12.

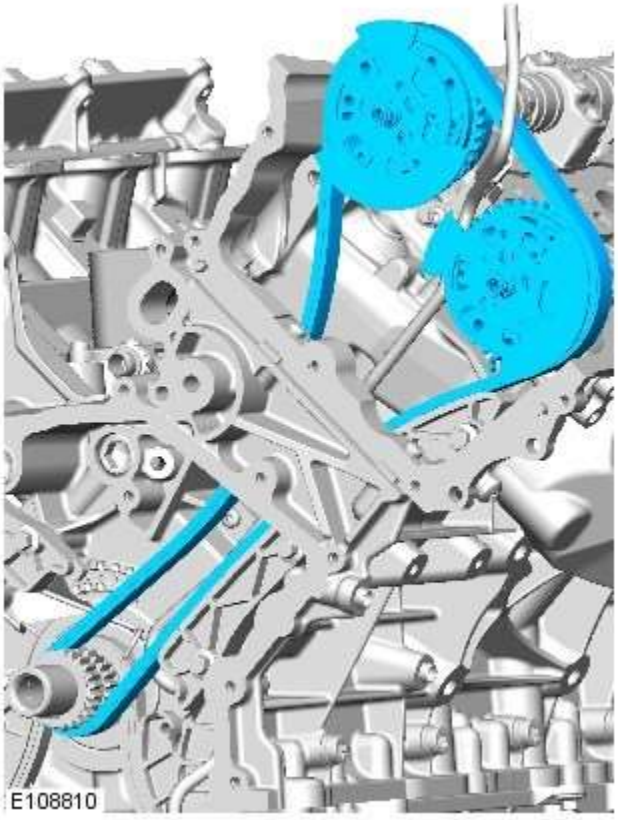


13.

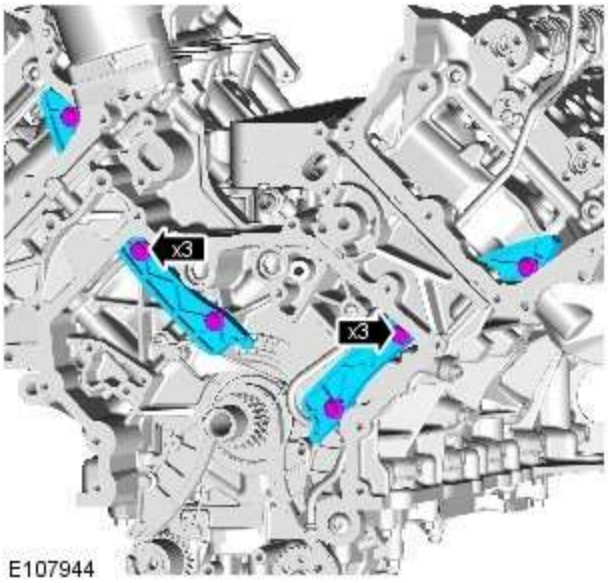


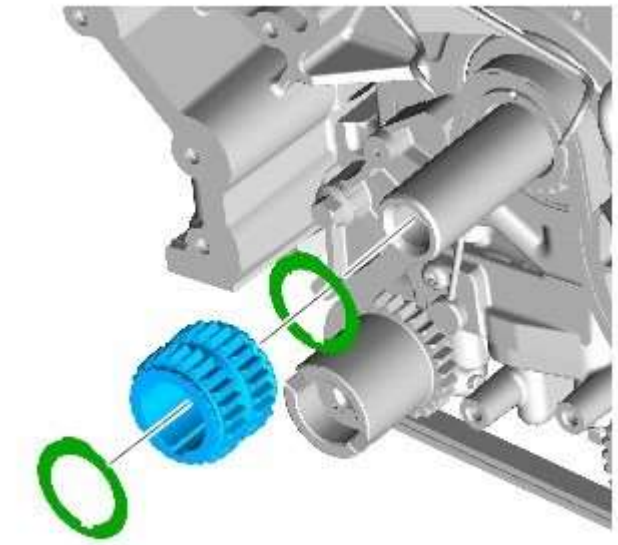
14. CAUTION: If the VVT is knocked or dropped then the VVT must be replaced.

Remove the timing chain with the VVT units.



15.

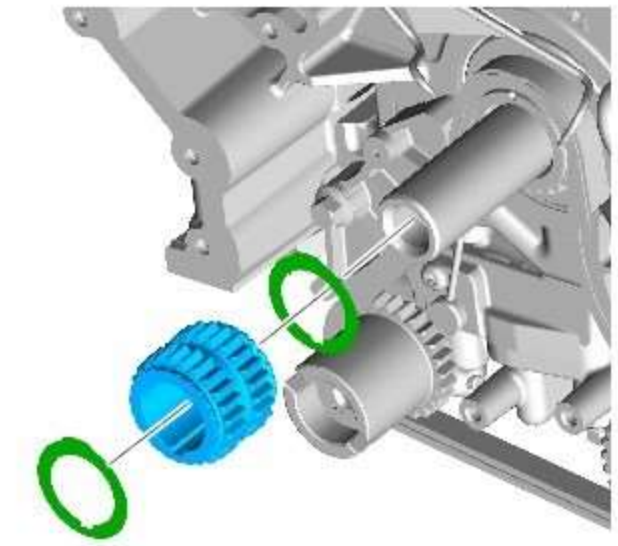




E107945

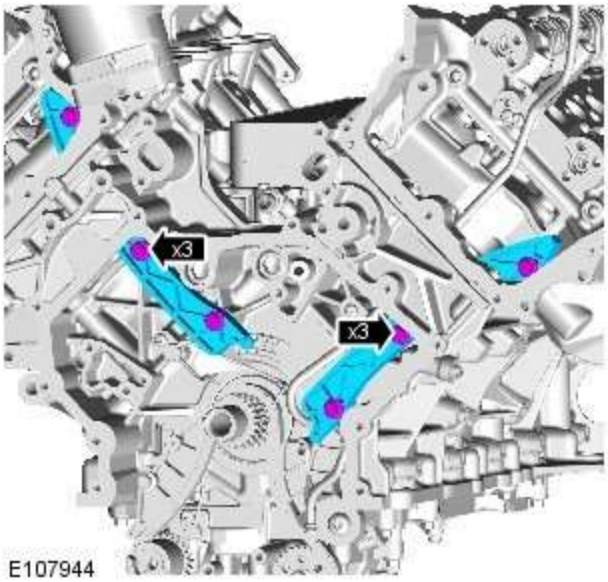
16. CAUTION: Discard the friction washer.

Installation

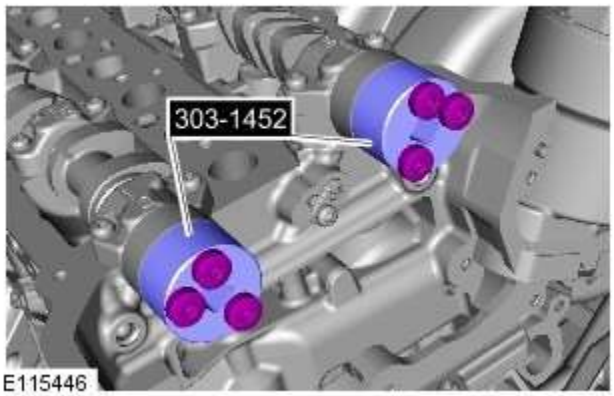


E107945

1. CAUTION: Install a new friction washer.



2. *Torque:* 12 Nm

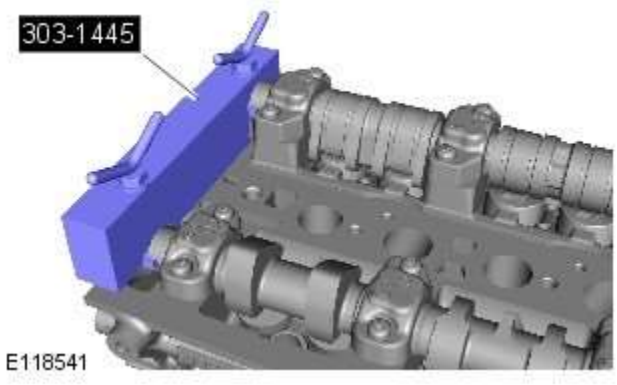


3.

- Install the special tool to each Camshaft.
- *Special Tool(s):* 303-1452
- *Torque:* 10 Nm

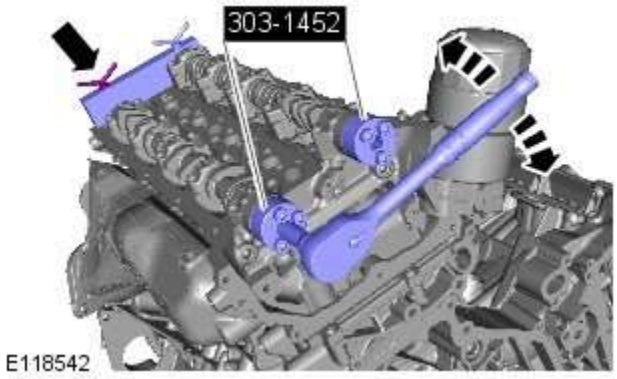
4.

- Carefully rotate the camshafts if the position is not as shown.



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.

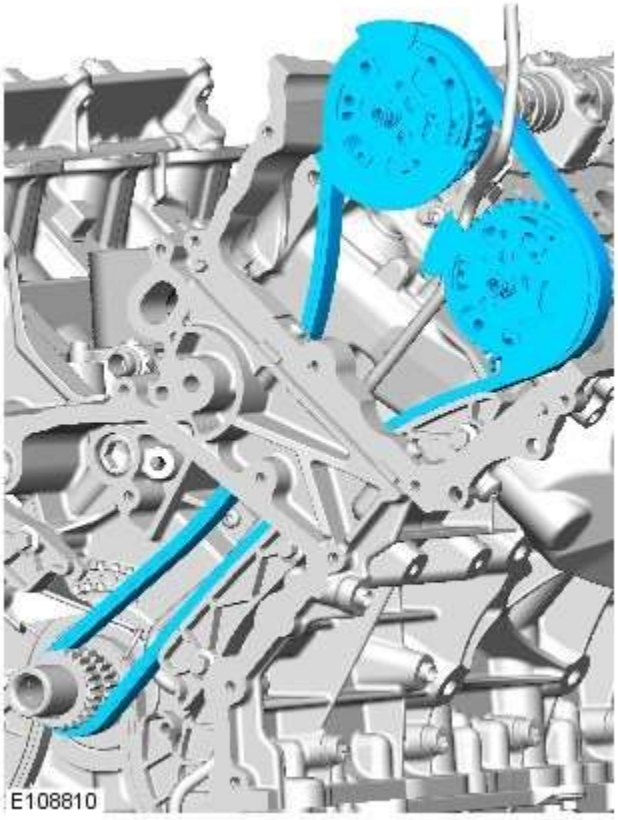


6. CAUTIONS:

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.

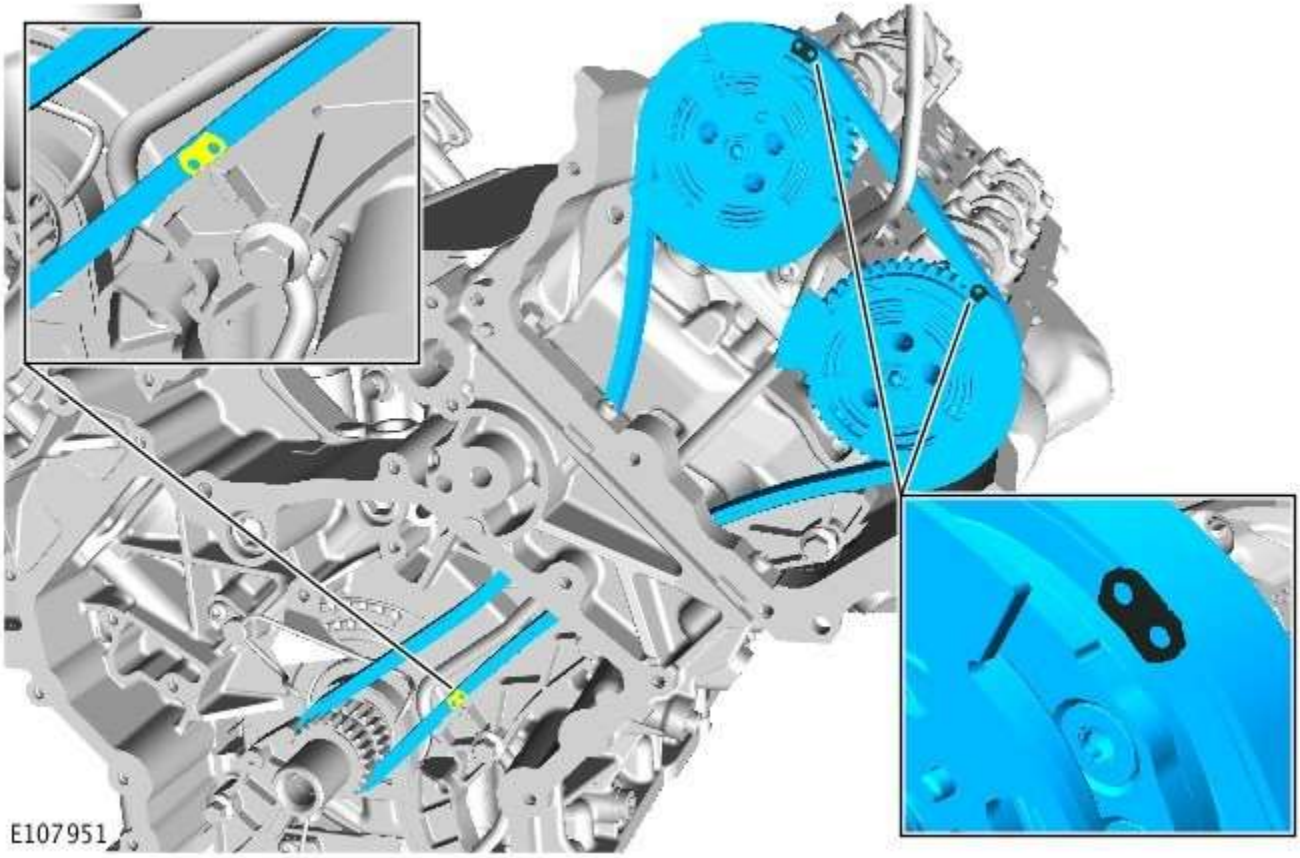
If the VVT is knocked or dropped then the VVT must be replaced.

NOTE: Do not tighten at this stage.

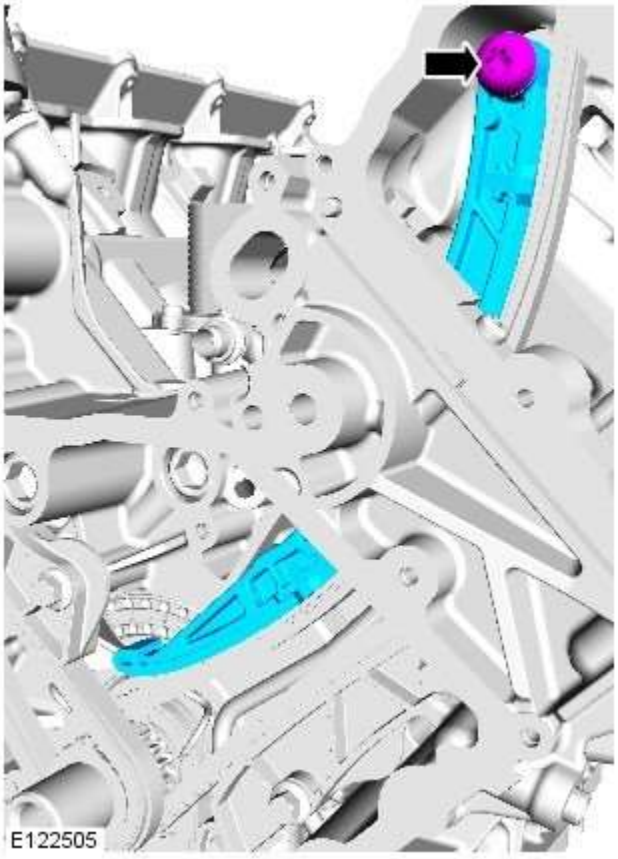
- Install the timing chain with the variable valve timing (VVT) units.

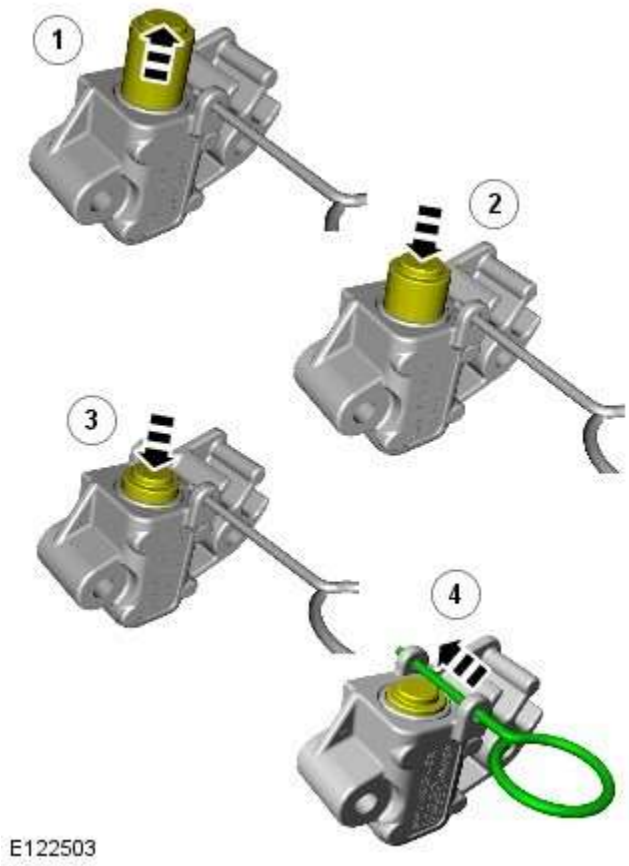
8.

- Make sure that all the timing chain alignment marks are in the positions shown.

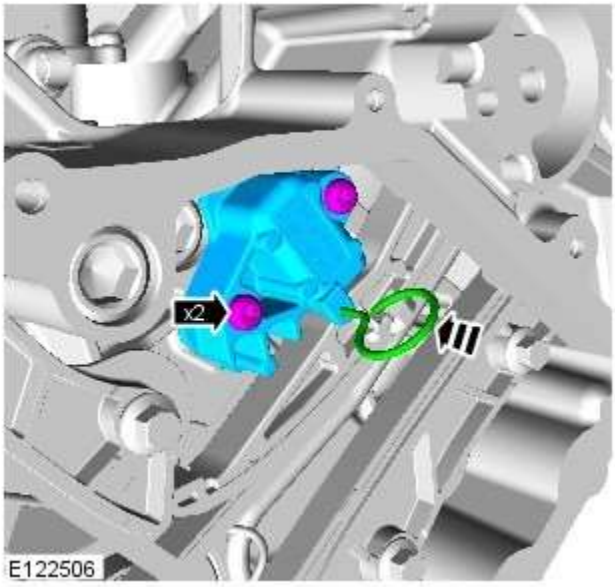


9. *Torque:* 25 Nm



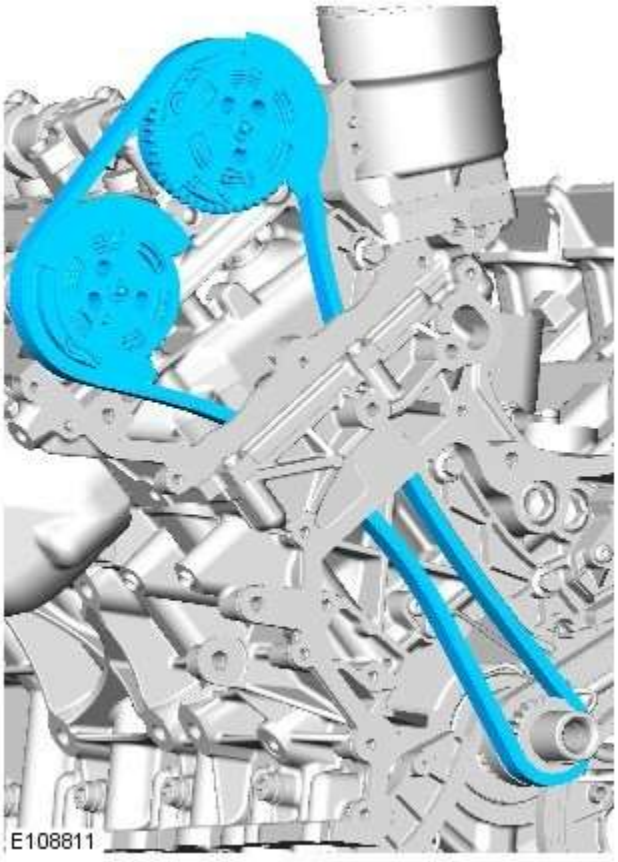


10. Make sure the tensioner piston is fully extended. Then fully depress and lock the tensioner piston with the grenade pin before installation, failure to do this may result in damage to the engine.



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.

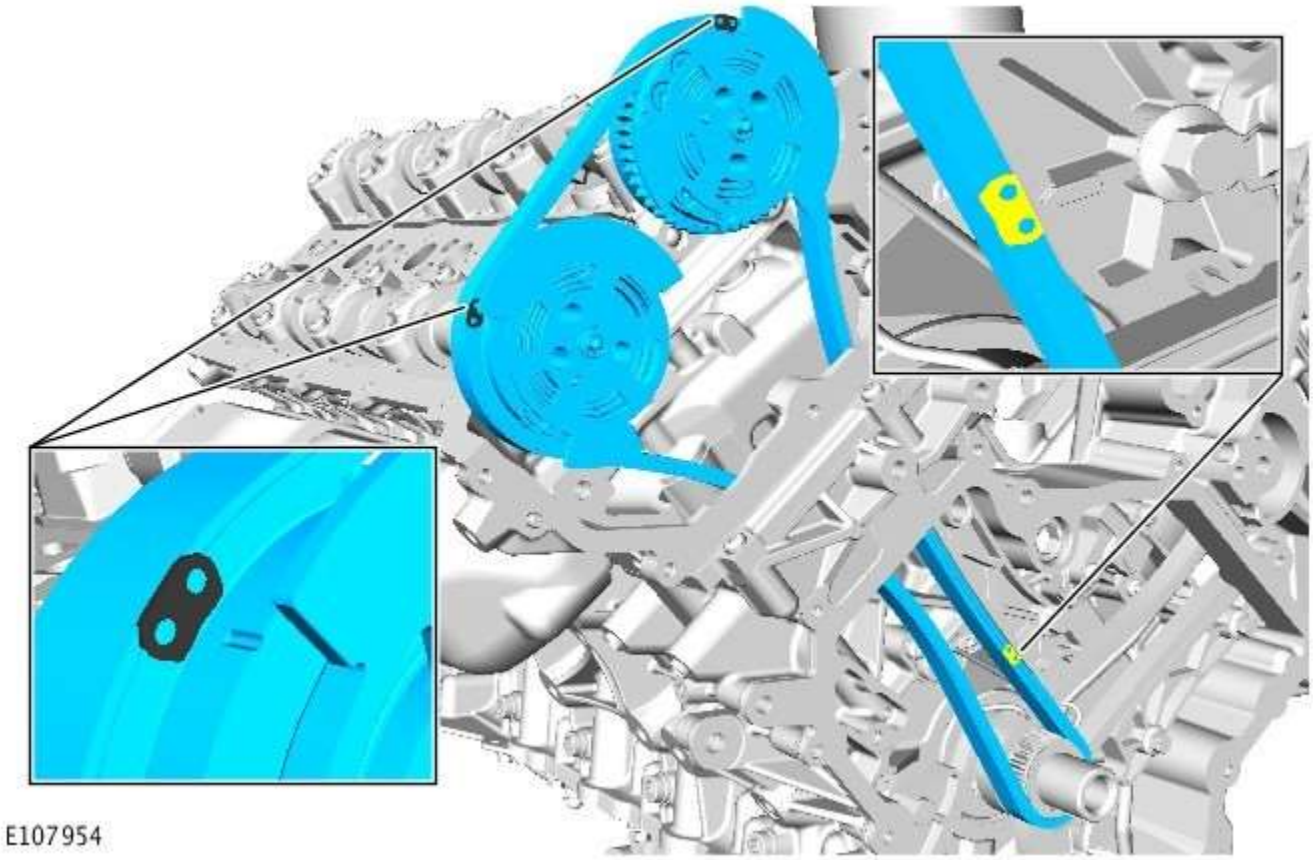
If the VVT is knocked or dropped then the VVT must be replaced.

NOTE: Do not tighten at this stage.

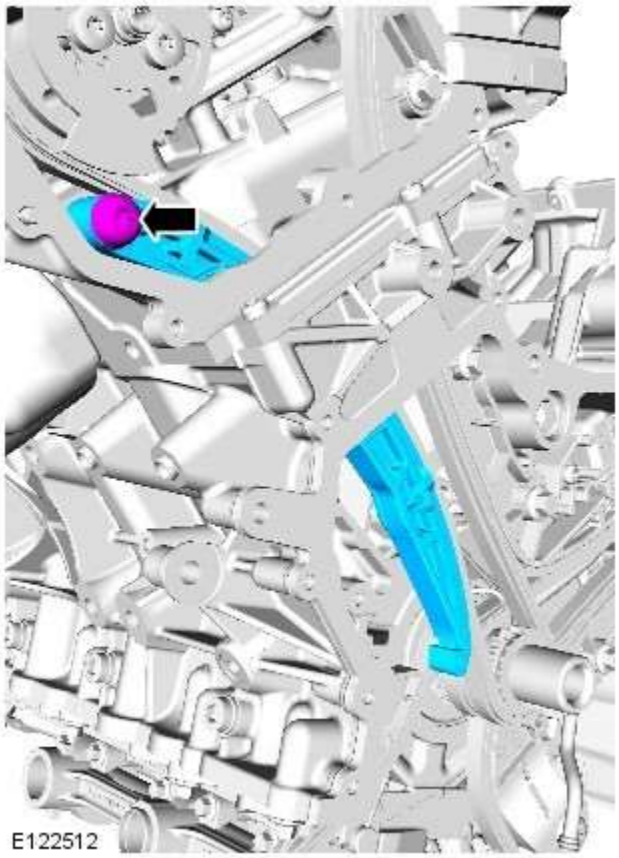
- Install the timing chain with the VVT units.

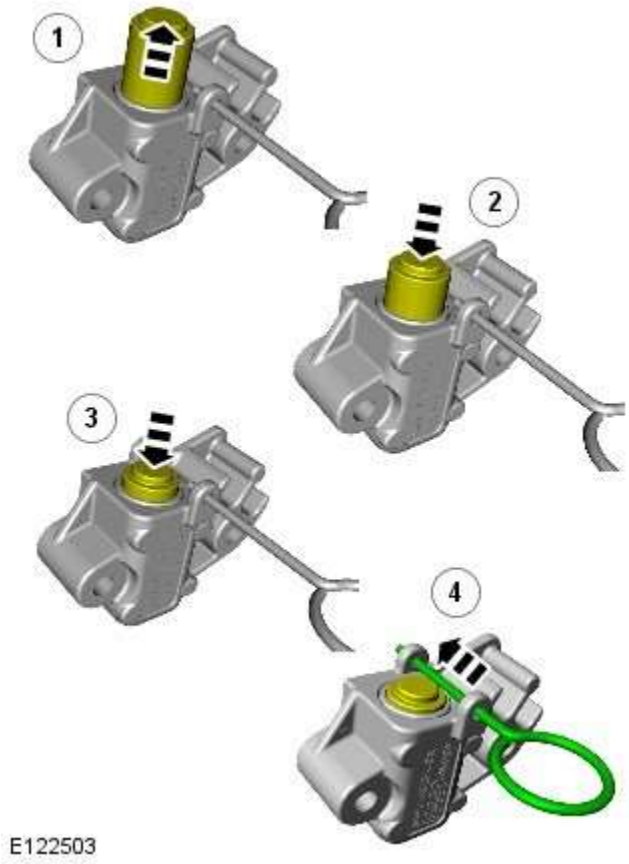
13.

- Make sure that all the timing chain alignment marks are in the positions shown.

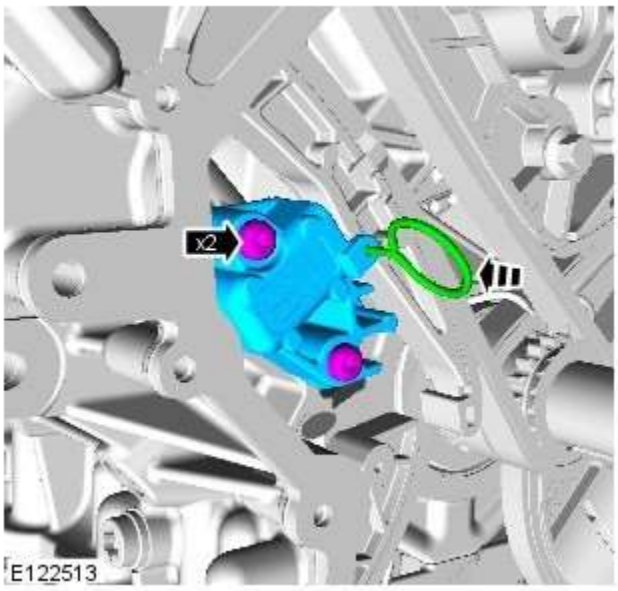


14. *Torque:* 25 Nm





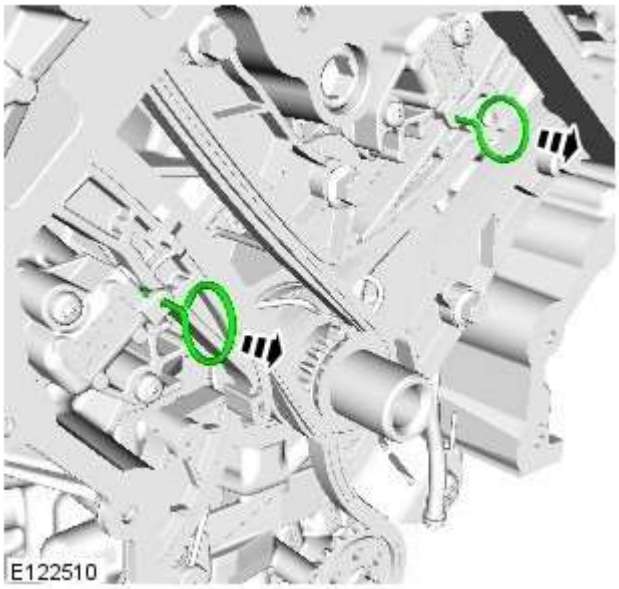
15. Make sure the tensioner piston is fully extended. Then fully depress and lock the tensioner piston with the grenade pin before installation, failure to do this may result in damage to the engine.



16. CAUTION: Do not release the timing chain tensioner locking pin at this stage.

    Torque: 10 Nm

17.

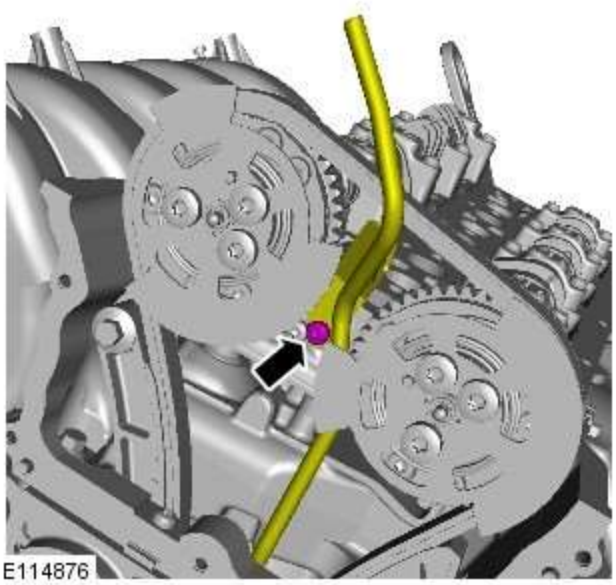


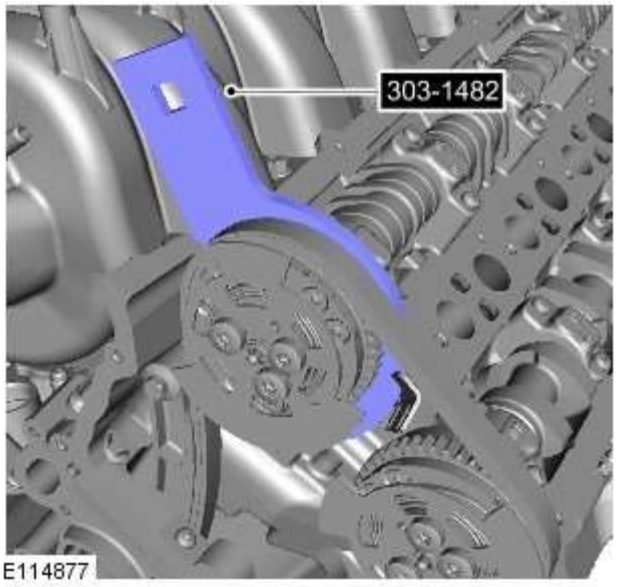
18. CAUTION: Do not use mechanical force.

Make sure that the tensioners are fully deployed.

19.

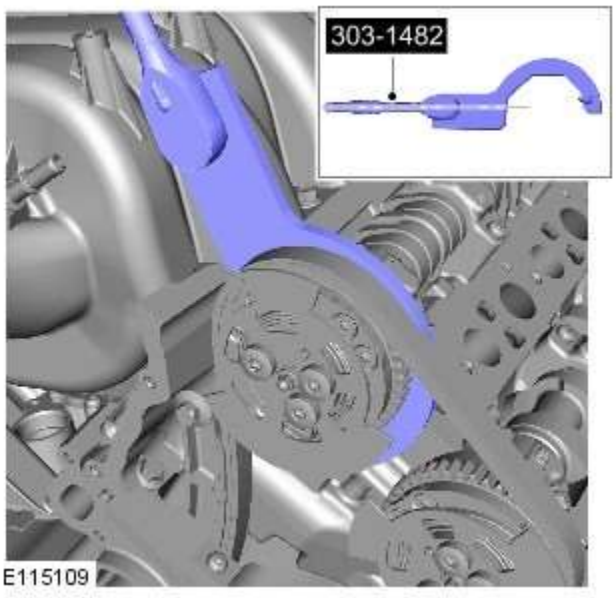
- Release and reposition the oil suction tube to one side.





20.

- Install the special tool.
- *Special Tool(s):* 303-1482

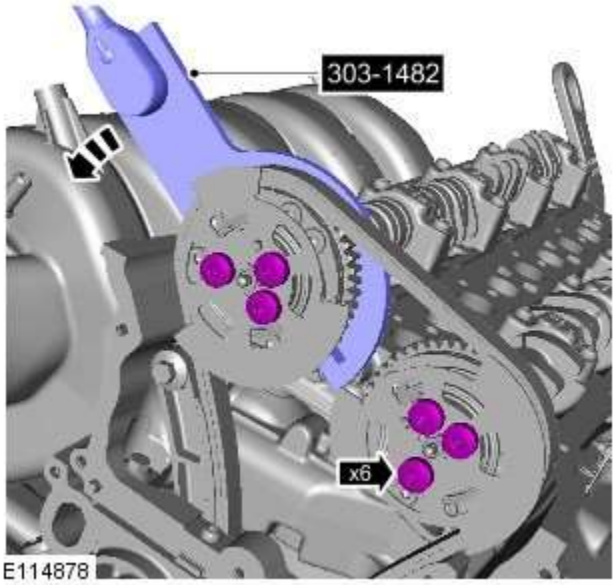


21. CAUTIONS:

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.

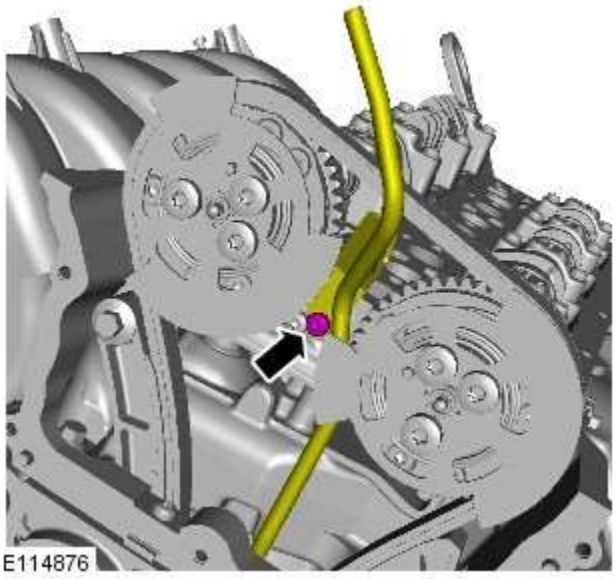
- Install the torque wrench to the special tool.
- *Torque:* 35 Nm



22. CAUTION: Make sure that the torque wrench does not move whilst tightening the VVT bolts.

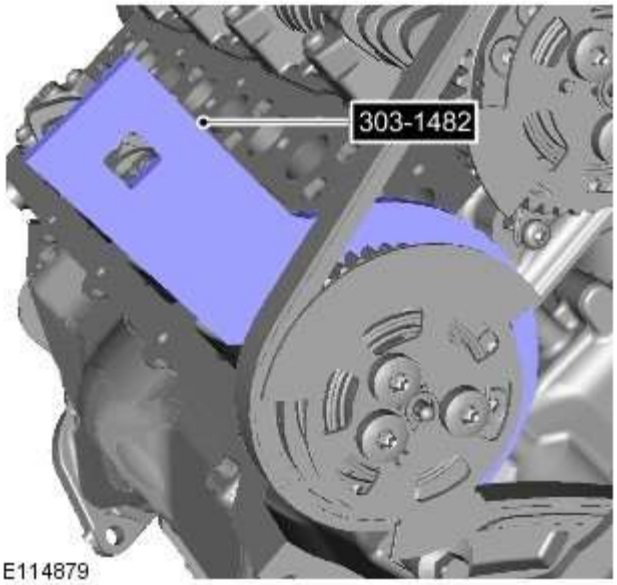
NOTE: Make sure to tighten the exhaust VVT unit bolts first.

- *Torque:* 32 Nm
- *Special Tool(s):* 303-1482



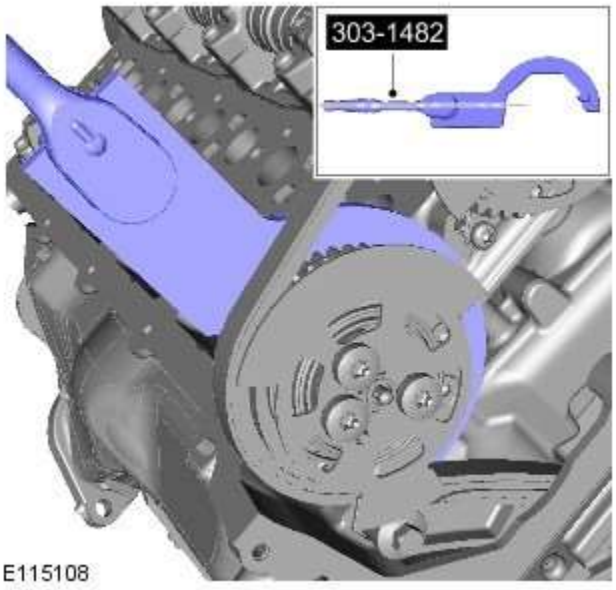
23.

- Install the oil suction tube.
- *Torque:* 10 Nm



24.

- Install the special tool.
- *Special Tool(s):* 303-1482

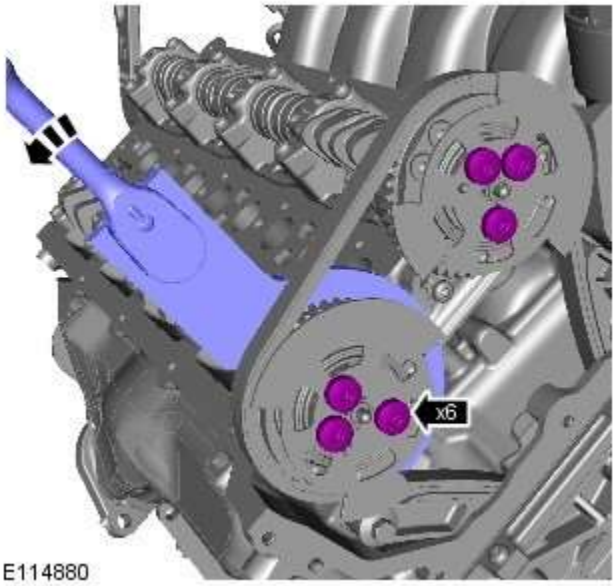


25. CAUTIONS:

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

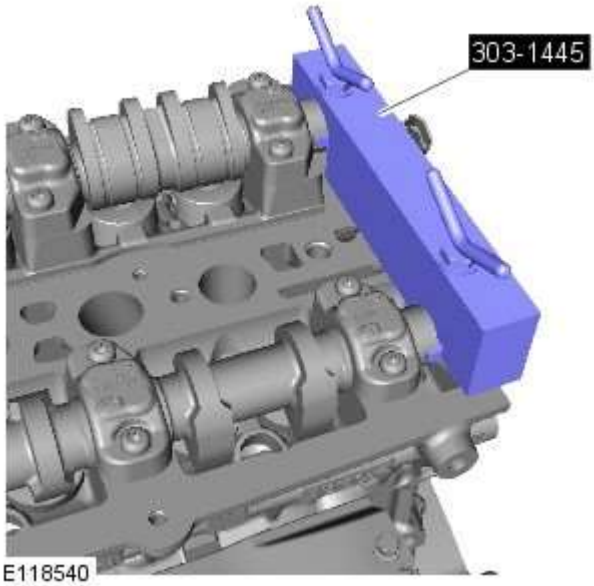


E114880

26. CAUTION: Make sure that the torque wrench does not move whilst tightening the VVT bolts.

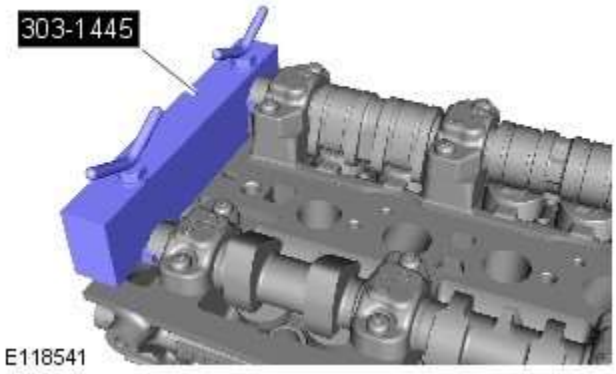
NOTE: Make sure to tighten the inlet VVT unit bolts first.

Torque: 32 Nm



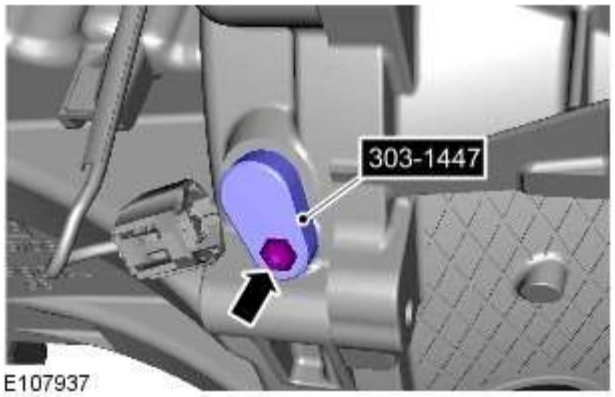
E118540

27.
- Remove the special tool.



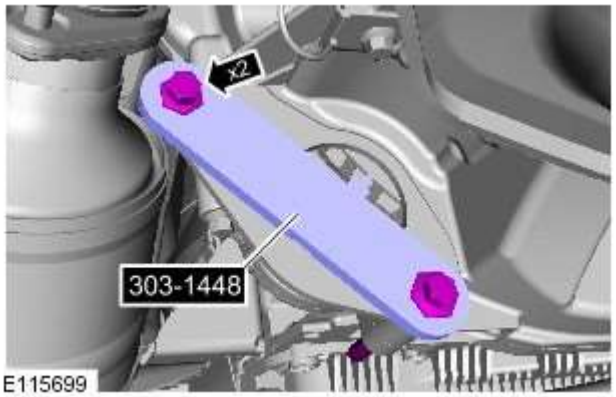
E118541

28.
- Remove the special tool.



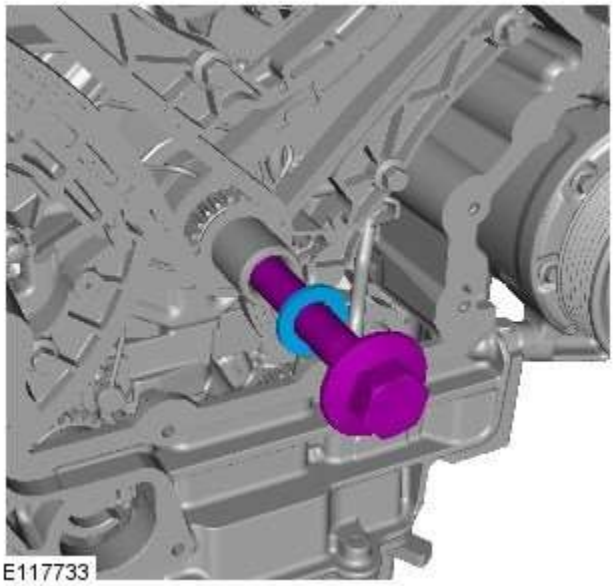
29.

- Remove the special tool.
- *Special Tool(s):* 303-1447



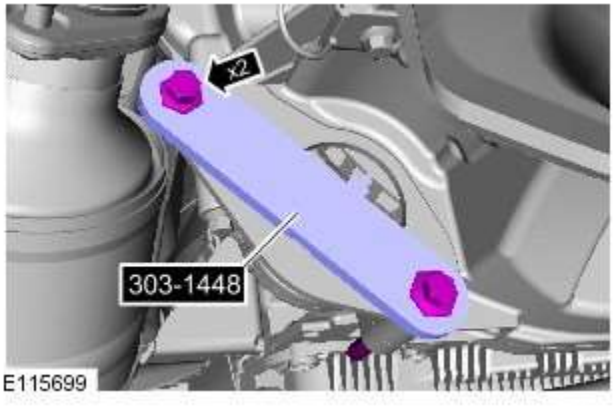
30.

- 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.

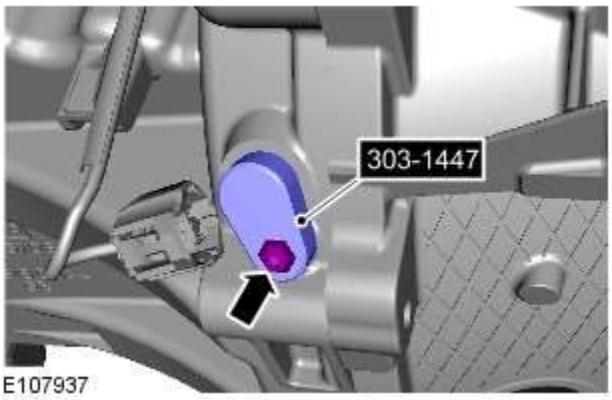
Torque: 50 Nm



32.

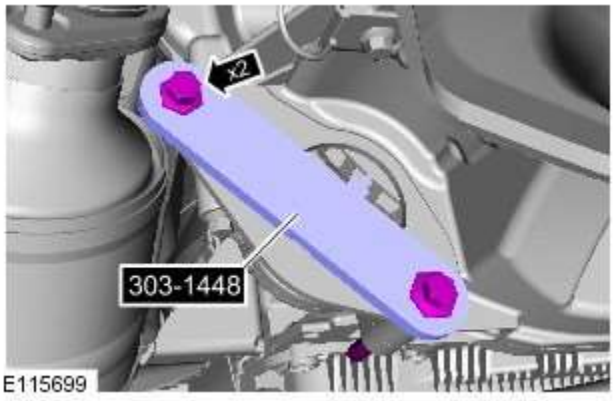
- Remove the special tool.
- *Special Tool(s):* 303-1448

33. Rotate the engine two complete turns clockwise.



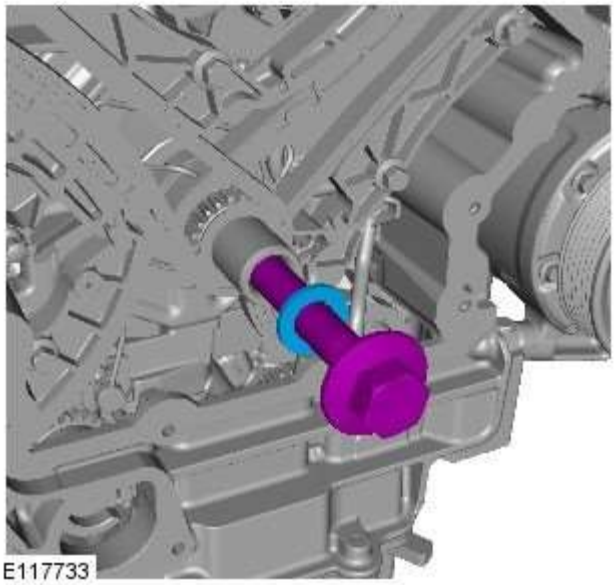
34. CAUTION: Only rotate the crankshaft clockwise.

- Install the special tool.
- *Special Tool(s):* 303-1447

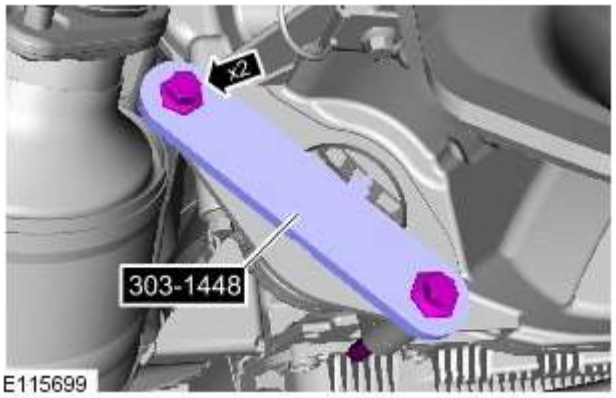


35.

- Install the special tool.
- *Special Tool(s):* 303-1448

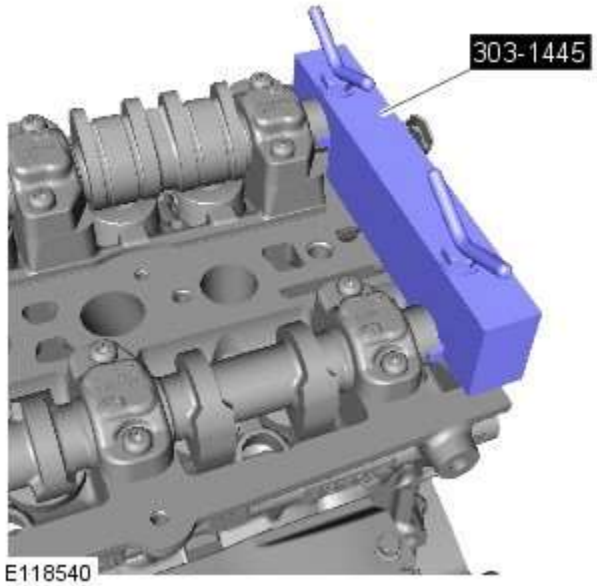


36.



37.

- Remove the special tool.
- *Special Tool(s):* 303-1448



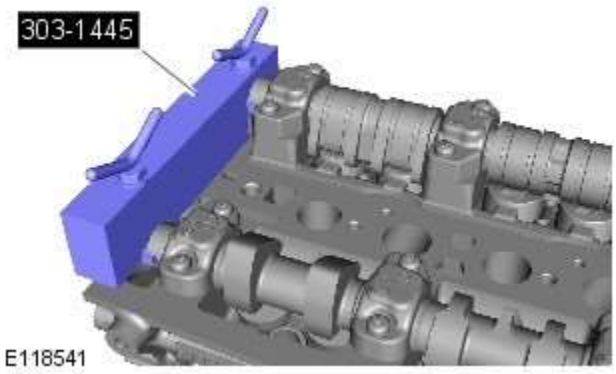
38. CAUTIONS:

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).

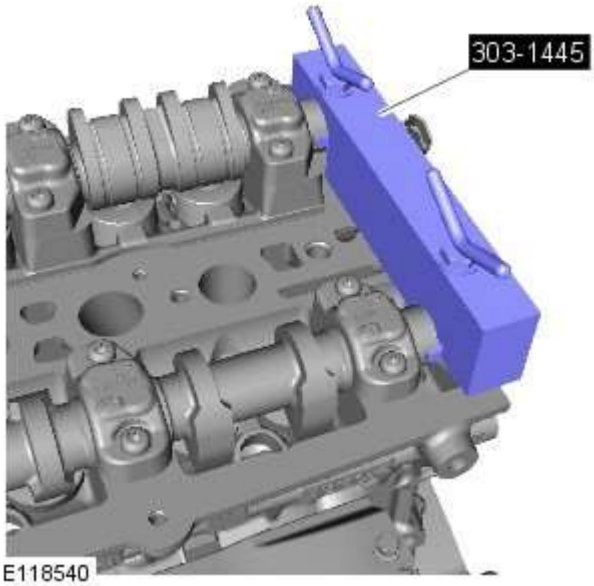
Install the special tool.

Special Tool(s): 303-1445

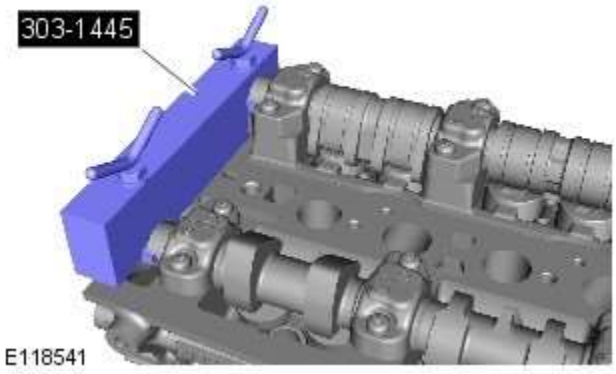


39. CAUTION: If the special tool cannot be installed, the timing chain installation steps must be repeated.

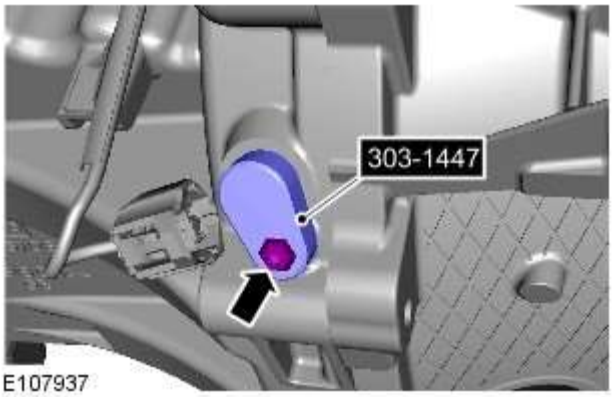
    Install the special tool.



40.
- Remove the special tool.

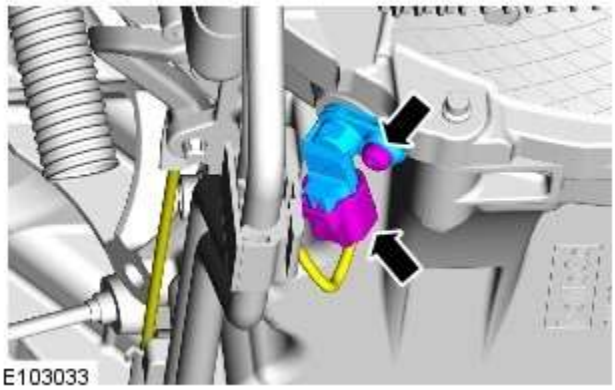


41.
- Remove the special tool.



E107937

42.
- Remove the special tool.
- *Special Tool(s):* 303-1447


E103033

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).

Published: 11-May-2011

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

Removal and Installation

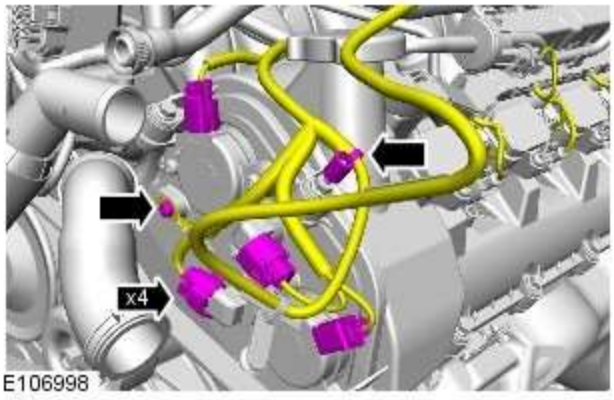
Special Tool(s)

 E116982	303-1446 Valve Cover Alignment Tool

Removal

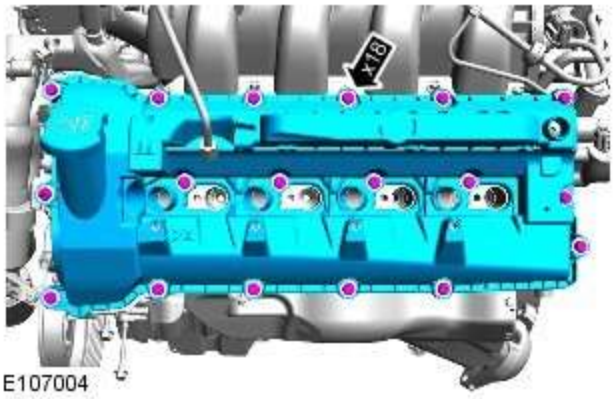
NOTE: Removal steps in this procedure may contain installation details.

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).



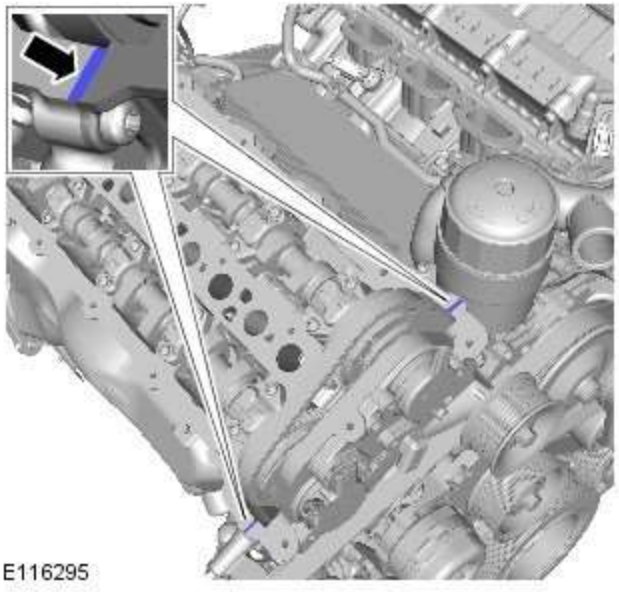
E106998

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.

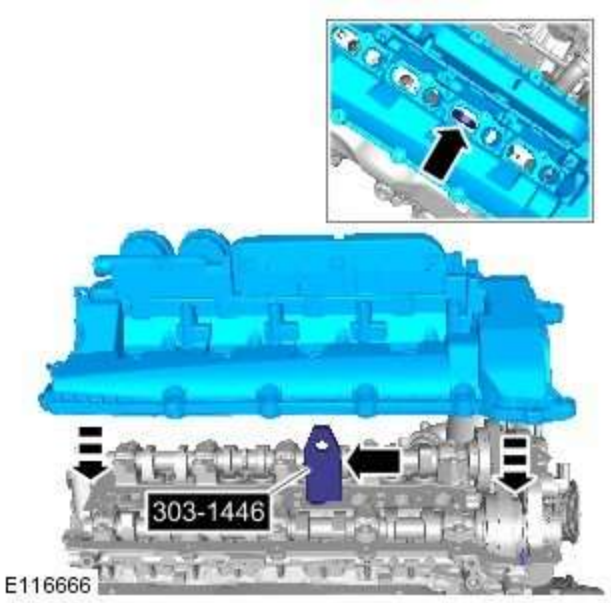
Installation of the valve cover and tightening must be carried out within 7 minutes of applying the sealant.

NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

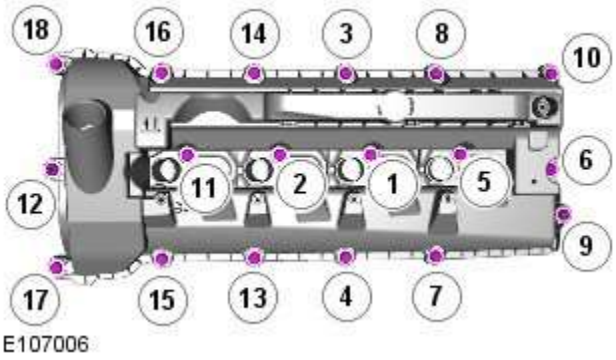
Apply two beads of silcone gasket sealant (Loctite 5901) as shown on the illustration. The application of the sealant must be 1.5mm diameter 12mm long. Install the valve cover immediately after applying the sealant. The cover should be fitted directly to the head without smearing the sealant or the seals.

To install, reverse the removal procedure.



2. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Special Tool(s): 303-1446



3. NOTE: Tighten the bolts in the indicated sequence.

   Torque: 13 Nm

Published: 11-May-2011

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

Removal and Installation

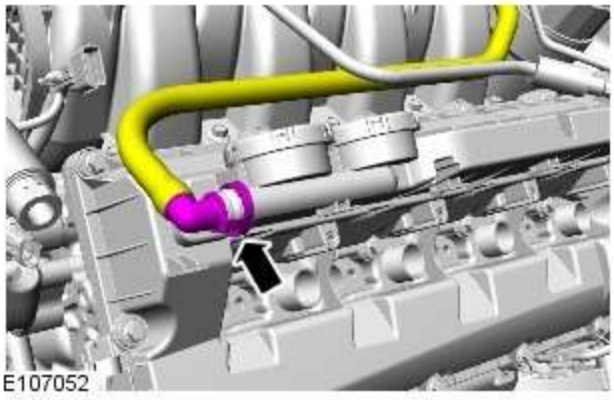
Special Tool(s)

 E116982	303-1446 Valve Cover Alignment Tool

Removal

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

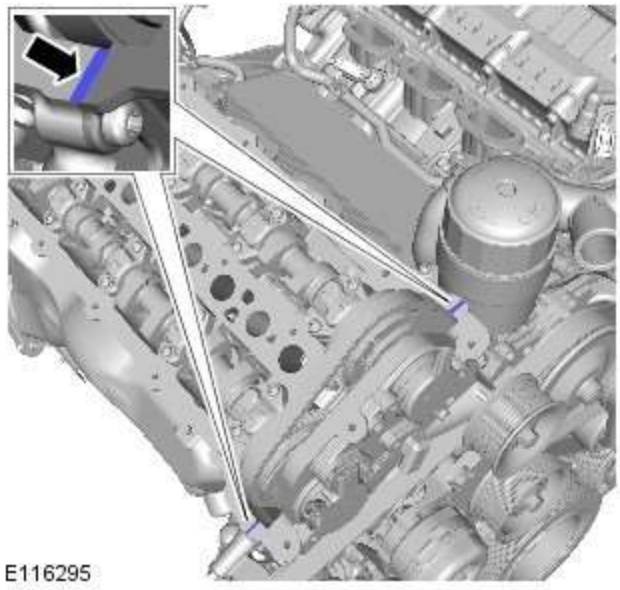
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Supercharger (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
3. Refer to: Secondary Bulkhead Panel RH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 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).


E107052

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.

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.

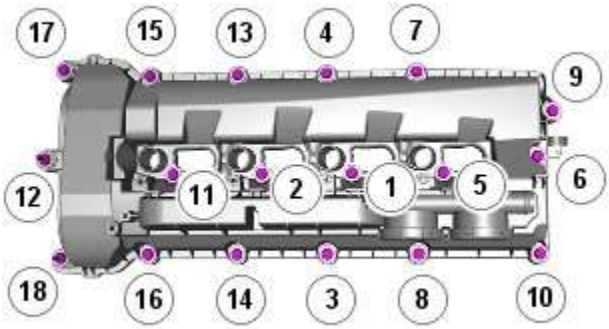
   Installation of the valve cover and tightening must be carried out within 7 minutes of applying the sealant.

   NOTE: Apply two beads of silcone 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.

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

Published: 23-Jul-2011

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.

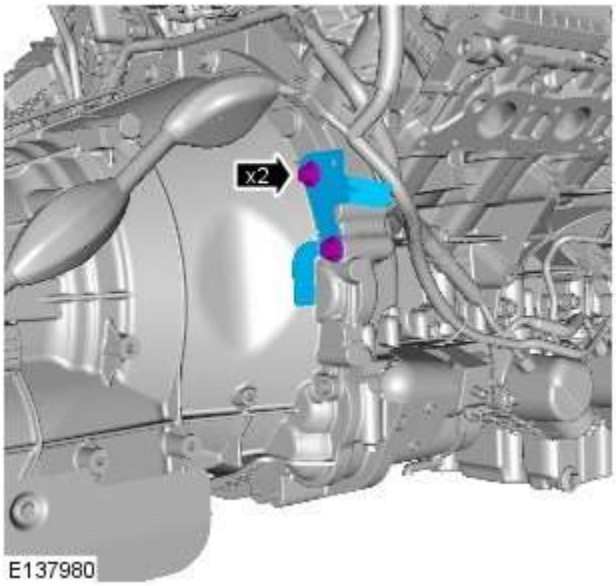
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

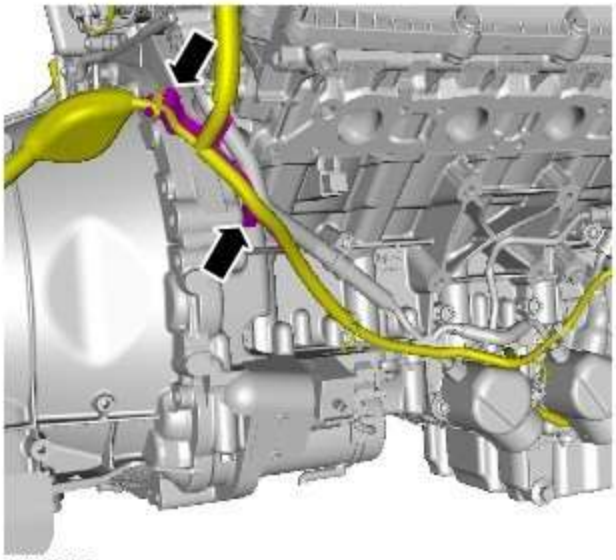
   Raise and support the vehicle.

3. Refer to: Exhaust Manifold RH (303-01C Engine - V8 5.0L Petrol, Removal and Installation).

4.

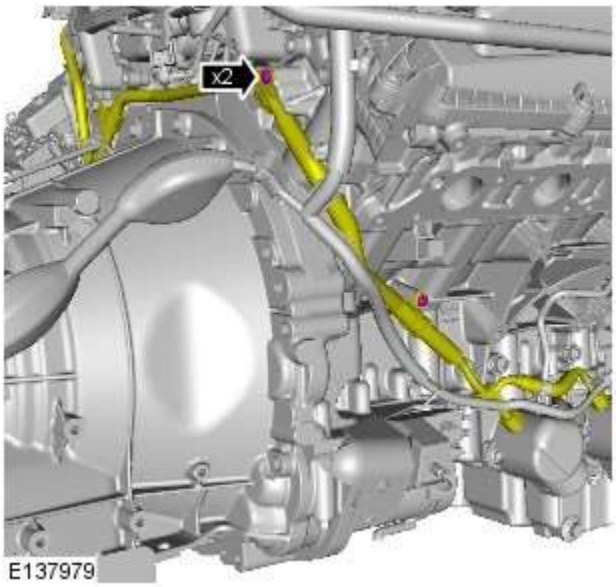


5.

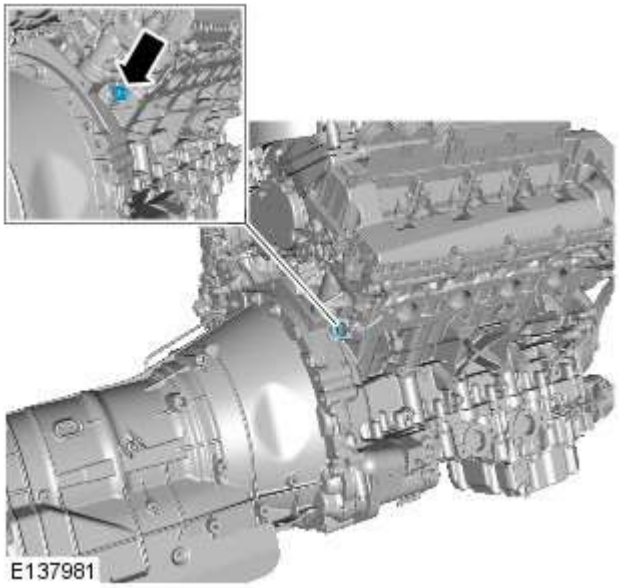


E137978

6.



E137979



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.

Published: 10-Oct-2011

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.

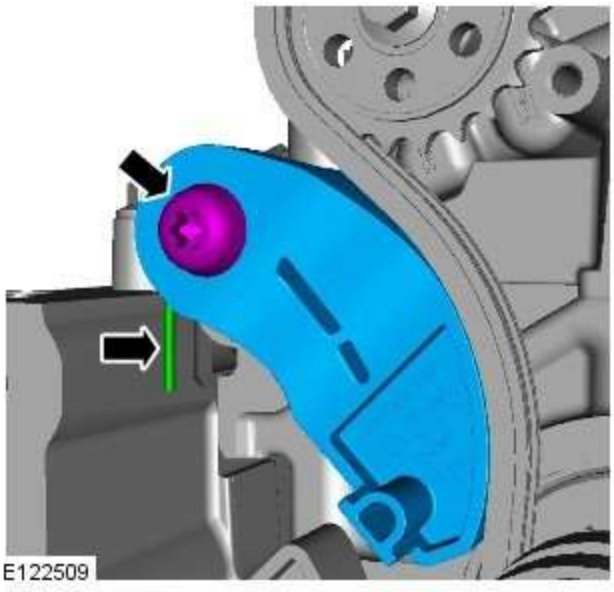
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

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.



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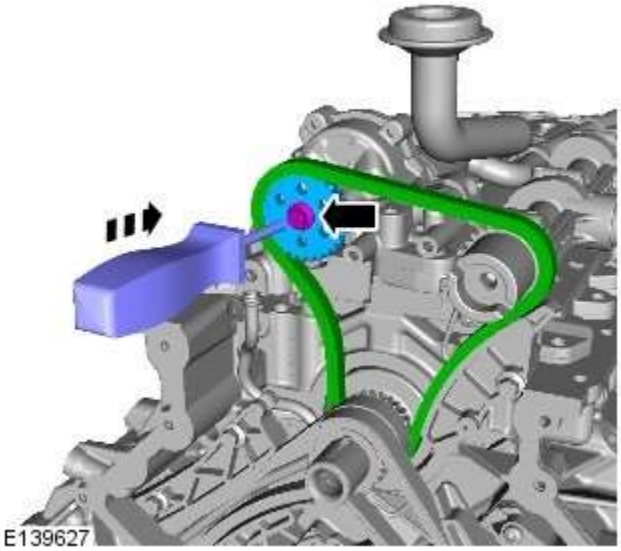

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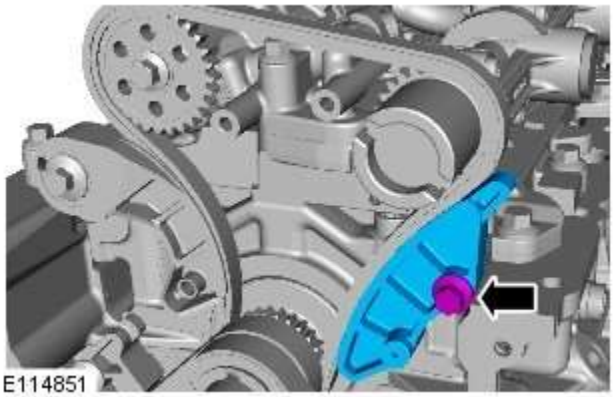
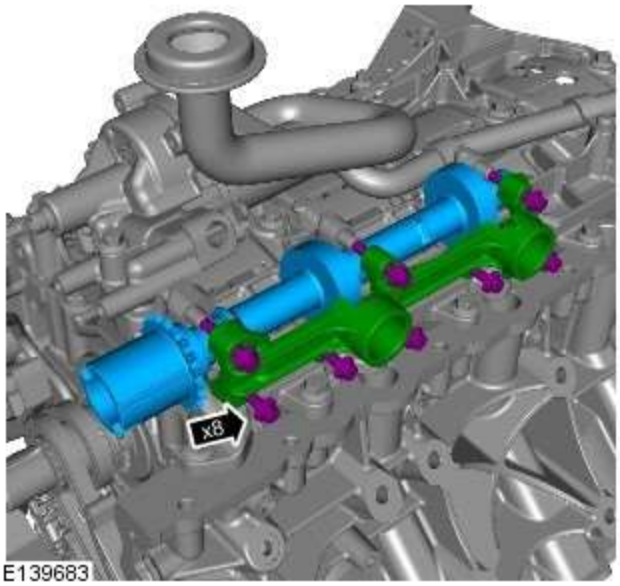
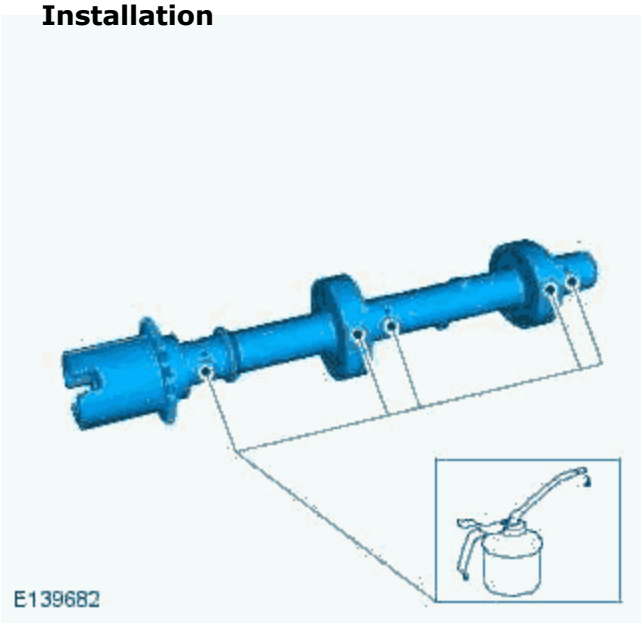


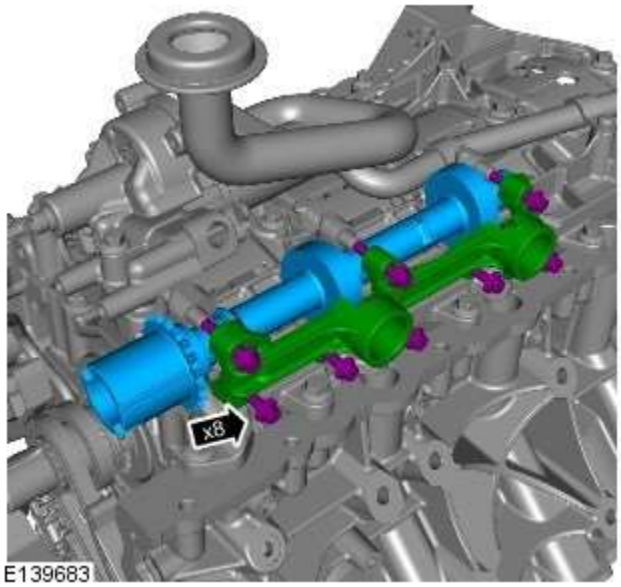
7. CAUTION: Take extra care when removing the component, prevent damage to the mating faces.



Installation



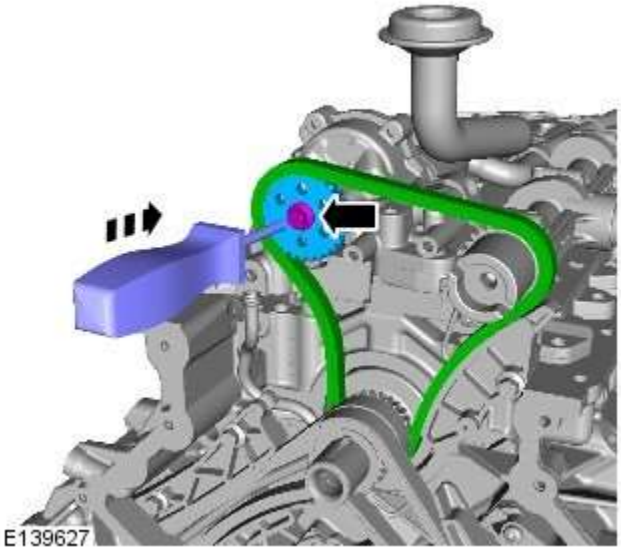
1. CAUTION: Make sure that the mating faces are clean and free of foreign material.



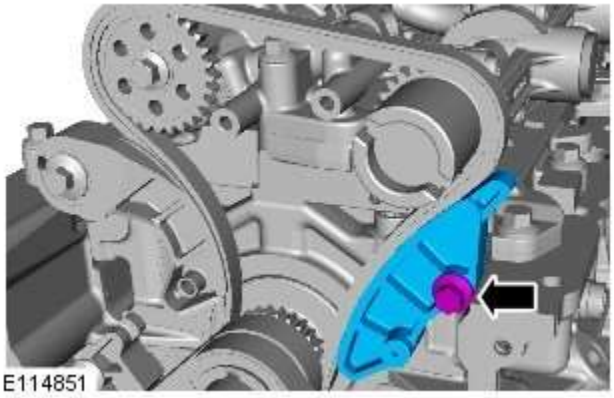
2. CAUTION: Take extra care not to damage the mating faces.

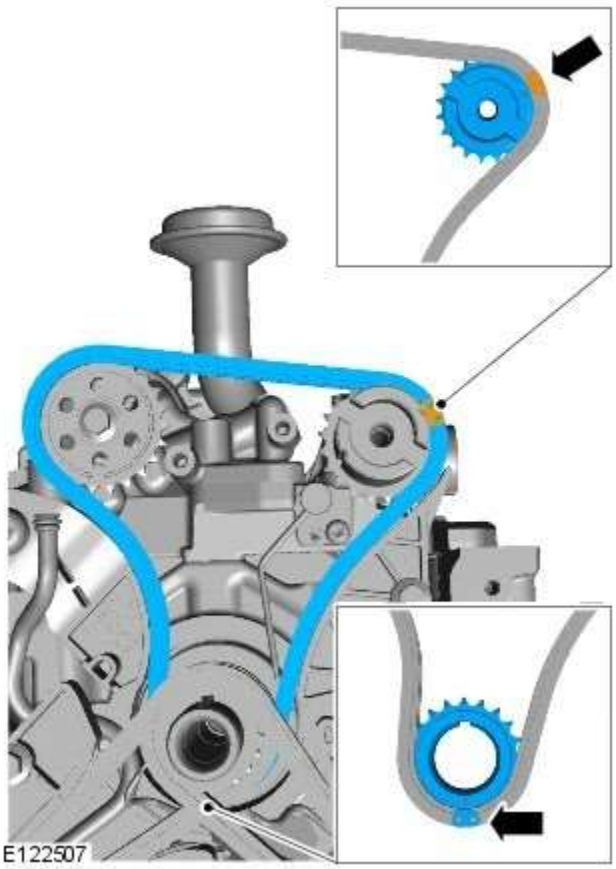
   Torque: 12 Nm

3. *Torque:* 21 Nm

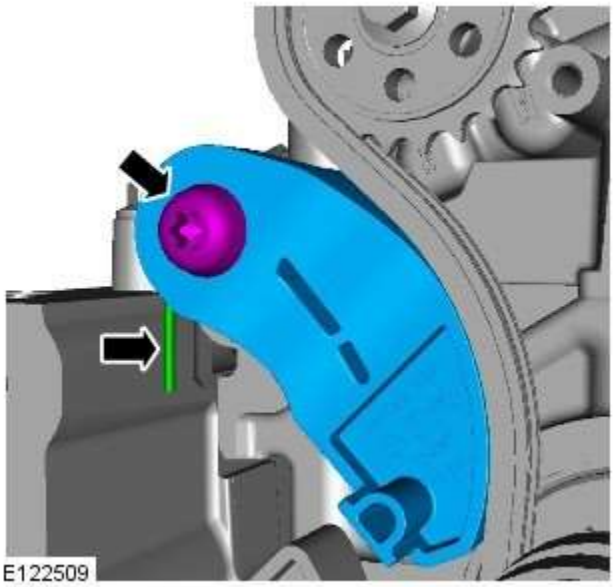


4. *Torque:* 12 Nm





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. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 10-Oct-2011

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.

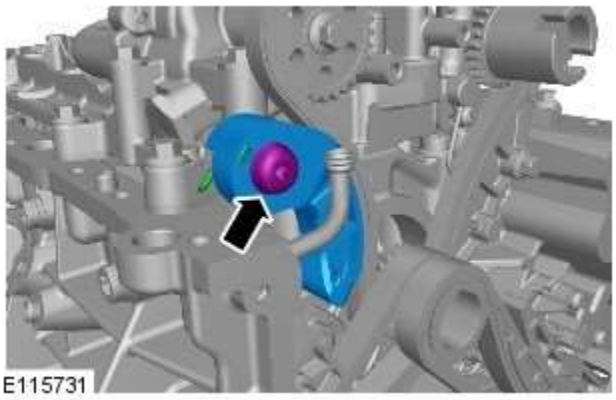
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

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.



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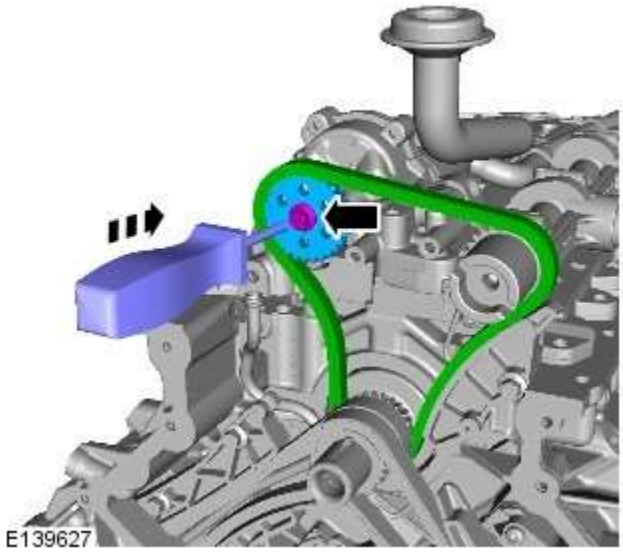
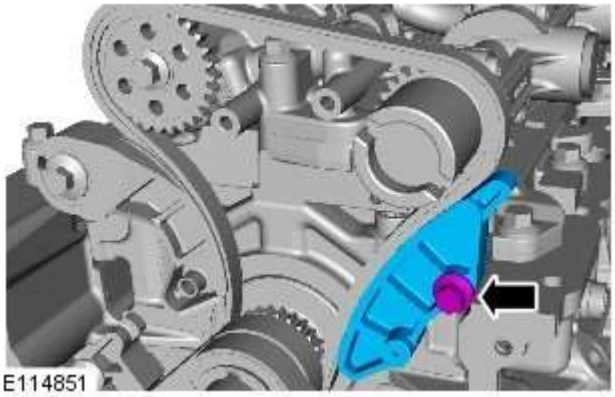
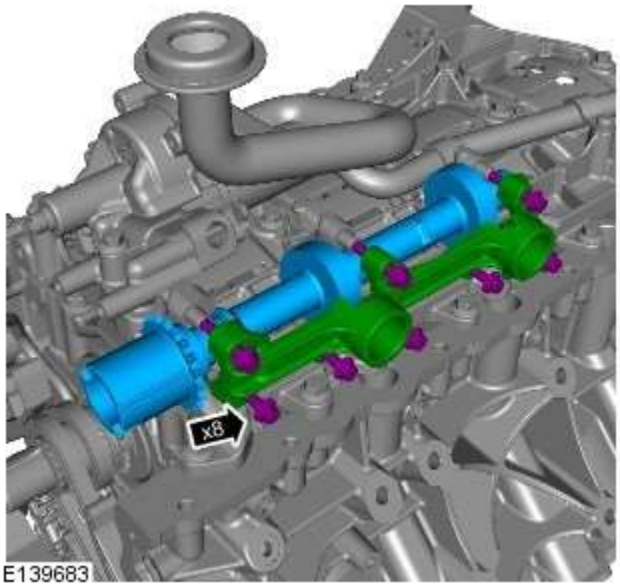


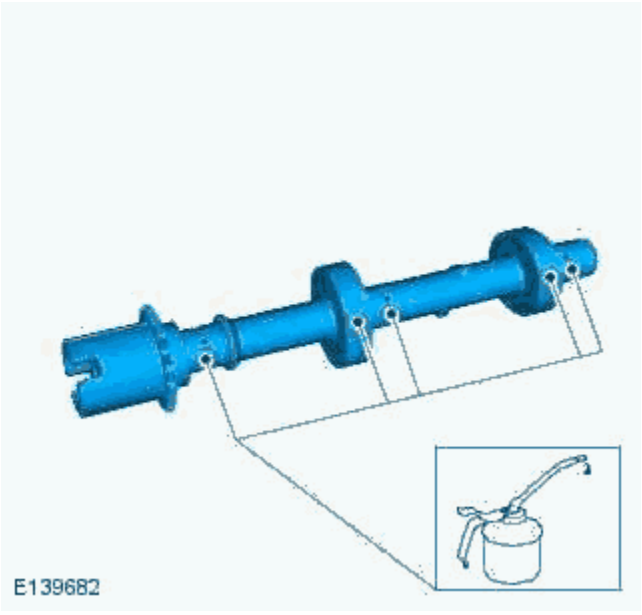


6.

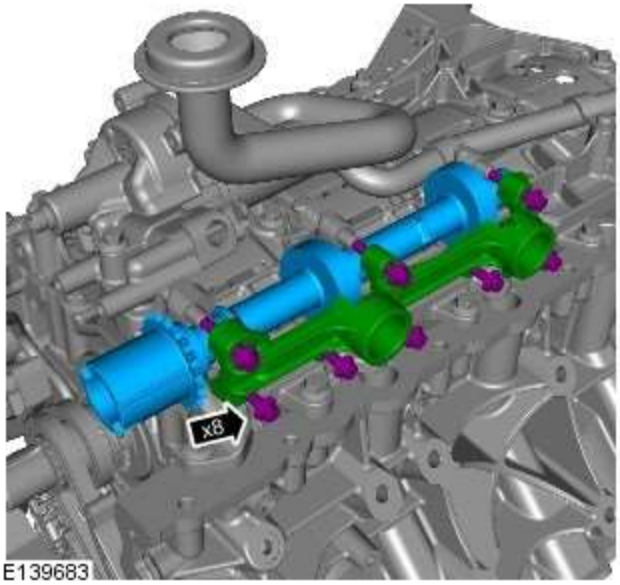


7. CAUTION: Take extra care when removing the component, prevent damage to the mating faces.

Installation



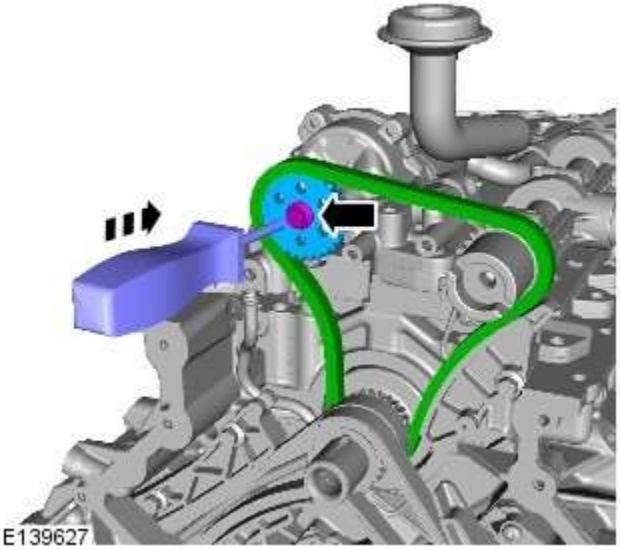
1. CAUTION: Make sure that the mating faces are clean and free of foreign material.



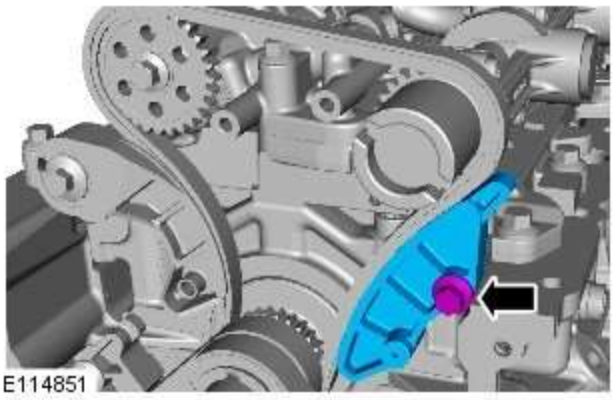
2. CAUTION: Take extra care not to damage the mating faces.

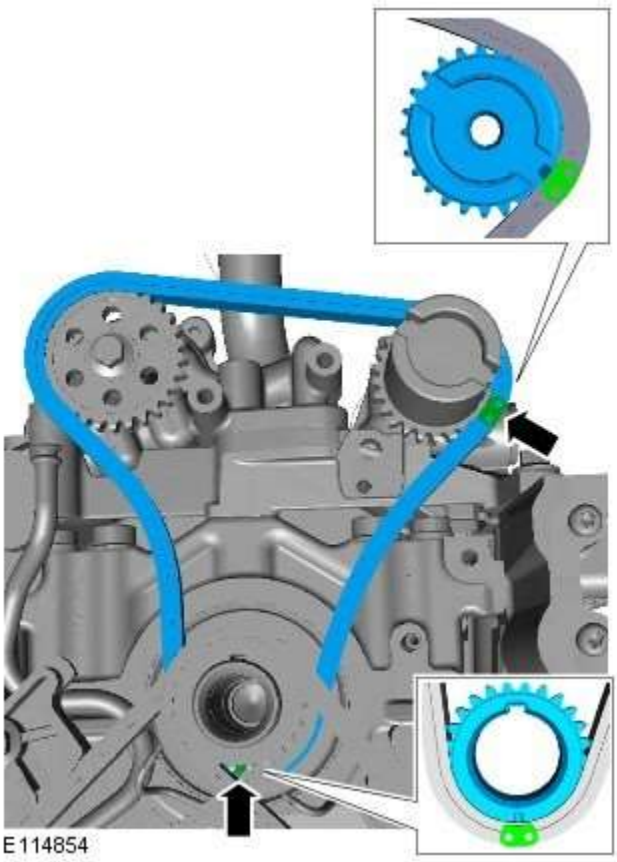
   Torque: 12 Nm

3. *Torque:* 21 Nm

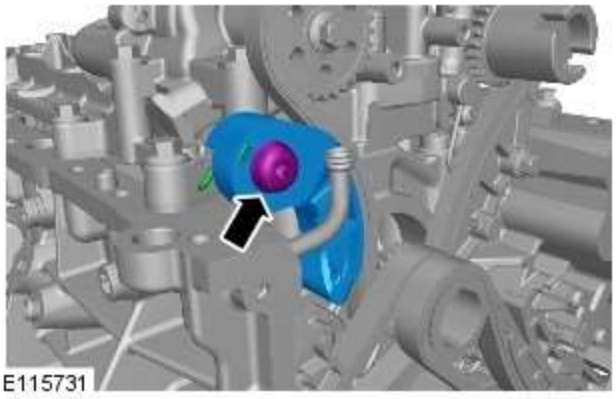


4. *Torque:* 12 Nm





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.

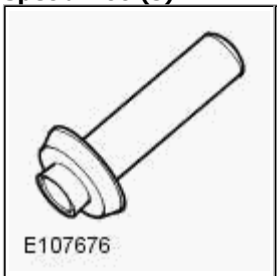
   Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 19-Dec-2011

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

Removal and Installation

Special Tool(s)

 E107676	303-1433 Lower Timing Cover Alignment tool

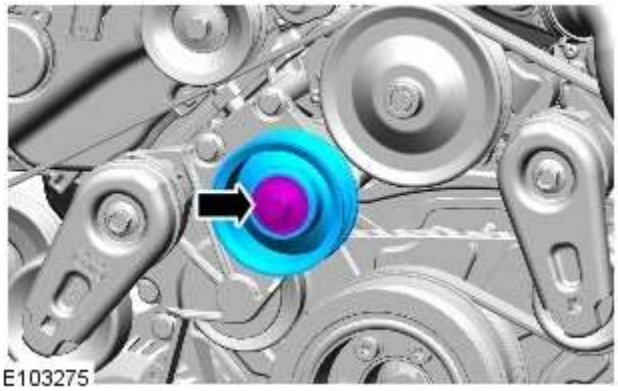
Removal

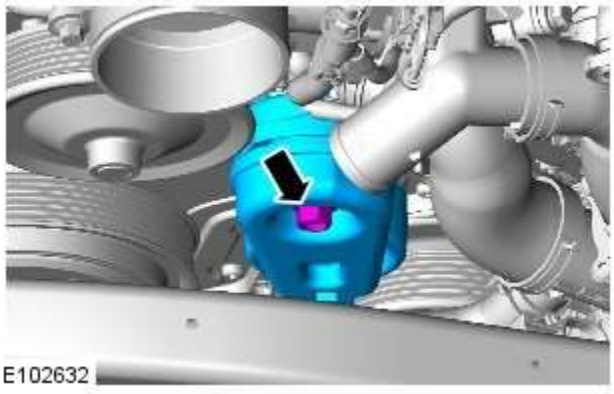
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Make sure to support the vehicle with axle stands.

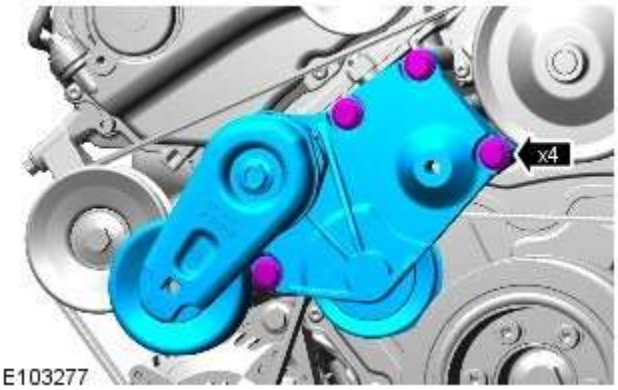
   Raise and support the vehicle.

3. Refer to: Crankshaft Pulley (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

4. 
E103275

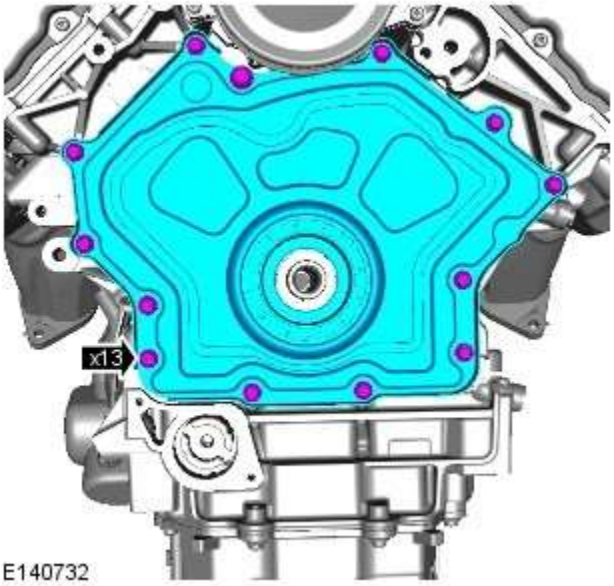
5. 
E102632

6.

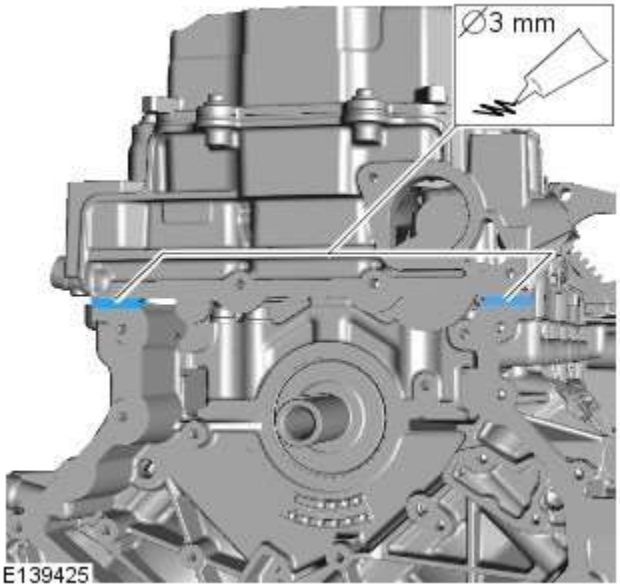


7. Refer to: Brake Vacuum Pump - V8 5.0L Petrol/V8 S/C 5.0L Petrol (206-07 Power Brake Actuation, Removal and Installation).

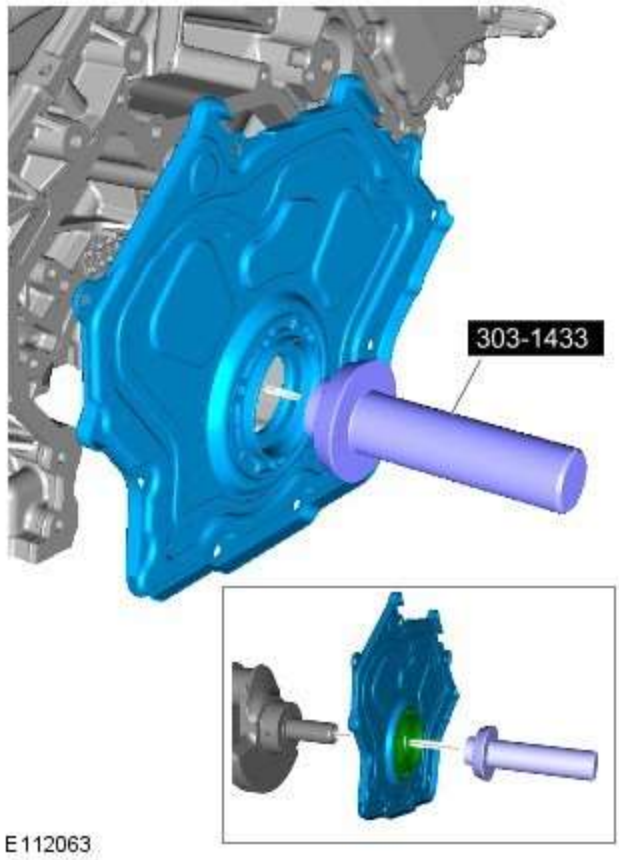
8.



Installation



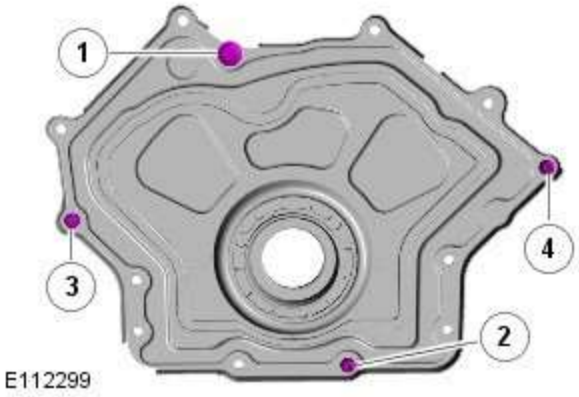
1. Apply RTV sealant WSE-M4G323-A6 (Loctite 5901G) to the areas shown, and tighten the bolts within 7 minutes.



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

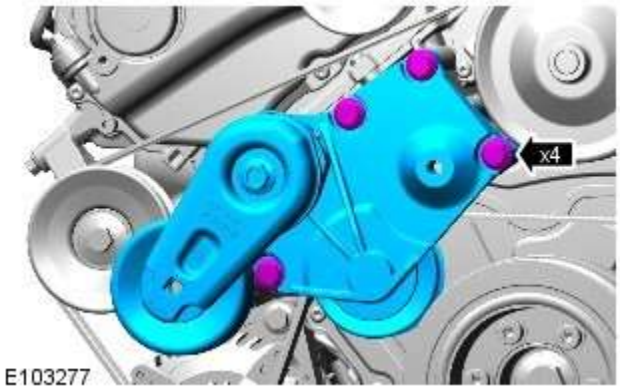
3. NOTE: Tighten the bolts in the indicated sequence.

Torque:
M6 12 Nm
M8 20 Nm

E112300

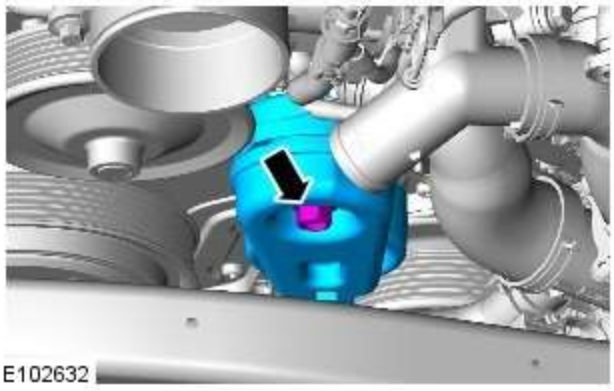
4. *Torque:* 12 Nm

5. Refer to: Brake Vacuum Pump - V8 5.0L Petrol/V8 S/C 5.0L Petrol (206-07 Power Brake Actuation, Removal and Installation).



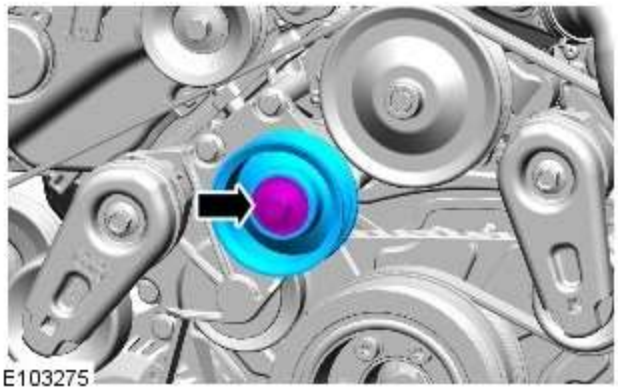
E103277

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


E111933

16.

- Press the cruise control cancel button twice within 2 seconds.

E111932

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.


E111933

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.

E111932

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).

Published: 10-Jul-2013

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).

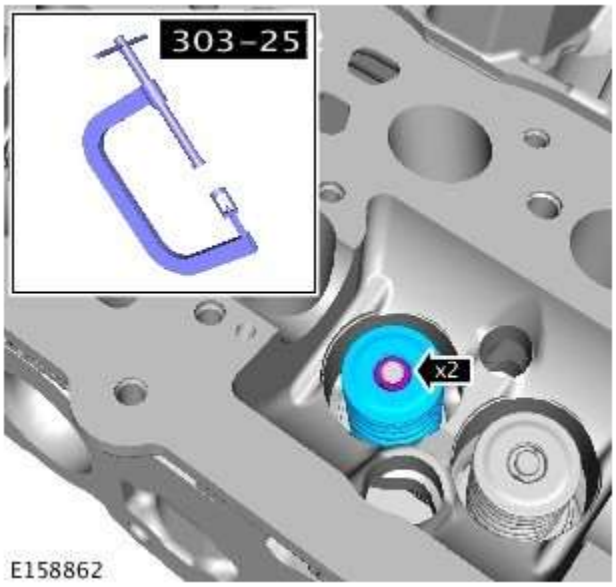
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   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.



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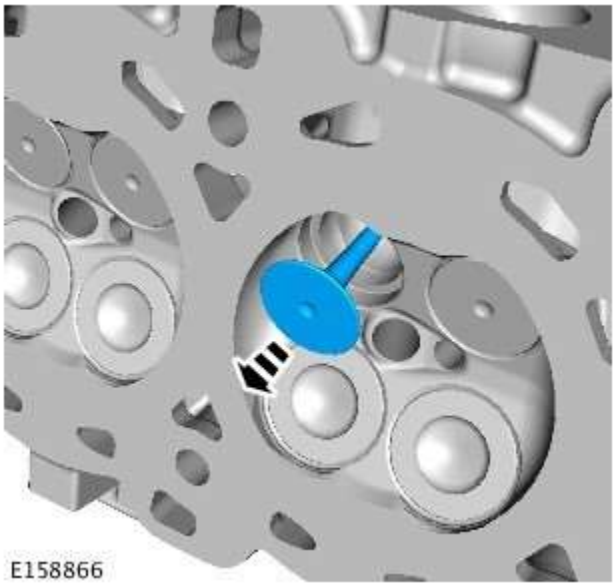

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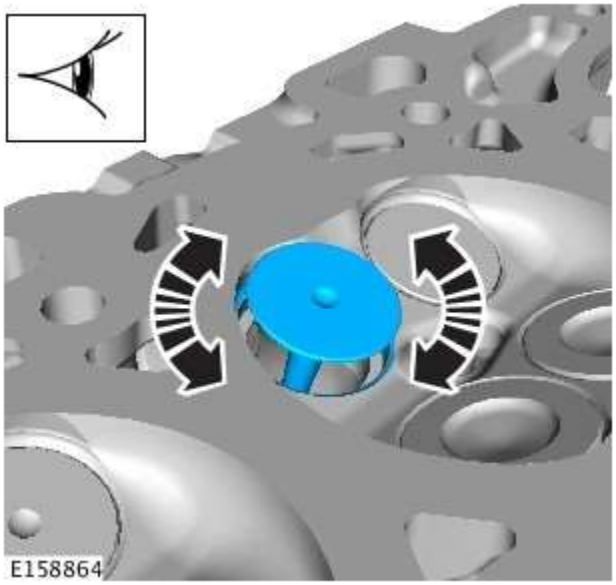


8. CAUTIONS:

   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.

Published: 19-Nov-2013

Engine - V8 S/C 5.0L Petrol - Engine

Removal

Special Tool(s)

 E115254	303-1435 Engine Lifting Brackets Rear

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).

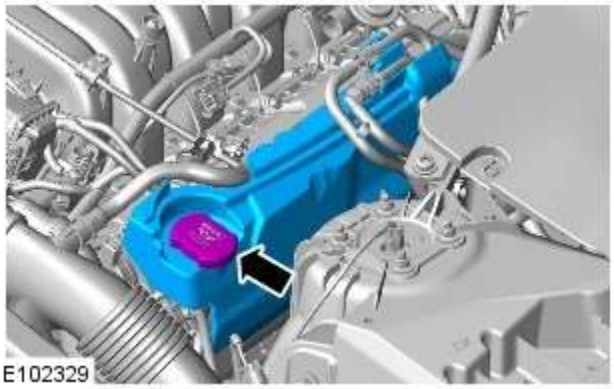
11. Refer to: Coolant Expansion Tank (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

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).

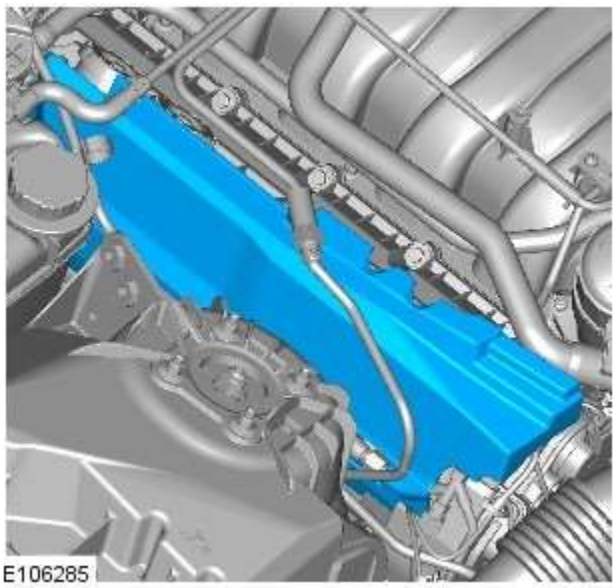
13. Refer to: Secondary Bulkhead Panel LH - TDV6 3.0L Diesel /V8 5.0L Petrol/V8 S/C 5.0L Petrol (501-02 Front End Body Panels, Removal and Installation).

14. Refer to: Power Steering Fluid Reservoir - V8 5.0L Petrol/V8 S/C 5.0L Petrol (211-02 Power Steering, Removal and Installation).

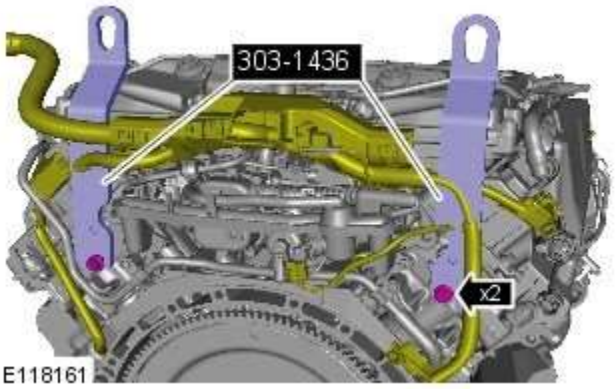
15.

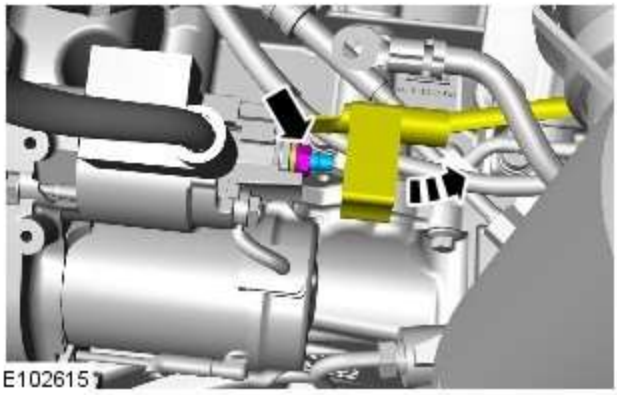

E102329

16.


E106285

17. *Torque:* 40 Nm





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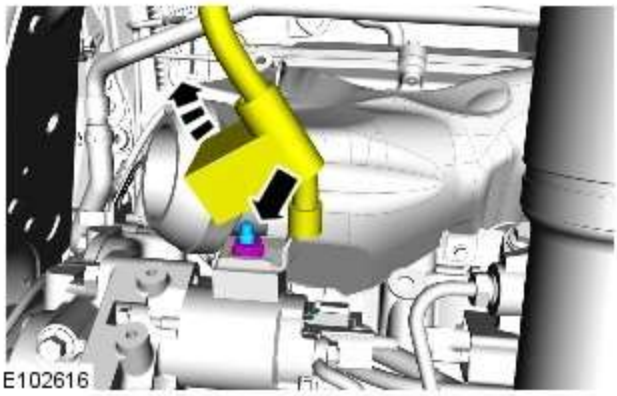

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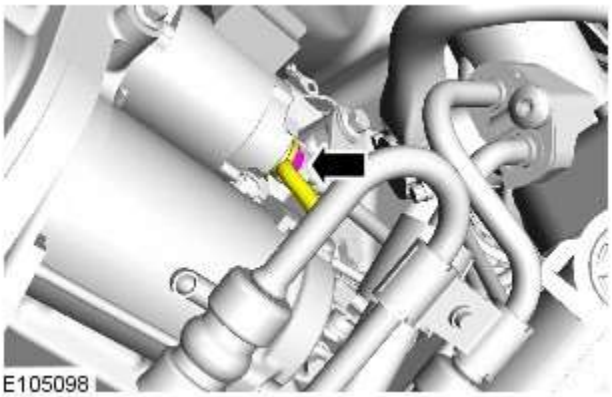

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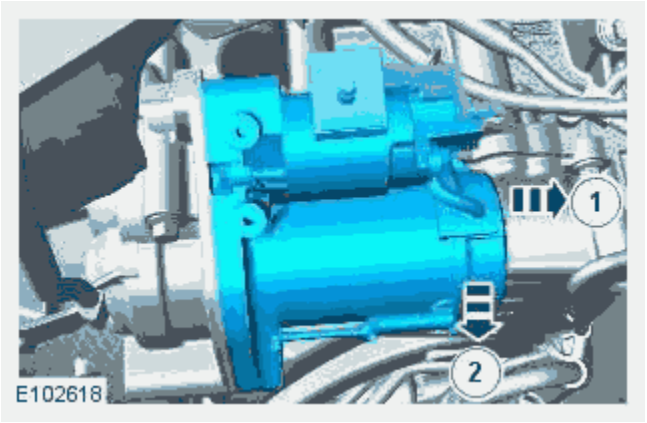
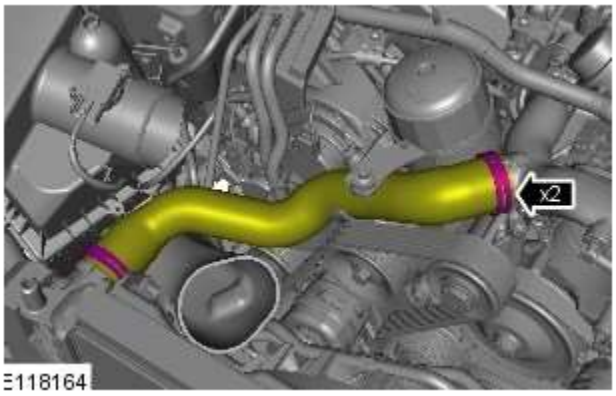


22. Lower the vehicle.

23.



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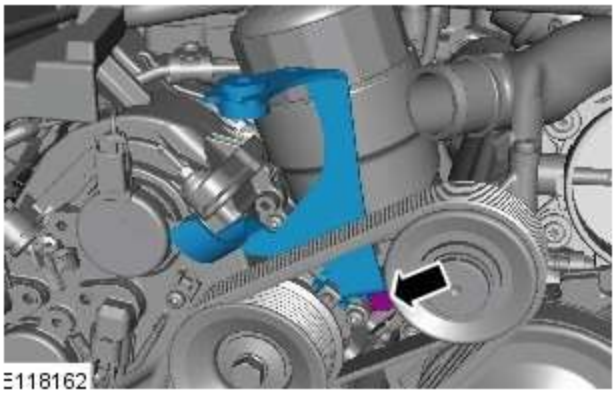

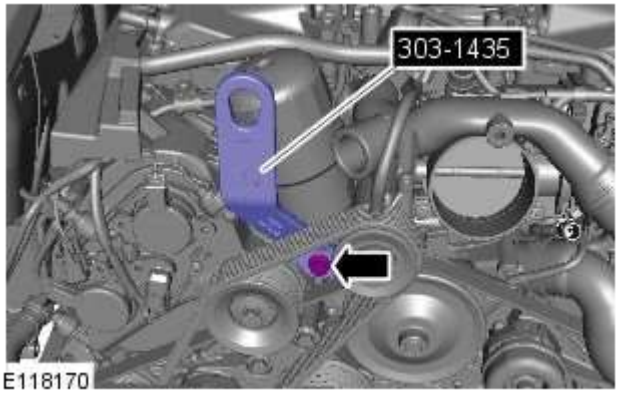

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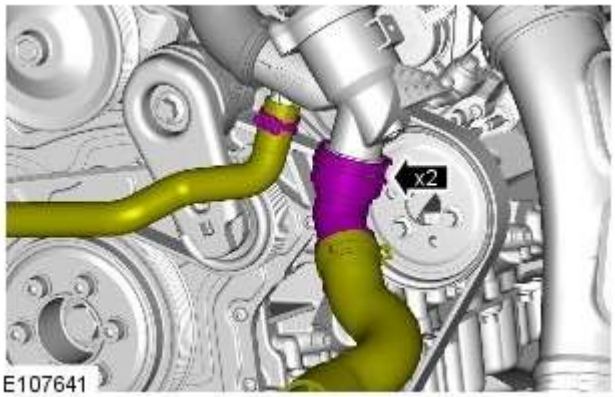
- *Special Tool(s):* 303-1435



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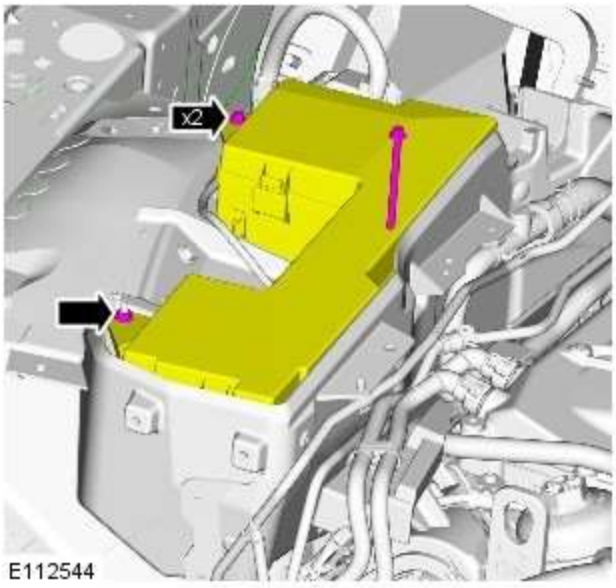

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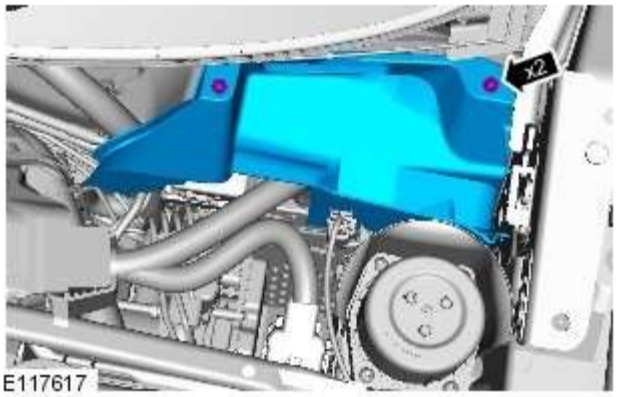

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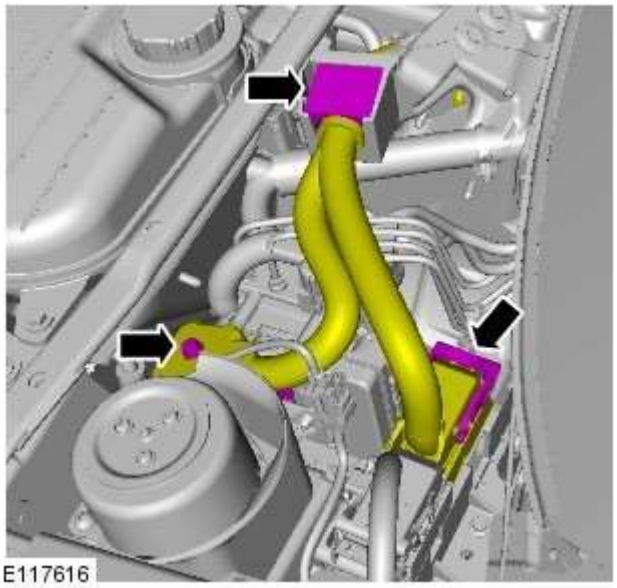

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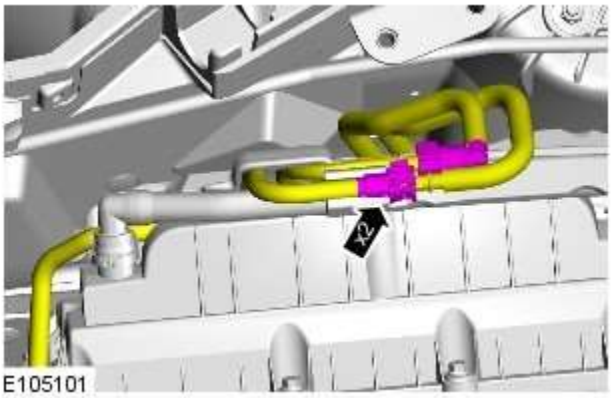
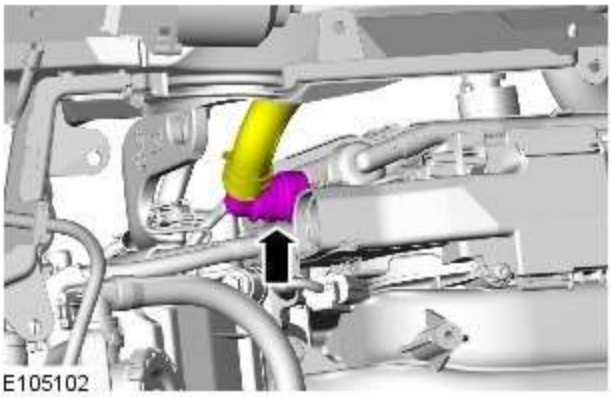


30. CAUTIONS:

Be prepared to collect escaping fluids.

Make sure that all openings are sealed. Use new blanking caps.

31.



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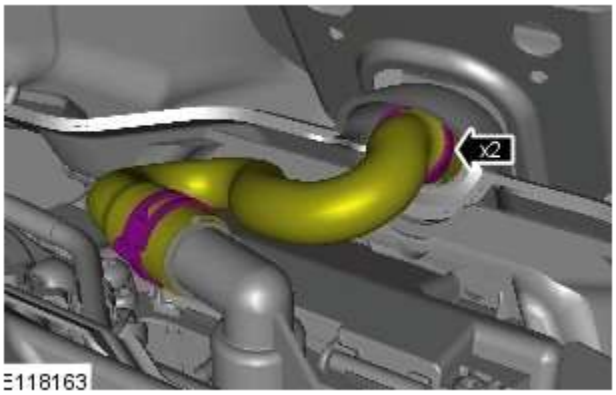

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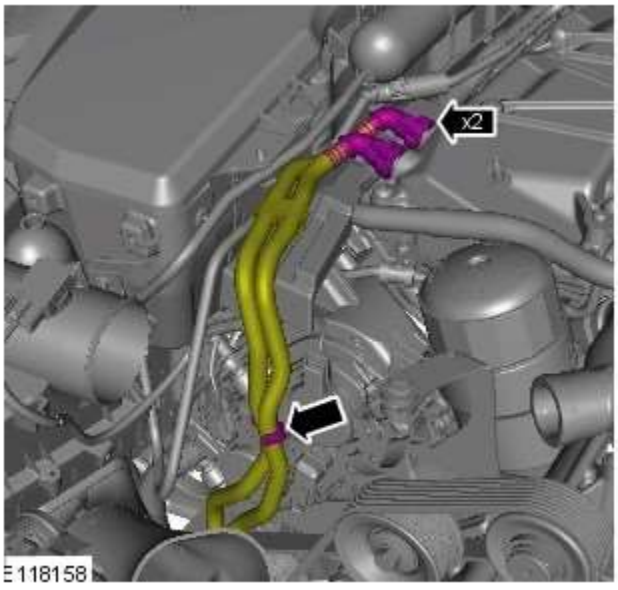

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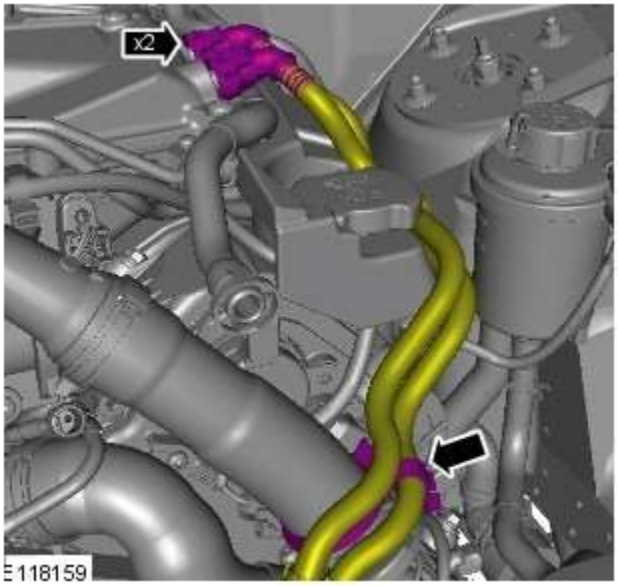

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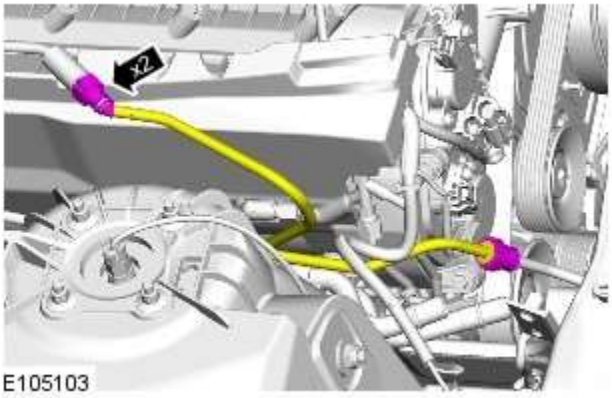

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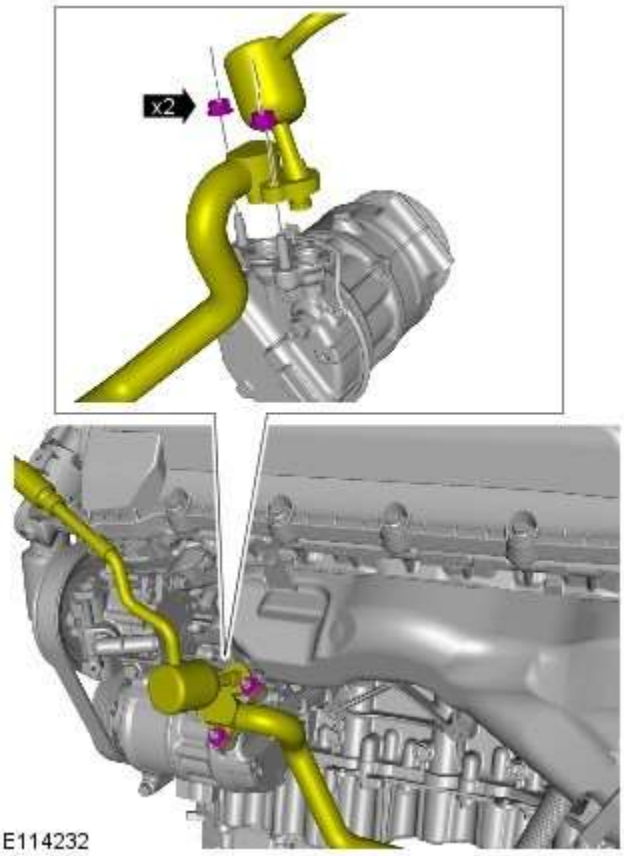

E114232

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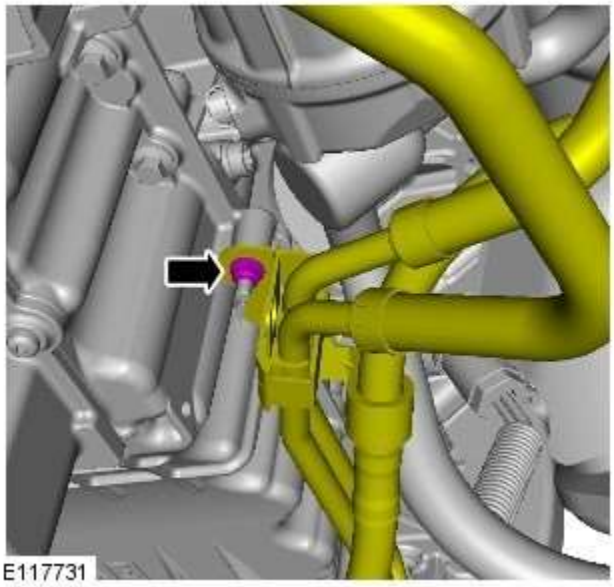
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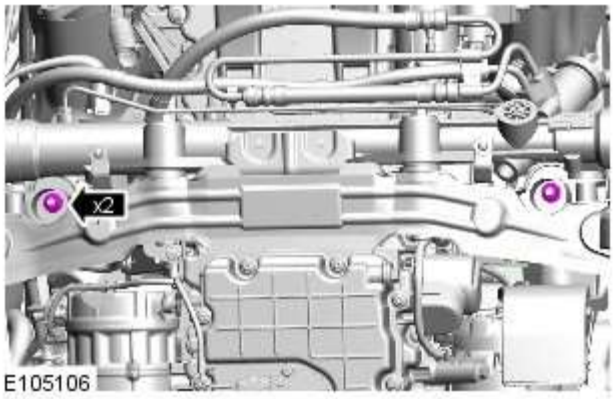

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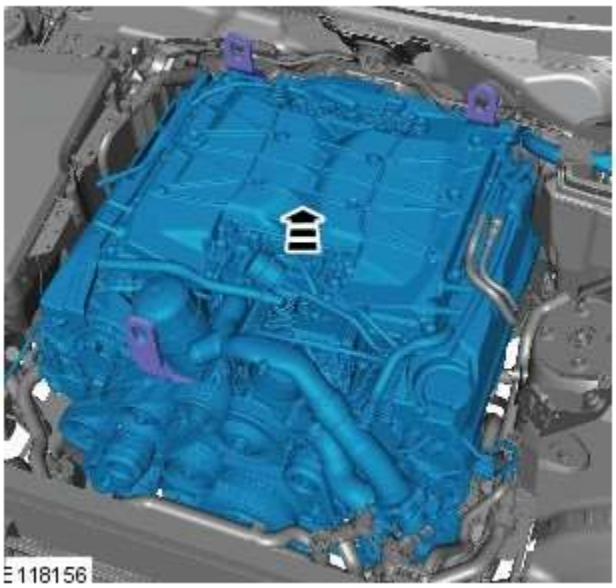


39. NOTE: This step requires the aid of another technician.

Using a suitable tool, remove the engine.

Published: 19-Nov-2013

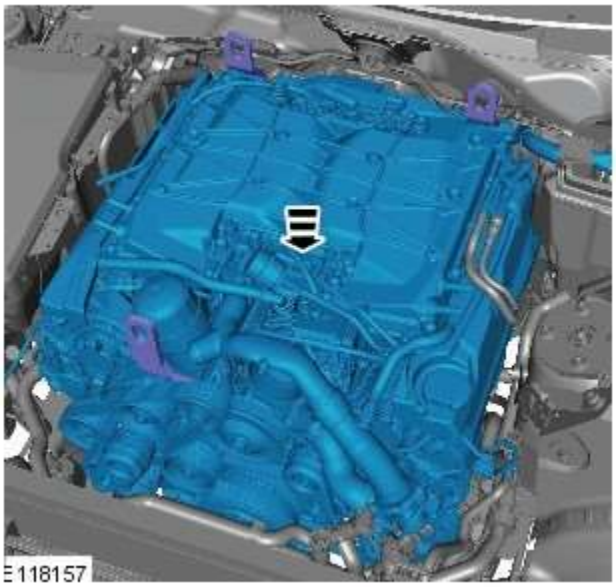
Engine - V8 S/C 5.0L Petrol - Engine

Installation

NOTES:

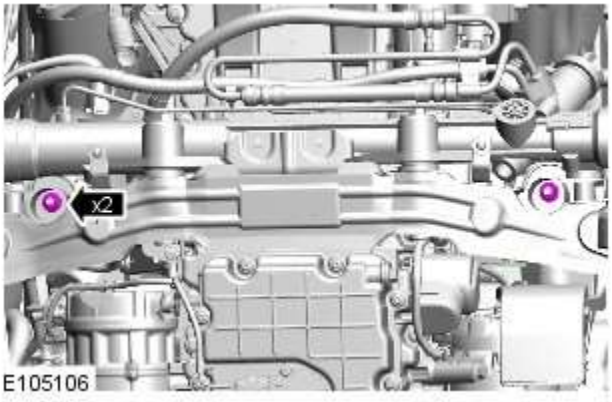
Some variation in the illustrations may occur, but the essential information is always correct.

If a new engine is to be installed, remove the intake manifold to access the top transmission retaining bolts.



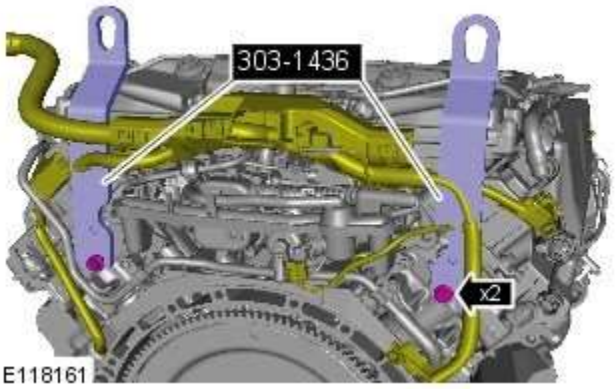
1. NOTE: This step requires the aid of another technician.

   Install the engine assembly.



2. *Torque:* 45 Nm

3.



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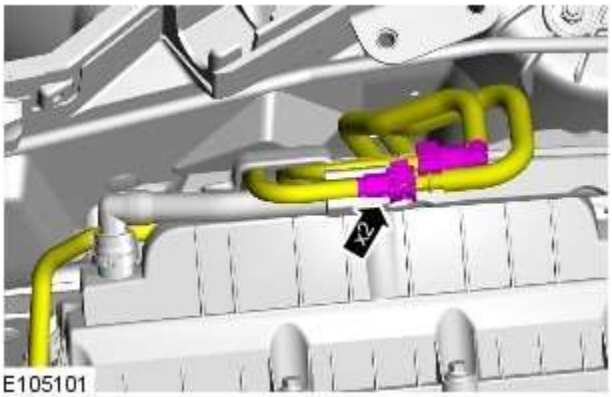
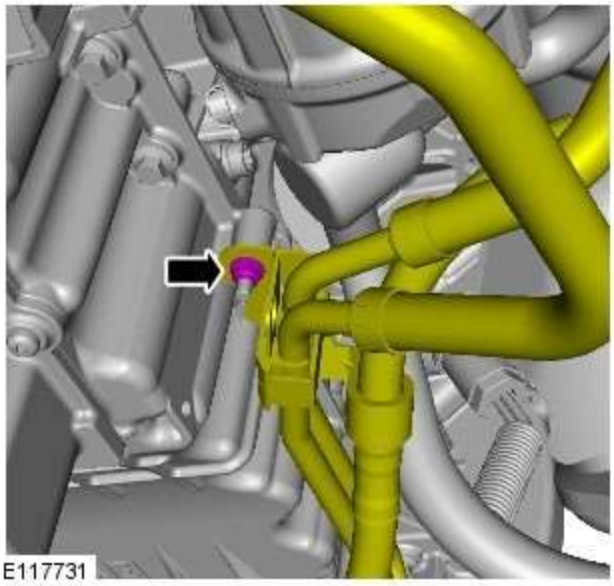
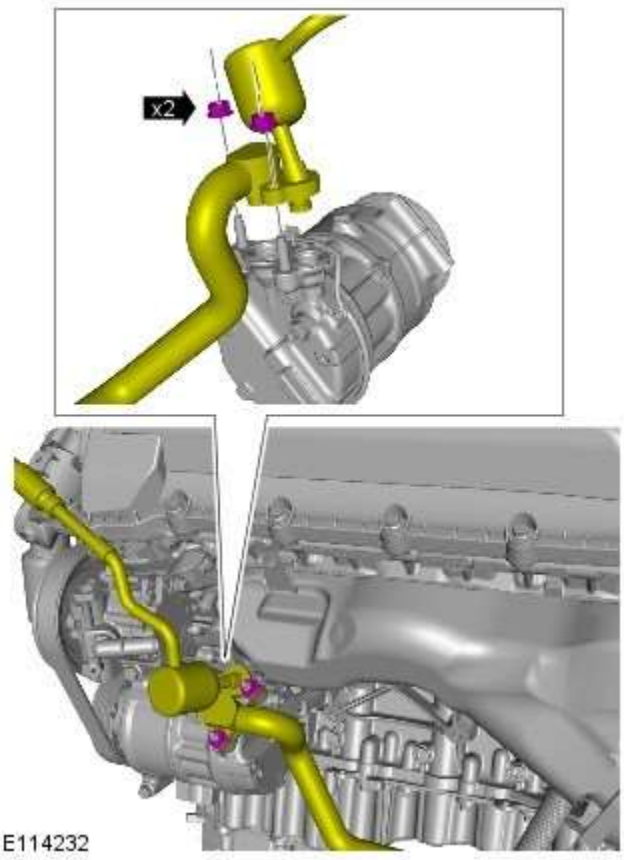


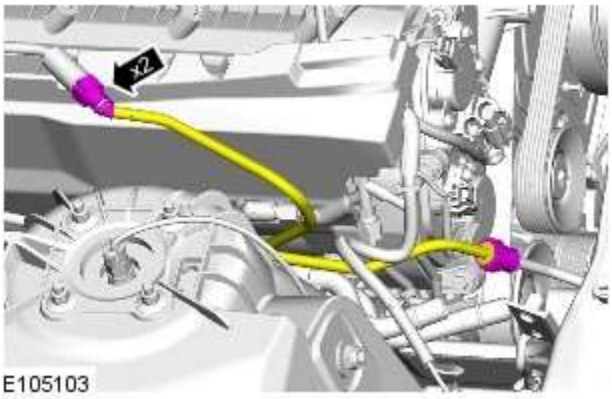
5. *Torque:* 12 Nm





6. CAUTION: Install new o-ring seals

Torque: 9 Nm



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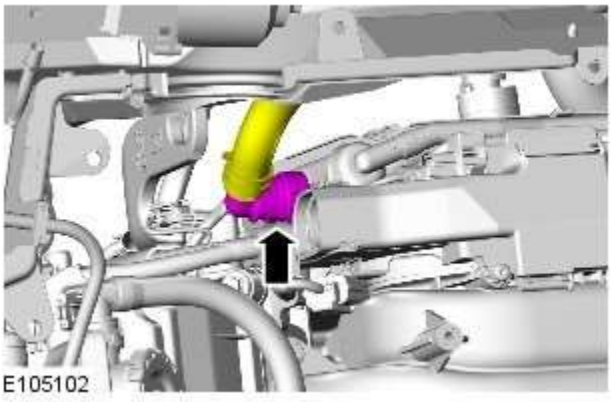

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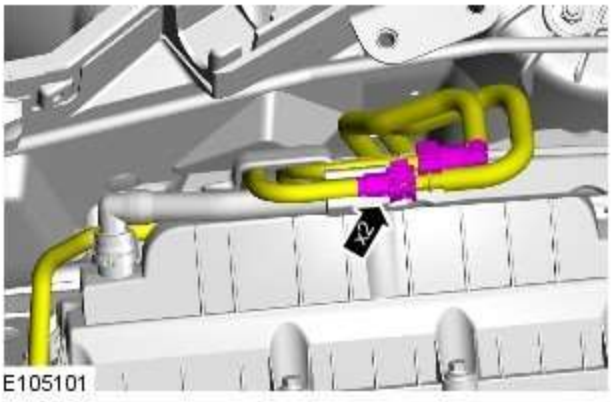
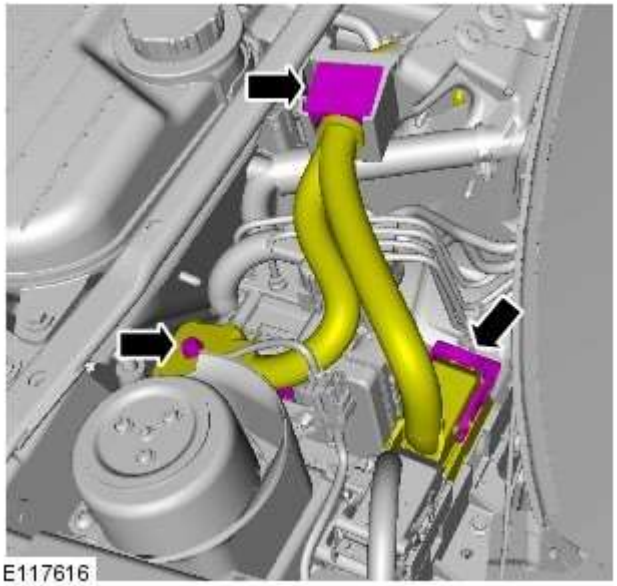
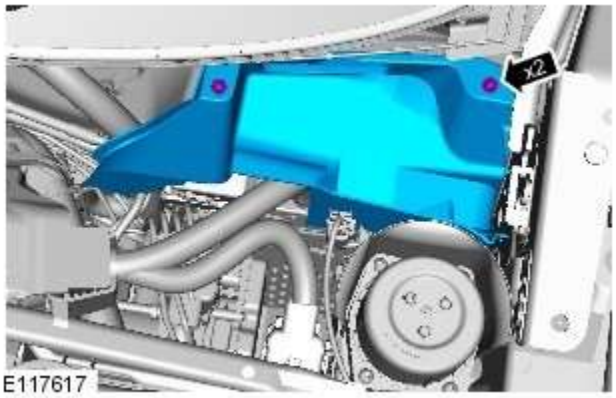


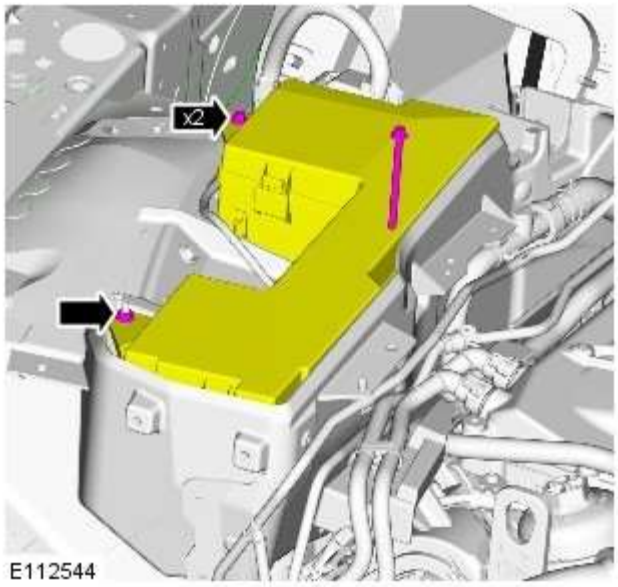
9. NOTE: Remove and discard the blanking caps.



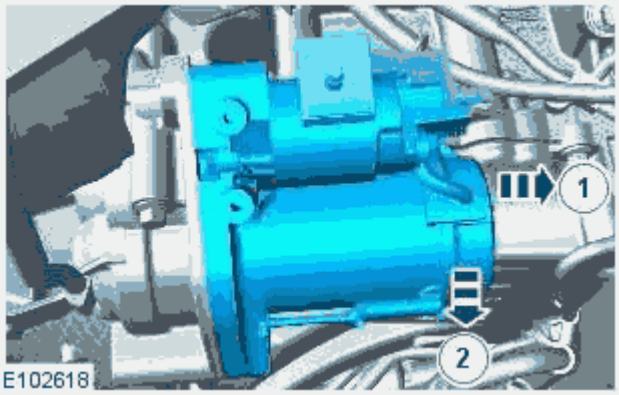
10. *Torque:* 3 Nm



11. *Torque:* 9 Nm



12. *Torque:* 9 Nm



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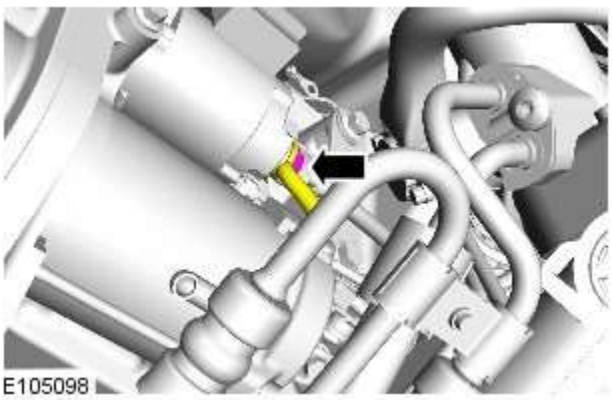
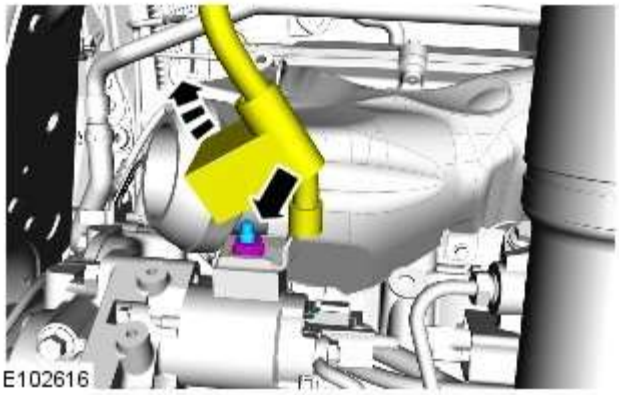
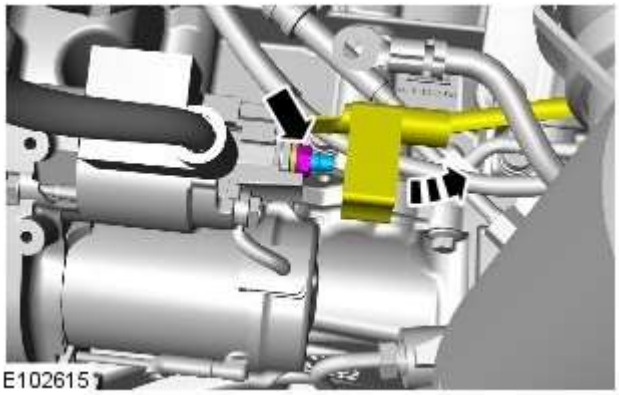


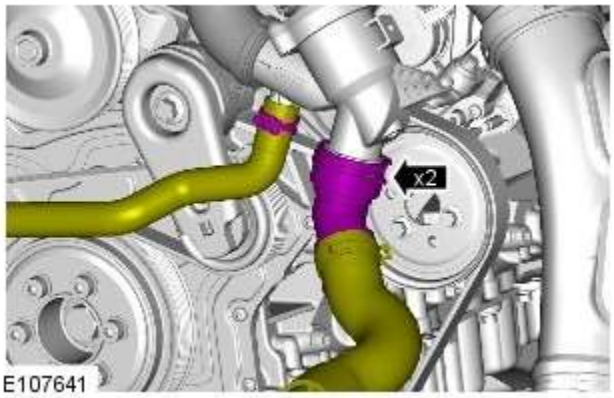
14. *Torque:* 10 Nm



15. *Torque:* 12 Nm

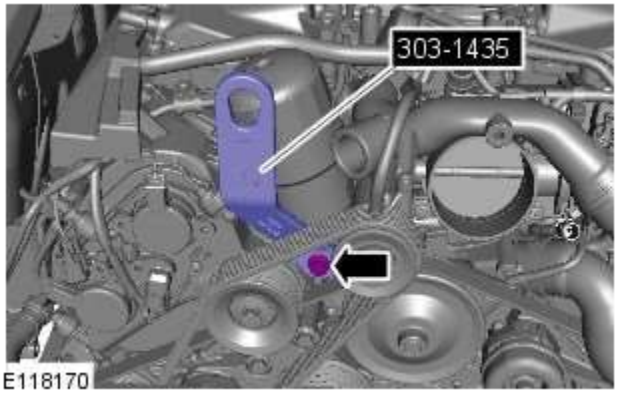


16. *Torque:* 12 Nm



17.

18. Lower the vehicle.



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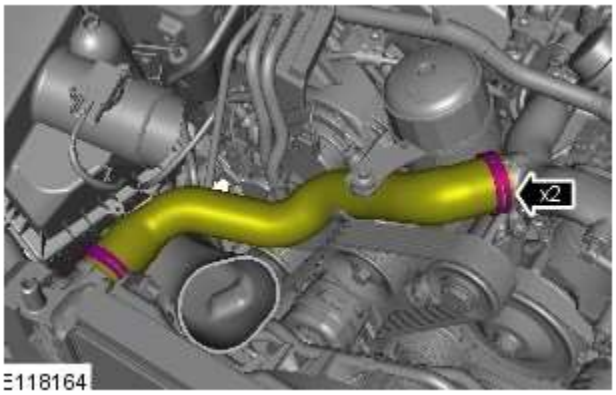

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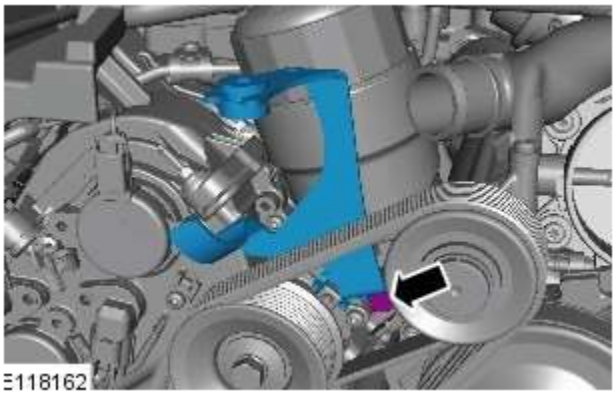
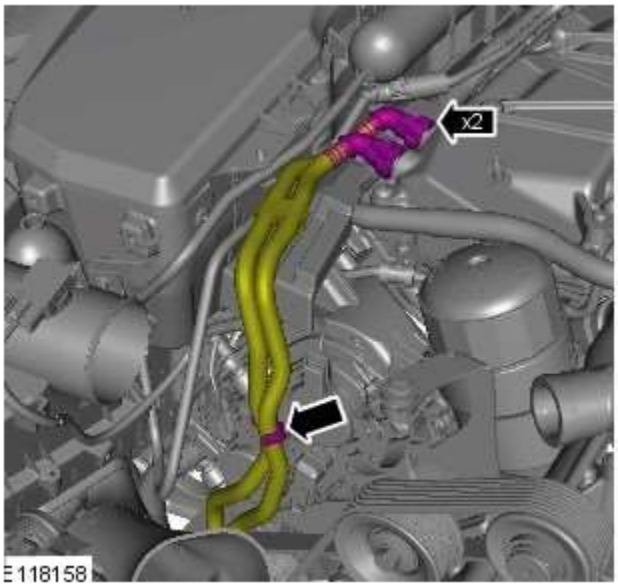


21. *Torque:* 25 Nm

22.



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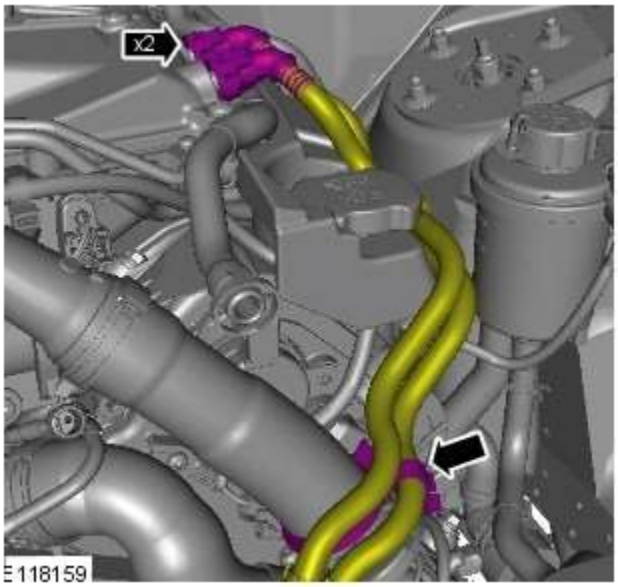

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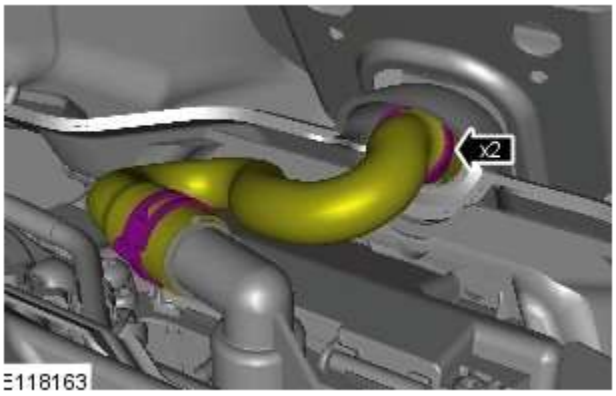

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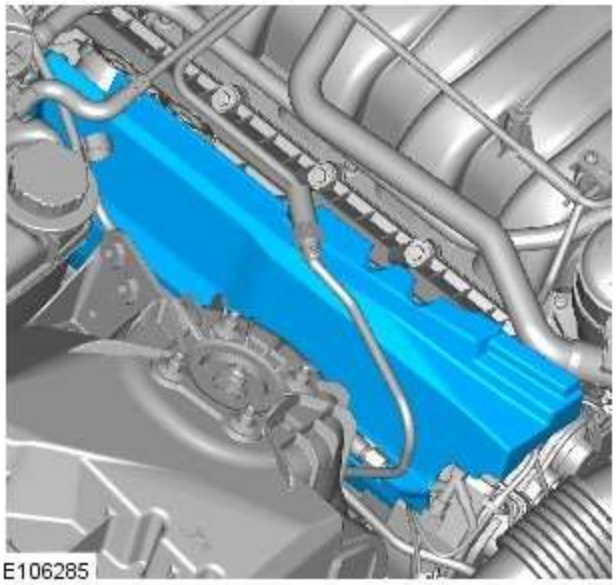

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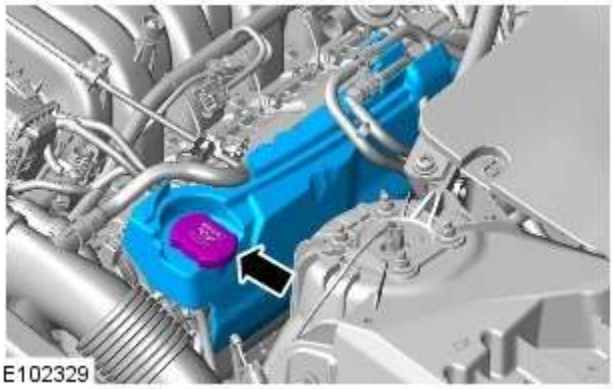


27. Refer to: Power Steering Fluid Reservoir - V8 5.0L Petrol/V8 S/C 5.0L Petrol (211-02 Power Steering, Removal and Installation).

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).

Published: 24-Jun-2011

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

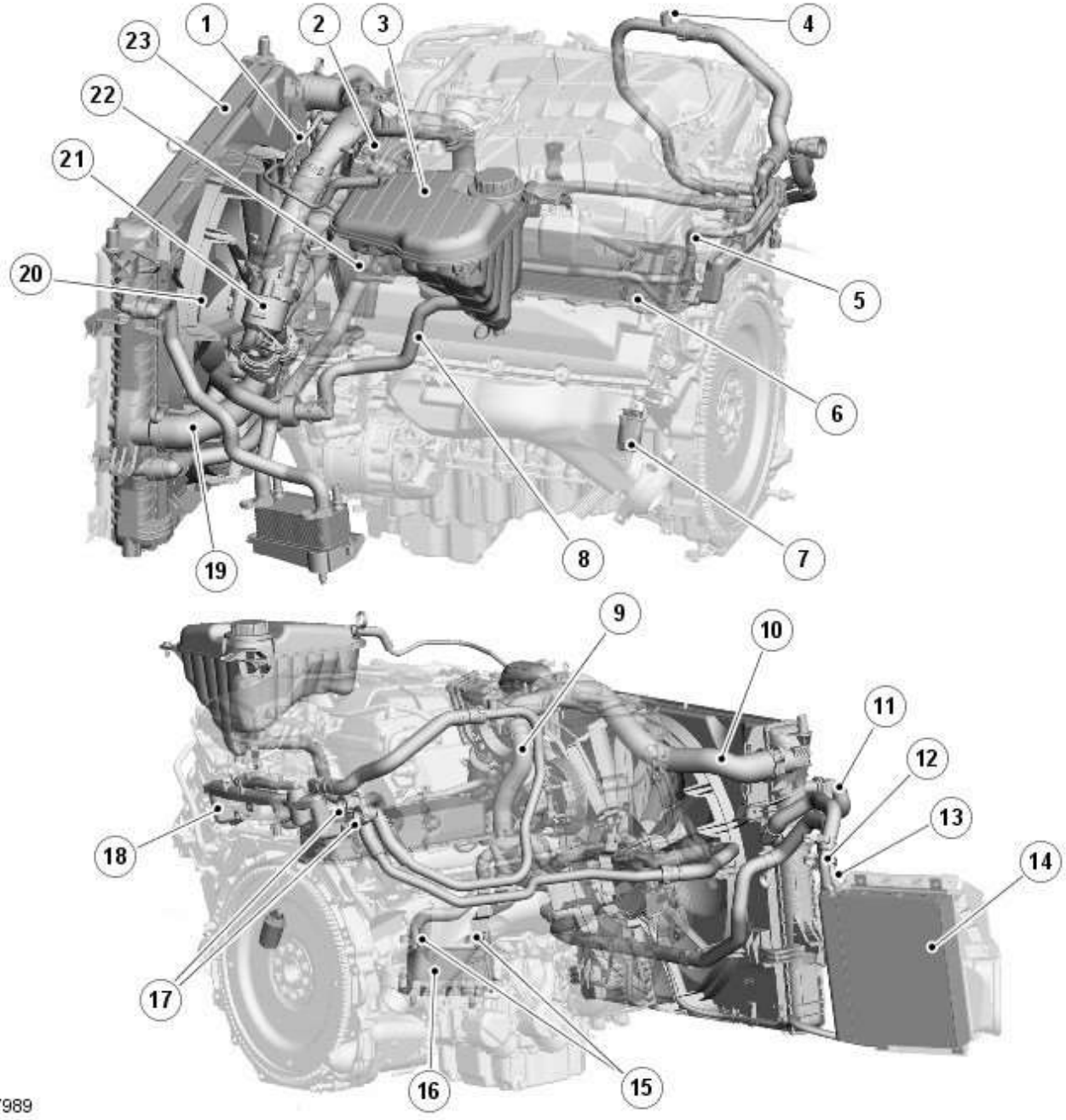
Description	Nm	lb-ft	lb-in
Coolant expansion tank retaining bolt	7	-	62
Cooling fan motor and shroud retaining nuts	7	-	62
Thermostat housing retaining bolts	10	7	-
Coolant pump retaining bolts	11	8	-
Radiator retaining bolts	9	-	80
Radiator drain plug	2	-	18
Coolant bleed screw(s)	3	-	27

Published: 11-May-2011

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Cooling - Component Location

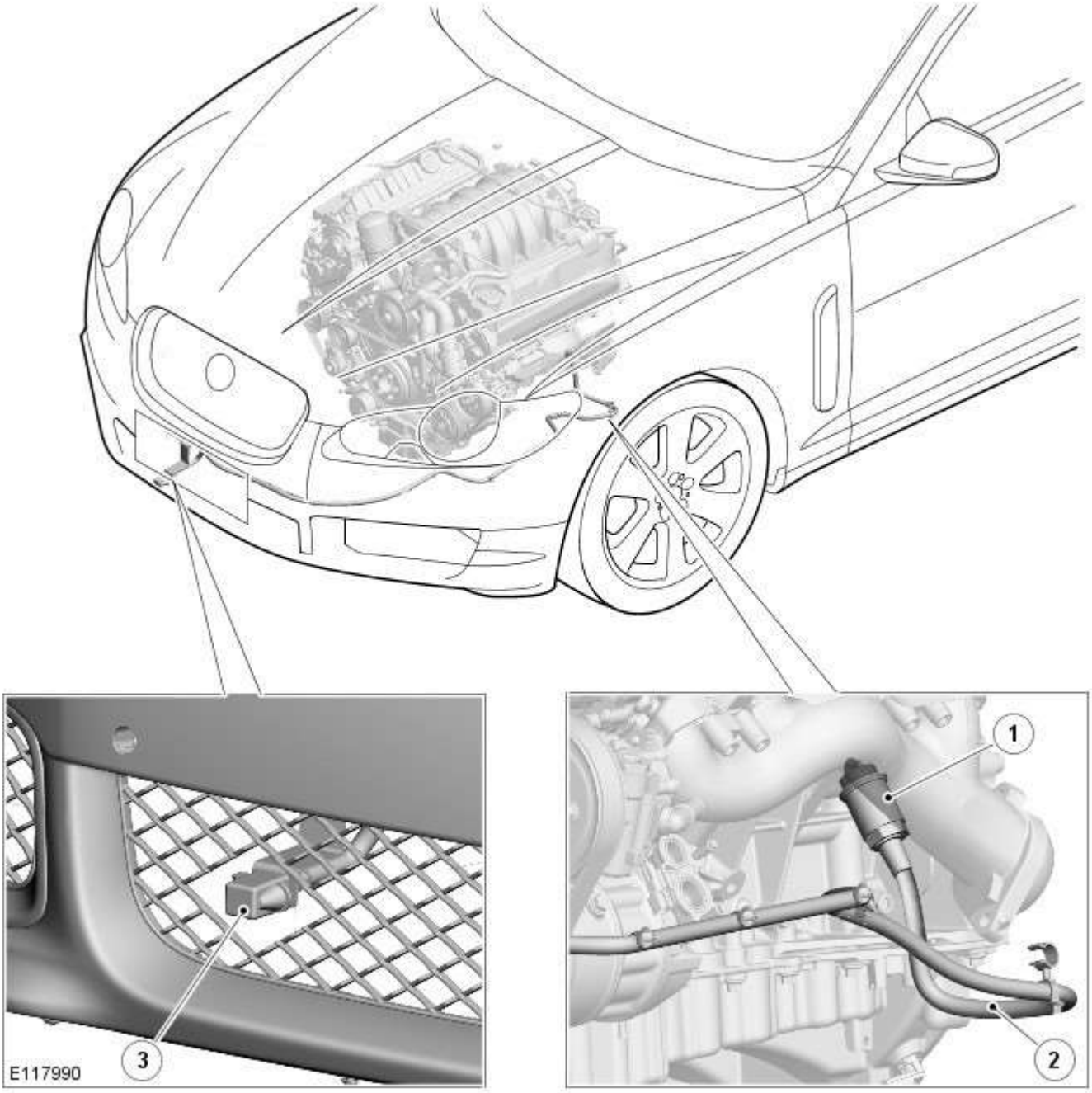
Description and Operation

COMPONENT LOCATION - SHEET 1 OF 2 (SUPERCHARGER VEHICLES)



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

COMPONENT LOCATION - SHEET 2 OF 2



Item	Description
1	Engine block heater **Comments:** 110 V ac version shown, 240 V ac version similar.
2	Harness
3	Connector

Published: 11-May-2011

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.

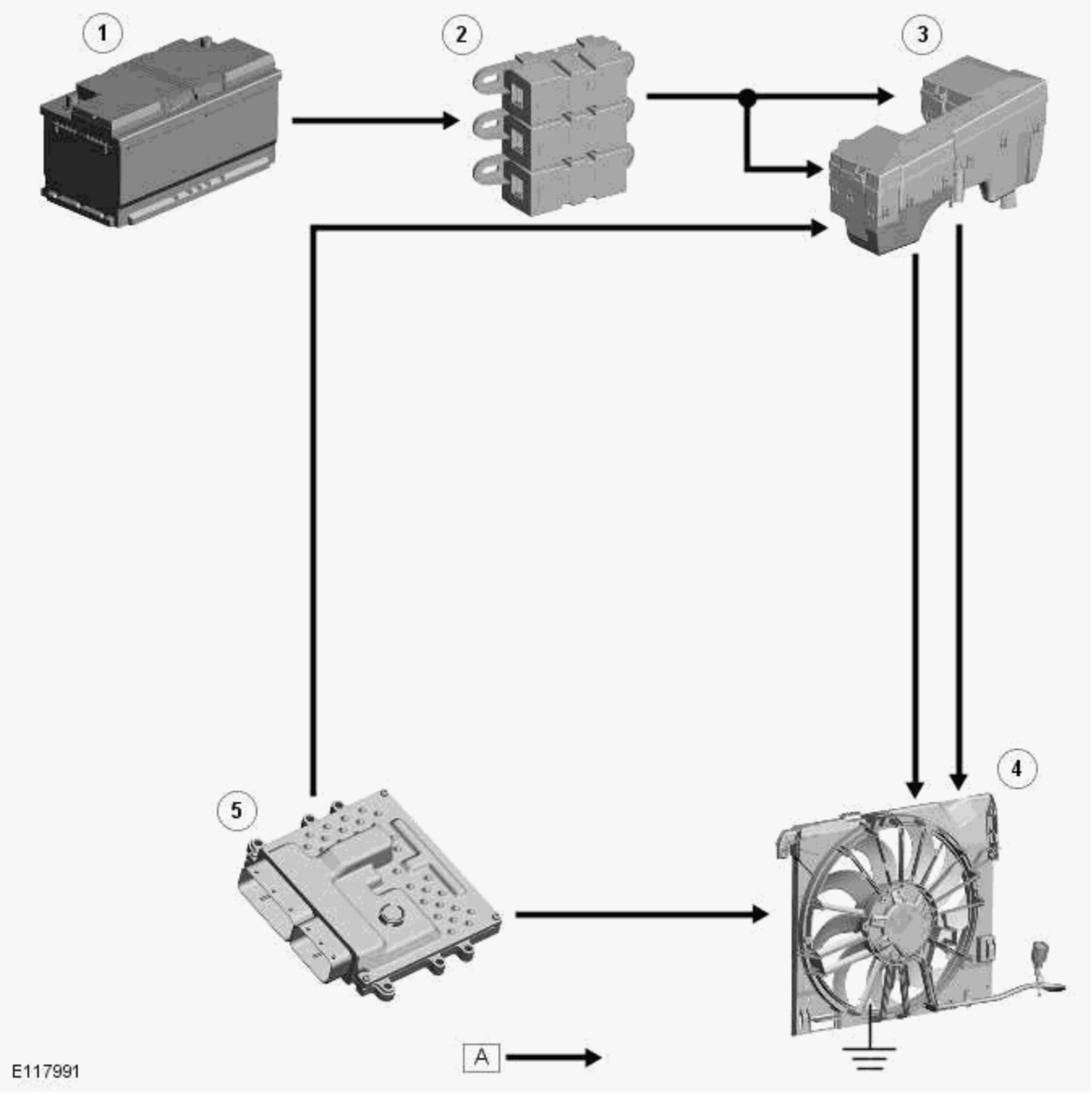
Published: 11-May-2011

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Cooling - System Operation and Component Description

Description and Operation

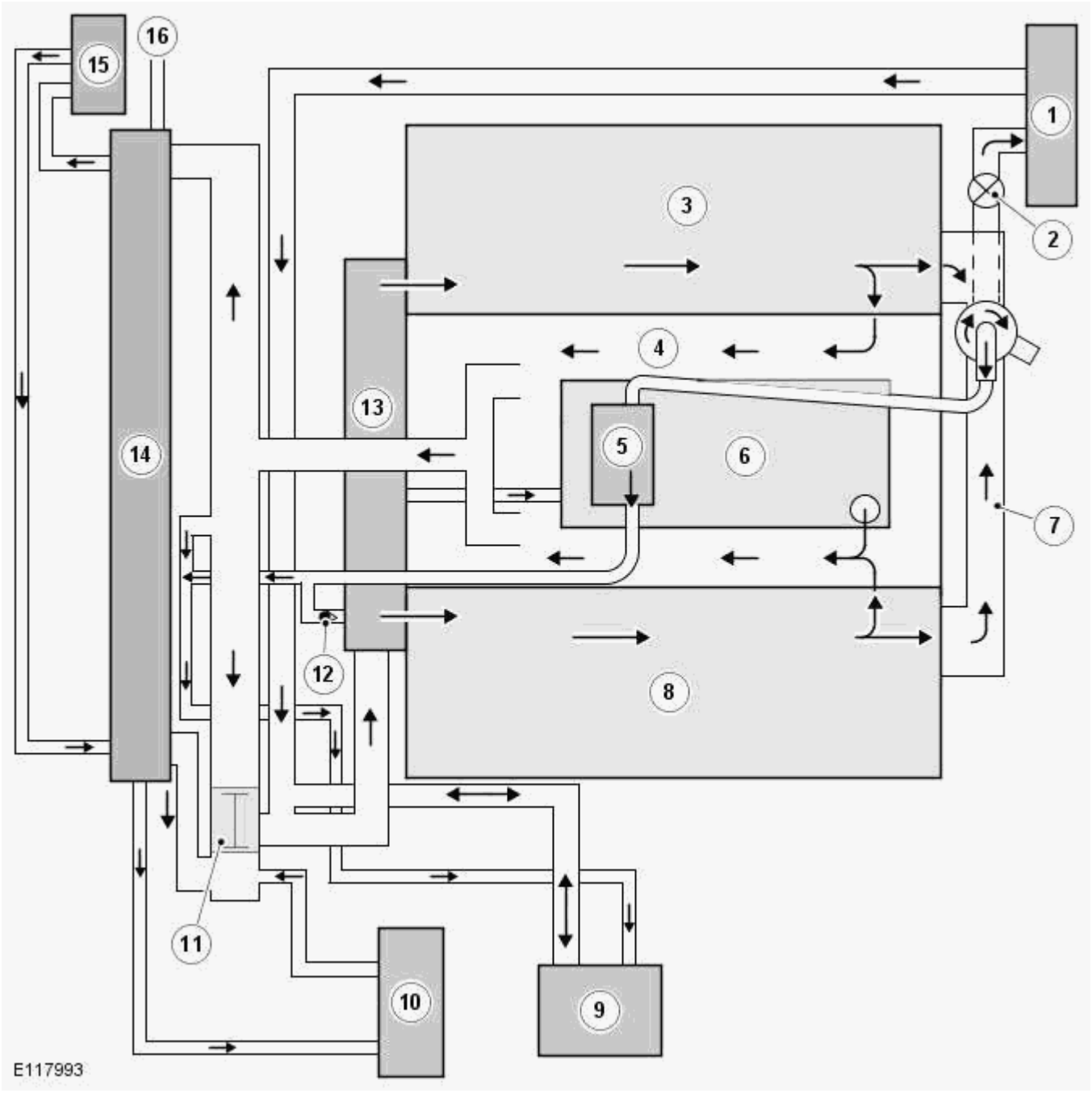
Control Diagram

NOTE: **A** = Hardwired



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



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.

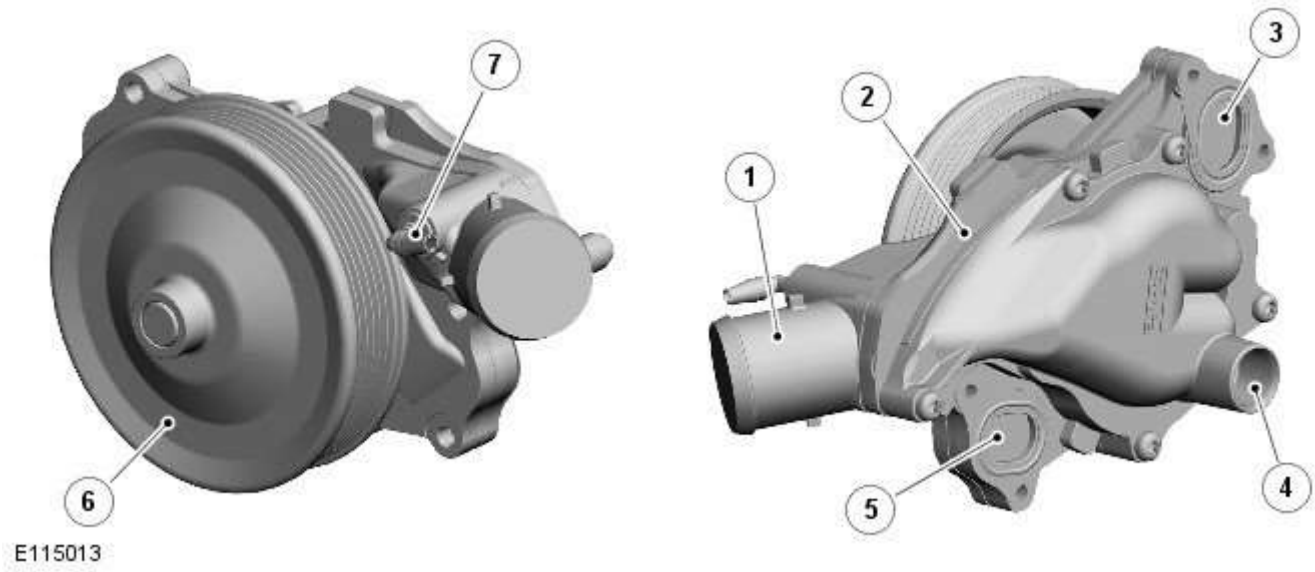
The cooling fan is operated by a fan control module integrated into the cooling fan motor. The fan control module regulates the voltage, and thus speed, of the cooling fan motor in response to a PWM (pulse width modulation) signal from the ECM (engine control module).

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

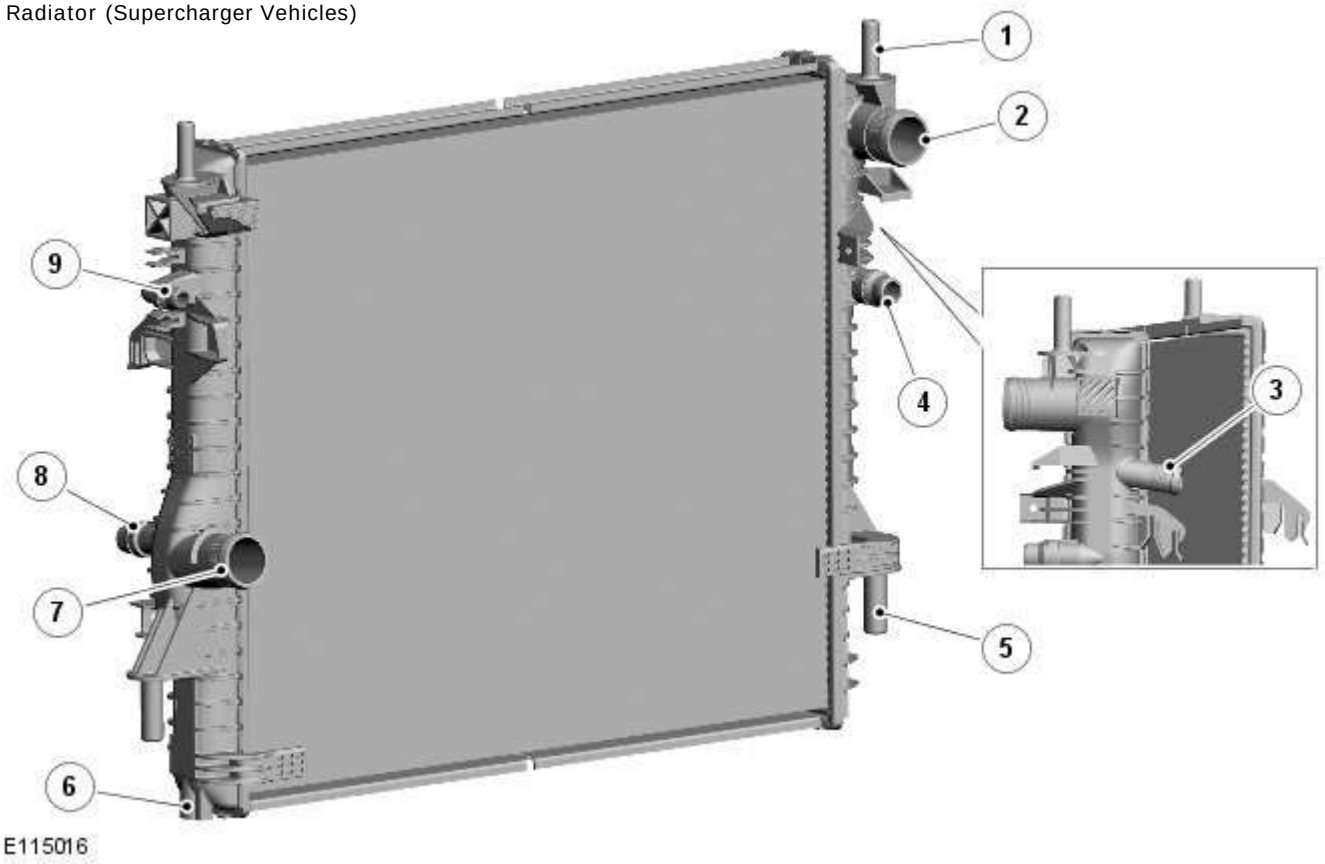
The thermostat is a multi-stage device located in the coolant pump inlet to provide fast response and control of the engine outlet temperature.

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 engines 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)



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.

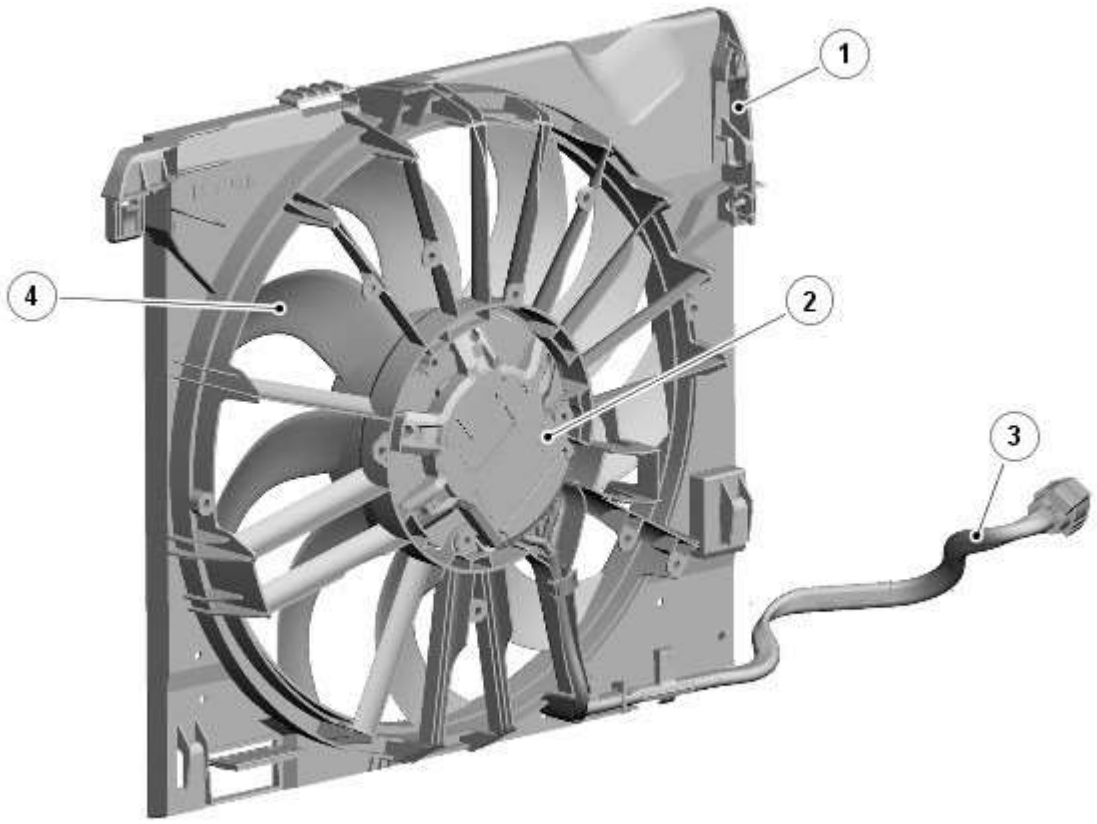
The two end tanks incorporate connections for the upper and lower hoses, the coolant supply hose of the transmission fluid cooler and, on SC vehicles, the supply and return hoses of the auxiliary radiator. A drain plug is installed in the bottom of the LH (left-hand) end tank.

AUXILIARY RADIATOR (SUPERCHARGER VEHICLES ONLY)

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

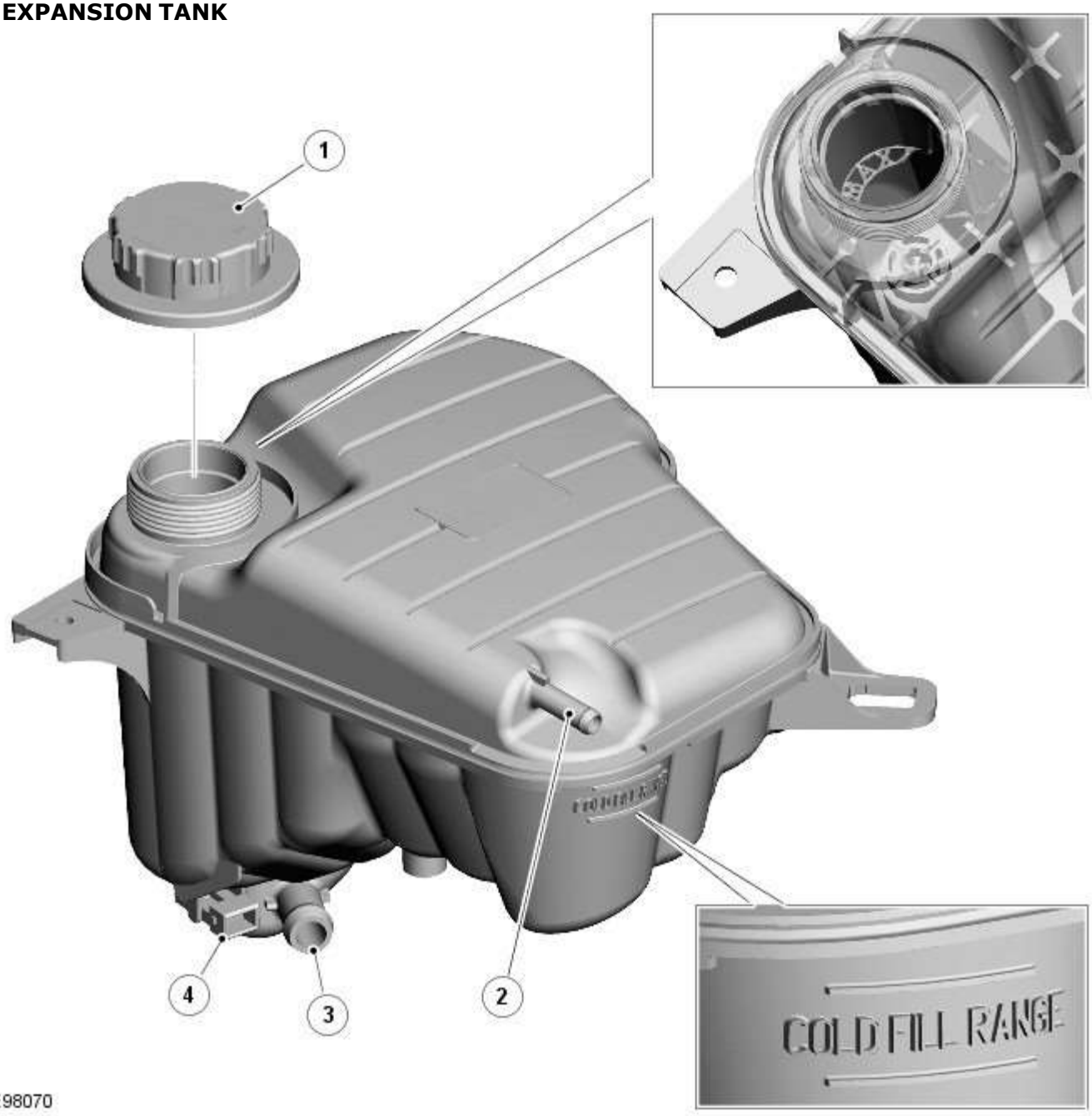


E115018

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



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.

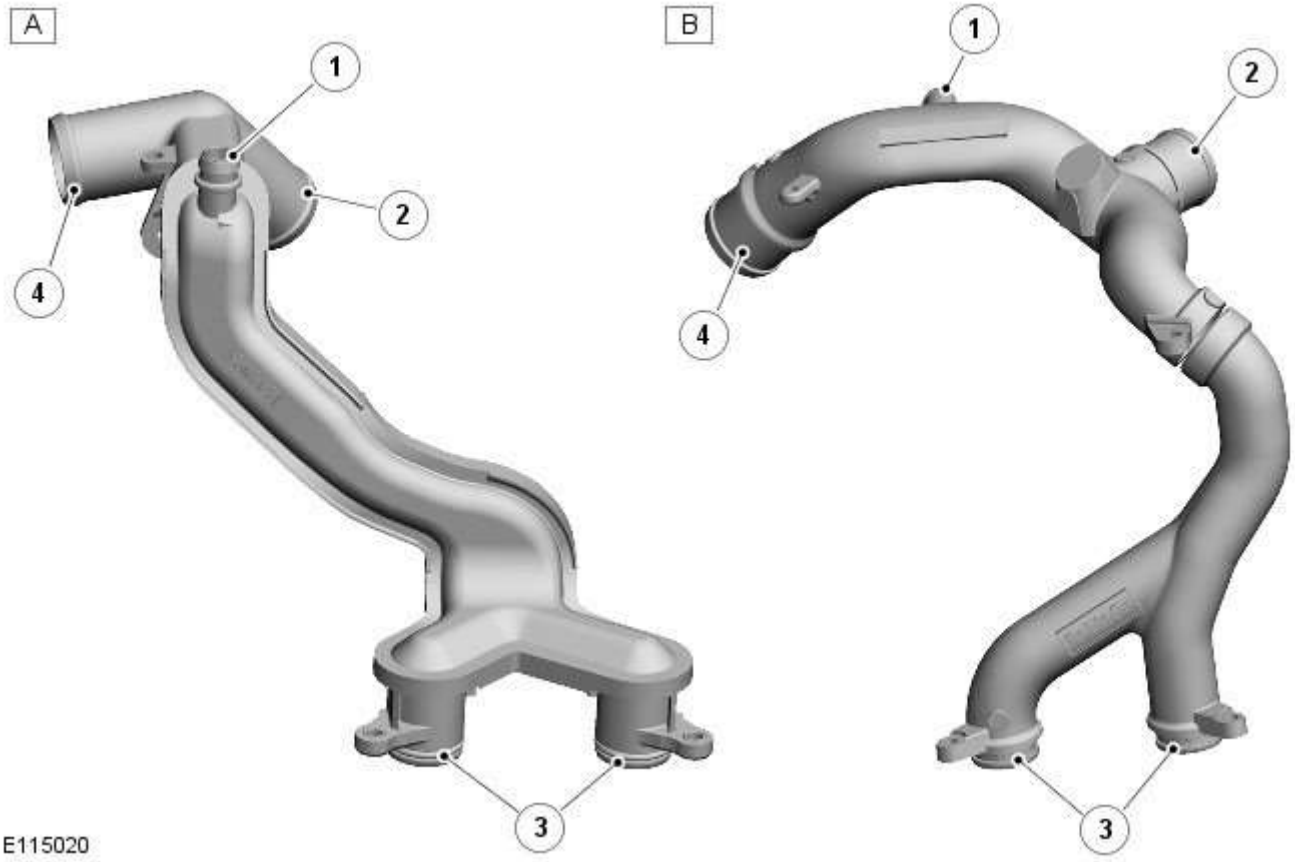
The expansion tank provides the following functions:

- 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.

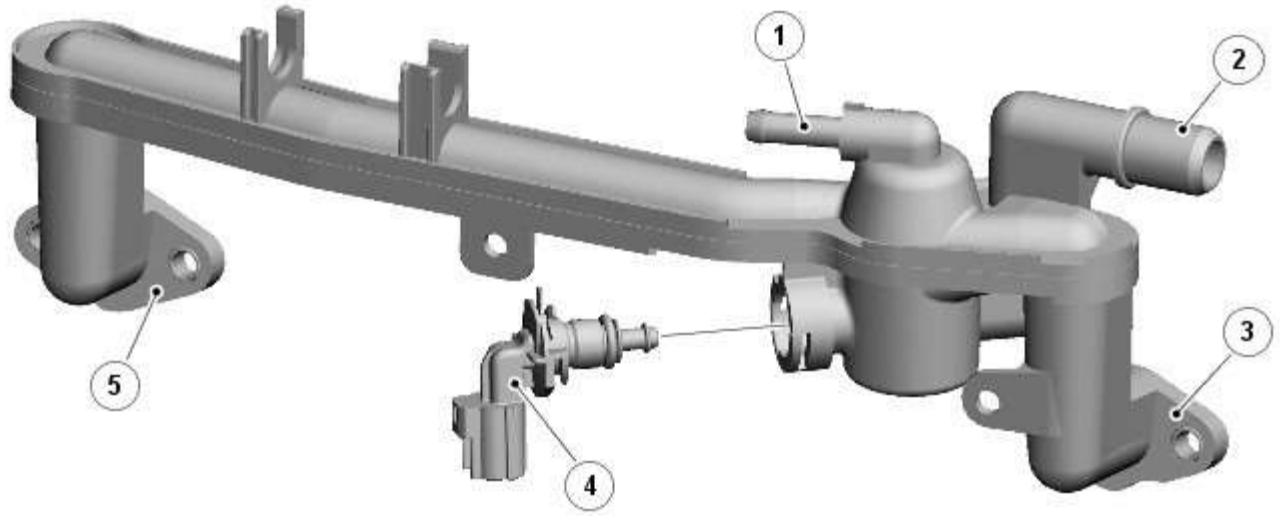
OUTLET TUBE AND HEATER MANIFOLD

Outlet Tube



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



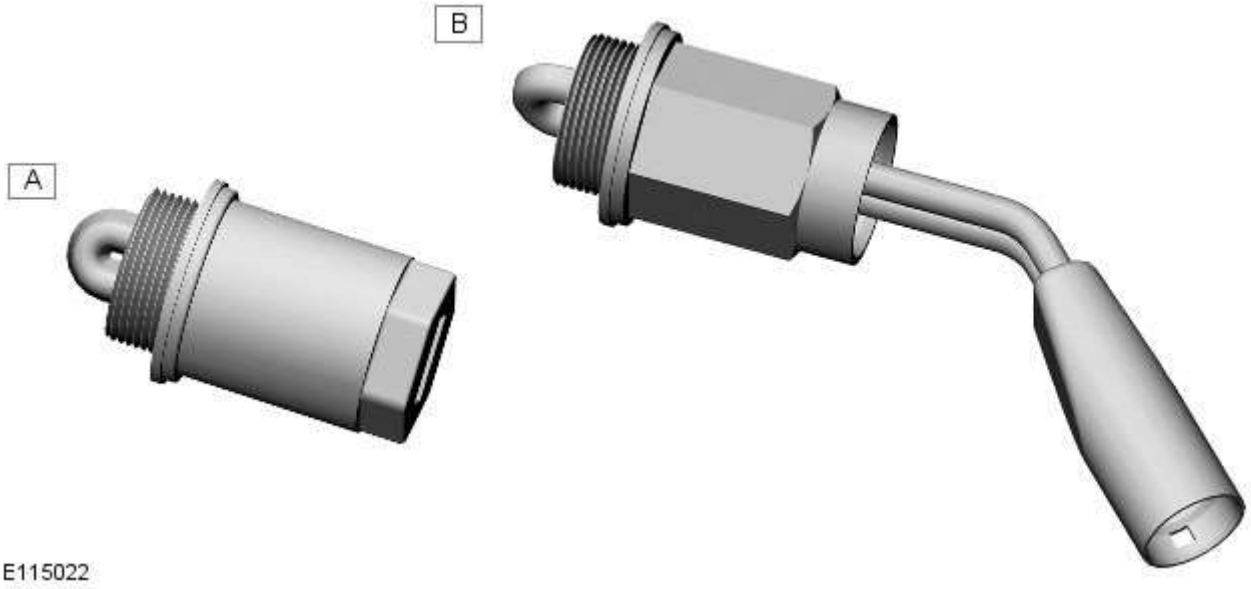
E115021

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.

Published: 17-Apr-2014

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
• Coolant leaks • Coolant hoses • Coolant expansion tank • Radiator • Heater core • Accessory drive belt • Cooling fan	• 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	• 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	• 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
	• Engine coolant temperature sensor • Restricted air flow over the radiator	
Engine not reaching normal temperature	• 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	• Circuit reference PWM - Duty cycle is implausible • Circuit reference PWM - Frequency out of range • Circuit reference PWM - Circuit is open circuit • Circuit reference PWM - Circuit is short circuit to power • Circuit reference PWM - 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	• Circuit reference - IGN - - Circuit is open circuit • Circuit reference - IGN - - 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	
	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).
	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 (0X03F9) -**
	2 Record the value of the datalogger signal – **Electric Fan PWM Control - Commanded (0X03F9) -**
	Is the value of the datalogger signal – **Electric Fan PWM Control - Commanded (0X03F9) -**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 resistanceRefer to the electrical circuit diagrams and check the following connectors for signs of water ingress, and pins for damage and/or corrosionEngine control module, connector and wiringCircuit reference - ECFC -Cooling fan motor control unit connector and wiringCircuit reference - VBATT -Circuit reference - IGN -Circuit reference - PWM -Circuit reference - GND -Battery junction box, connector and wiringEngine junction box, connector and wiringCheck 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 (0X03F9) -**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 (0X03F9) -**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 • 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 - Megafuses

	- Megafuse fixing nuts • Engine junction box - Megafuse - Megafuse fixing nuts - Fuses - Engine control module relay
	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? **Yes** Rectify as required **No** Proceed to the next step. A9 'Cooling fan validation procedure'
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 (0XF405) -**and - **Electric Fan PWM Control - Commanded (0X03F9) -** as the engine coolant temperature reaches operating temperature the fan speed should also increase between the values of 9 and 90%
	Did the cooling fan rotate at increasing speed as engine coolant temperature increased? **Yes** Return vehicle to customer **No** Contact dealer technical support

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).

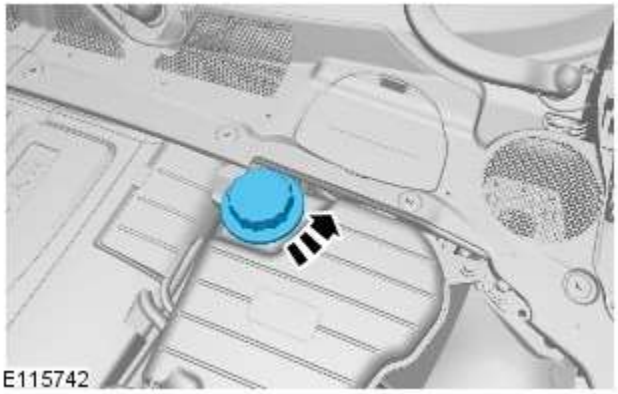
Published: 11-May-2011

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.

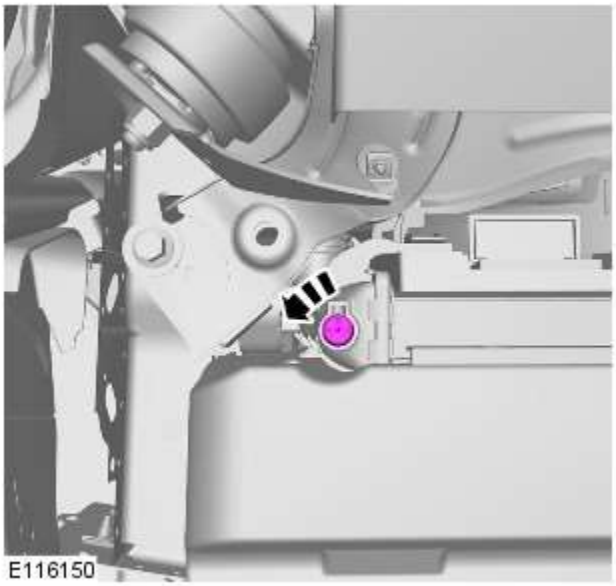
   CAUTIONS:

   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

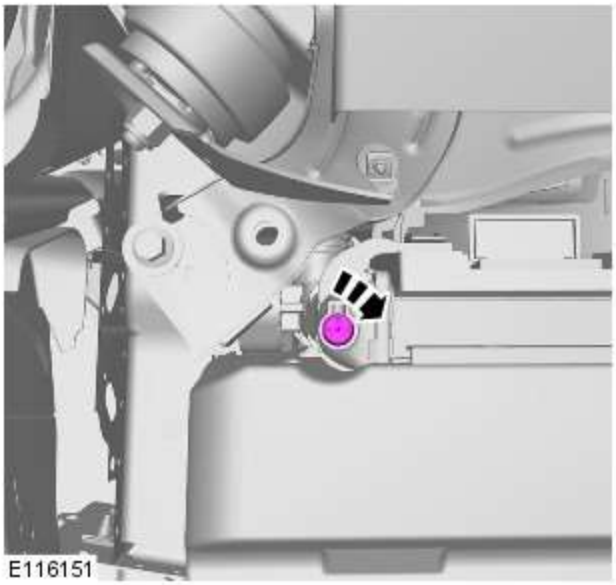
   Be prepared to collect escaping coolant.

3. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

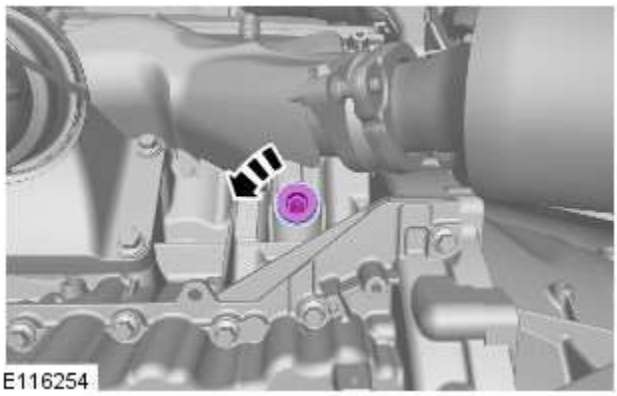
   Raise and support the vehicle.



4. CAUTION: Be prepared to collect escaping coolant.


E116151

5. *Torque:* 2 Nm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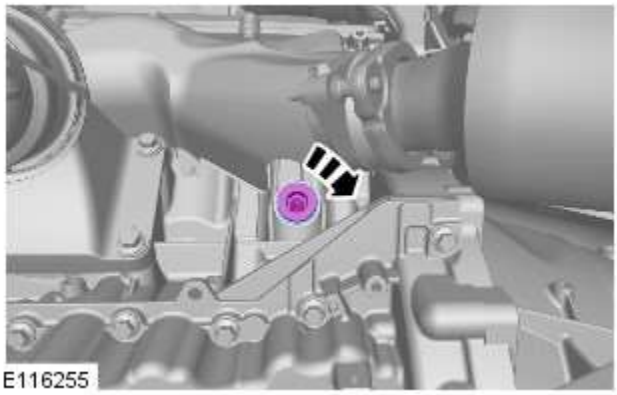
6. CAUTION: Be prepared to collect escaping coolant.

NOTE: Only carry out the following step if the coolant is to be drained from the engine.


E116255

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 emited 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.

Published: 14-Feb-2013

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

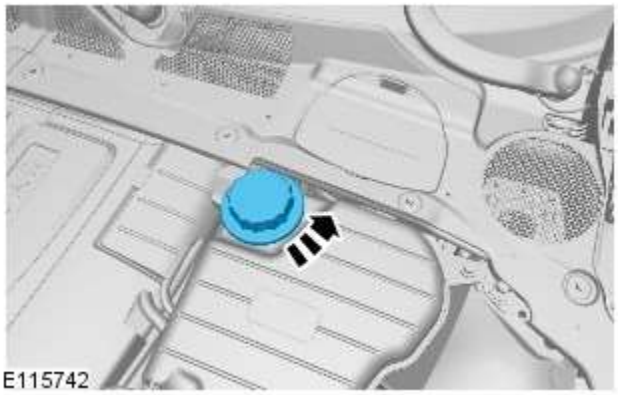
General Procedures

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).

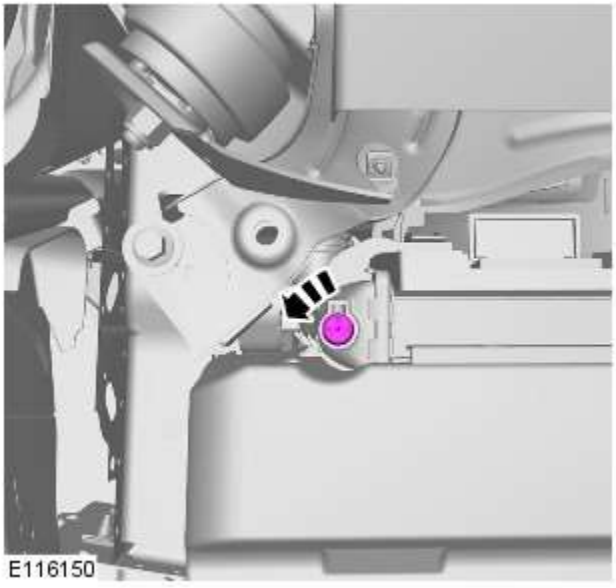


3. WARNINGS:

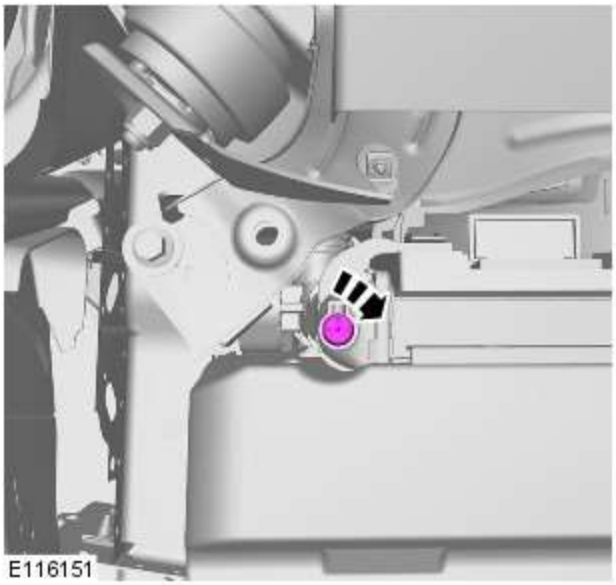
   Release the cooling system pressure by slowly turning the coolant expansion tank cap a quarter of a turn. Cover the expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

   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

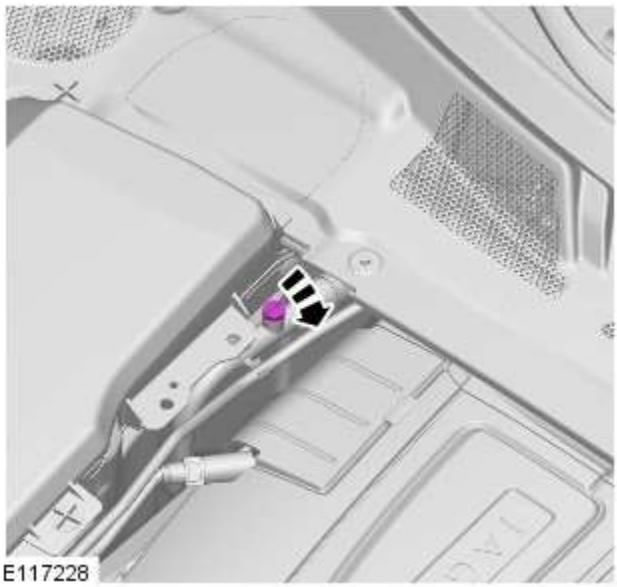
1. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

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.


E117228

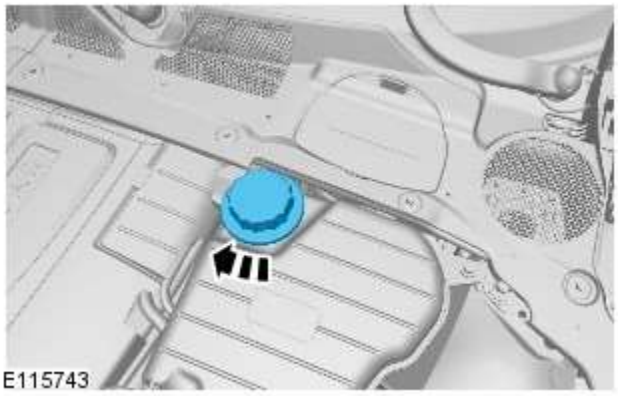
5.
- Continue to fill the coolant until the maximum level is reached.

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 the start the engine and return to Step 7.


E115743

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.

Published: 14-Feb-2013

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).

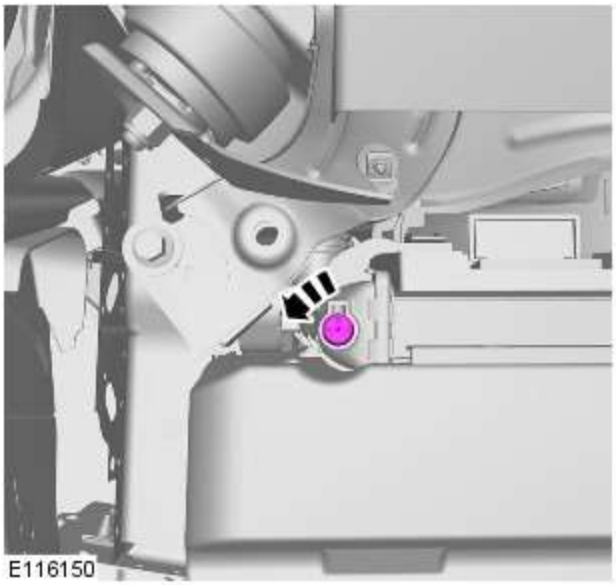
4. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

5. WARNINGS:

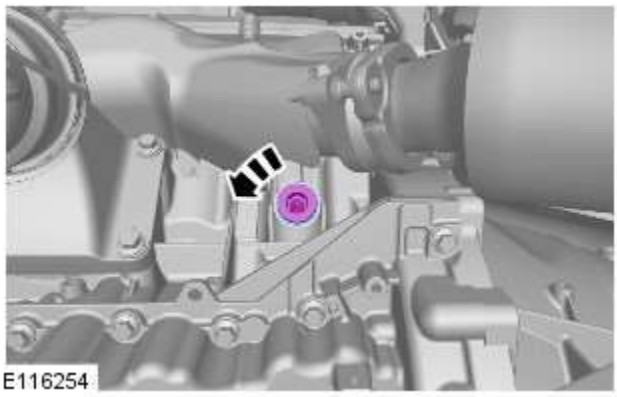
   Release the cooling system pressure by slowly turning the coolant expansion tank cap a quarter of a turn. Cover the expansion tank cap with a thick cloth to prevent the possibility of scalding. Failure to follow this instruction may result in personal injury.

   Be prepared to collect escaping fluid.

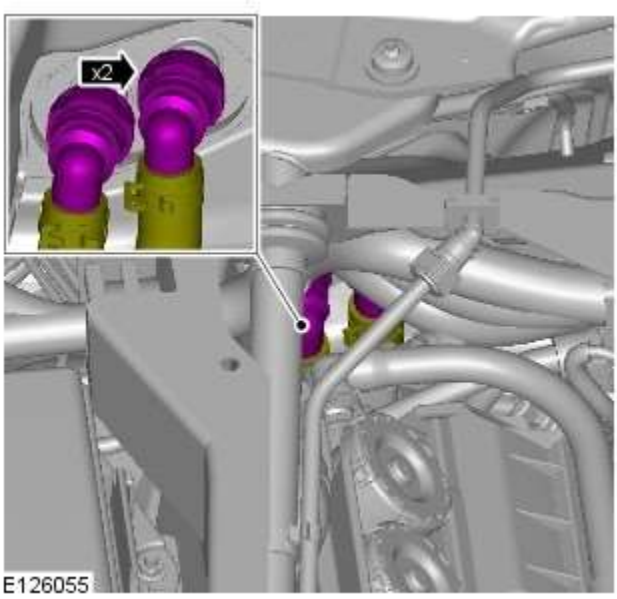
   CAUTION: Since injury such as scalding could be caused by escaping steam or coolant, make sure the vehicle cooling system is cool prior to carrying out this procedure.



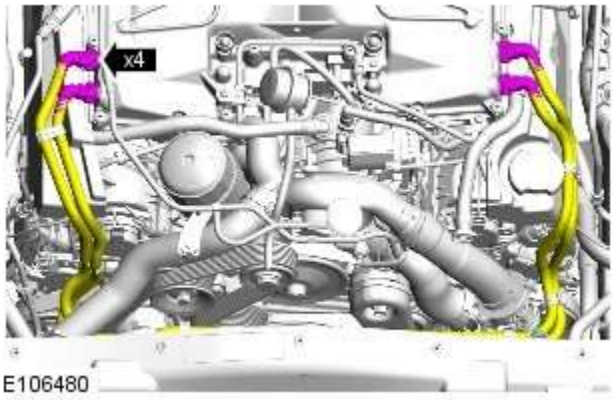
6. CAUTION: Be prepared to collect escaping fluids.



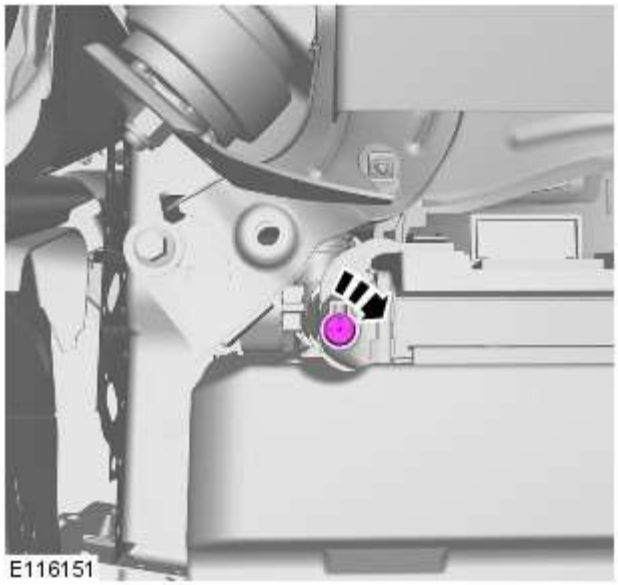
7. CAUTION: Be prepared to collect escaping fluids.



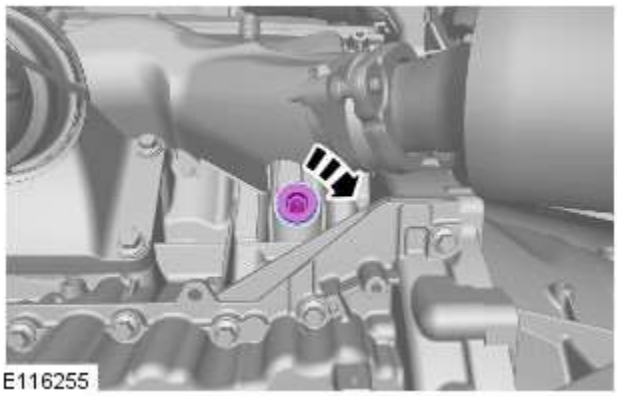
8. CAUTION: Be prepared to collect escaping coolant.



9.



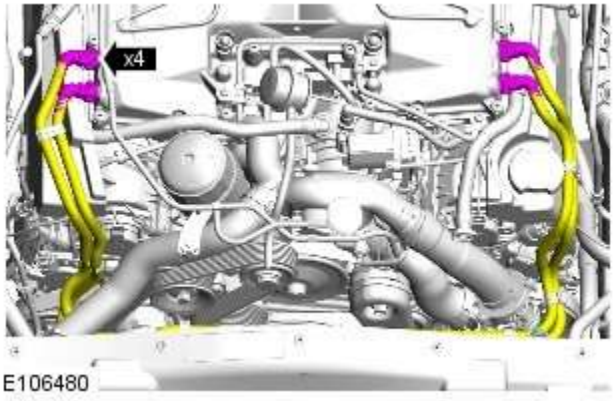
10. *Torque:* 2 Nm



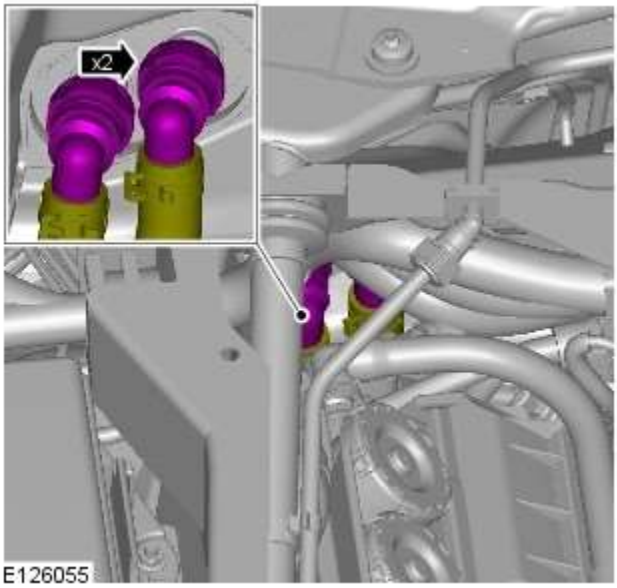
11. *Torque:* 50 Nm

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

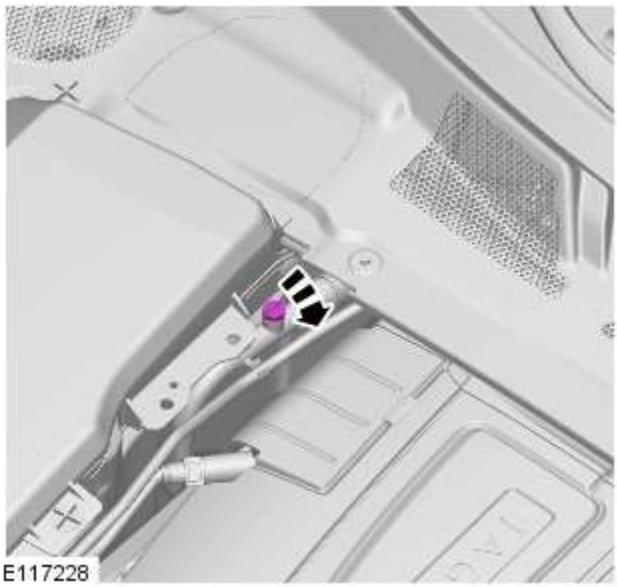


1.



2. CAUTION: Be prepared to collect escaping coolant.

3.


E117228

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 the start the engine and return to Step 7.


E115743

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).

Published: 19-Nov-2013

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Auxiliary Radiator

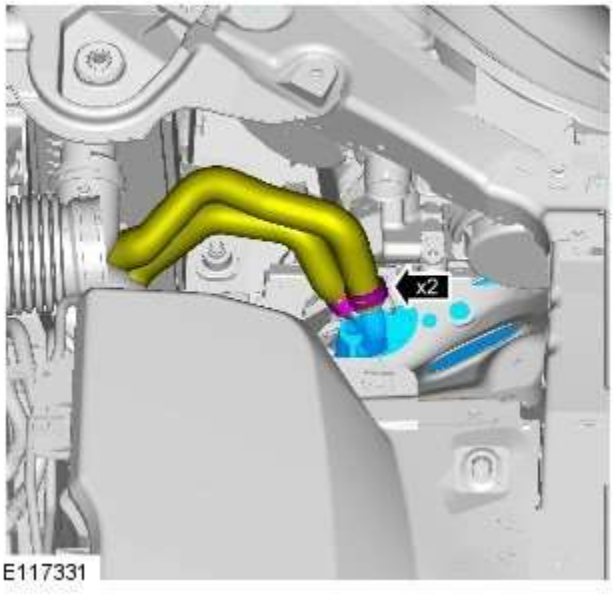
Removal and Installation

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).

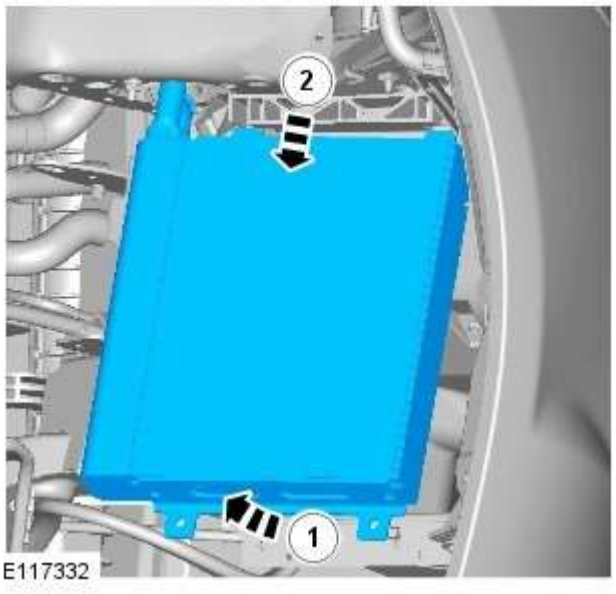
E112441

7. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Torque: 9 Nm


E112442

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.

Published: 14-Apr-2014

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Coolant Expansion Tank

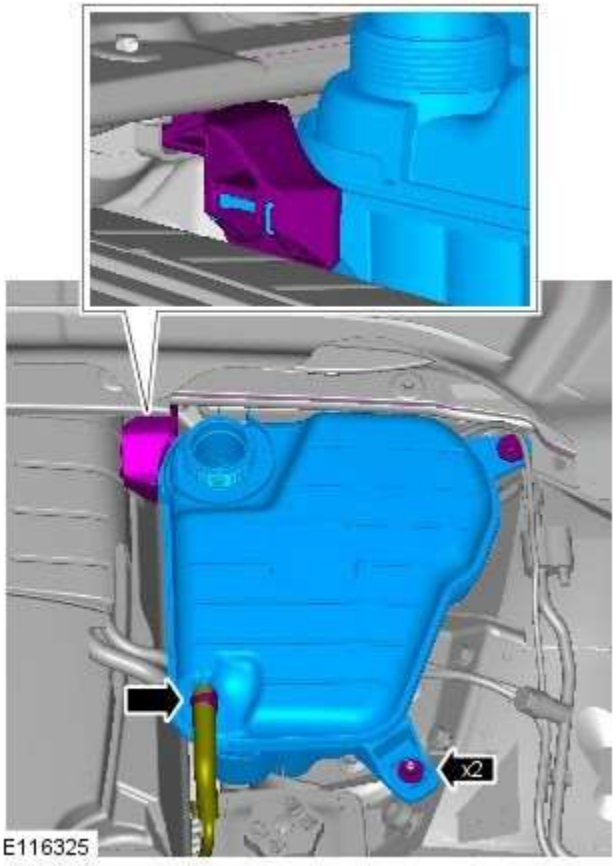
Removal and Installation

Removal

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

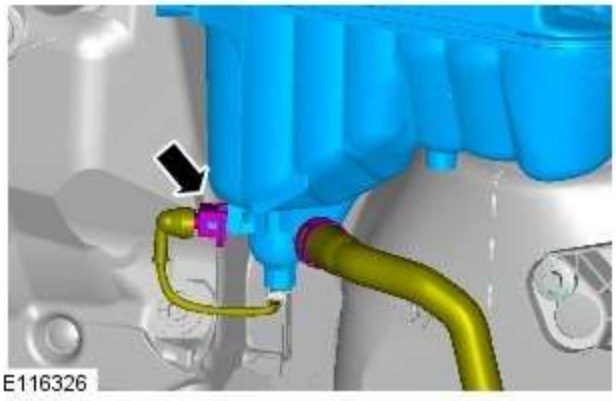
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

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



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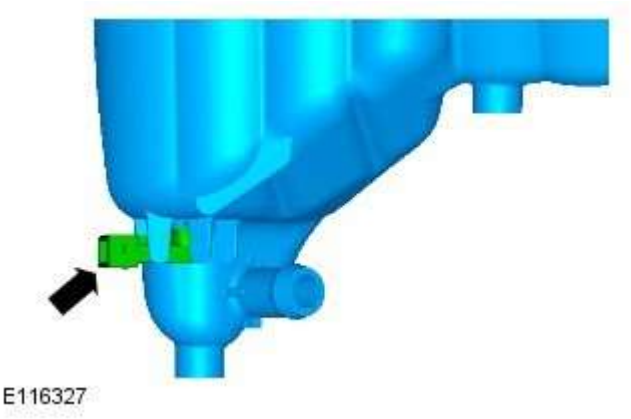

E116327

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.

Published: 11-May-2011

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Cooling Fan Motor and Shroud Vehicles With: Supercharger

Removal and Installation

Removal

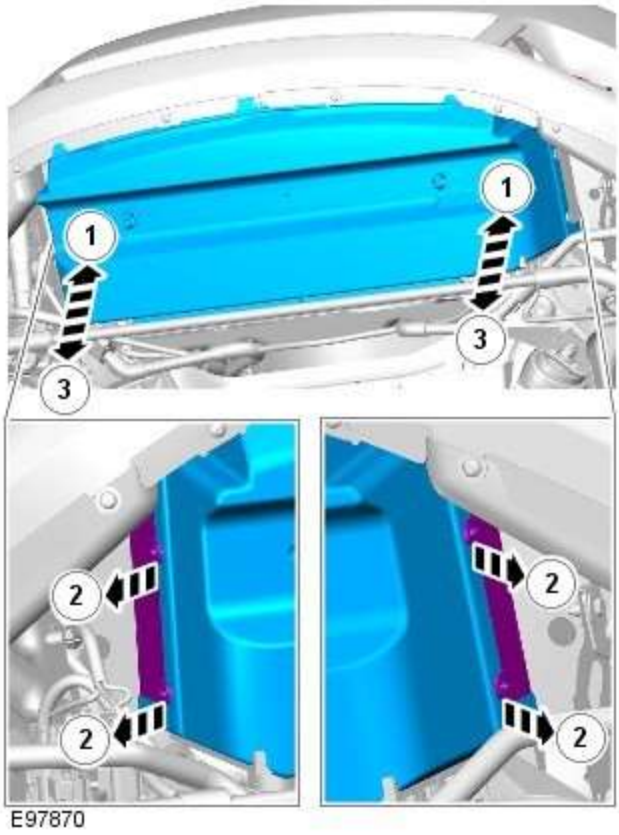
NOTE: Removal steps in this procedure may contain installation details.

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.

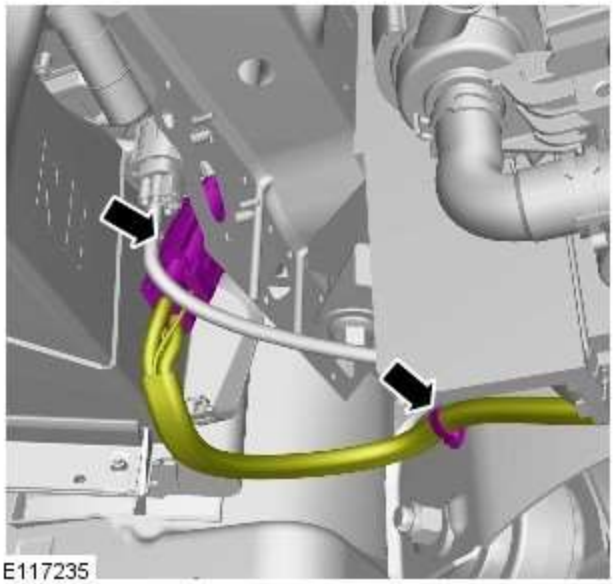
   Raise and support the vehicle.

3. Refer to: Radiator Splash Shield (501-02 Front End Body Panels, Removal and Installation).

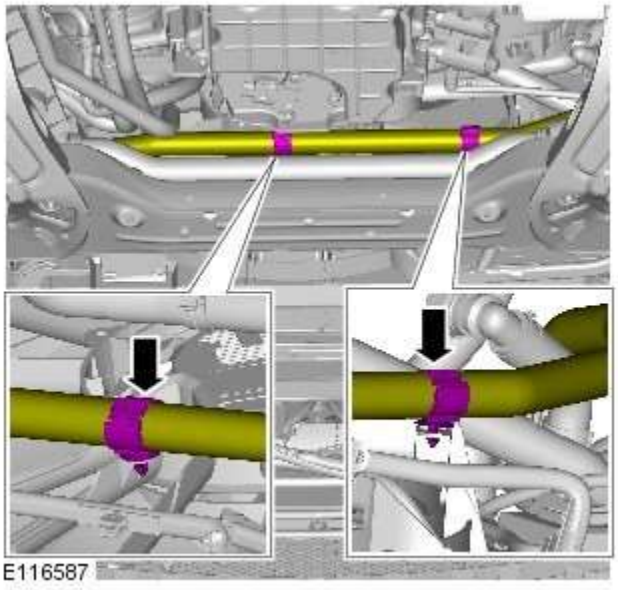


E97870

4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.


E117235

5. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.


E116587

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).

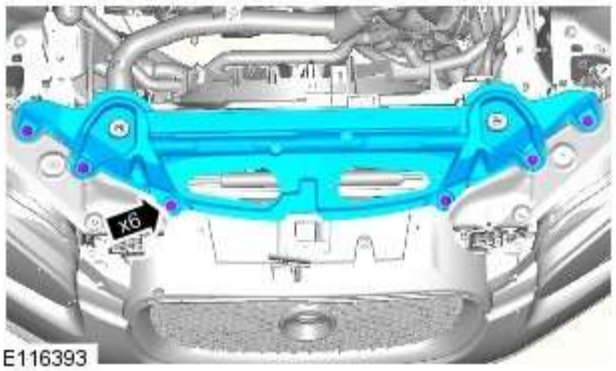
9. Refer to: Air Cleaner Outlet Pipe RH (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

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).

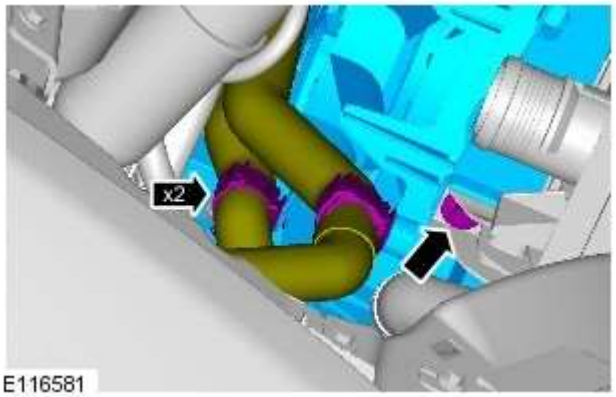
11. Refer to: Air Cleaner RH (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

12. Refer to: Air Cleaner LH (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

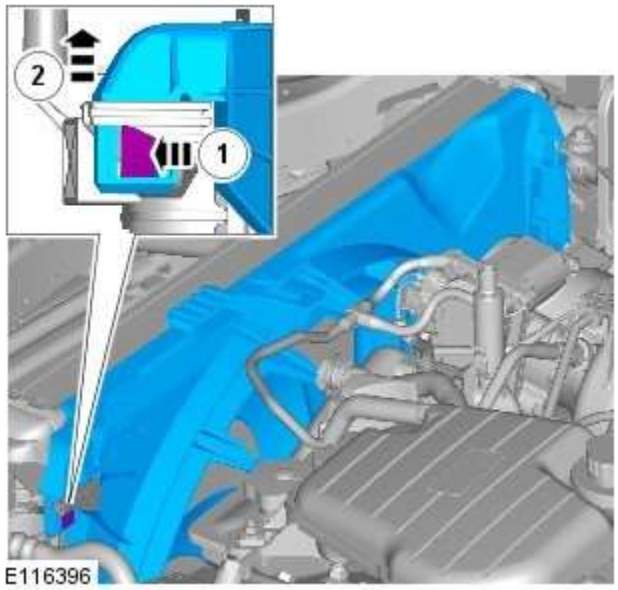
13. *Torque:* 9 Nm



14. *Torque:* 7 Nm



15.



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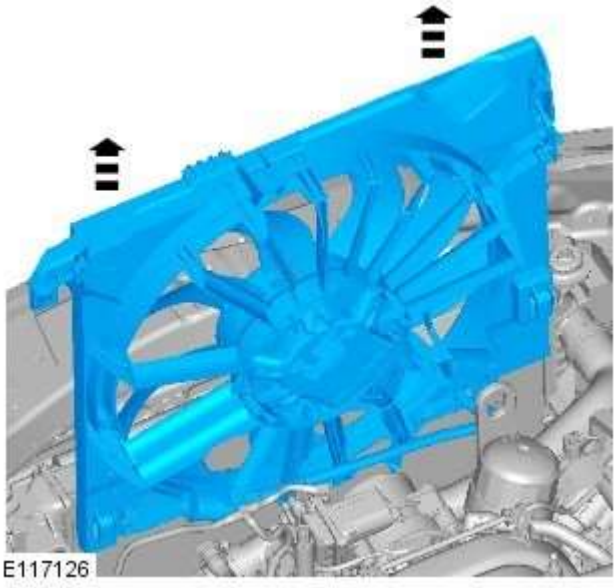


Installation

1. To install, reverse the removal procedure.

Published: 19-Nov-2013

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Cooling Module Vehicles With: Supercharger

Removal and Installation

Removal

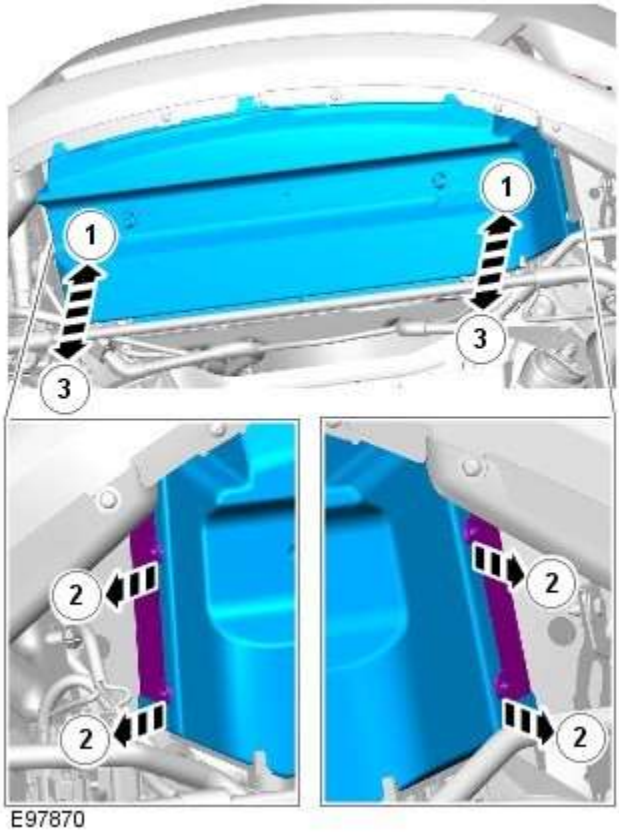
NOTE: Removal steps in this procedure may contain installation details.

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.



E97870

4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

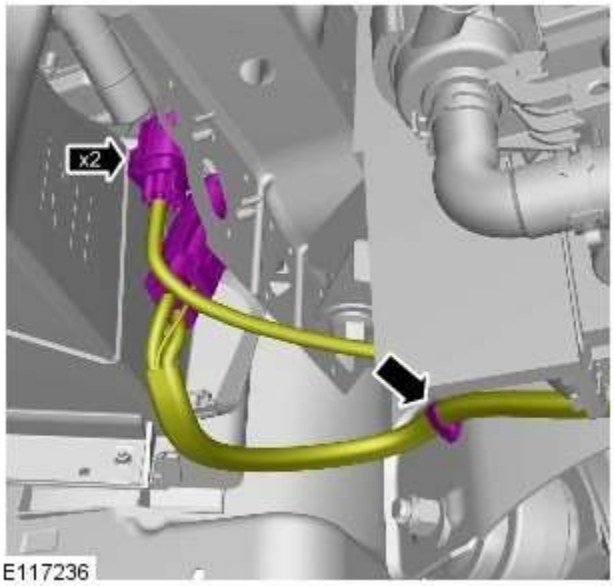
5. WARNINGS:

   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.

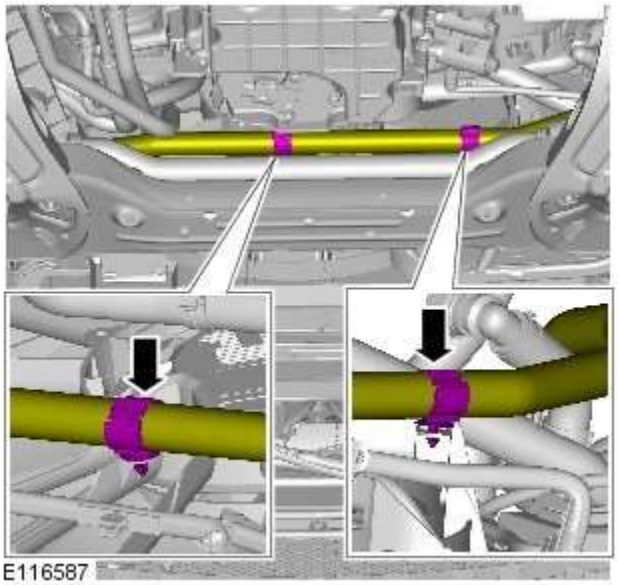
Refer to: Cooling System Partial Draining, Filling and Bleeding - V8 S/C 5.0L Petrol (303-03C Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol, General Procedures).

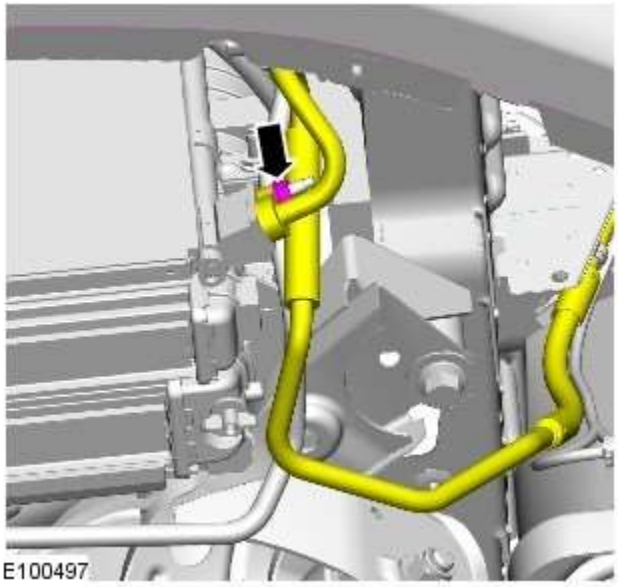
6.



E117236

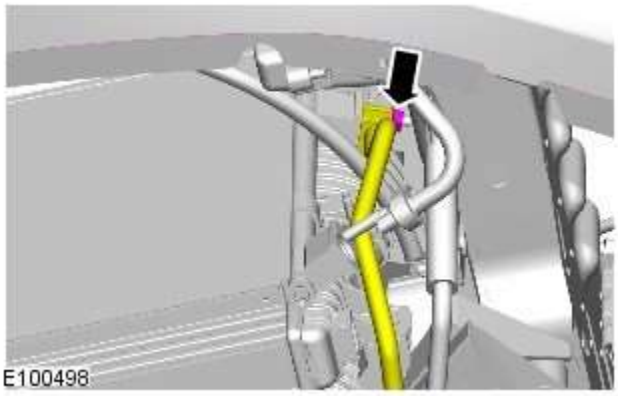
7.


E116587



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.

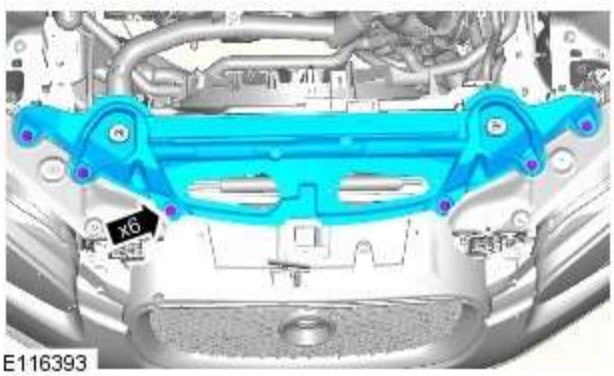
11. Refer to: Air Cleaner Outlet Pipe LH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

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).

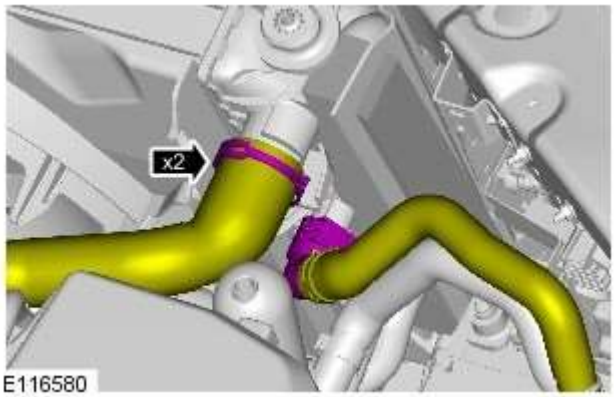
14. Refer to: Air Cleaner RH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

15. Refer to: Air Cleaner LH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

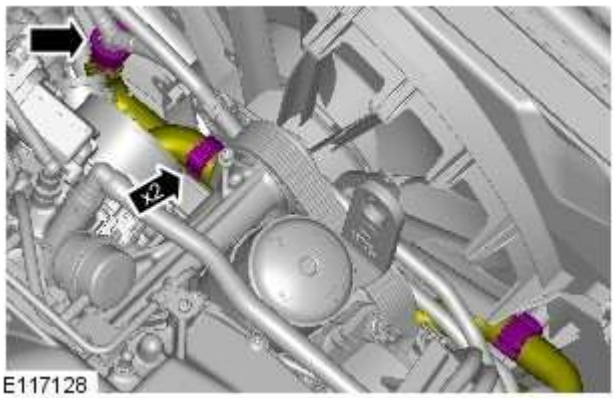


16. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

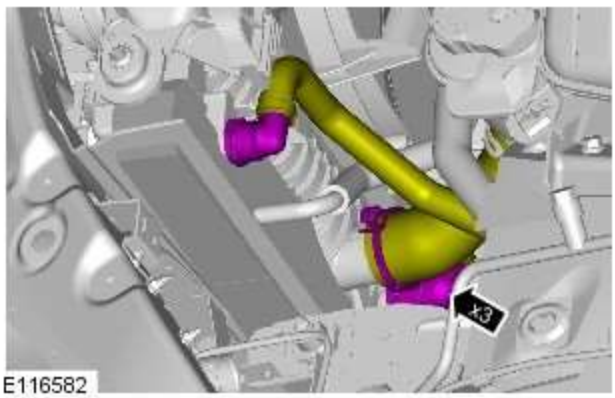
Torque: 9 Nm



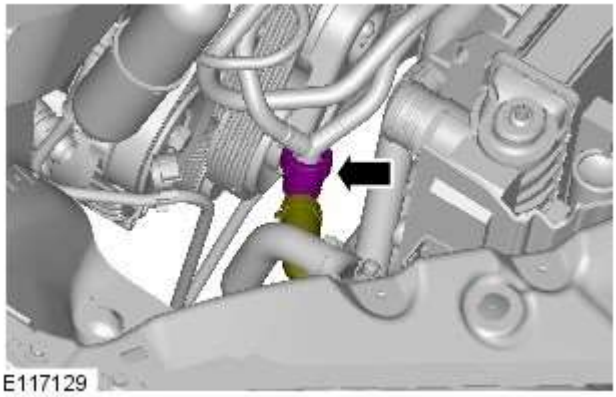
17. CAUTION: Be prepared to collect escaping coolant.



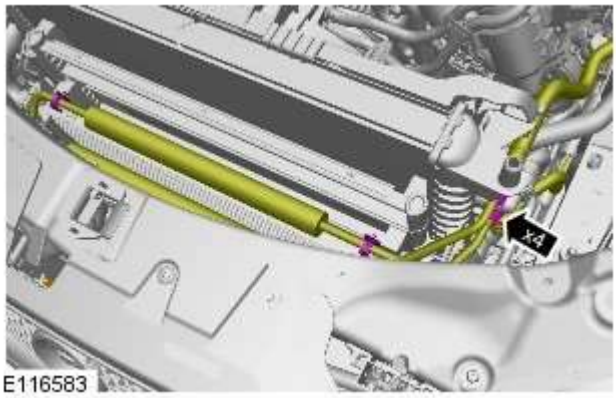
18.



19.



20.



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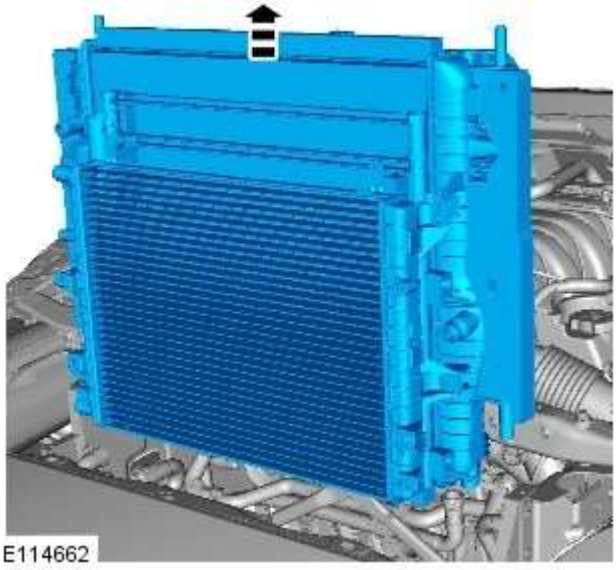


22. CAUTION: Be prepared to collect escaping coolant.

Installation

1. To install, reverse the removal procedure.

Published: 07-Aug-2012

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).

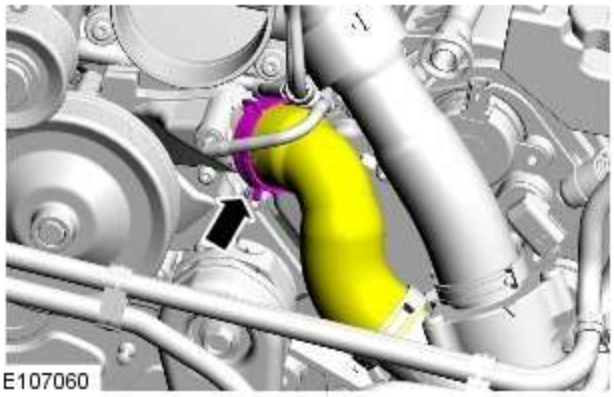
6. Refer to: Air Cleaner Outlet Pipe LH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

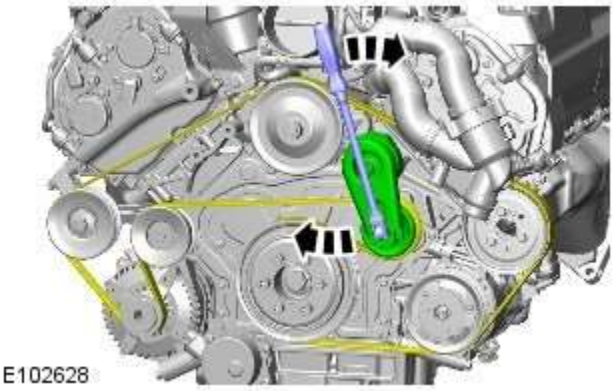
7. Refer to: Air Cleaner LH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

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).

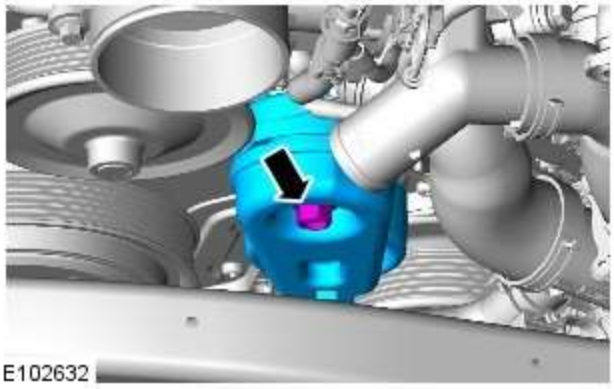
10.





11.

Torque: 40 Nm



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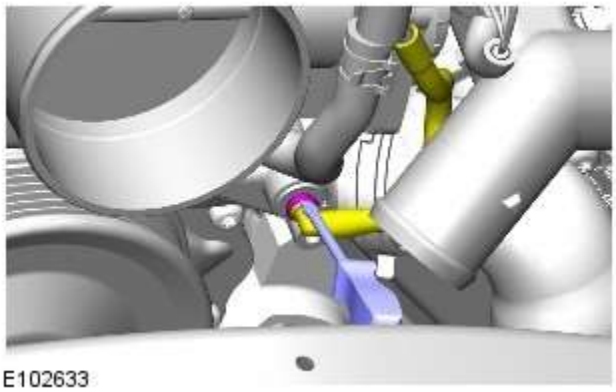
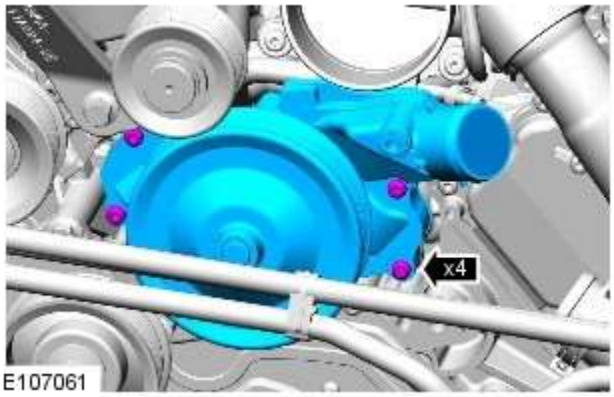


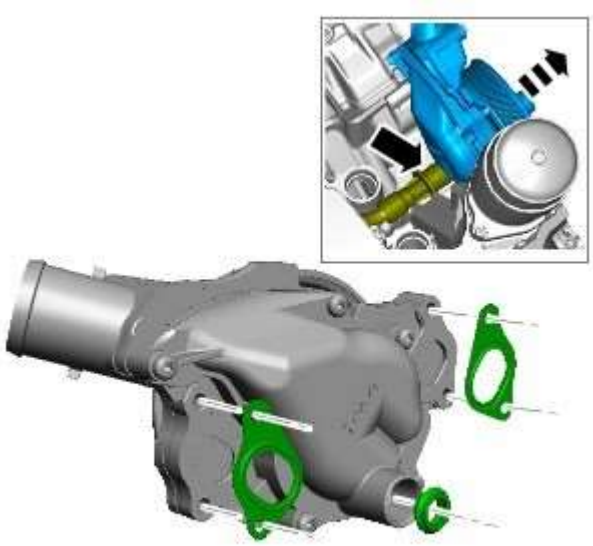
13.

WARNING: Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.

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

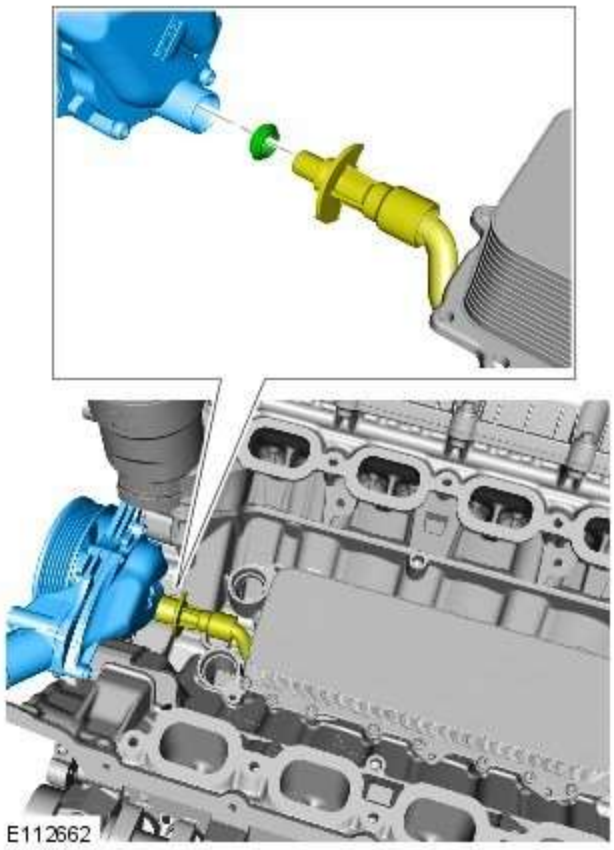




E102636

15. CAUTION: Note the fitted position of the component prior to removal.

Installation



E112662

1. To install, reverse the removal procedure.

Published: 19-Nov-2013

Engine Cooling - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Radiator Vehicles With: Supercharger

Removal and Installation

Removal

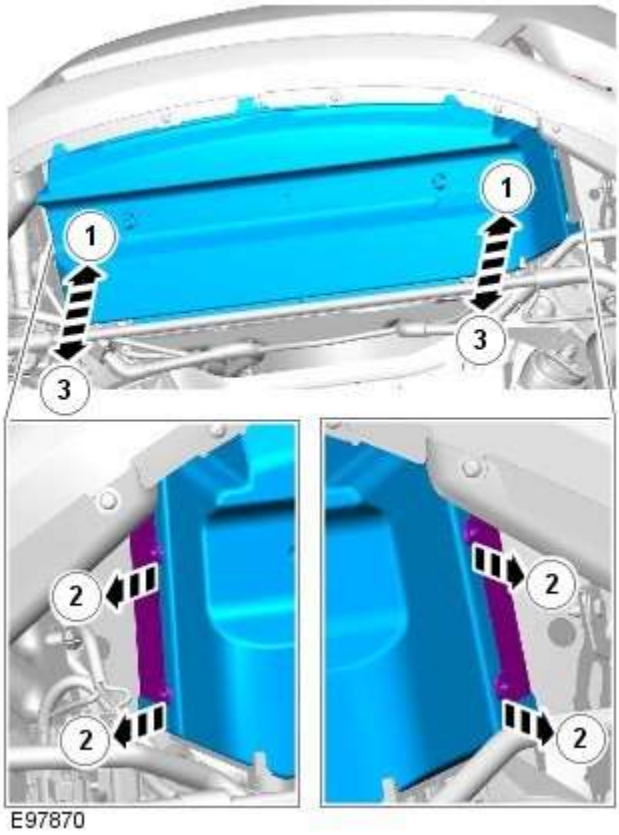
NOTE: Removal steps in this procedure may contain installation details.

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.

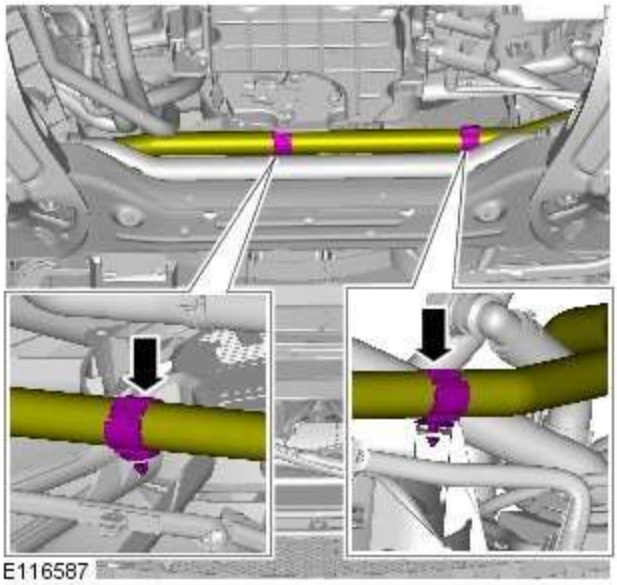
   Raise and support the vehicle.

3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

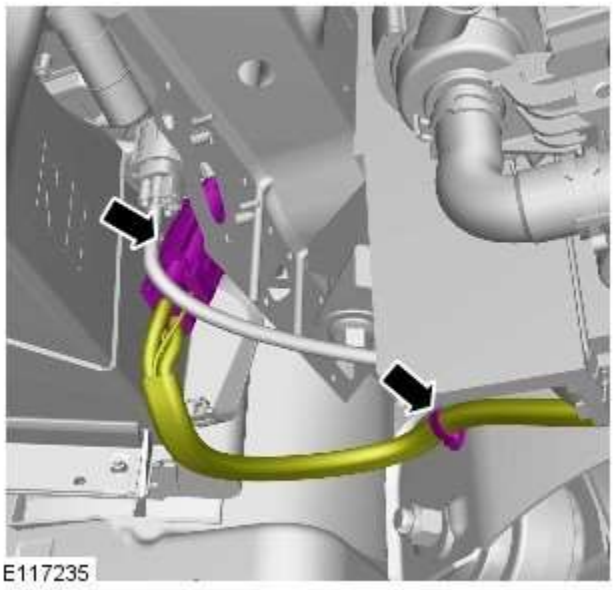


E97870

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).

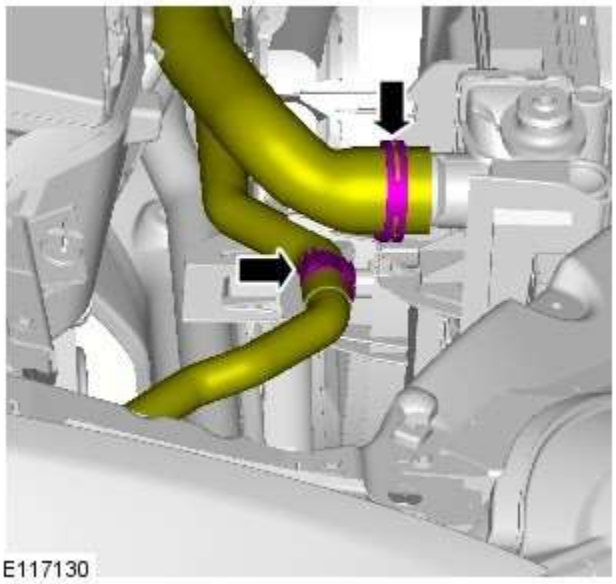
10. Refer to: Air Cleaner Outlet Pipe T-Connector (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

11. Refer to: Air Cleaner RH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

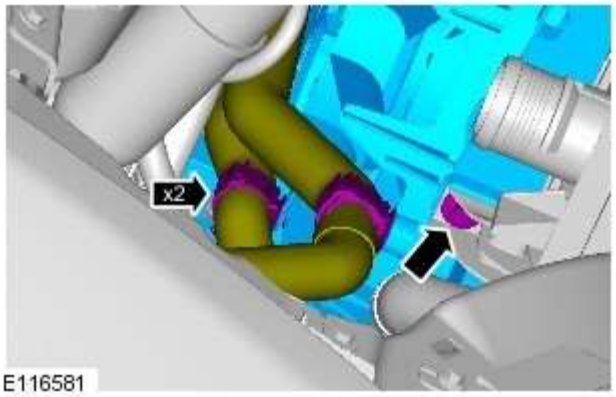
12. Refer to: Air Cleaner LH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

13. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

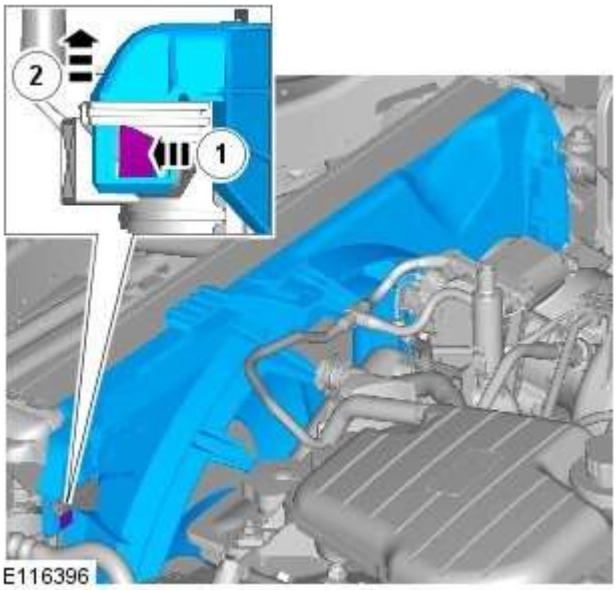
Torque: 9 Nm



14. CAUTION: Be prepared to collect escaping coolant.



15. *Torque:* 7 Nm



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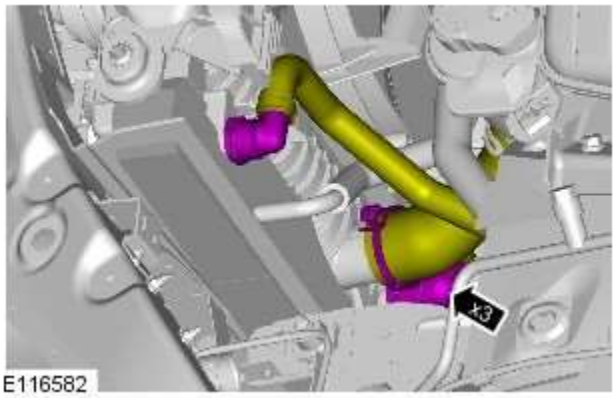
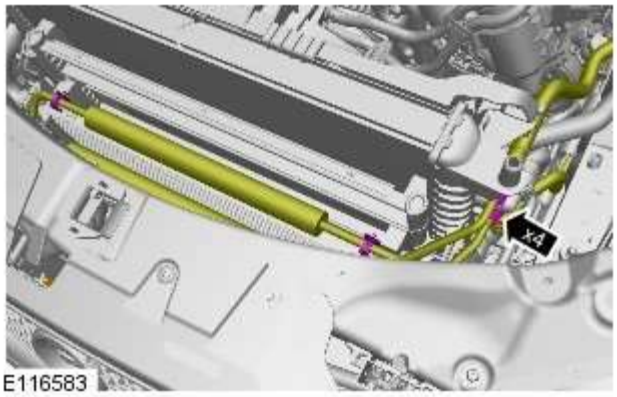
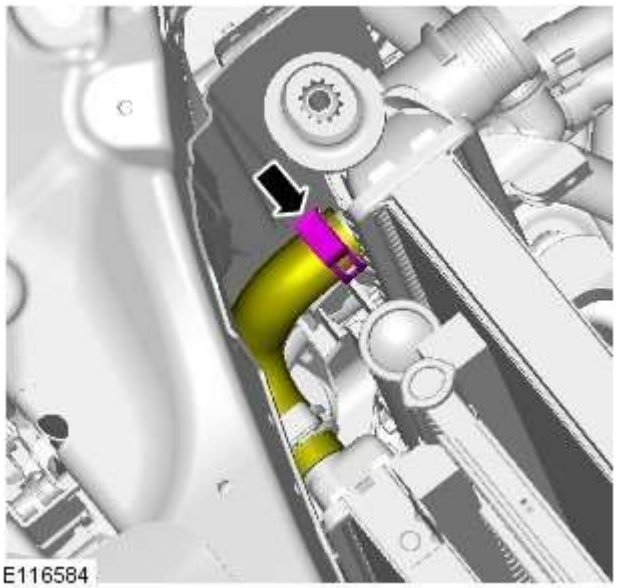


17. CAUTION: Be prepared to collect escaping coolant.

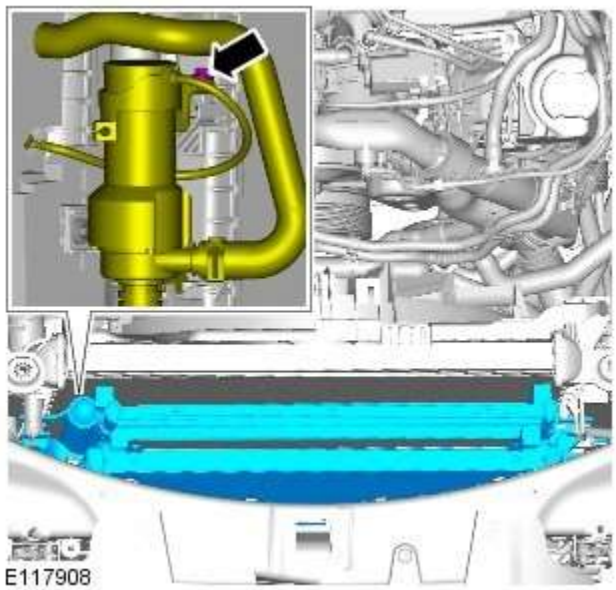
18.

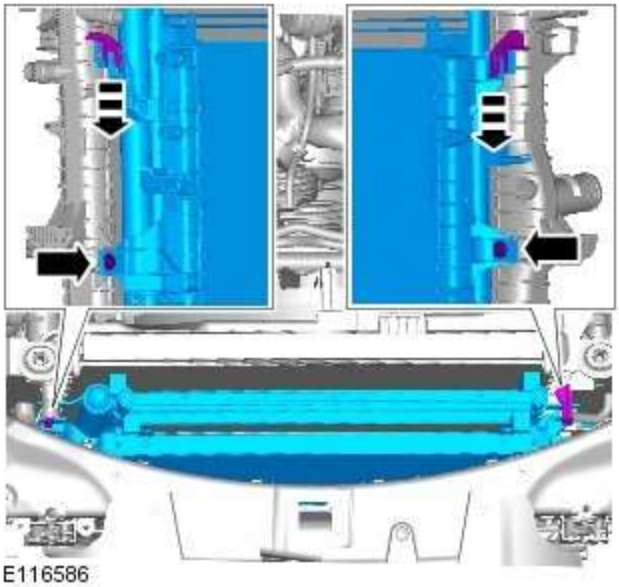


19. CAUTION: Be prepared to collect escaping coolant.



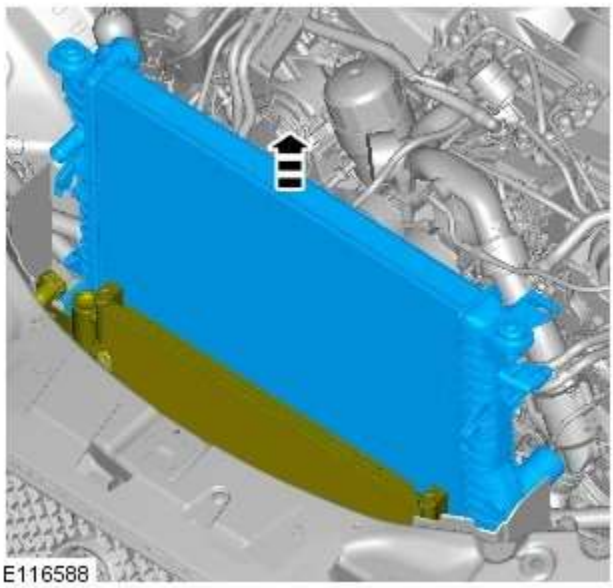
20. *Torque:* 7 Nm




E116586

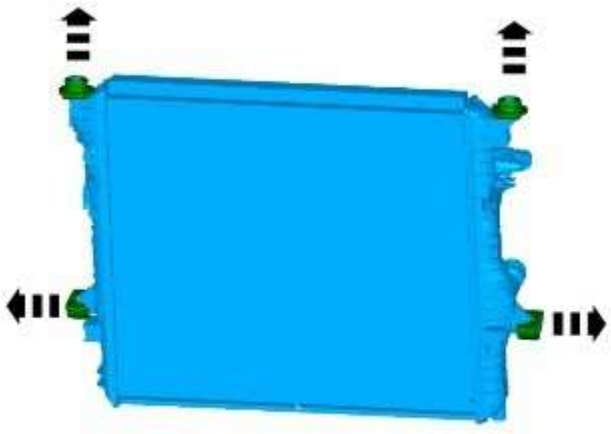
21. NOTE: Support the air conditioning (A/C) condenser.

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.

Published: 19-Nov-2013

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.

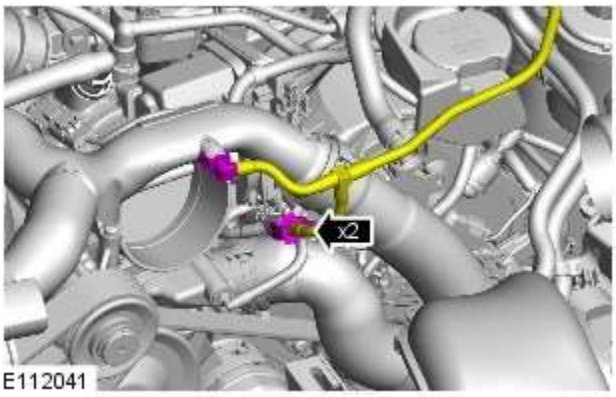
   Raise and support the vehicle.

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).

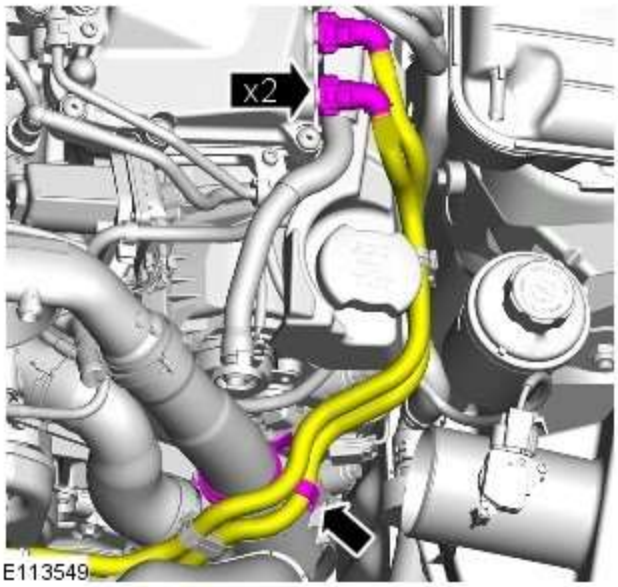
4. Refer to: Air Cleaner Outlet Pipe T-Connector (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

5. Refer to: Air Cleaner Outlet Pipe LH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

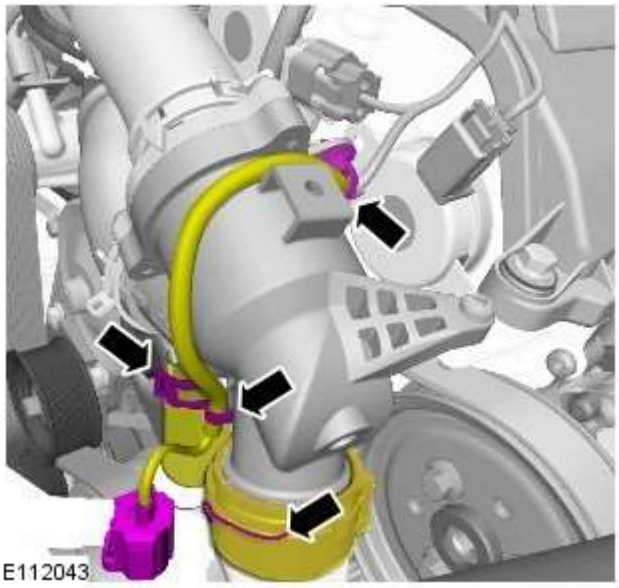
6. Refer to: Air Cleaner LH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).



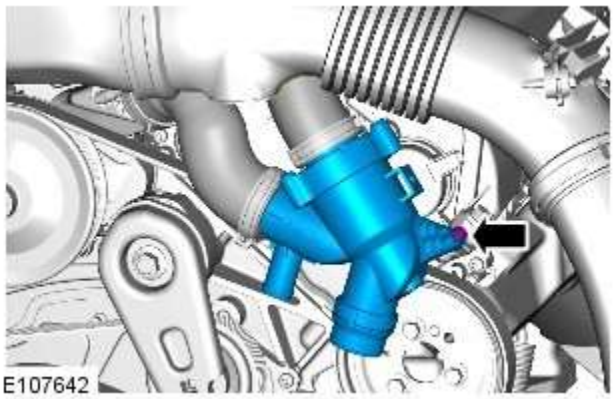
7. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



8. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

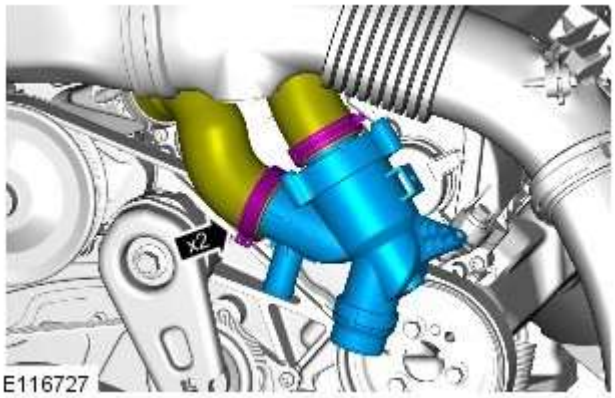


9. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



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

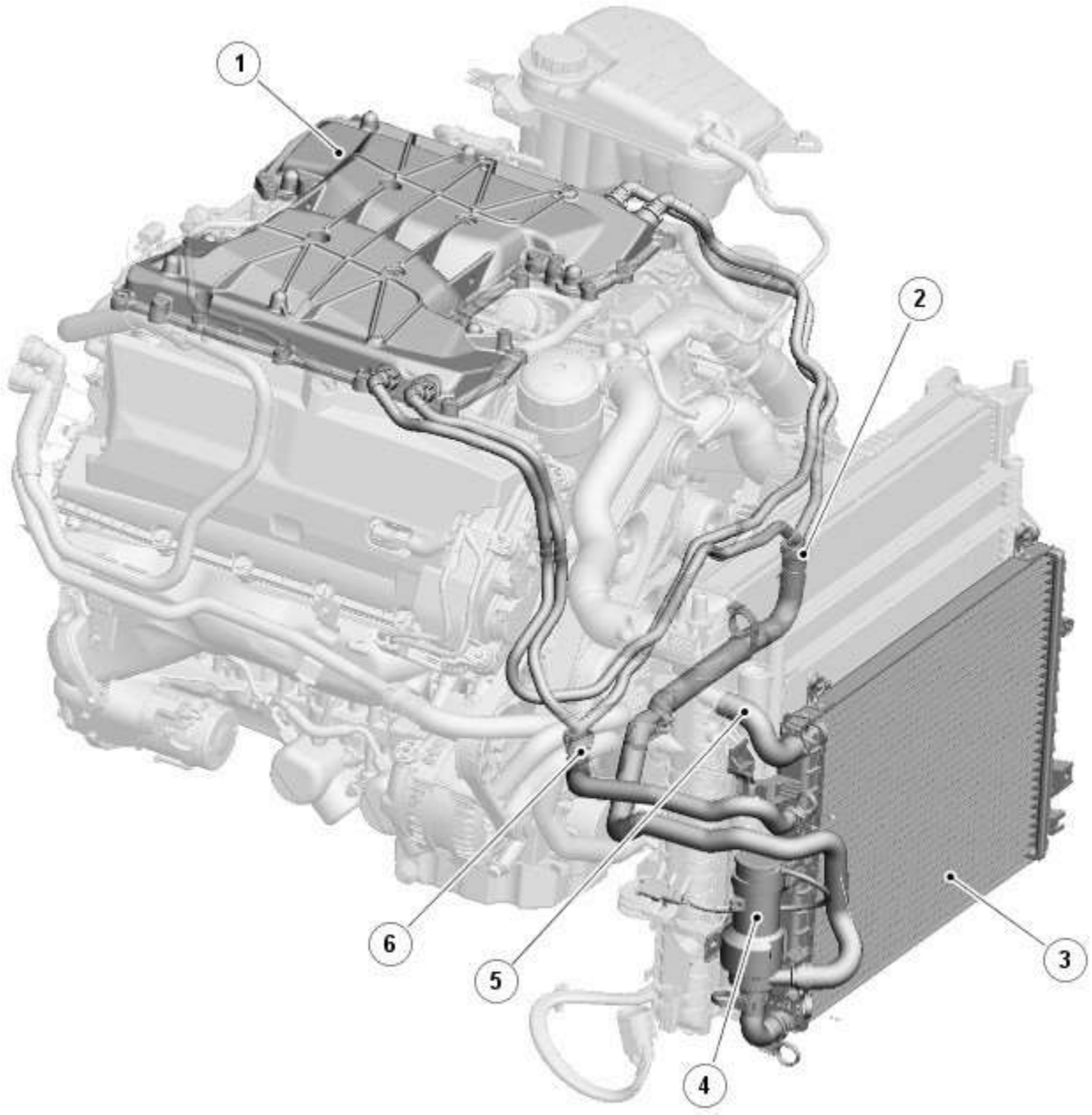
1. To install, reverse the removal procedure.

Published: 11-May-2011

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

Published: 11-May-2011

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.

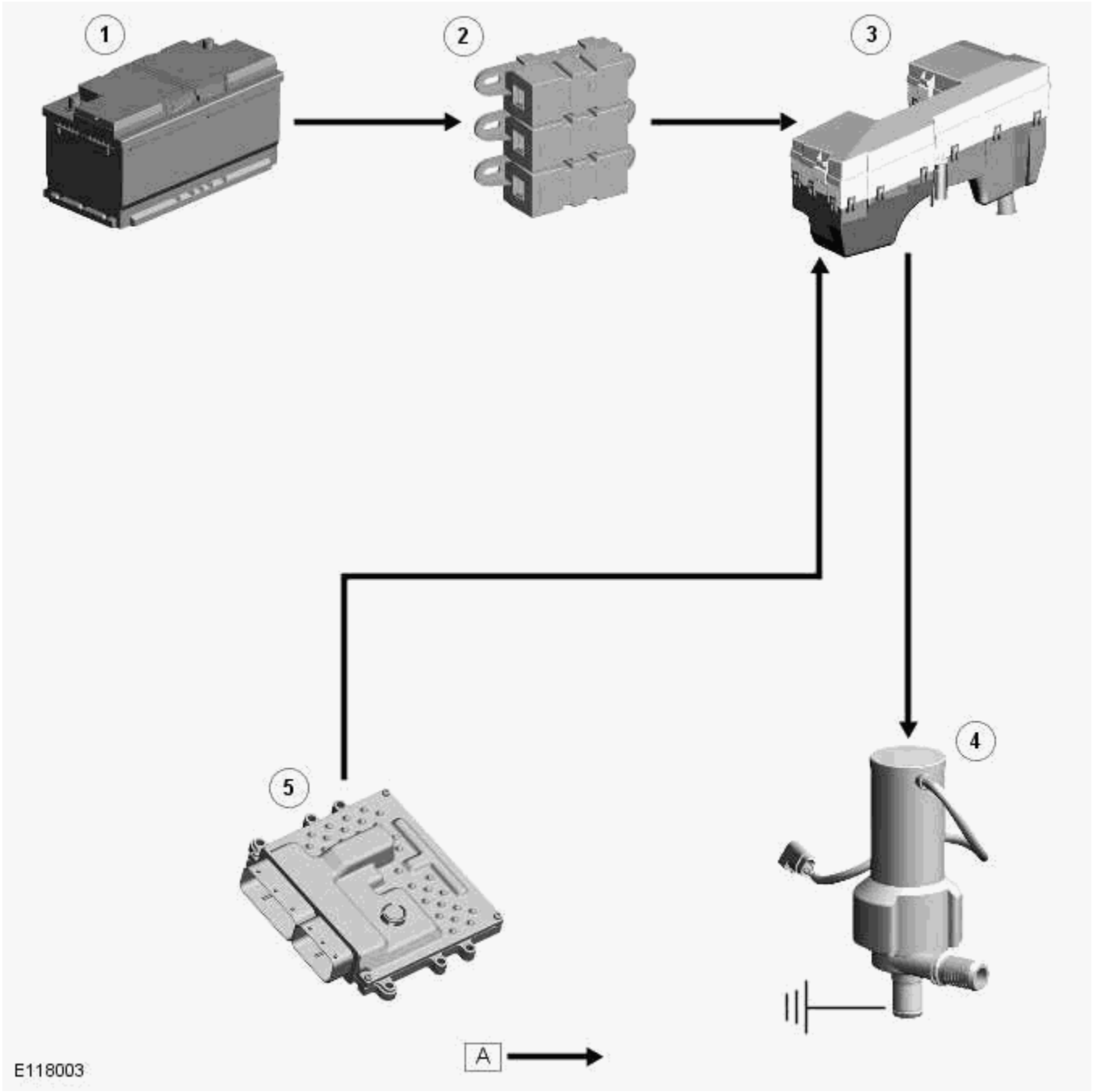
Published: 11-May-2011

Supercharger Cooling - V8 S/C 5.0L Petrol - Supercharger Cooling - System Operation and Component Description

Description and Operation

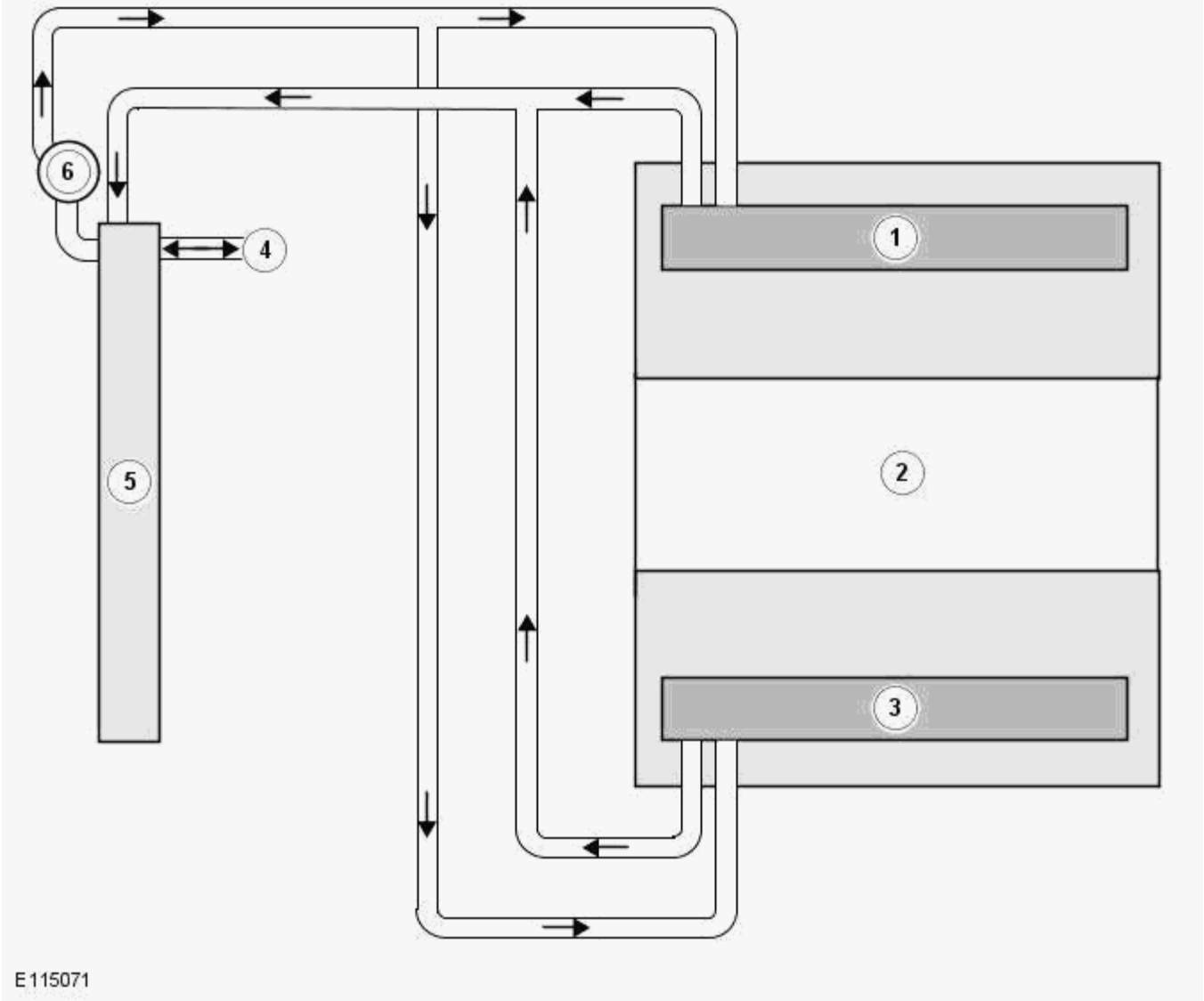
Control Diagram

NOTE: A = Hardwired



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



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

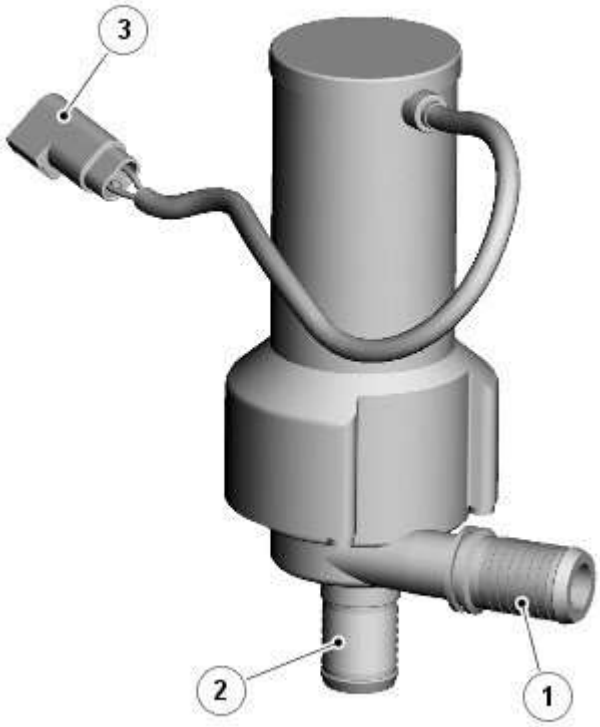
System Operation

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

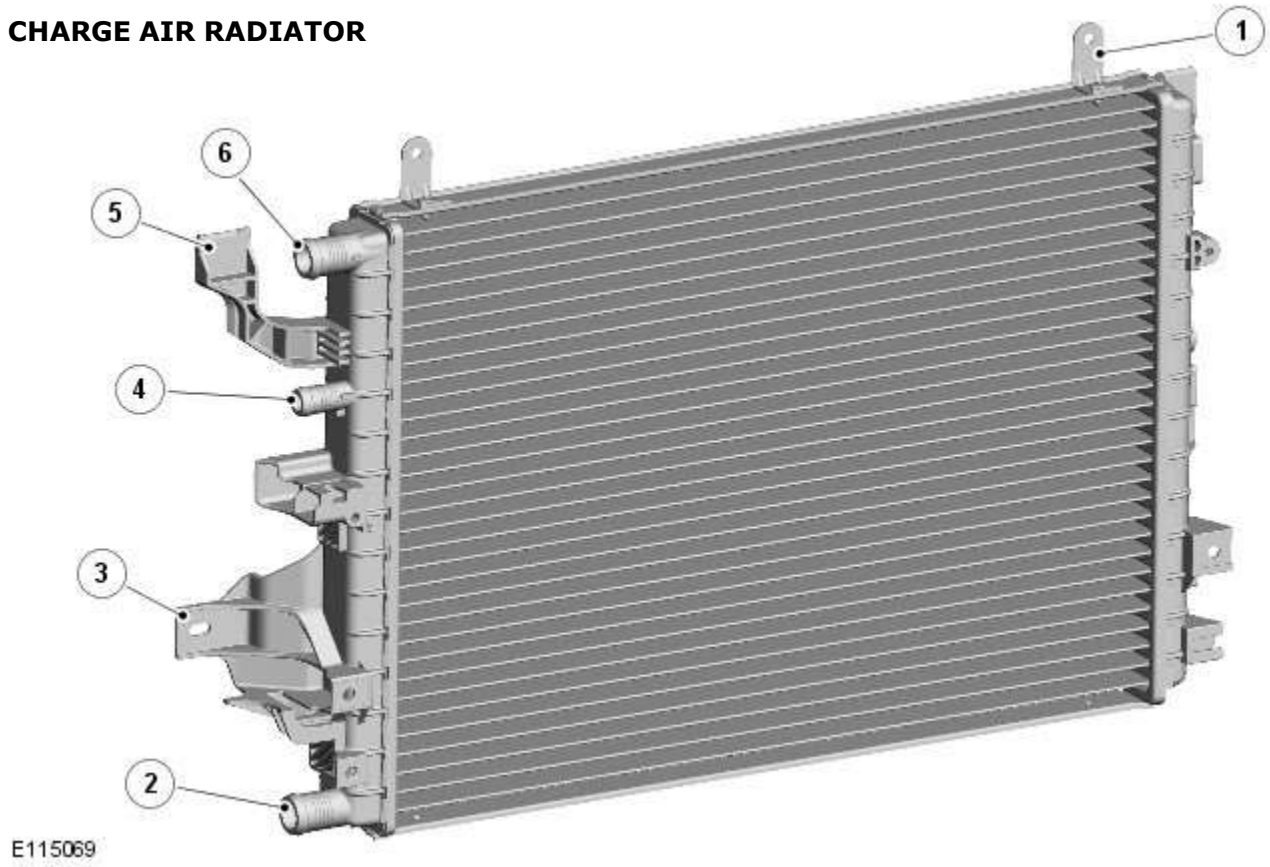


E98150

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



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).

Published: 19-Nov-2013

Supercharger Cooling - V8 S/C 5.0L Petrol - Radiator

Removal and Installation

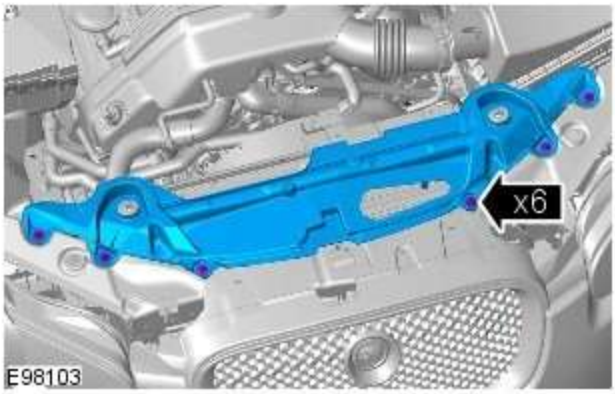
Removal

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).

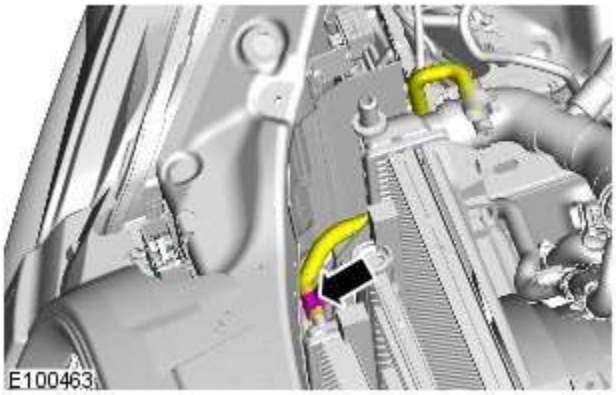
2. Refer to: Air Cleaner LH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

3. Refer to: Air Cleaner RH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).

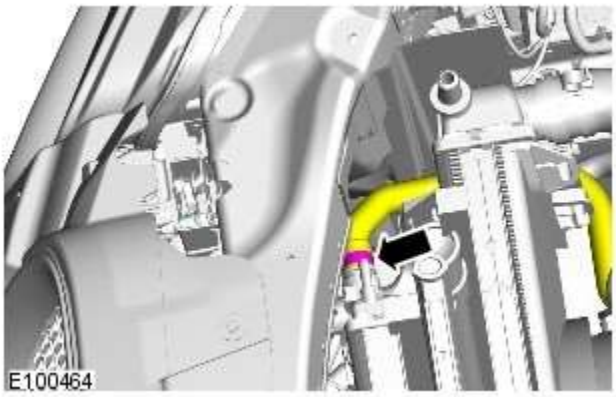


4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Torque: 9 Nm



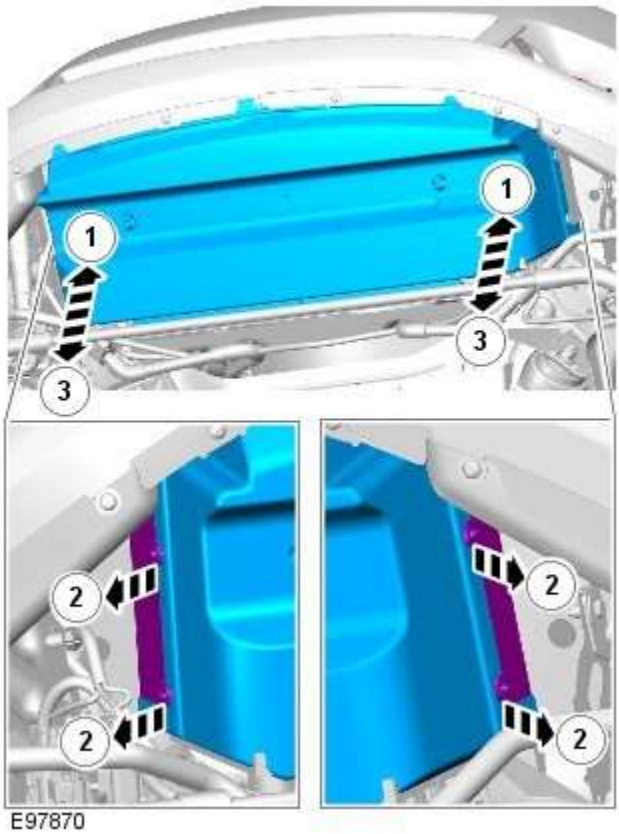
5. CAUTION: Be prepared to collect escaping coolant.



6.

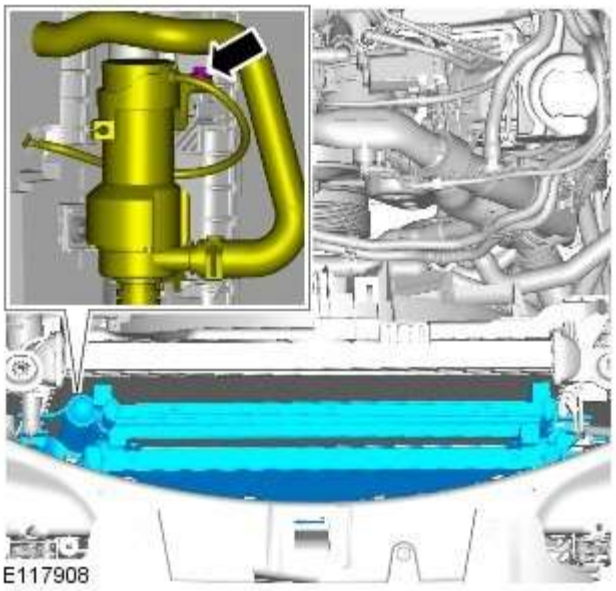
7. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

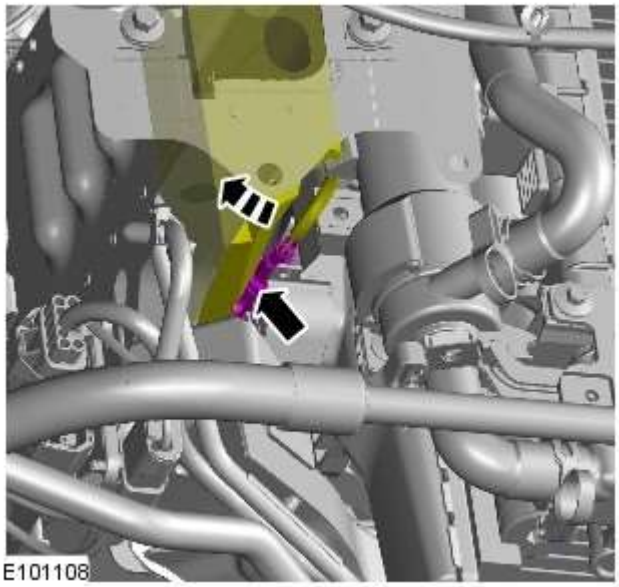


8. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

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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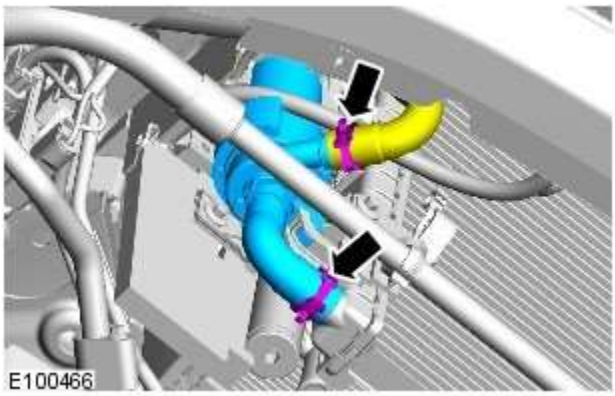
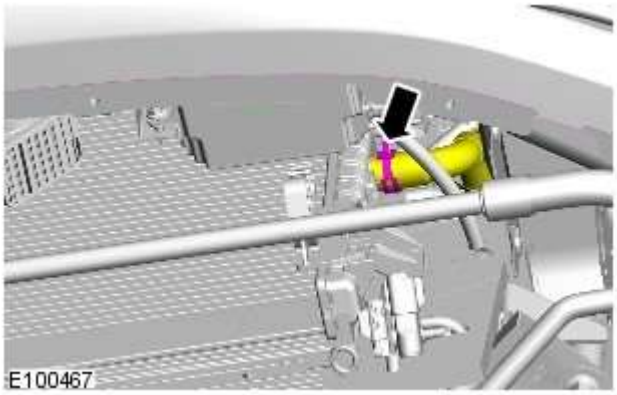


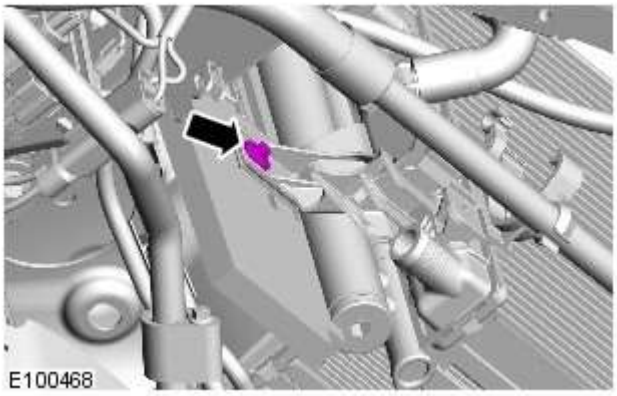
12. CAUTION: Be prepared to collect escaping coolant.

13.

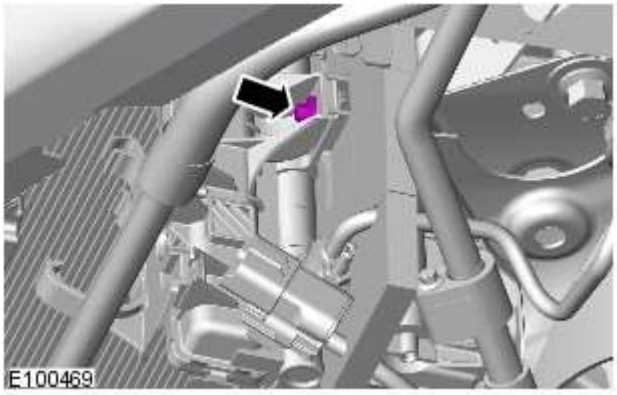


14. NOTE: Support the air conditioning (A/C) condenser.

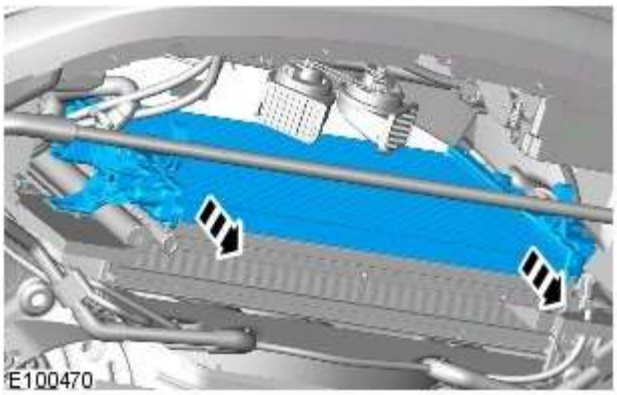
Torque: 7 Nm



15. *Torque:* 7 Nm



16. CAUTION: Be prepared to collect escaping coolant.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

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.

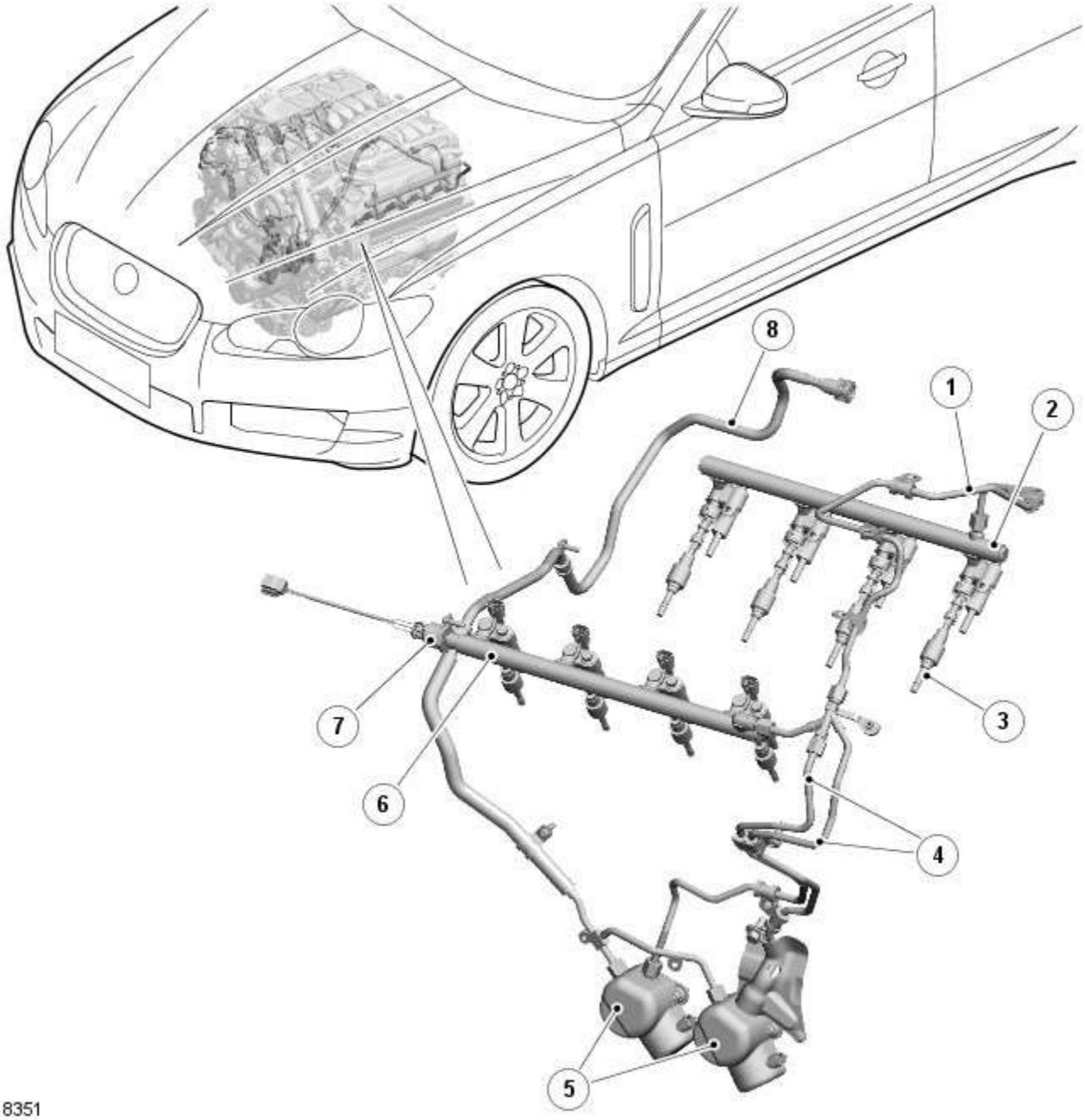
Description	Nm	lb-ft	lb-in
Ignition coil-on-plugs retaining bolts	7	-	62
Spark plugs	20	15	-
Fuel rail retaining bolt	Stage 1 - 20 Stage 2 - 30	Stage 1 - 15 Stage 2 - 22	-
Fuel rail crossover pipe unions	21	15	-
Fuel rail crossover pipe retaining bolts	12	9	-
Fuel pressure regulator	33	24	-
Fuel rail 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	-

Published: 11-May-2011

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

Published: 11-May-2011

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.

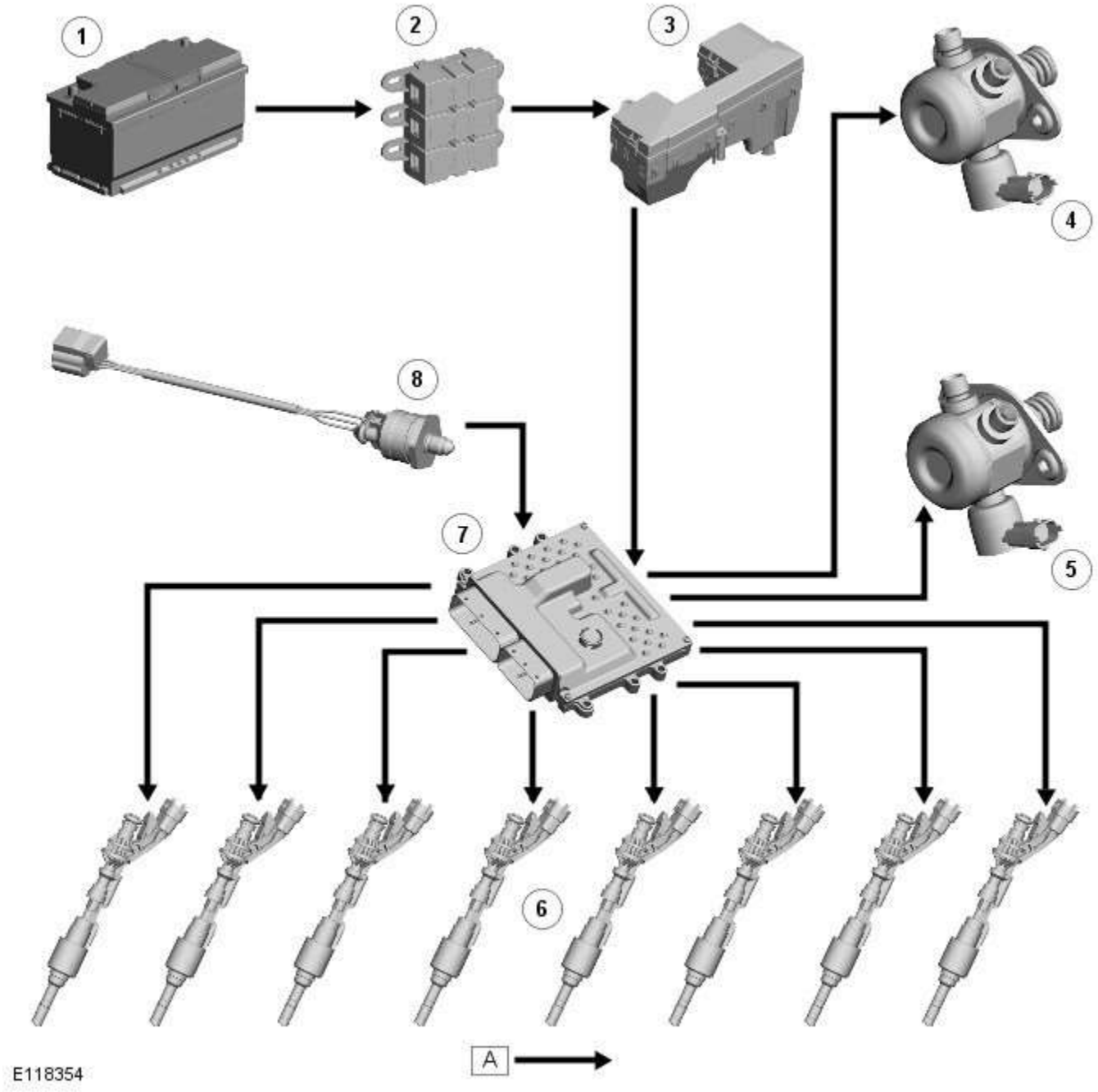
Published: 15-Mar-2013

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



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

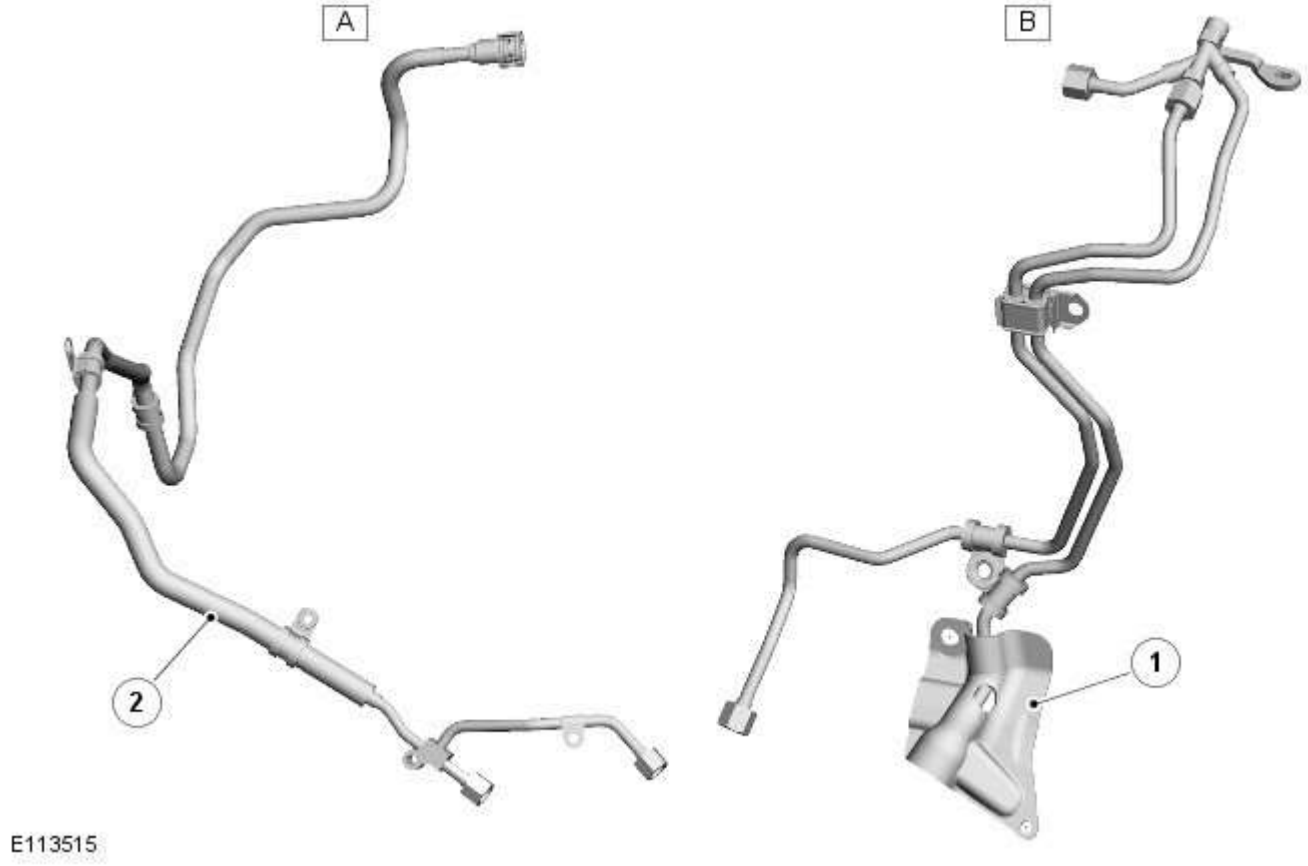
GENERAL

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/in^2).

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

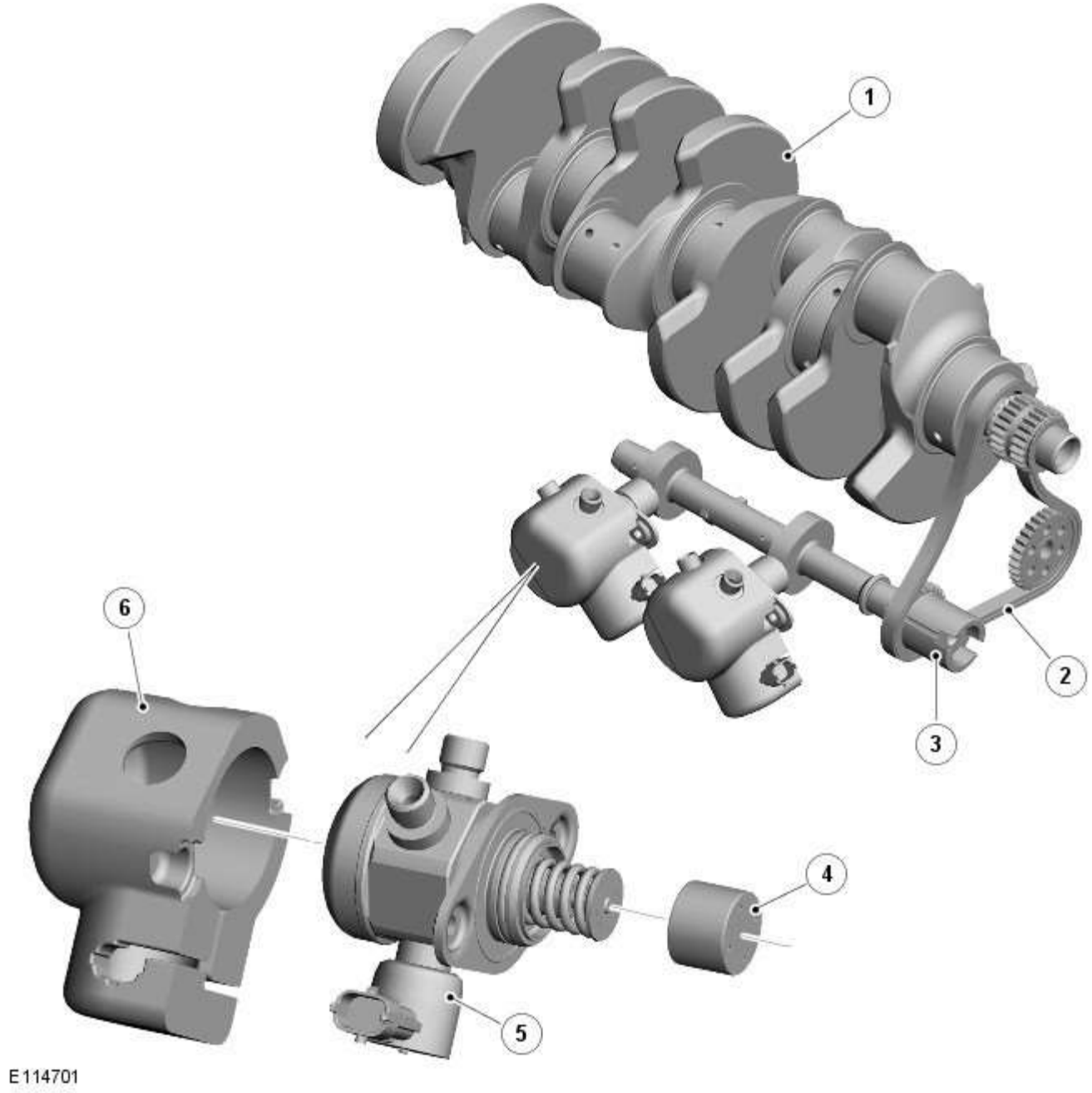


Item	Description
A	LP fuel lines
B	HP fuel lines
1	Acoustic cover
2	Heat reflective and insulation sleeves

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

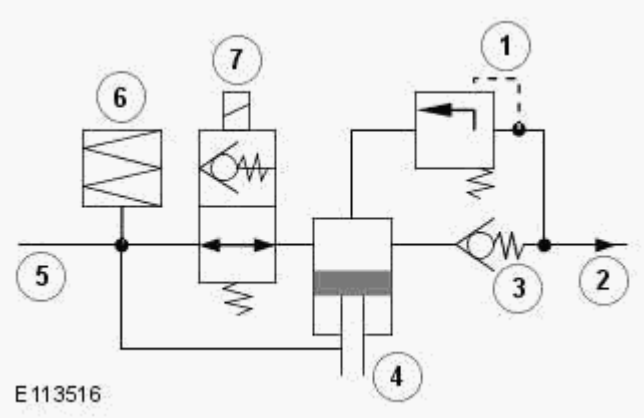


Item	Description
1	Crankshaft
2	Auxiliary drive chain
3	Auxiliary camshaft
4	Tappet
5	HP fuel pump
6	Acoustic cover

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 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.



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.

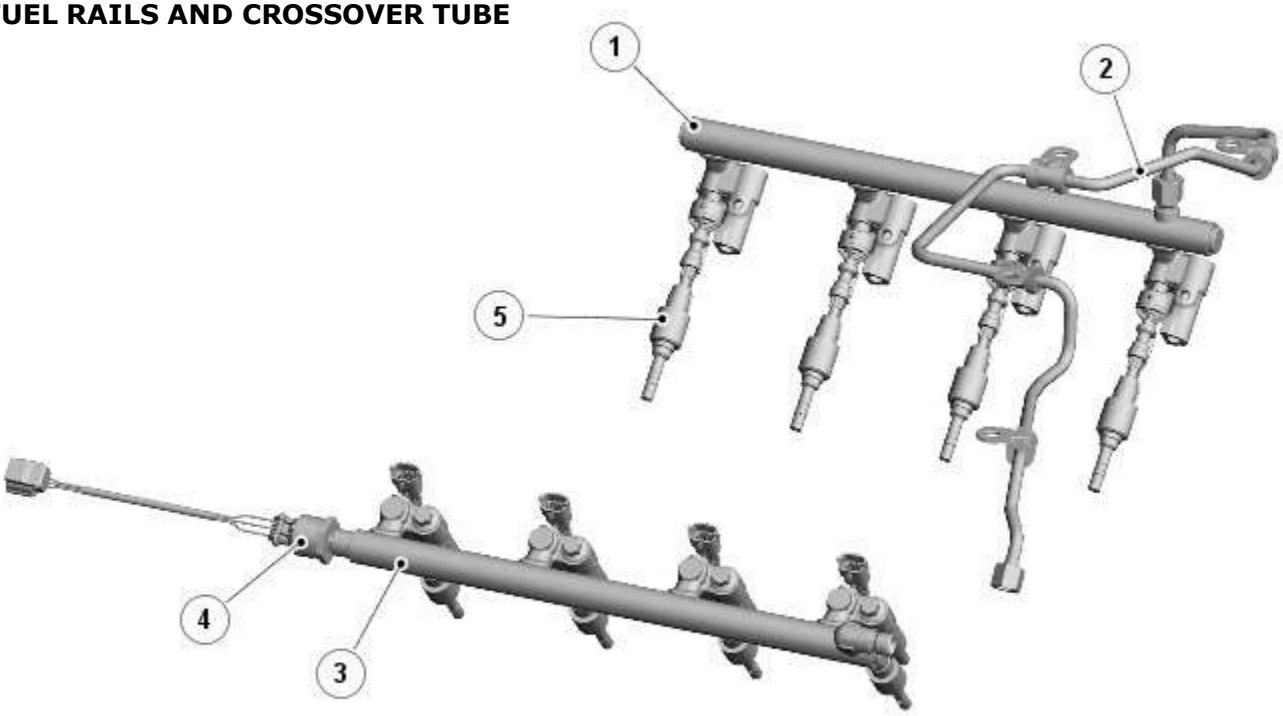
The damper absorbs pressure pulses from the plunger when the fuel metering valve is open at the start of the delivery stroke.

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/in^2), the PRV opens and returns fuel to the inlet side of the plunger.

FUEL RAILS AND CROSSOVER TUBE



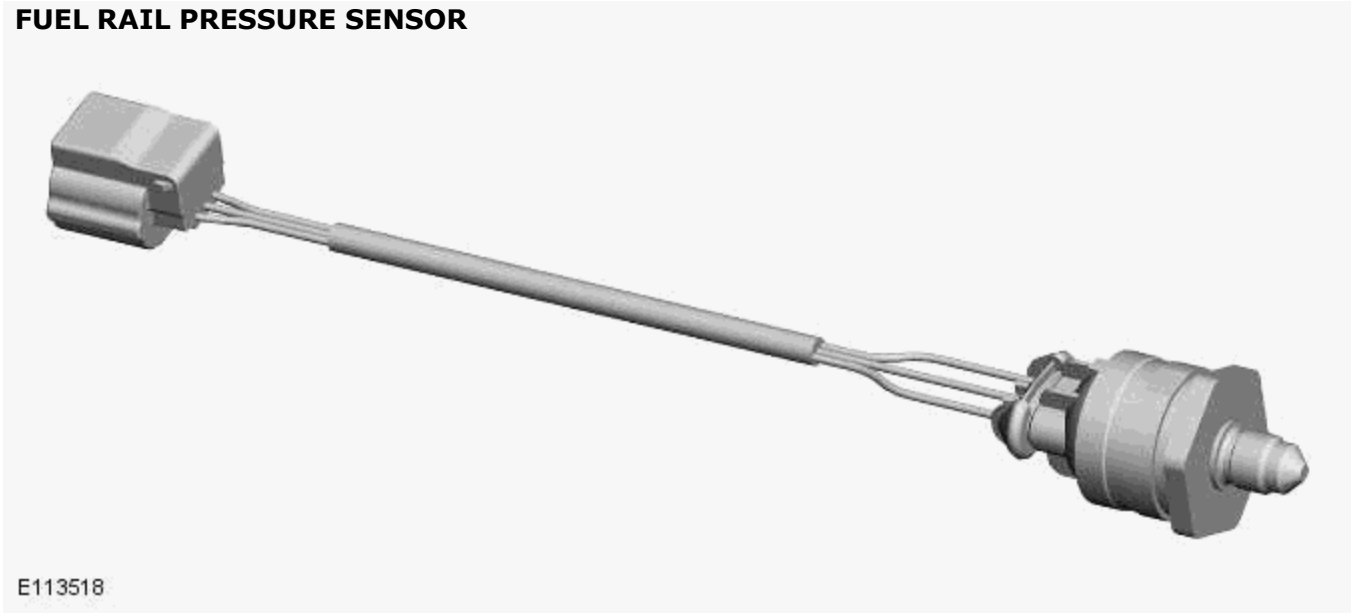
E113517

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



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

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.

Published: 11-May-2011

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
• 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	• 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	• 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	• 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	• 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
	• Purge valve	
Difficult hot start	• 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)	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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).

Published: 11-May-2011

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

Published: 11-May-2011

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

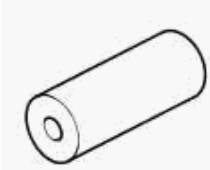
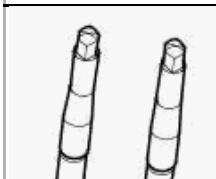
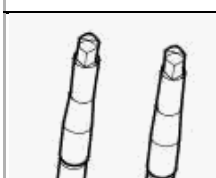
1. Refer to: Fuel Rail RH (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Removal and Installation).

Published: 21-Nov-2013

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Fuel Rail LH

Removal and Installation

Special Tool(s)

 E115268	303-1450 Spark Plug Remover/Installer
 E114526	310-197 Remover, Fuel Injector
 E107680	310-198 Installer, Teflon Seal
 E107681	310-199 Re-shape Tool, Teflon Seal
 E107682	310-200-01 Fuel Rail Installation Guide Pins - Threaded
 E107682	310-200-02 Fuel Rail Installation Guide Pins - Unthreaded

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.

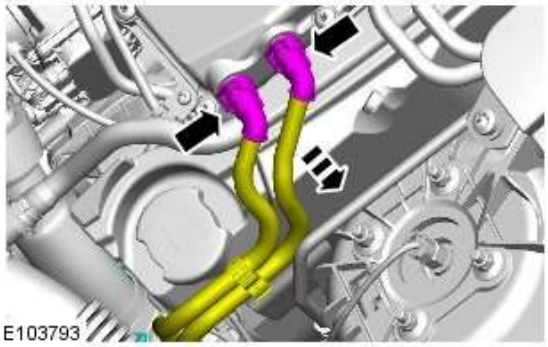
1. Refer to: Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

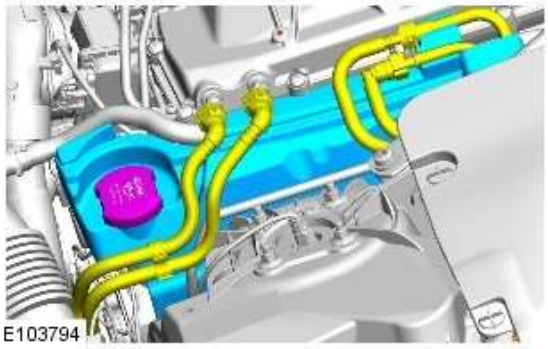
3. Refer to: Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol (310-00 Fuel System - General Information, General Procedures).

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.



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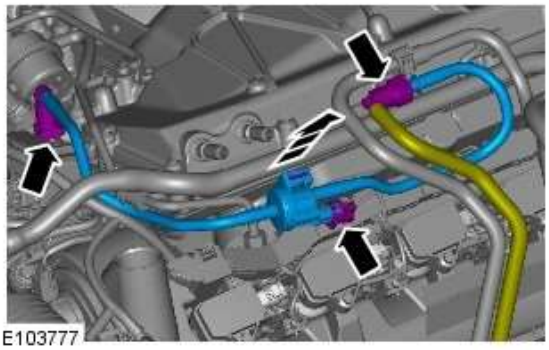
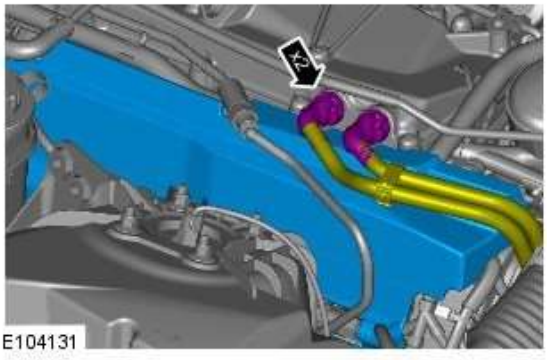
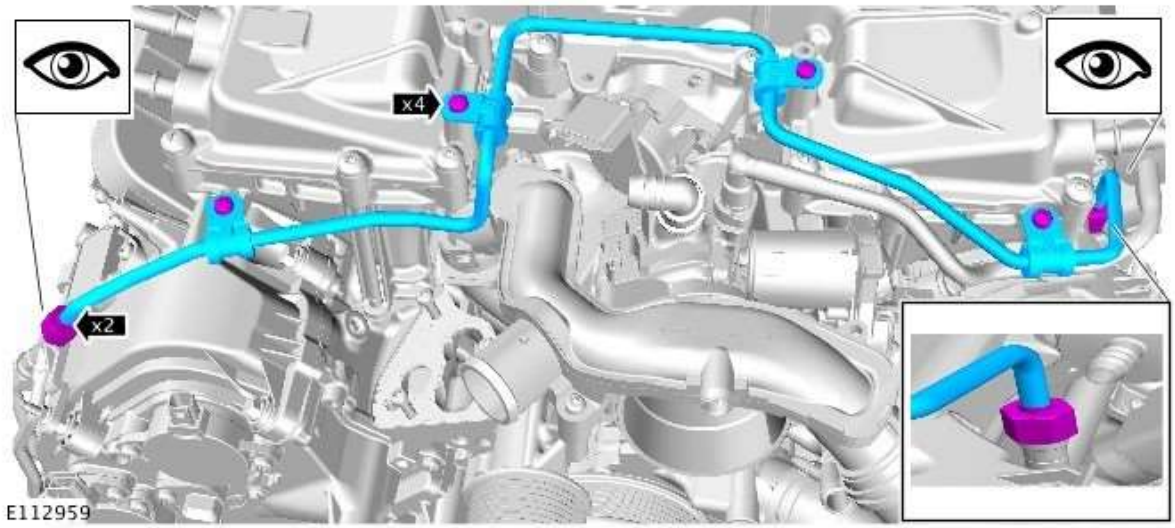


8. CAUTION: Be prepared to collect escaping fluids.



9. CAUTION: Be prepared to collect escaping fluids.

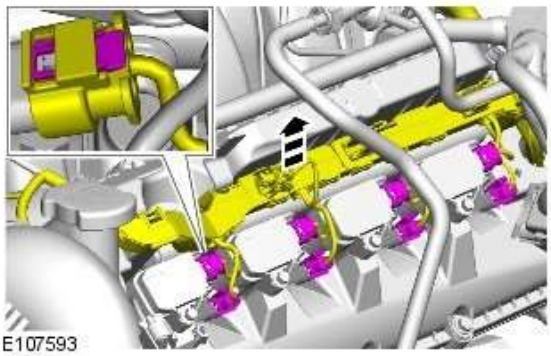
10. Refer to: Air Cleaner Outlet Pipe RH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).



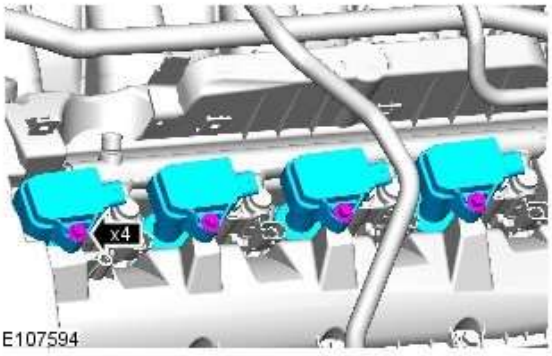
11. CAUTIONS:

Be prepared to collect escaping fluids.

Make sure that all openings are sealed. Use new blanking caps.



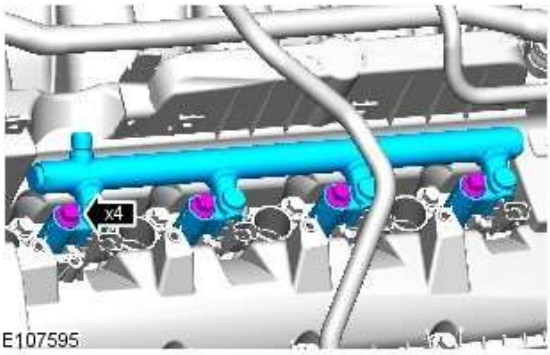
12.



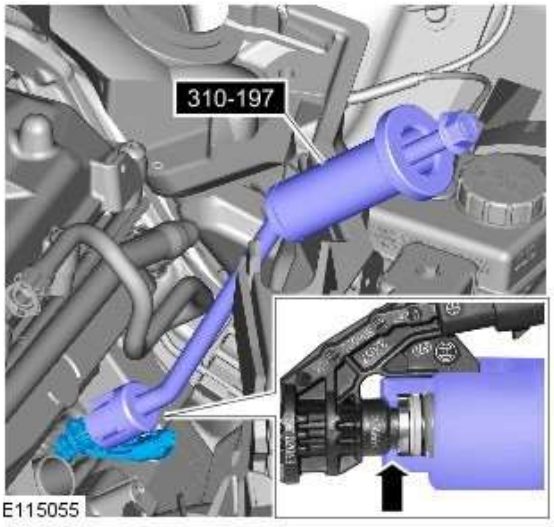
13.

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.



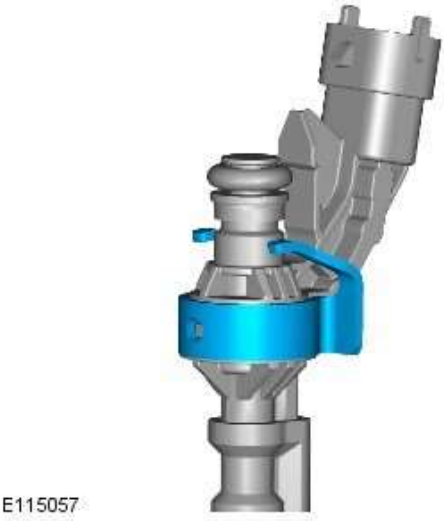
16. CAUTIONS:

Make sure that the special tool is located correctly to the fuel injector prior to removing the fuel injector.

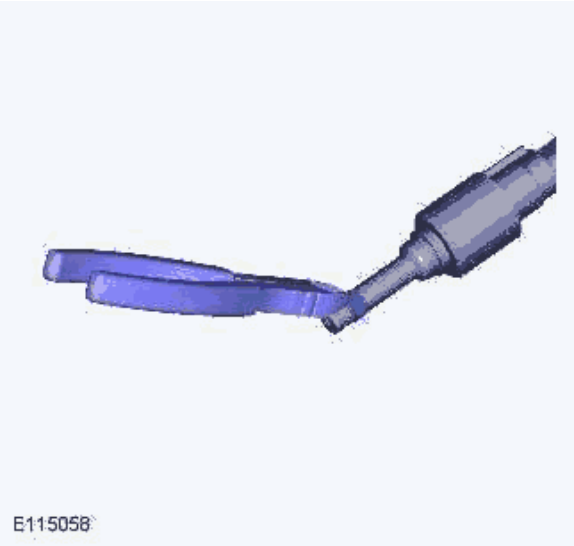
Make sure that the special tool is held square to the fuel injector during removal.

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.

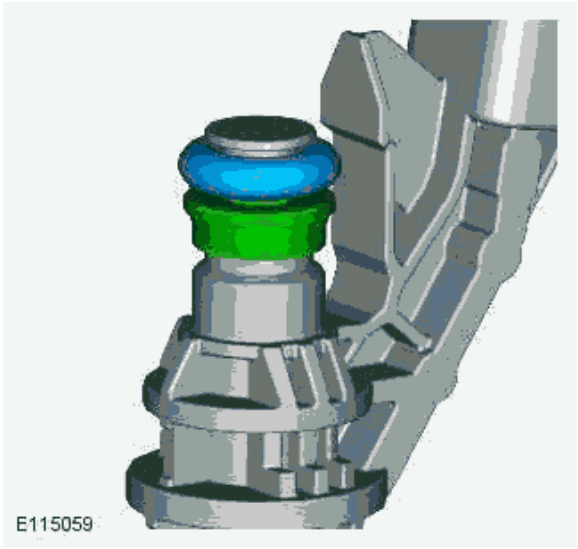


18. CAUTIONS:

Do not use a knife to remove the Teflon seal as damage could occur to the fuel injector.

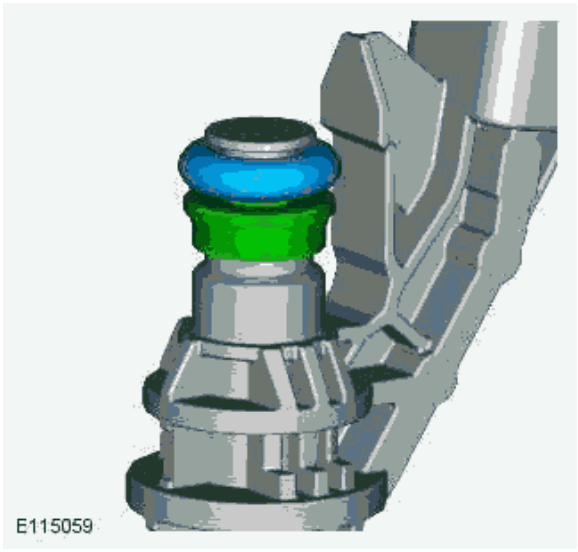
Do not cut the Teflon seal to deep as damage could occur to the fuel injector.

Pinch the Teflon seal to allow the tool to cut the Teflon seal without damaging the fuel injector.

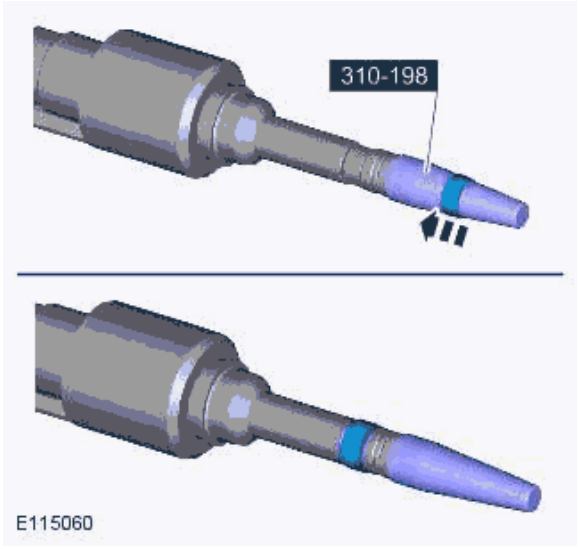


19. CAUTION: Do not use any sharp tools to remove the O-ring seal as damage could occur to the fuel injector.

Installation

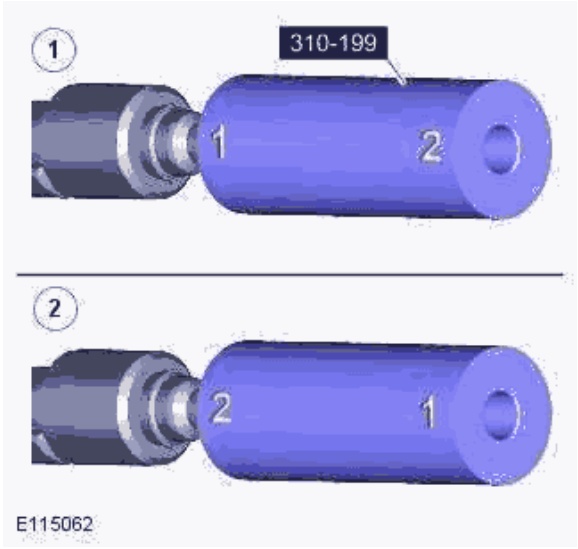


1. Install new O-ring seals.

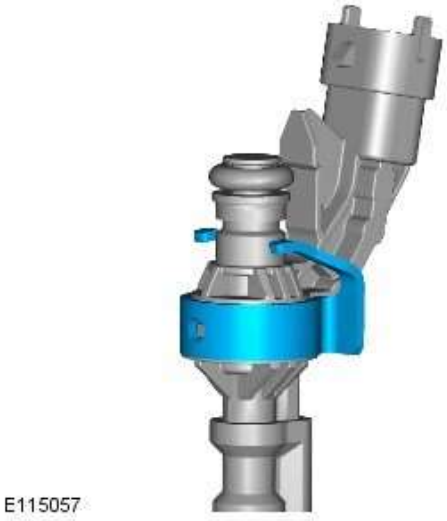


2. Install new Teflon seals.

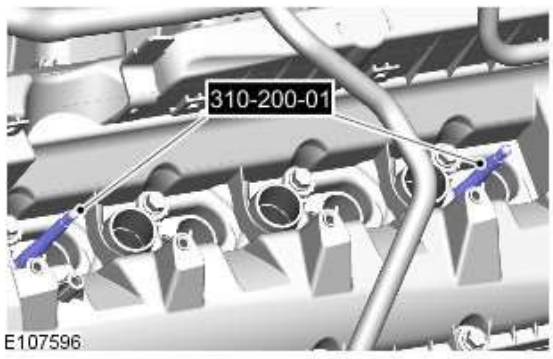
   Special Tool(s): 310-198



3. *Special Tool(s):* 310-199

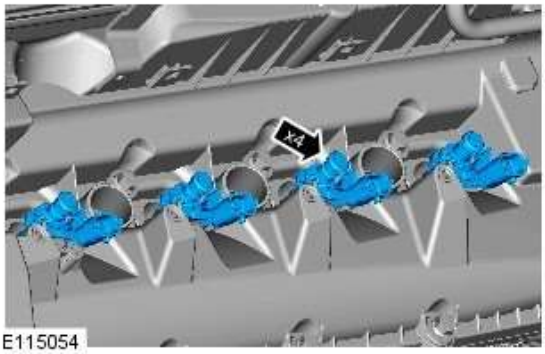


4. CAUTION: If the original fuel injector is being installed, the original fuel injector clamp must installed with the fuel injector it was removed with.



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.

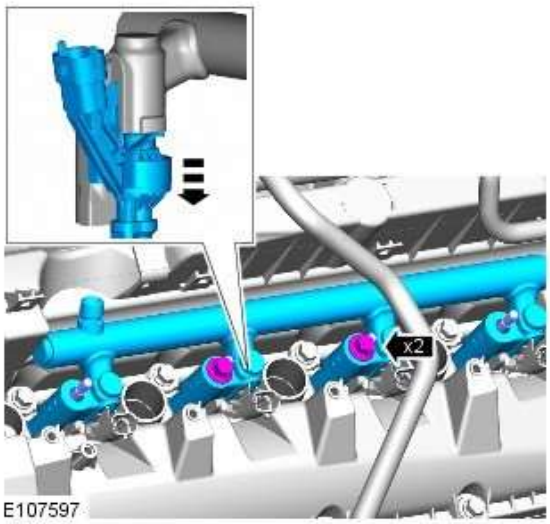
   Special Tool(s): 310-200-01, 310-200-02



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:

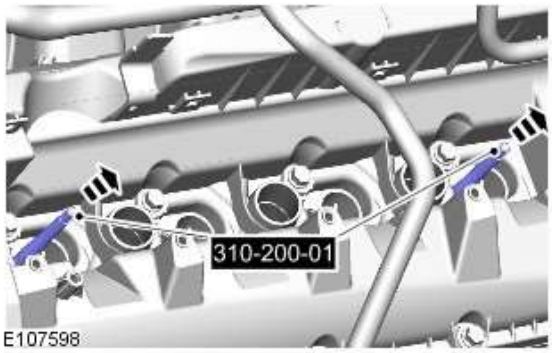
If new fuel injectors are installed, a new injector clamp must be installed

Make sure that the fuel injector is aligned and installed into the fuel rail correctly, as noted in the removal step.

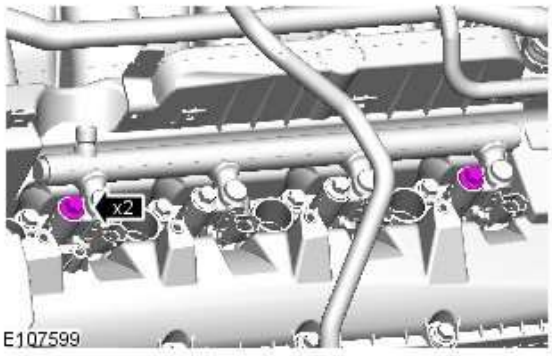
Tighten the fuel rail retaining bolts a turn at a time until the correct torque is achieved.

NOTE: Lubricate the fuel injector O-ring seals with clean engine oil.

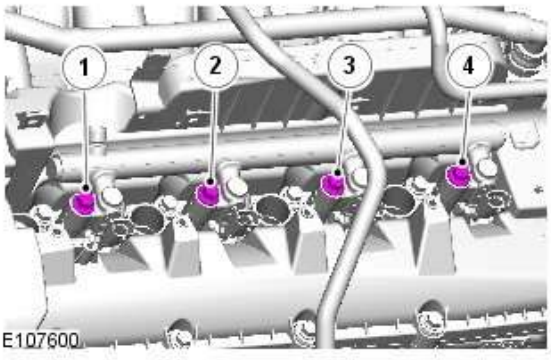
Torque: 20 Nm



8. *Special Tool(s):* 310-200-01, 310-200-02

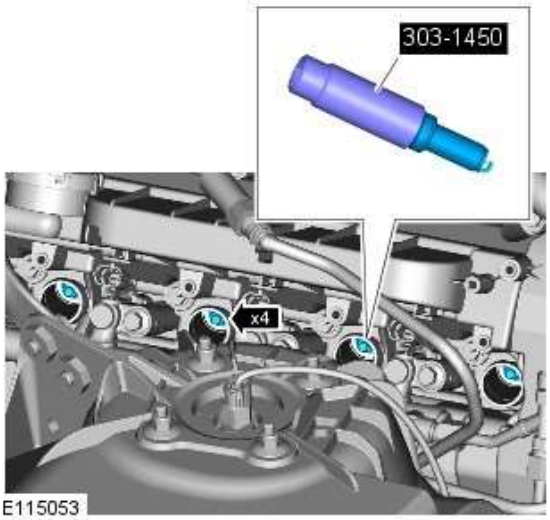


9. *Torque:* 20 Nm



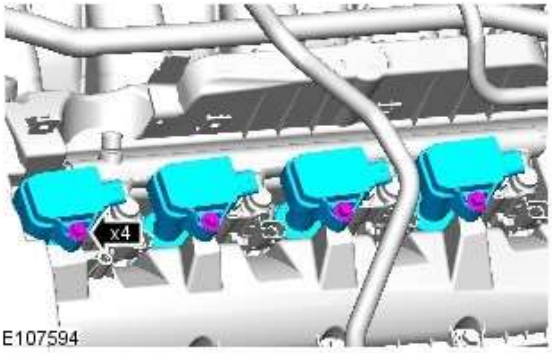
10. NOTE: Tighten in the sequence indicated.

Torque:
Bolt 2 30 Nm
Bolt 3 30 Nm
Bolt 1 30 Nm
Bolt 4 30 Nm

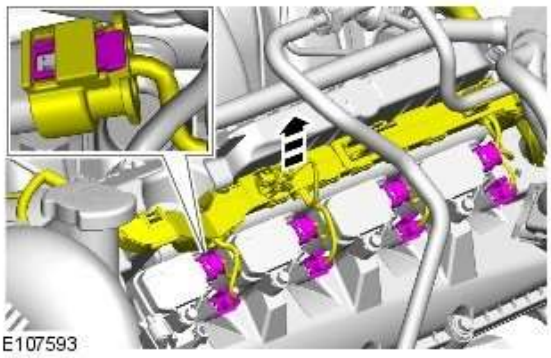


11. NOTE: RH shown LH similar.

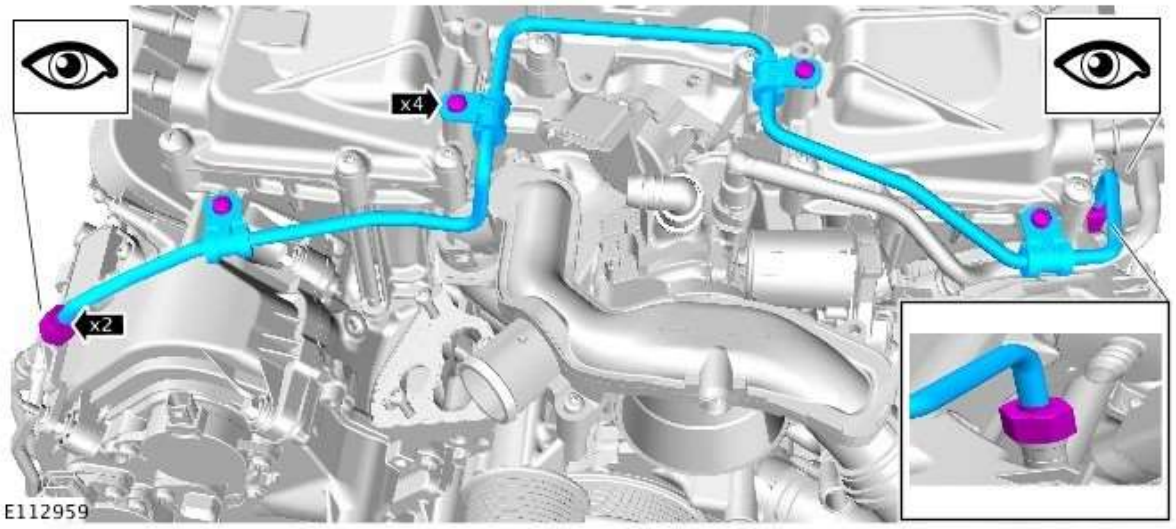
Special Tool(s): 303-1450
Torque: 20 Nm



12. *Torque:* 7 Nm



13.

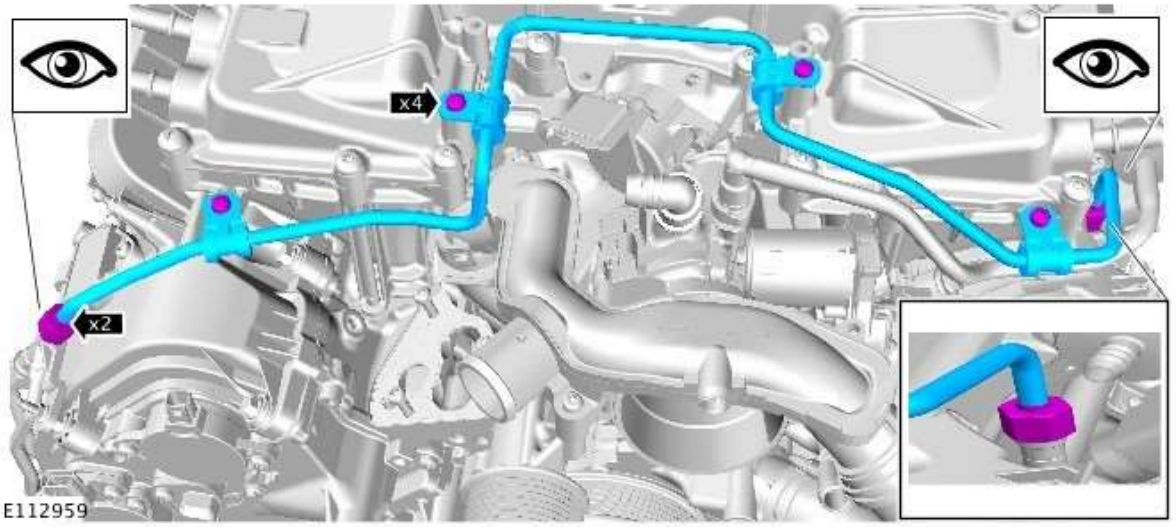


14. NOTES:

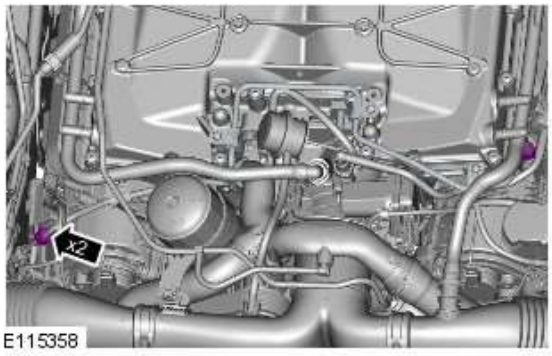
Lubricate the union threads with clean engine oil.

Do not tighten at this stage.

Remove and discard the blanking caps.



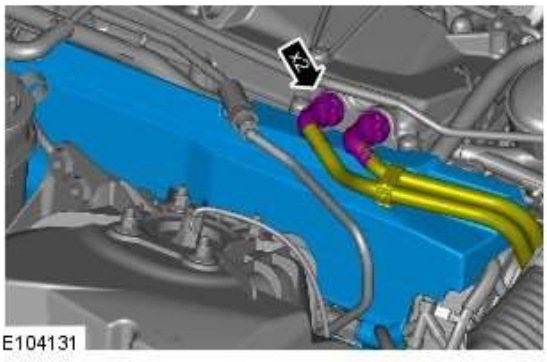
15. *Torque:*
union 21 Nm
bolts 8 Nm



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.



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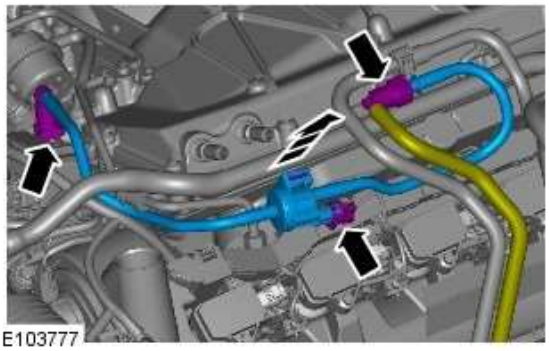

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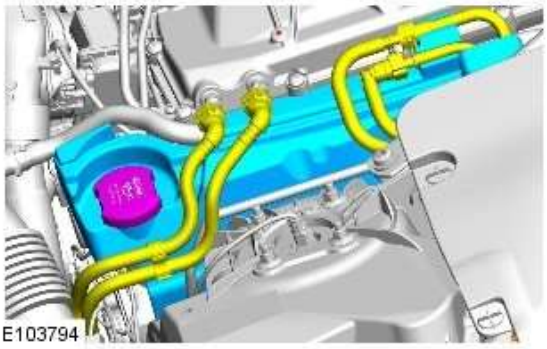
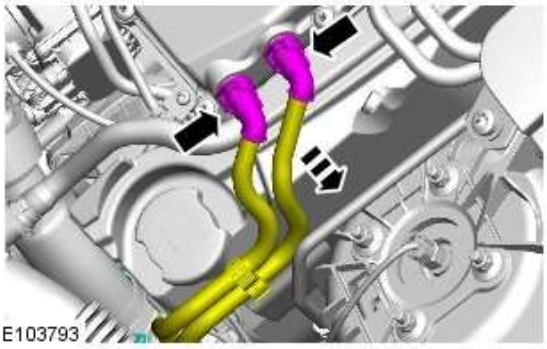


21.



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).

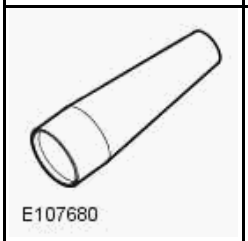
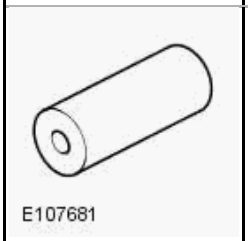
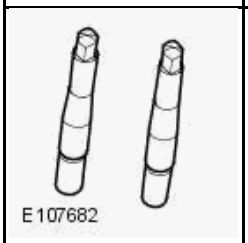
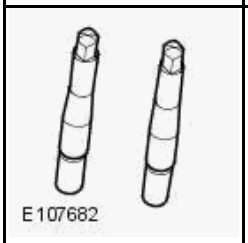
23. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

Published: 12-Nov-2013

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Fuel Rail RH

Removal and Installation

Special Tool(s)

 E115268	303-1450 Spark Plug Remover/Installer
 E114526	310-197 Remover, Fuel Injector
 E107680	310-198 Installer, Teflon Seal
 E107681	310-199 Re-shape Tool, Teflon Seal
 E107682	310-200-01 Fuel Rail Installation Guide Pins - Threaded
 E107682	310-200-02 Fuel Rail Installation Guide Pins - Unthreaded

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.

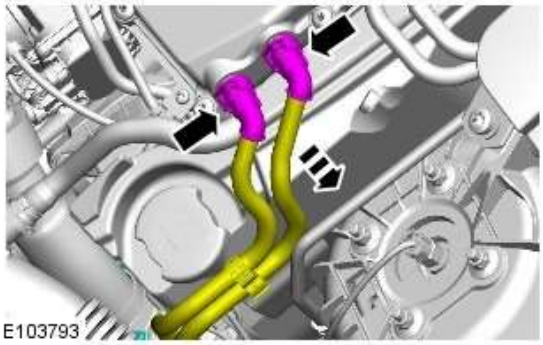
1. Refer to: Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions (100-00 General Information, Description and Operation).

2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

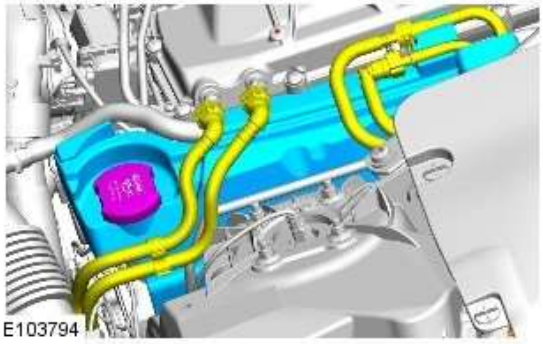
3. Refer to: Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol (310-00 Fuel System - General Information, General Procedures).

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).

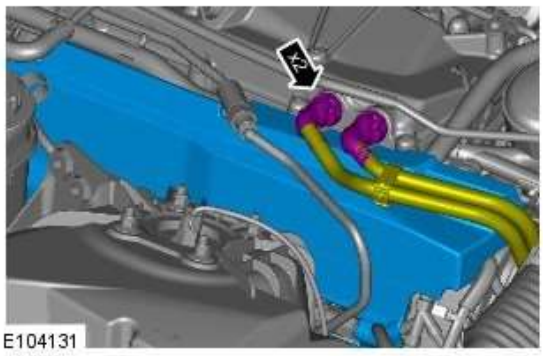
5. Refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - V8 5.0L Petrol, General Procedures).



6. CAUTION: Be prepared to collect escaping fluids.



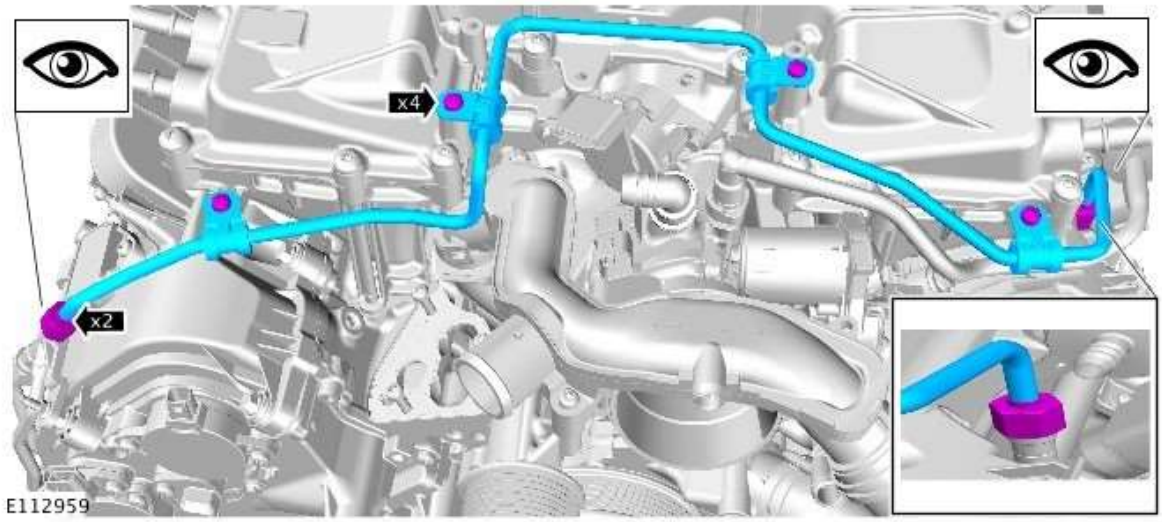
7.



8. CAUTION: Be prepared to collect escaping fluids.

9. Refer to: Air Cleaner Outlet Pipe RH (303-12C Intake Air Distribution and Filtering - V8

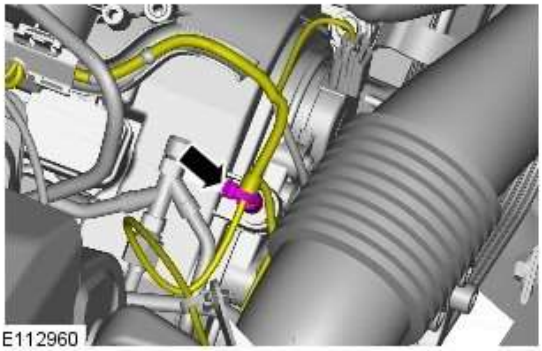
5.0L Petrol, Removal and Installation).



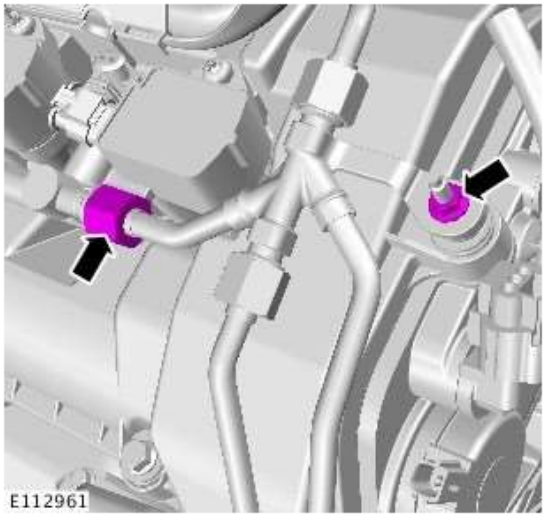
10. CAUTIONS:

Be prepared to collect escaping fluids.

Make sure that all openings are sealed. Use new blanking caps.



11.



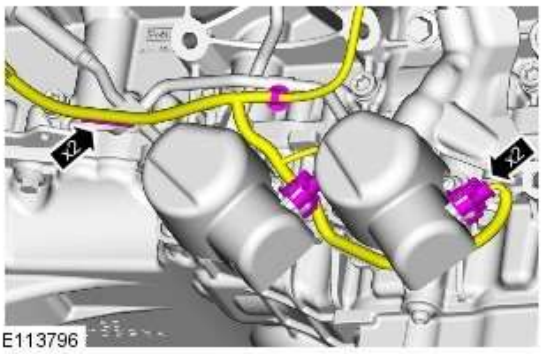
12. CAUTIONS:

Be prepared to collect escaping fluids.

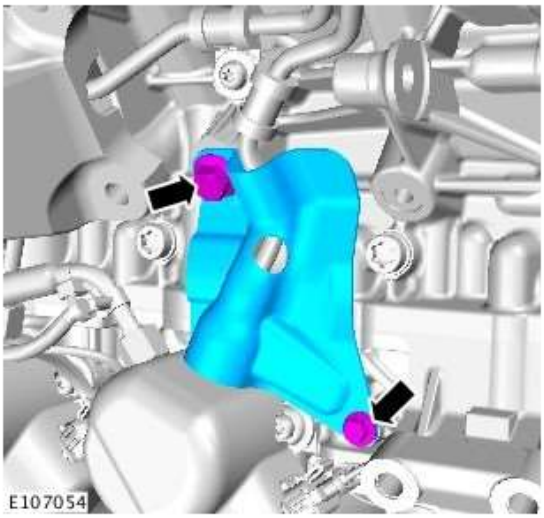
Make sure that all openings are sealed. Use new blanking caps.

13. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

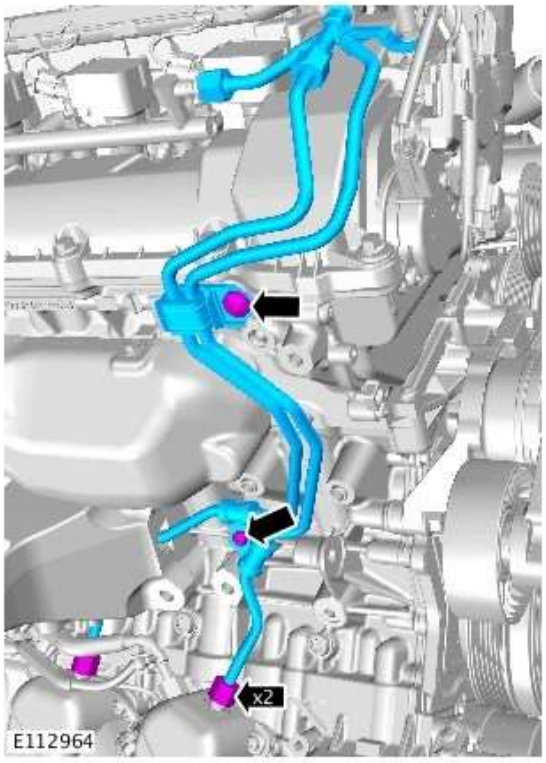
Raise and support the vehicle.



14. NOTE: Engine shown removed for clarity.



15. NOTE: Engine shown removed for clarity.



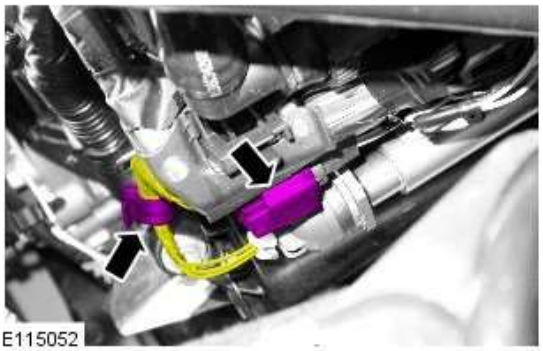
16. CAUTIONS:

Be prepared to collect escaping fluids.

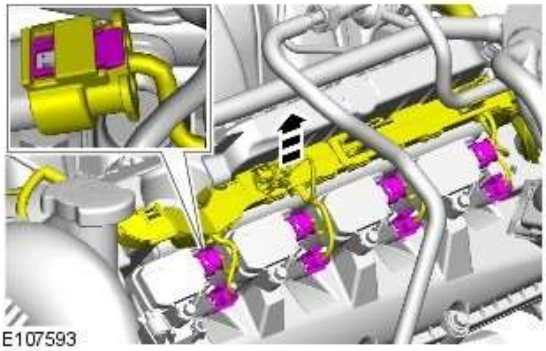
Make sure that all openings are sealed. Use new blanking caps.

NOTE: Engine shown removed for clarity.

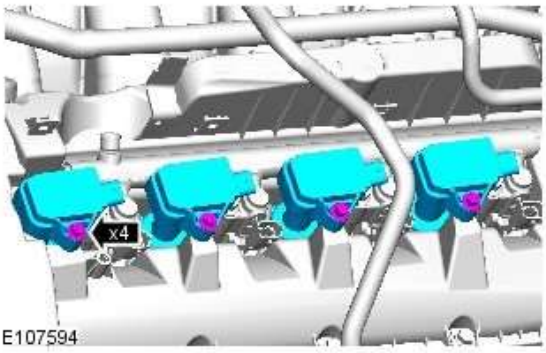
17. Lower the vehicle.



18.

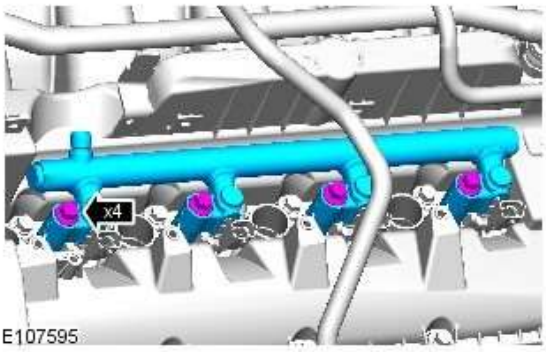


19. NOTE: LH shown RH similar.



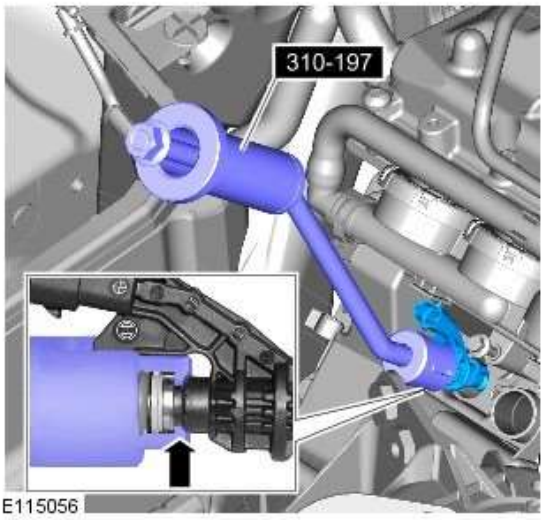
20. NOTE: LH shown RH similar.

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.



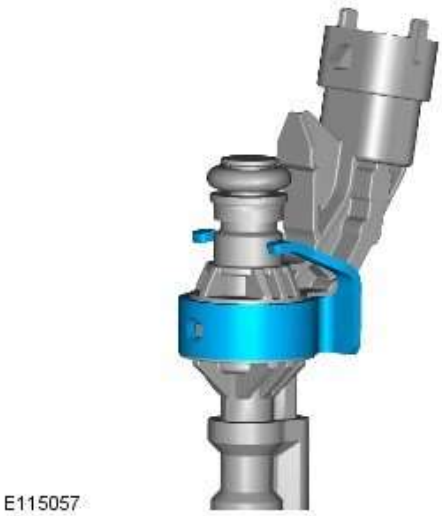
23. CAUTIONS:

Make sure that the special tool is located correctly to the fuel injector prior to removing the fuel injector.

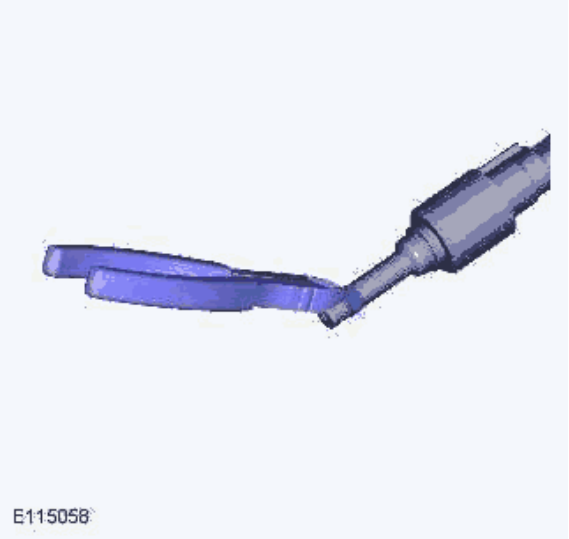
Make sure that the special tool is held square to the fuel injector during removal.

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.

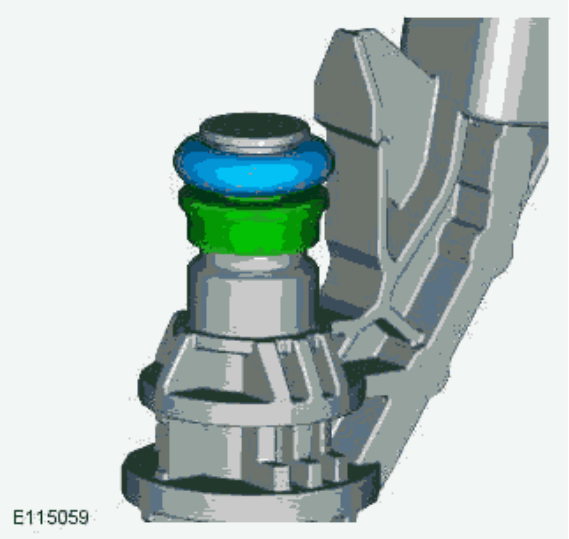


25. CAUTIONS:

    Do not use a knife to remove the Teflon seal as damage could occur to the fuel injector.

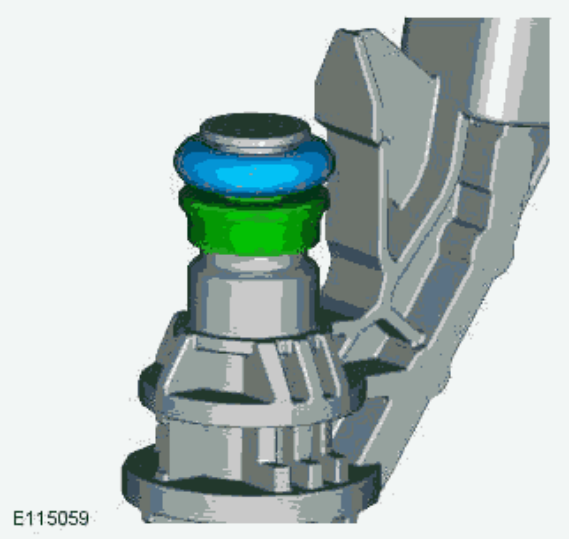
    Do not cut the Teflon seal to deep as damage could occur to the fuel injector.

    Pinch the Teflon seal to allow the tool to cut the Teflon seal without damaging the fuel injector.

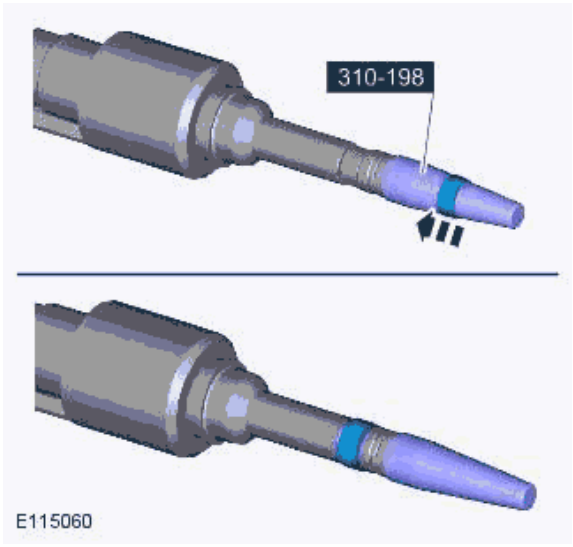


26. CAUTION: Do not use any sharp tools to remove the O-ring seal as damage could occur to the fuel injector.

Installation

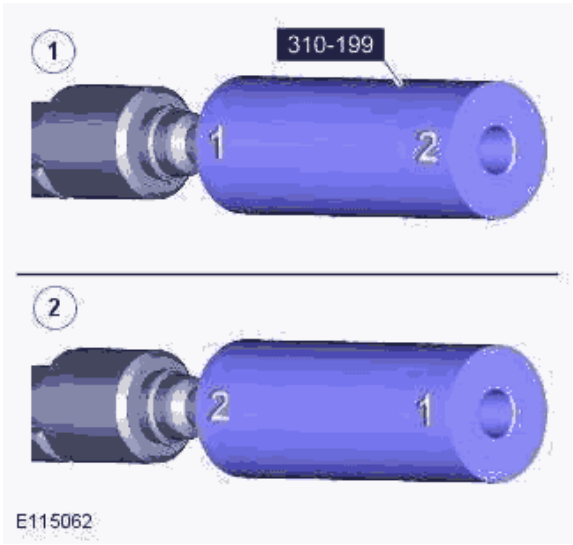


1. Install new O-ring seals.

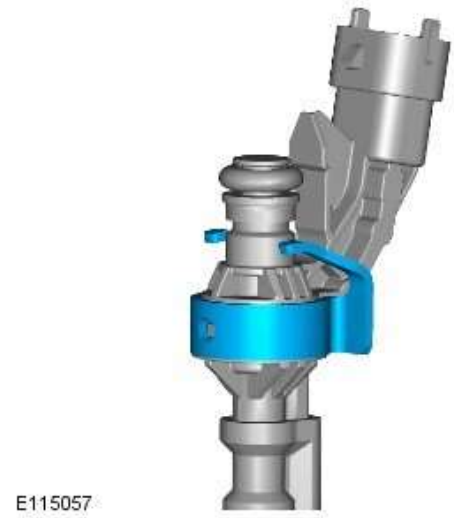


2. Install new Teflon seals.

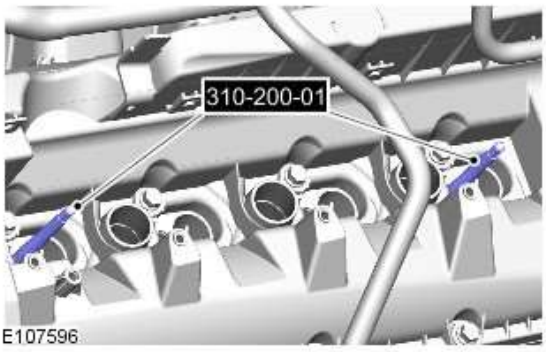
   Special Tool(s): 310-198



3. *Special Tool(s):* 310-199

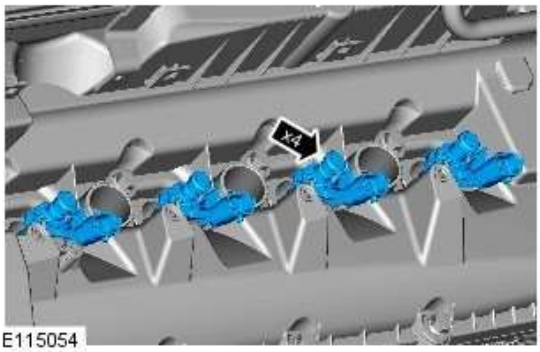


4. CAUTION: If the original fuel injector is being installed, the original fuel injector clamp must installed with the fuel injector it was removed with.



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.

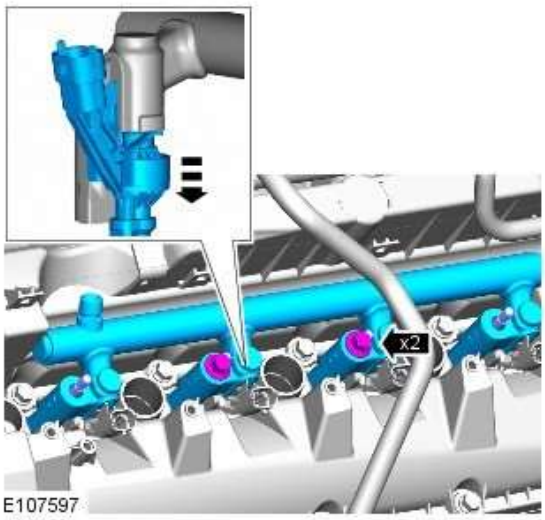
   Special Tool(s): 310-200-01, 310-200-02



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.

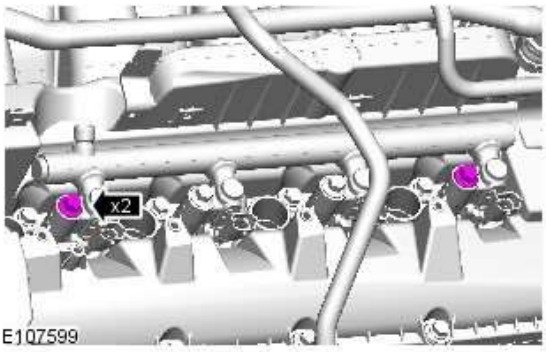
   Tighten the fuel rail retaining bolts a turn at a time until the correct torque is achieved.

   NOTE: Lubricate the fuel injector O-ring seals with clean engine oil.

   Torque: 20 Nm

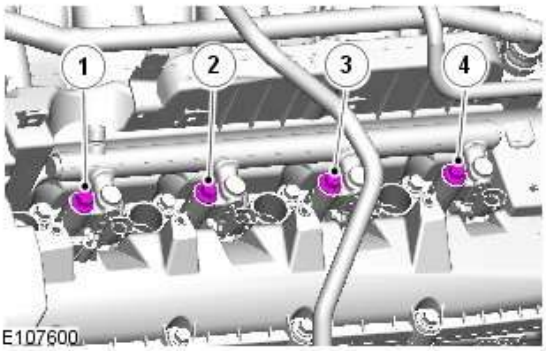
8. NOTE: LH shown RH similar.

   Special Tool(s): 310-200-01, 310-200-02



9. NOTE: LH shown RH similar.

   Torque: 20 Nm

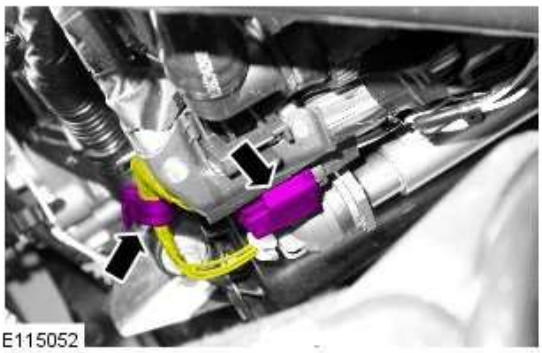


10. NOTES:

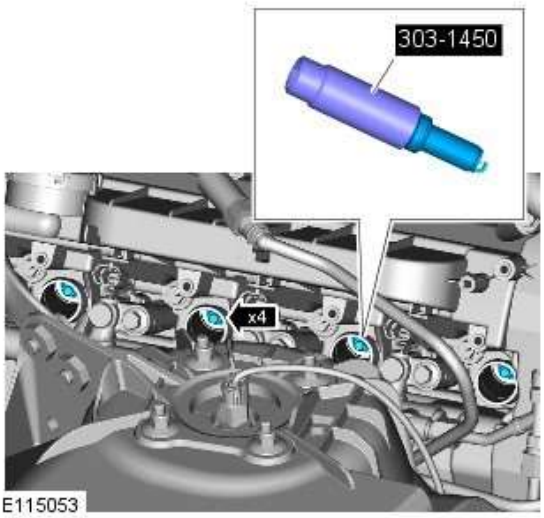
    LH shown RH similar.

    Tighten in the sequence indicated.

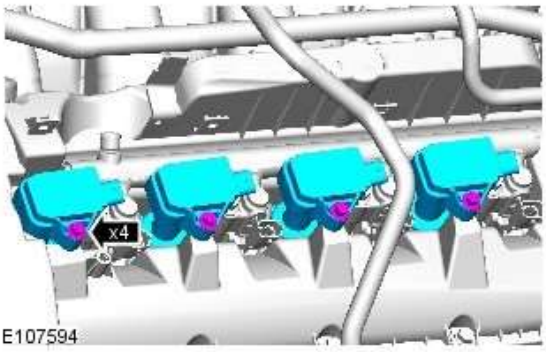
    Torque:
    Bolt 2 30 Nm
    Bolt 3 30 Nm
    Bolt 1 30 Nm
    Bolt 4 30 Nm



11.

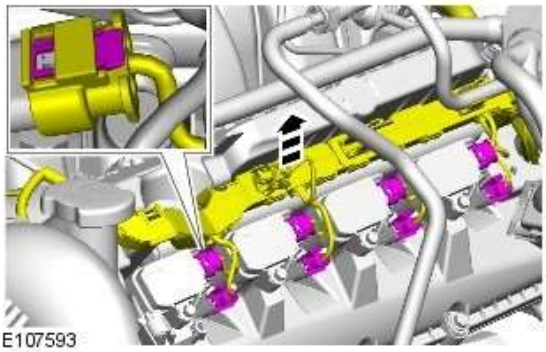


12. *Special Tool(s):* 303-1450
    Torque: 20 Nm

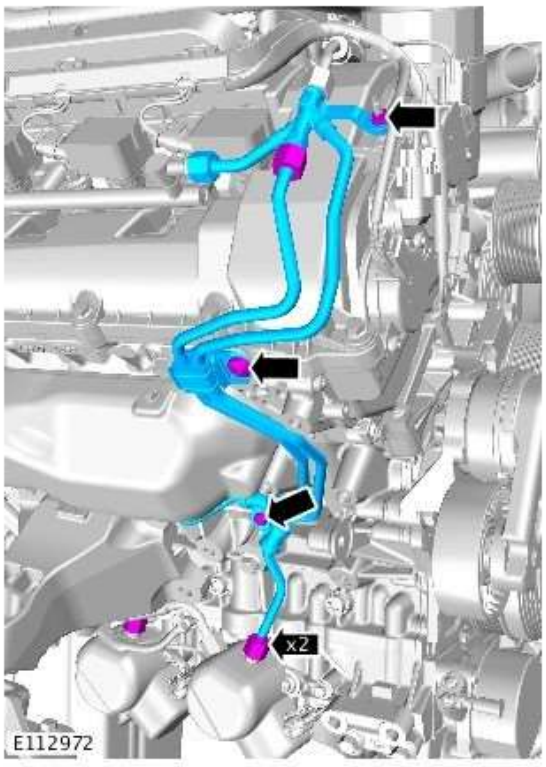


13. NOTE: LH shown RH similar.

Torque: 7 Nm



14. NOTE: LH shown RH similar.



15. CAUTION: Lubricate **only** the union threads with clean engine oil.

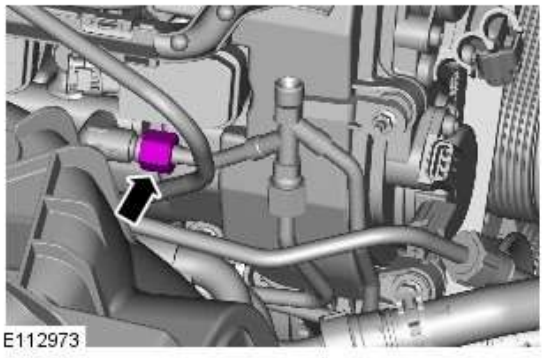
NOTES:

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.



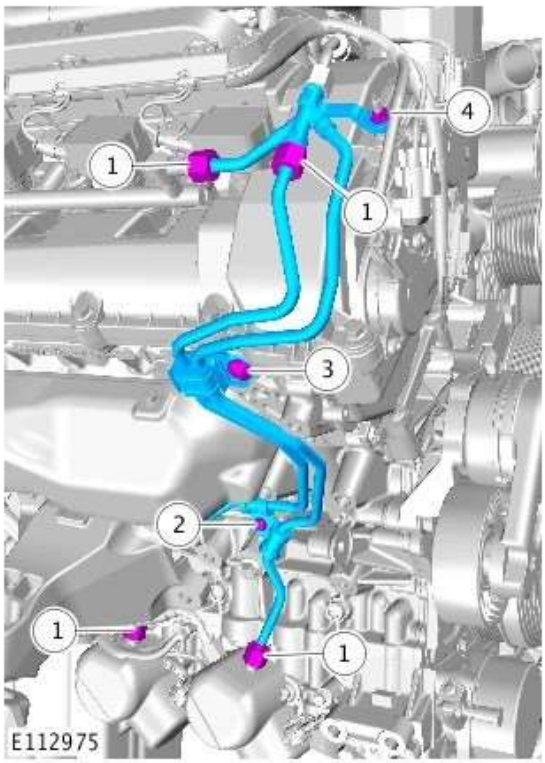
17. NOTES:

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.

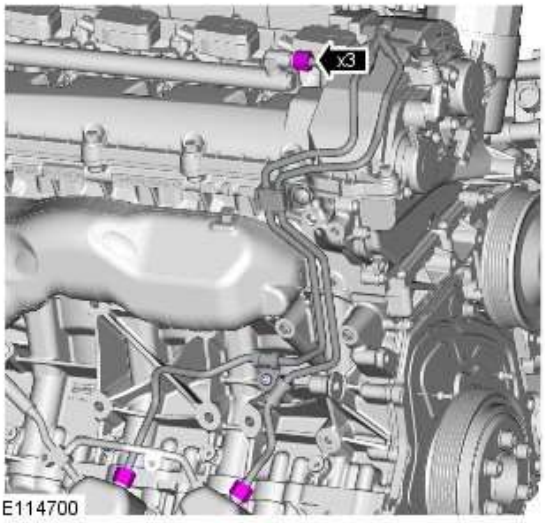
Raise and support the vehicle.



19. NOTE: Engine shown removed for clarity.

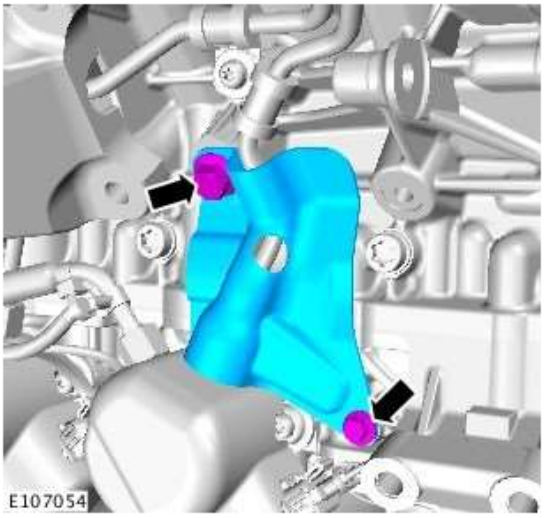
Torque:

Unions (1) 21 Nm
M6 (2) 11 Nm
M8 (3) 25 Nm
M5 nut (4) 6 Nm



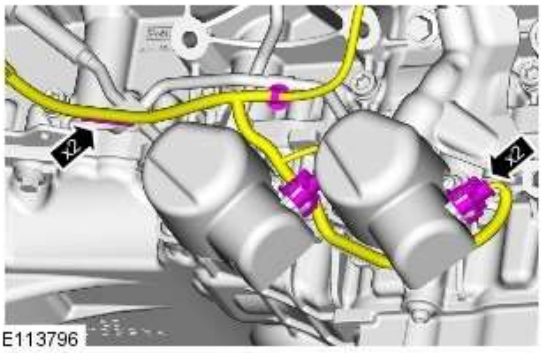
20. NOTE: Engine shown removed for clarity.

Torque: 21 Nm



21. NOTE: Engine shown removed for clarity.

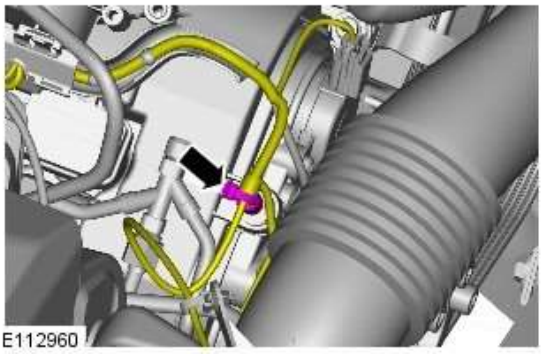
Torque:
M10 29 Nm
M6 11 Nm



22. NOTE: Engine shown removed for clarity.

23. Lower the vehicle.

24.

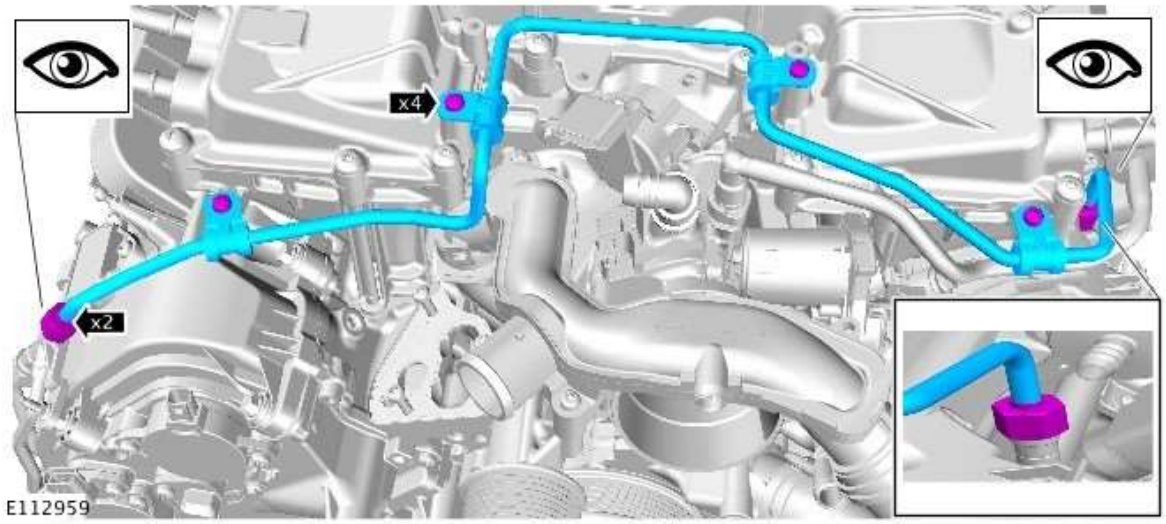


25. NOTES:

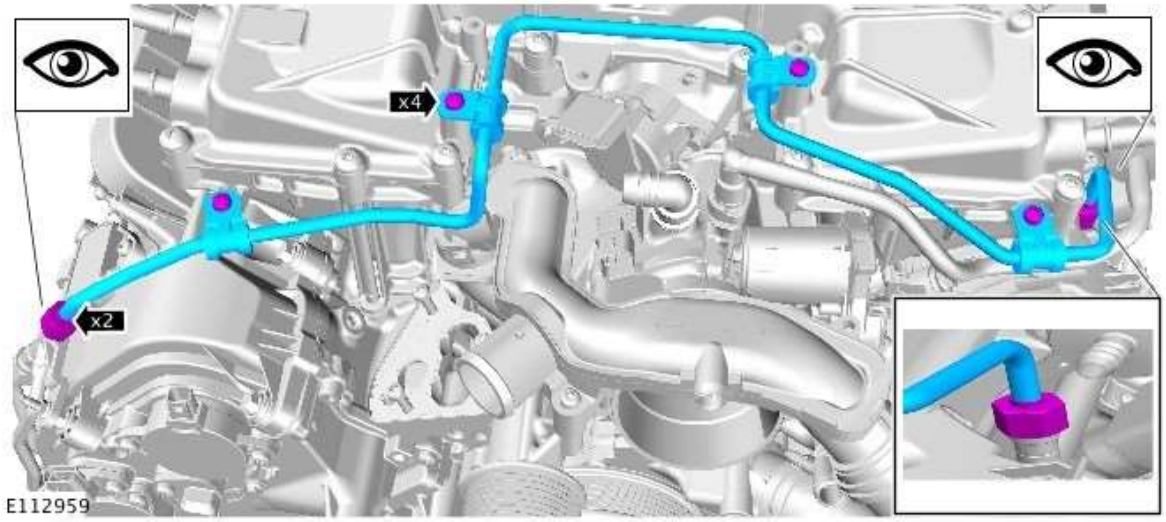
Lubricate the union threads with clean engine oil.

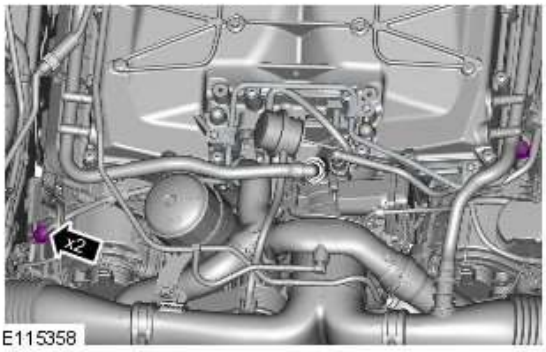
Do not tighten at this stage.

Remove and discard the blanking caps.



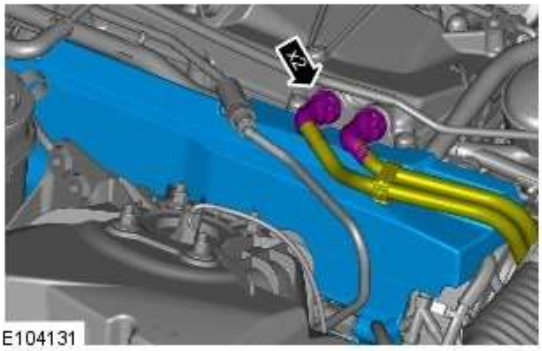
26. *Torque:*
Unions 21 Nm
Bolts 8 Nm



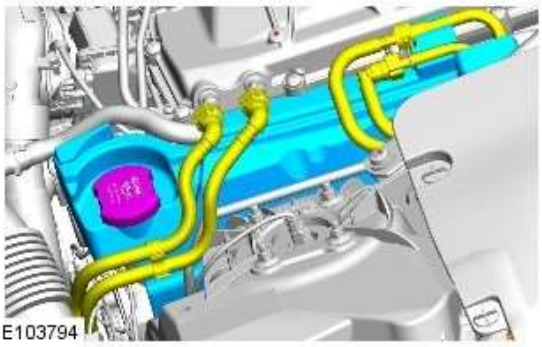


27. *Torque:* 21 Nm

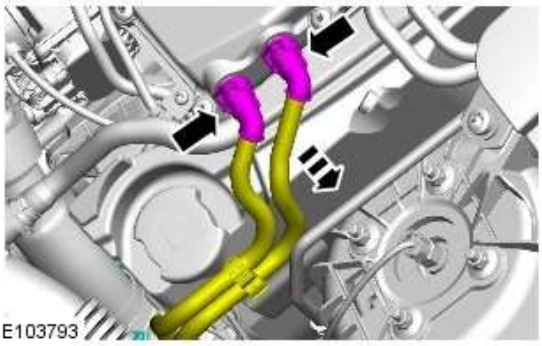
28. Refer to: Air Cleaner Outlet Pipe RH (303-12C Intake Air Distribution and Filtering - V8 5.0L Petrol, Removal and Installation).



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).

Published: 11-May-2011

Fuel Charging and Controls - V8 S/C 5.0L Petrol - Left-Hand Fuel Rail High-Pressure Fuel Pump

Removal and Installation

Removal

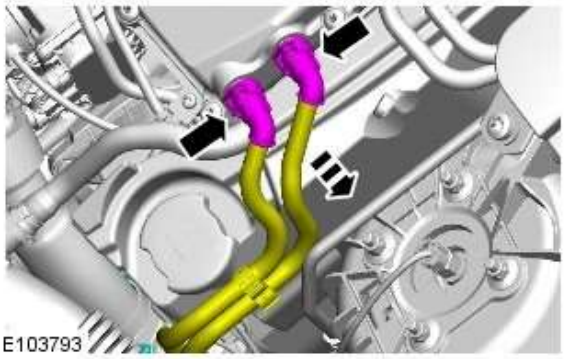
CAUTION: Make sure that tools and equipment are clean, free of foreign material and lubricant.

NOTES:

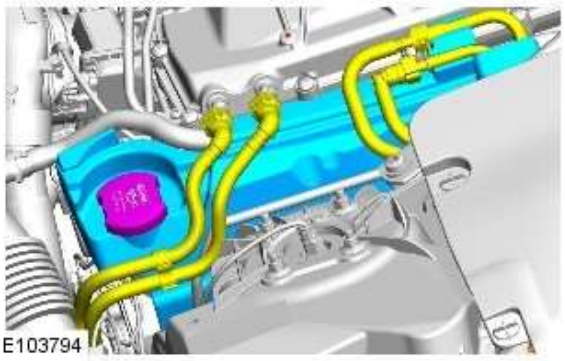
Removal steps in this procedure may contain installation details.

Some variation in the illustrations may occur, but the essential information is always correct.

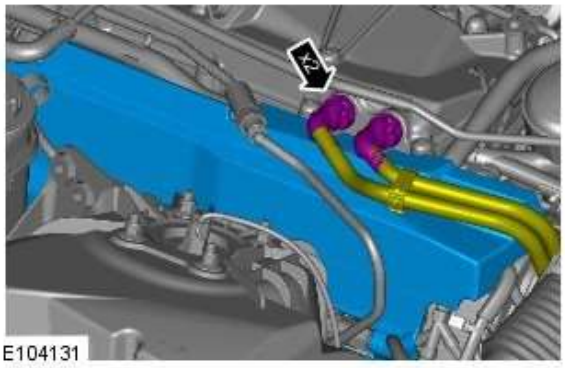
1. Refer to: Petrol and Petrol-Ethanol Fuel Systems Health and Safety Precautions (100-00 General Information, Description and Operation).
2. Refer to: Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol (310-00 Fuel System - General Information, General Procedures).
3. Refer to: Secondary 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).



7. CAUTION: Be prepared to collect escaping fluids.

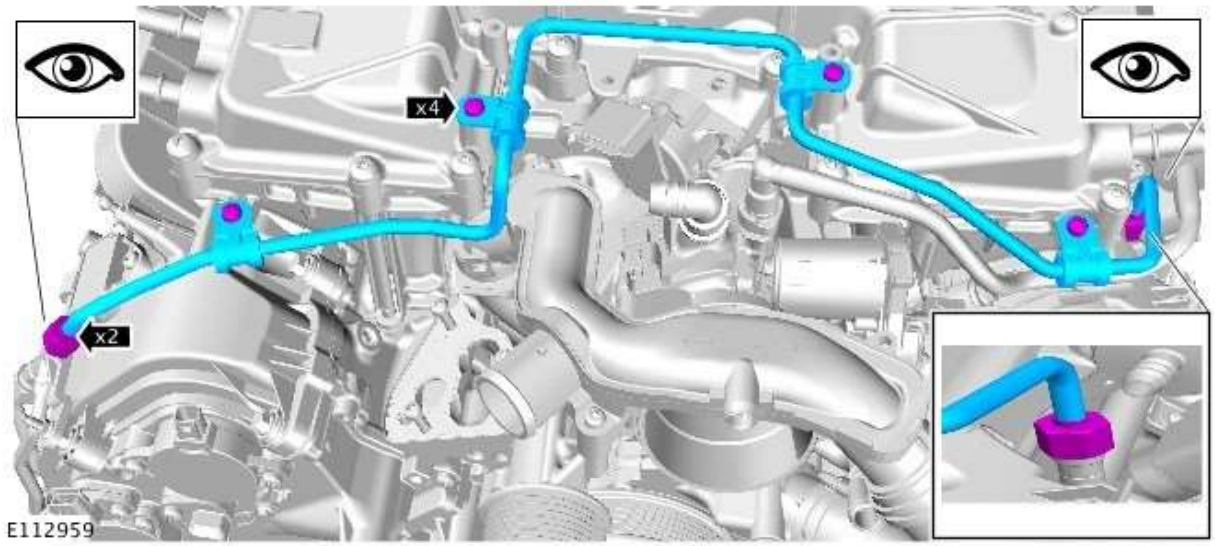


8.



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).

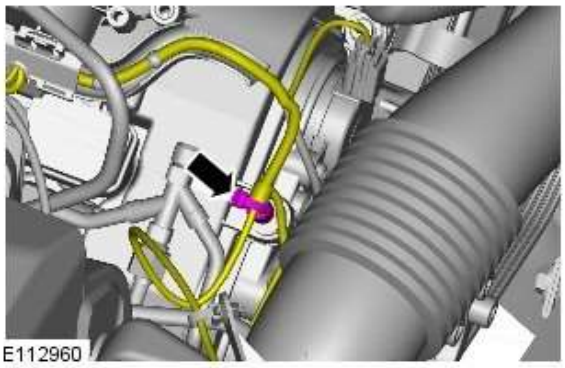


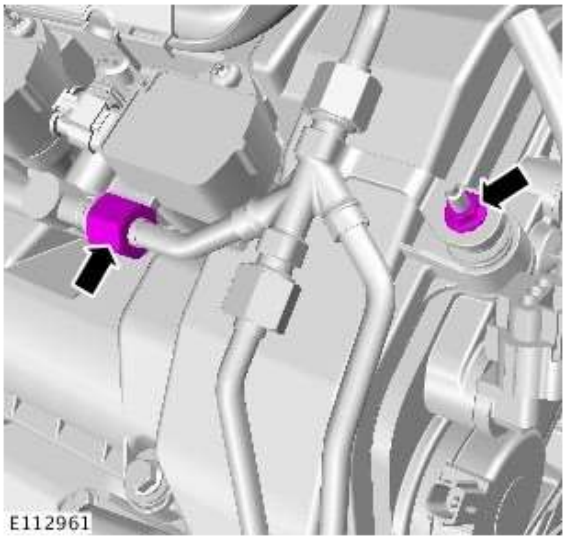
11. CAUTIONS:

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.

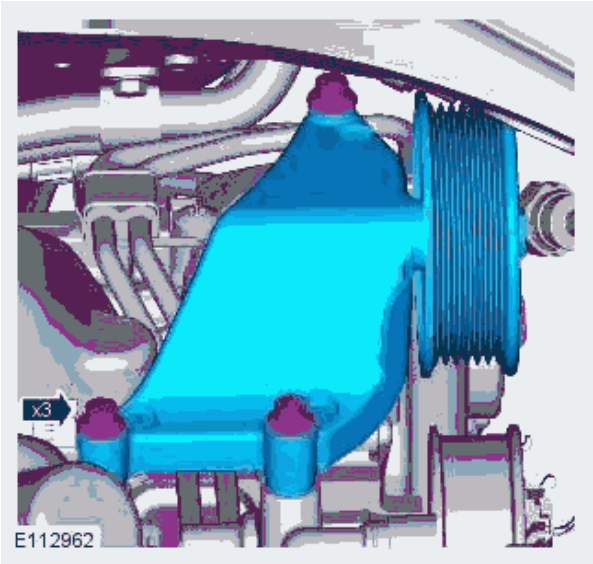
    Make sure that all openings are sealed. Use new blanking caps.

14. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

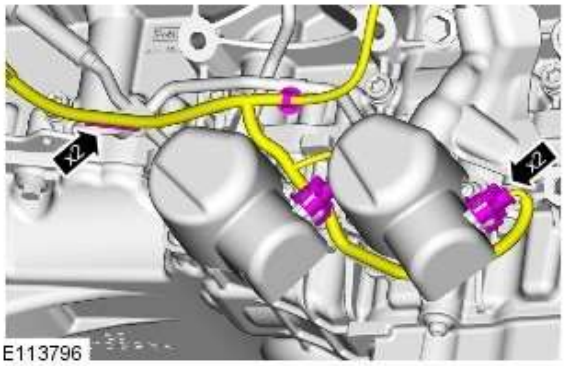
    Raise and support the vehicle.

15. Refer to: Engine Mount RH (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

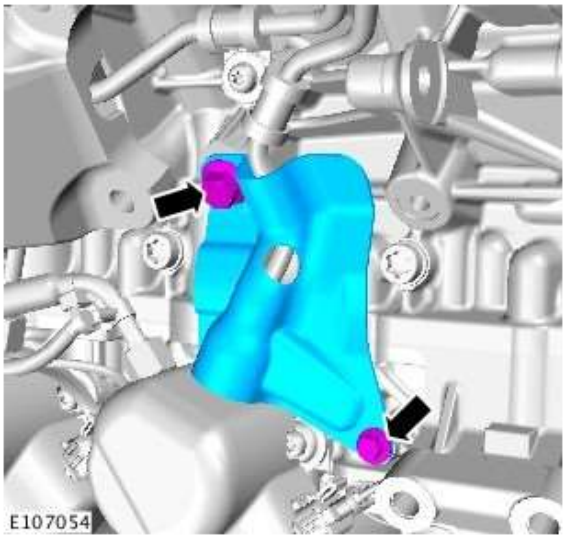
16. Refer to: Generator - V8 5.0L Petrol (414-02C Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).



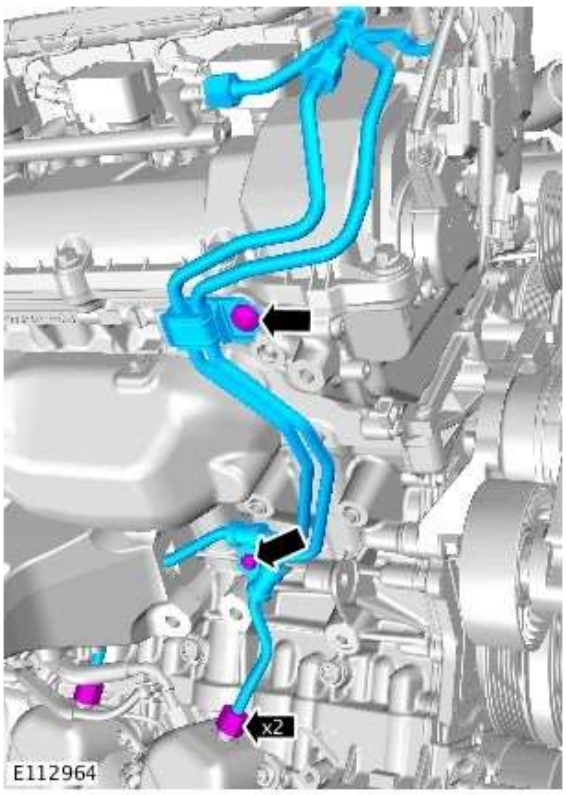
17.



18. NOTE: Engine shown removed for clarity.



19. NOTE: Engine shown removed for clarity.



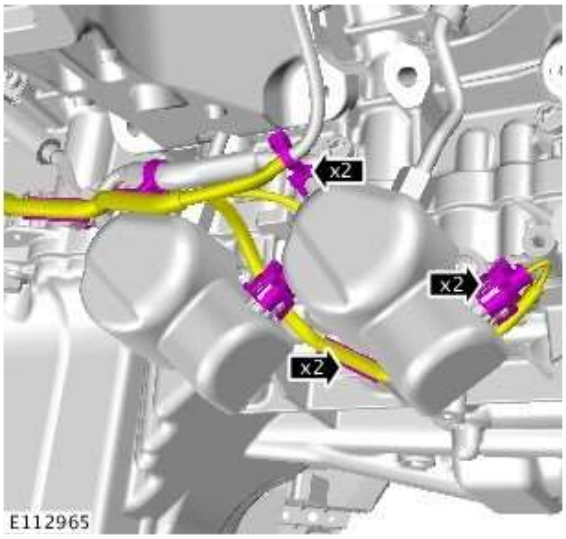
20. CAUTIONS:

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.

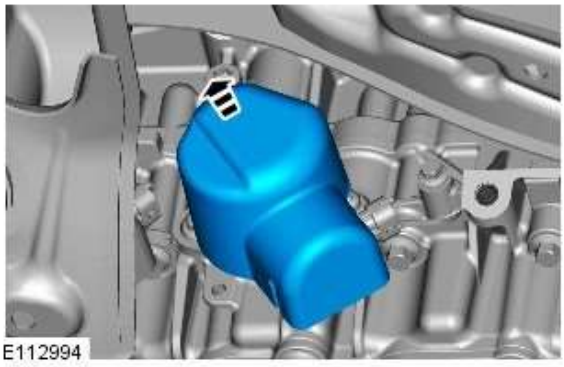
NOTE: Engine shown removed for clarity.



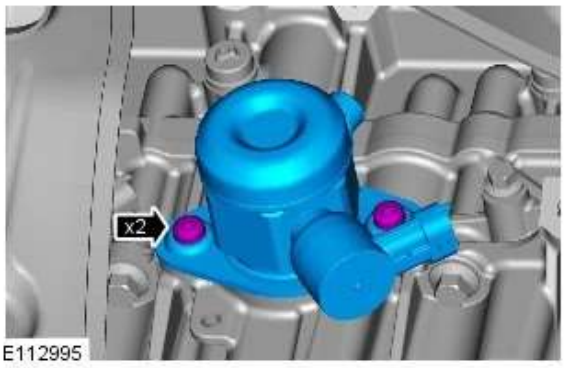
21. CAUTIONS:

Be prepared to collect escaping fluids.

Make sure that all openings are sealed. Use new blanking caps.



22.



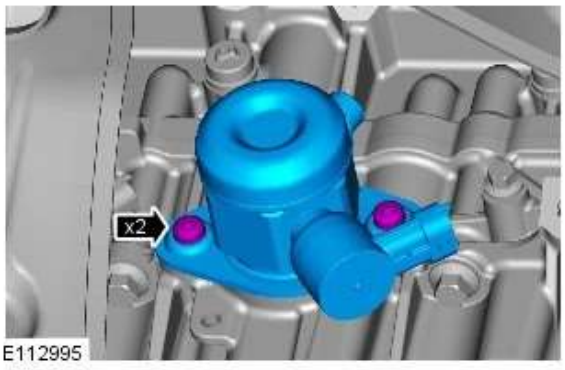
23. CAUTION: Be prepared to collect escaping fluids.

Loosen the Torx screws a turn each at a time.

24. CAUTION: Be prepared to collect escaping fluids.

Installation

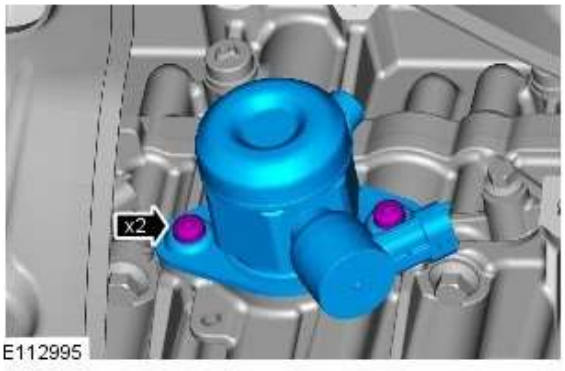
1. NOTE: Lubricate the fuel rail high-pressure fuel pump bucket with clean engine oil.



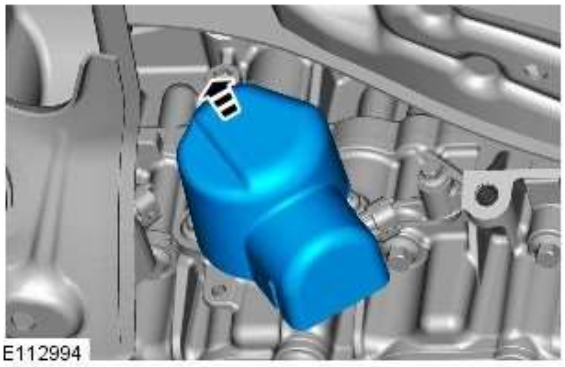
2. CAUTION: Tighten the Torx screws a turn at a time until the correct torque is achieved.

   NOTE: Lubricate the fuel rail high-pressure fuel pump O-ring seal with clean engine oil.

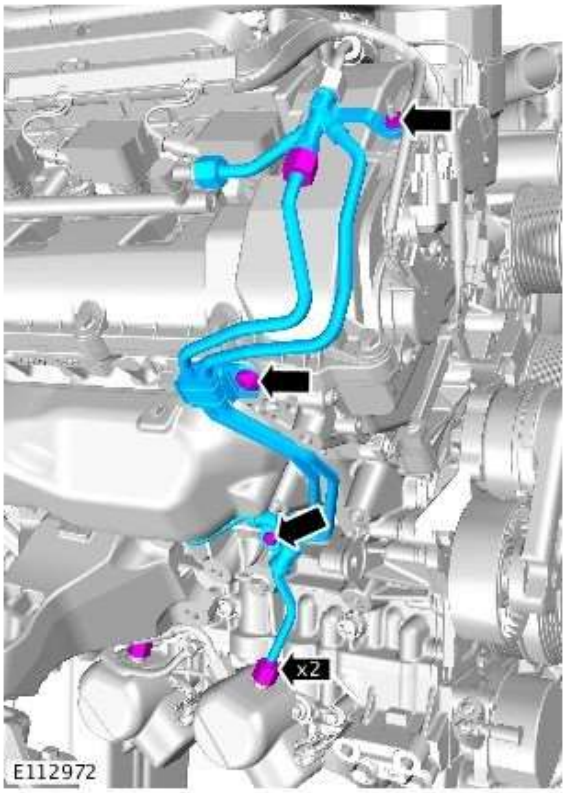
   Torque: 12 Nm



3. Loosen the Torx screws half a turn each.



4.



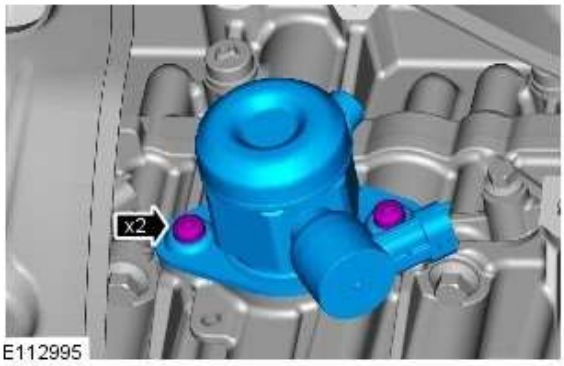
5. CAUTION: Install new high-pressure fuel supply lines.

   NOTES:

   Engine shown removed for clarity.

   Remove and discard the blanking caps.

   Install the bolt and unions fully finger tight before final tightening.

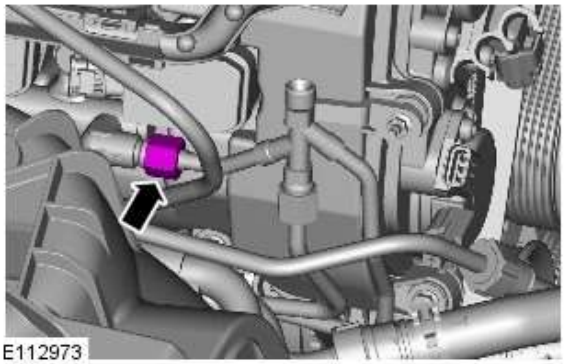


6. CAUTION: Care must be taken when positioning the fuel rail high-pressure fuel pump cover to one side.

   NOTE: Fuel rail high-pressure fuel pump cover shown removed for clarity.

   Torque: 12 Nm

7. Lower the vehicle.



8. NOTES:

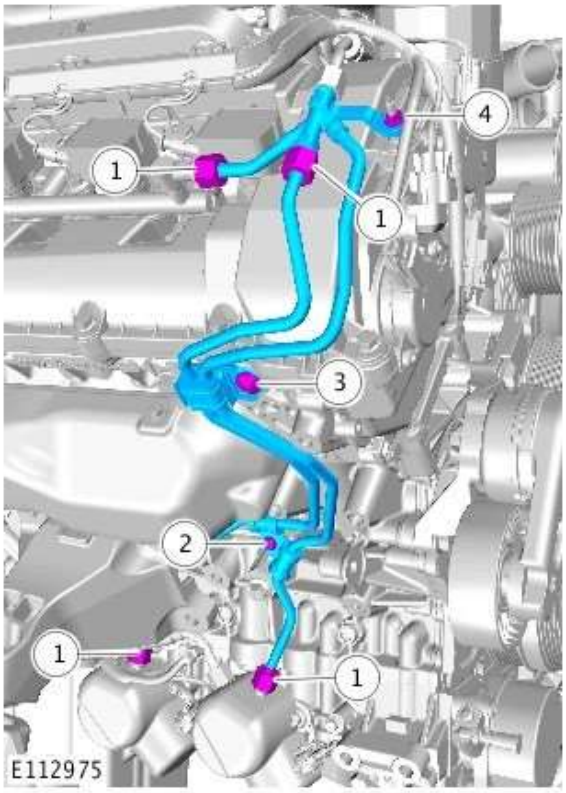
   Do not tighten at this stage.

   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.

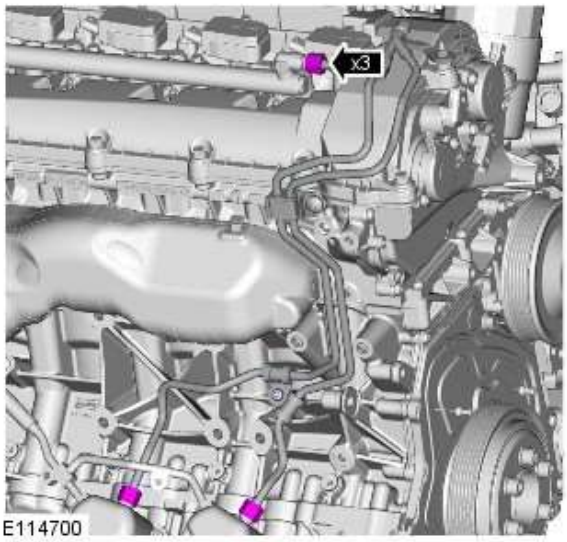
Raise and support the vehicle.



10. CAUTION: Lubricate **only** the union threads with clean engine oil.

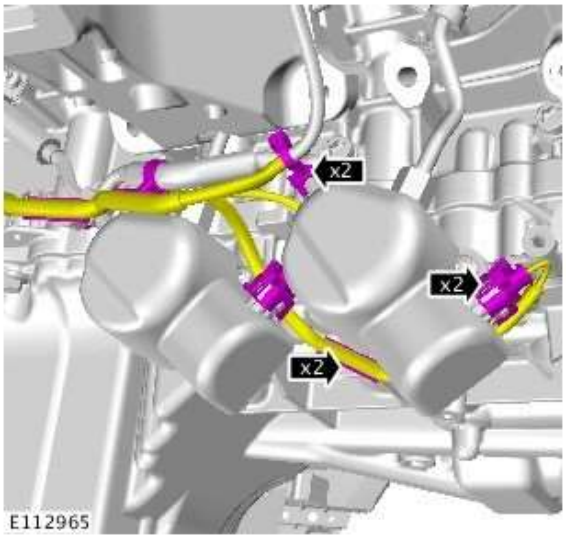
NOTE: Engine shown removed for clarity.

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

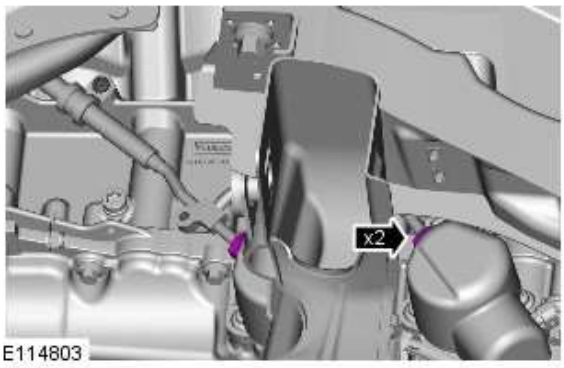


12. NOTES:

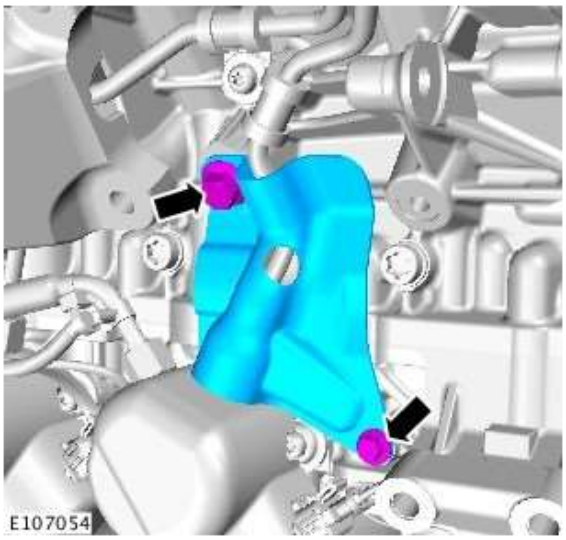
    Install the bolt and unions finger tight before final tightening.

    Remove and discard the blanking caps.

    Torque:
    Unions 21 Nm
    M6 11 Nm

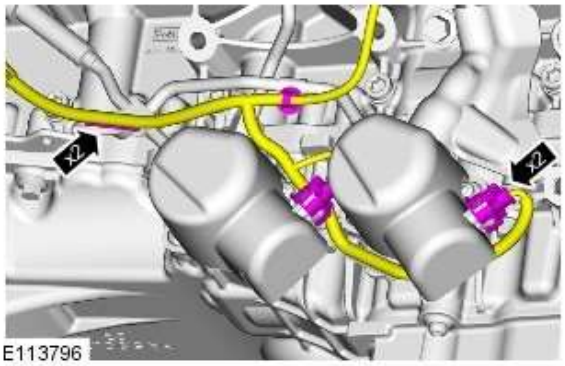


13. *Torque:* 21 Nm

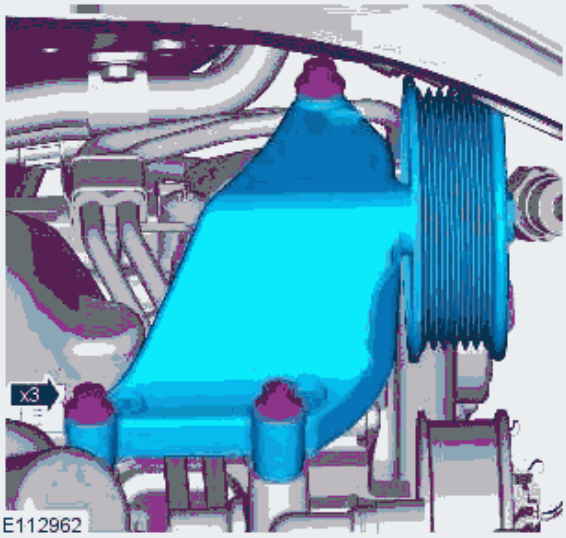


14. NOTE: Engine shown removed for clarity.

    Torque:
    M10 29 Nm
    M6 11 Nm



15. NOTE: Engine shown removed for clarity.



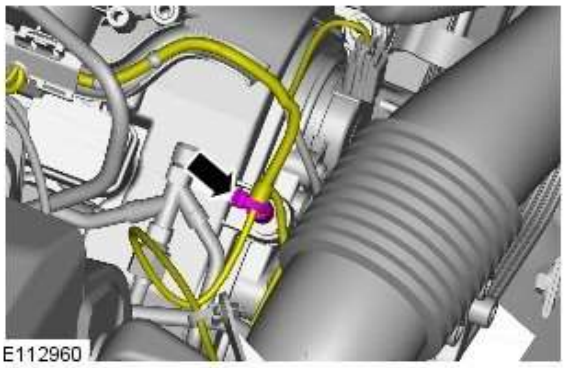
16. *Torque:* 25 Nm

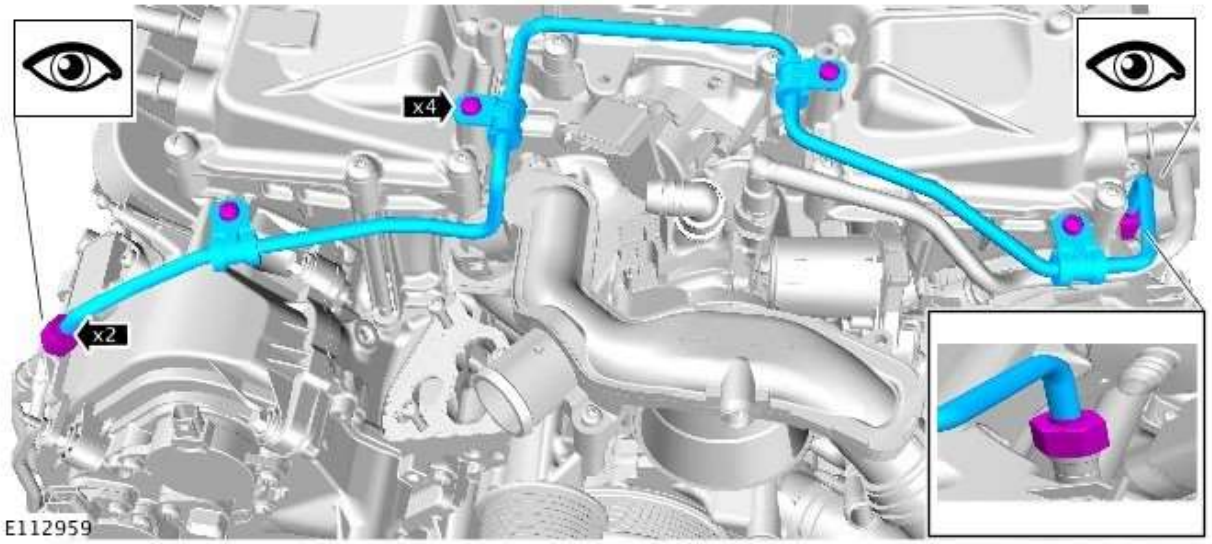
17. Refer to: Generator - V8 5.0L Petrol (414-02C Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Removal and Installation).

18. Refer to: Engine Mount RH (303-01D, In-vehicle Repair).

19. Lower the vehicle.

20.



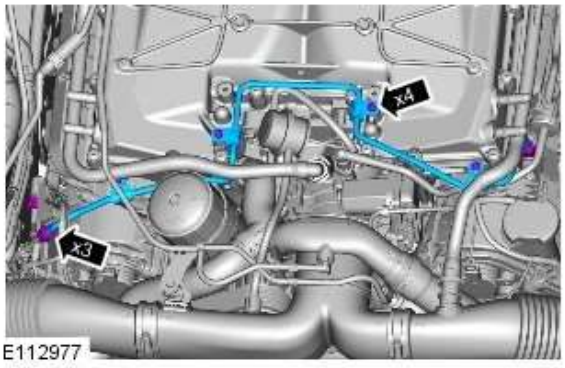


21. NOTES:

Lubricate the union threads with clean engine oil.

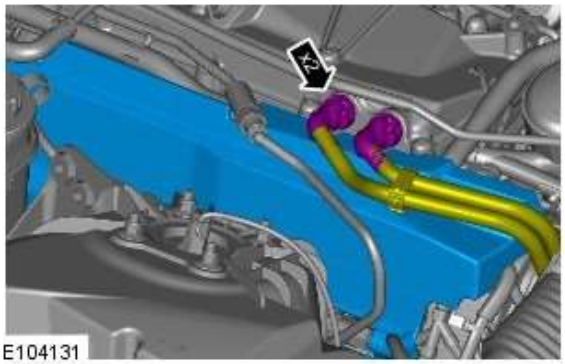
Do not tighten at this stage.

Remove and discard the blanking caps.



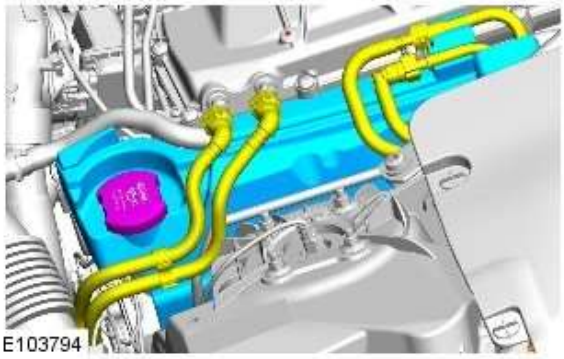
22. *Torque:*
Unions 21 Nm
Bolts 8 Nm

23. Refer to: Air Cleaner Outlet Pipe RH (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

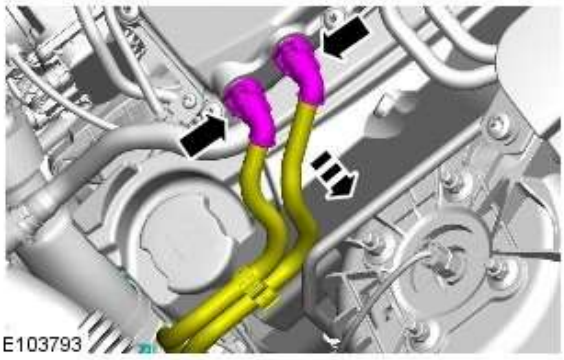


24.

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).

Published: 11-May-2011

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).

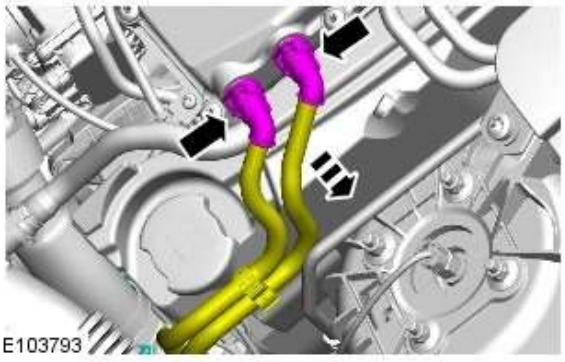
2. Refer to: Fuel System Pressure Release - V8 5.0L Petrol/V8 S/C 5.0L Petrol (310-00 Fuel System - General Information, General Procedures).

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).

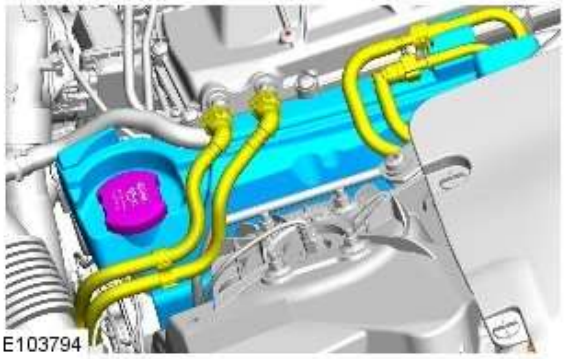
5. Refer to: Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

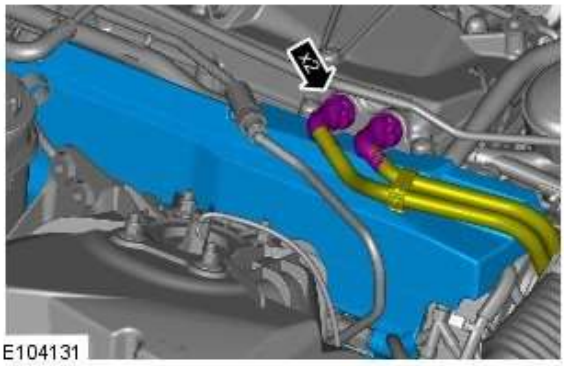
6. Refer to: Fuel Injection Component Cleaning (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, General Procedures).



7. CAUTION: Be prepared to collect escaping fluids.

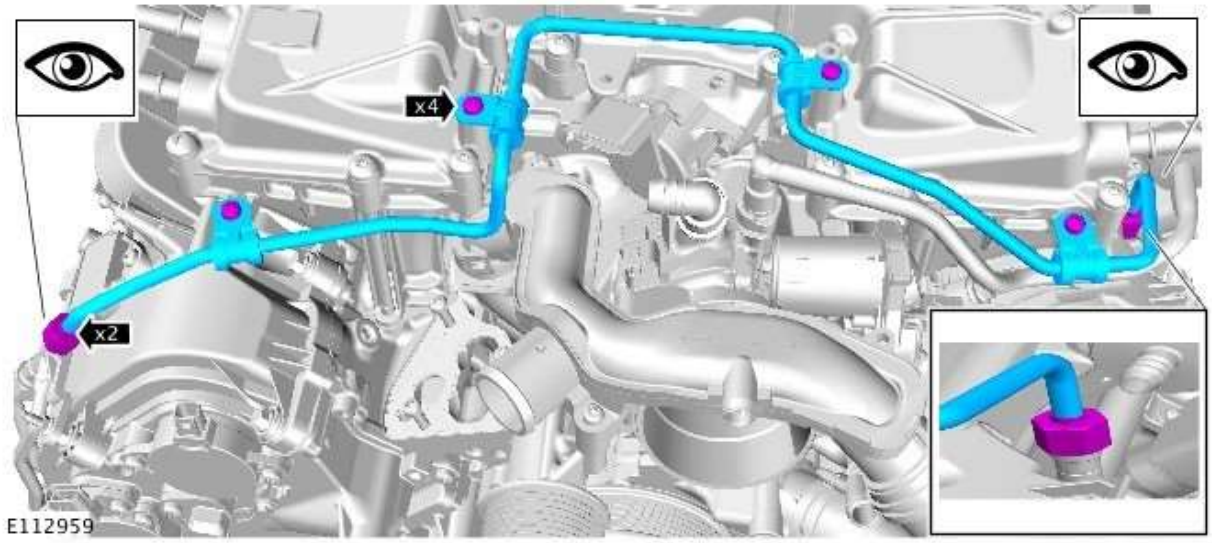
8.





9. CAUTION: Be prepared to collect escaping fluids.

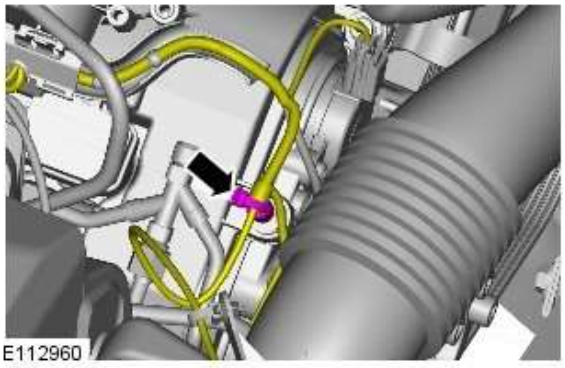
10. Refer to: Air Cleaner Outlet Pipe RH (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).



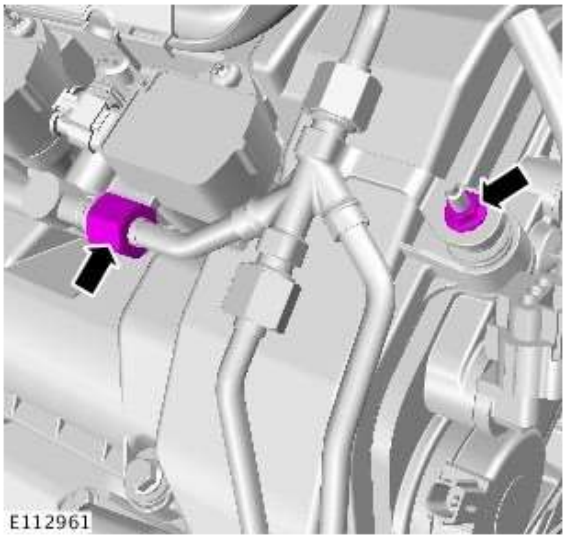
11. CAUTIONS:

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.

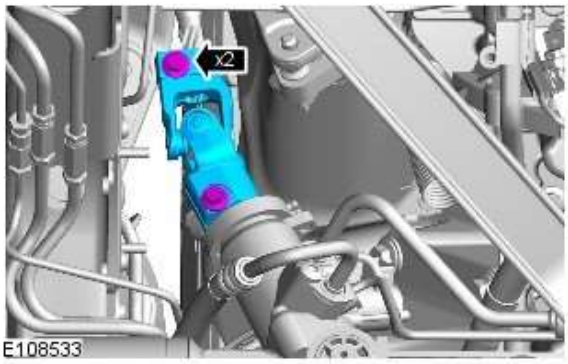
14. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

Raise and support the vehicle.

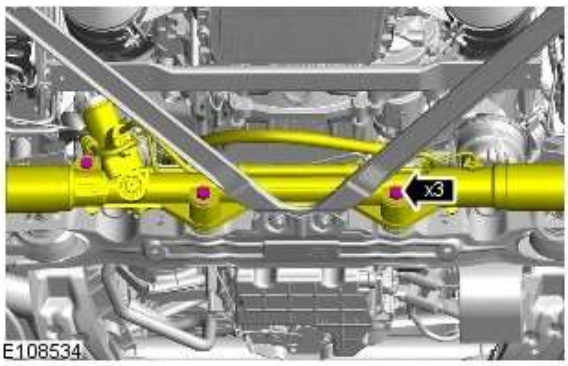
15. Refer to: Engine Mount RH (303-01D Engine - V8 S/C 5.0L Petrol, Removal and Installation).

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

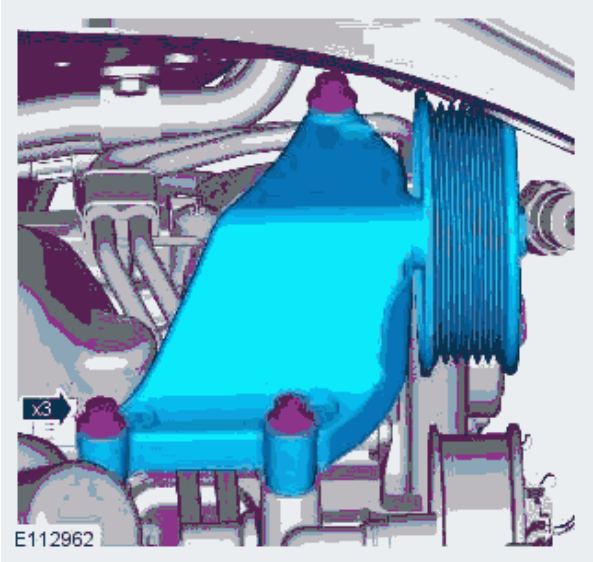


17.

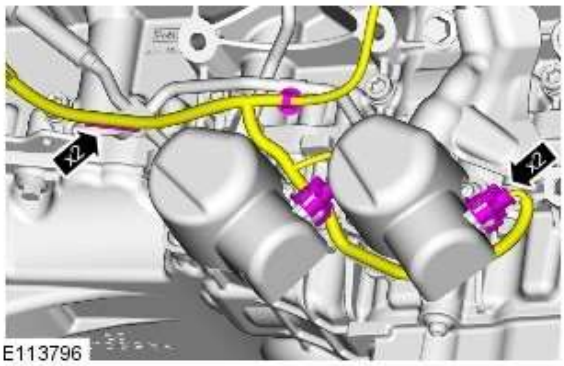


18.

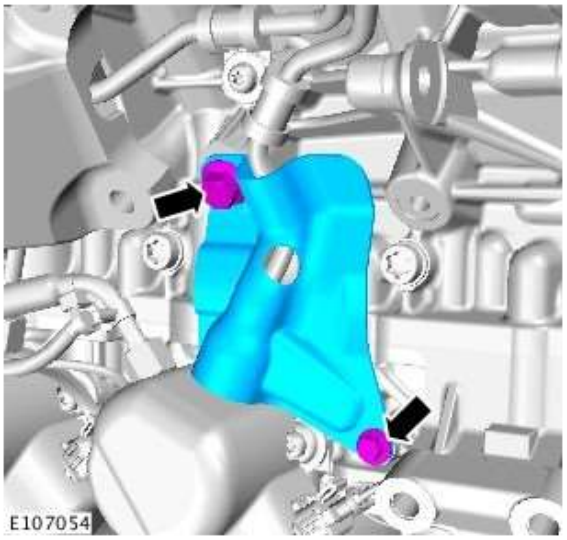
All vehicles



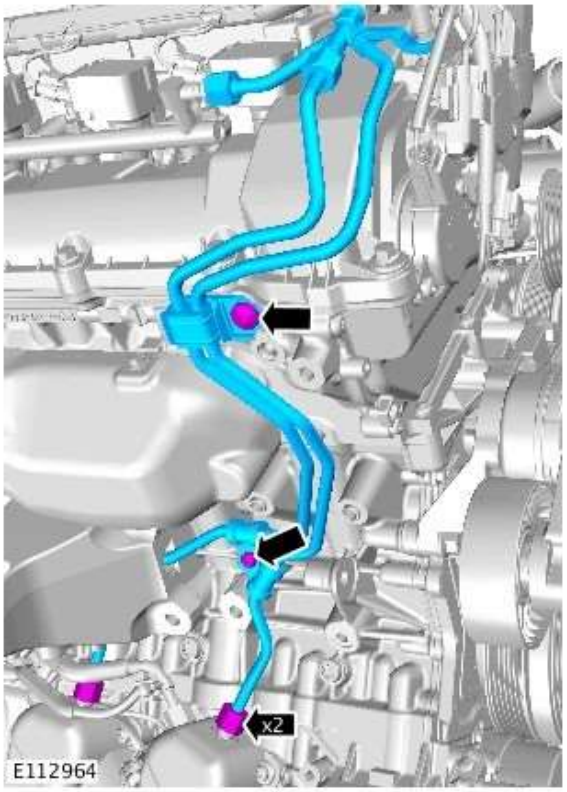
19.



20. NOTE: Engine shown removed for clarity.



21. NOTE: Engine shown removed for clarity.



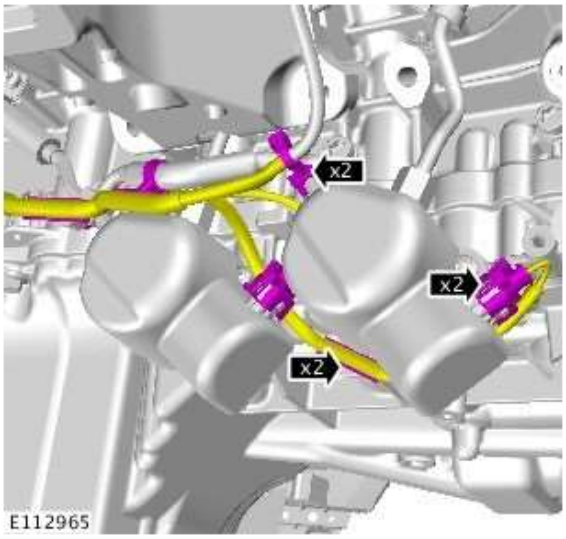
22. CAUTIONS:

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.

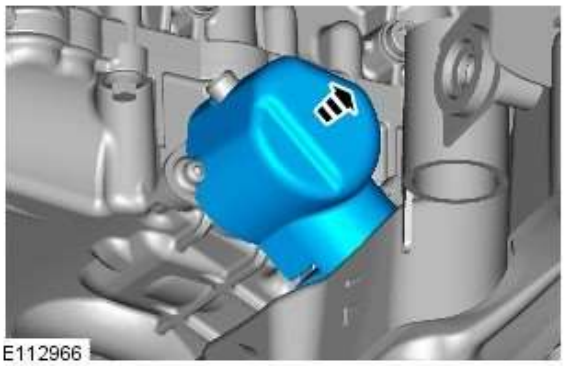
NOTE: Engine shown removed for clarity.



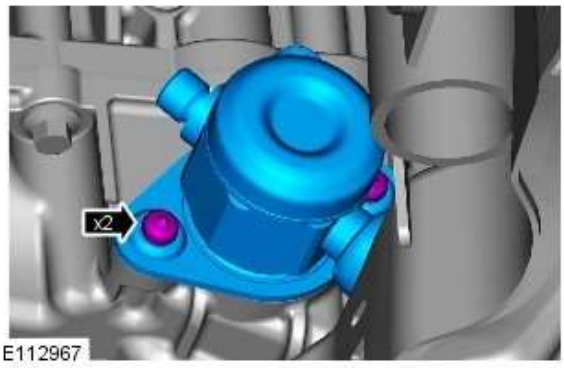
23. CAUTIONS:

    Be prepared to collect escaping fluids.

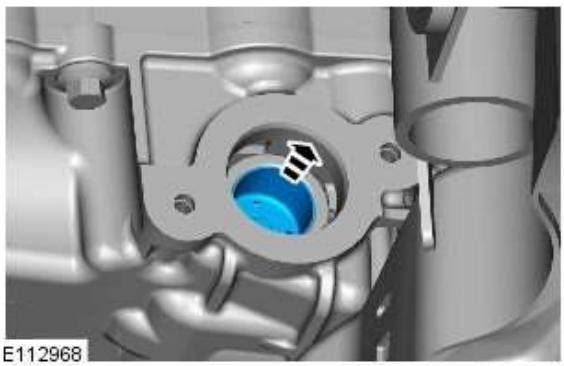
    Make sure that all openings are sealed. Use new blanking caps.



24.



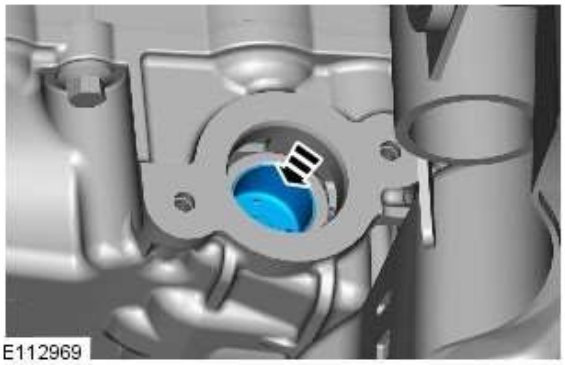
25. CAUTION: Be prepared to collect escaping fluids.



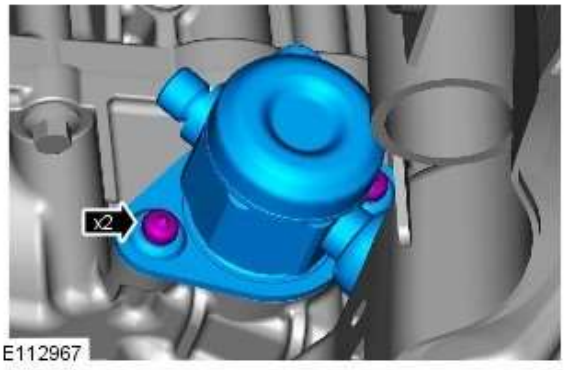
26. CAUTION: Be prepared to collect escaping fluids.

Installation

All vehicles

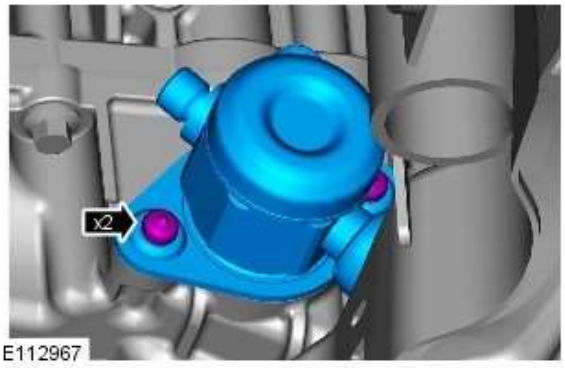


1. NOTE: Lubricate the fuel rail high-pressure fuel pump bucket with clean engine oil.

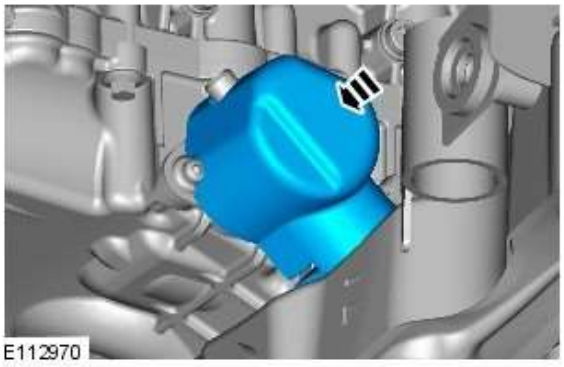


2. CAUTION: Tighten on both sides simultaneously.

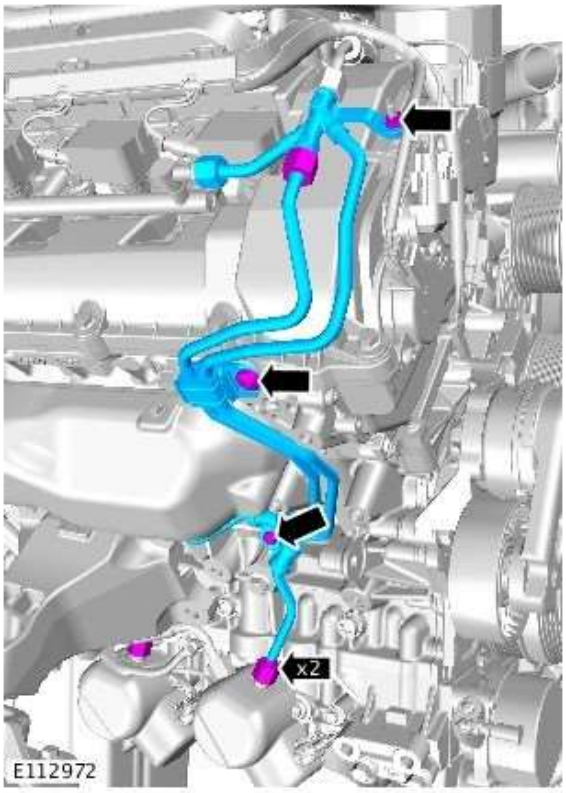
   Torque: 12 Nm



3. Loosen the Torx screws half a turn each.



4.



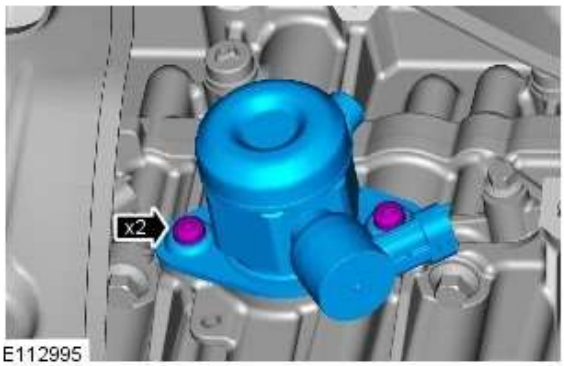
5. CAUTION: Install new high-pressure fuel supply lines.

   NOTES:

   Engine shown removed for clarity.

   Remove and discard the blanking caps.

   Install the bolt and unions fully finger tight before final tightening.

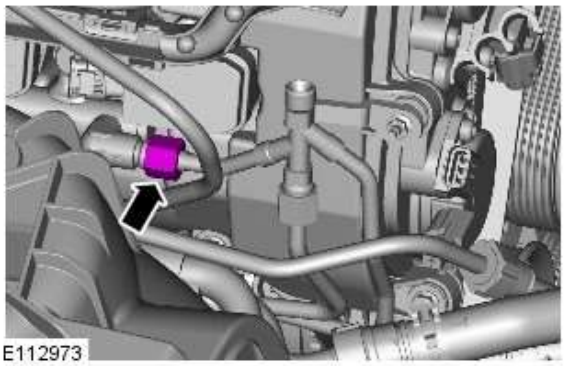


6. CAUTION: Care must be taken when positioning the fuel rail high-pressure fuel pump cover to one side.

   NOTE: Fuel rail high-pressure fuel pump cover shown removed for clarity.

   Torque: 12 Nm

7. Lower the vehicle.



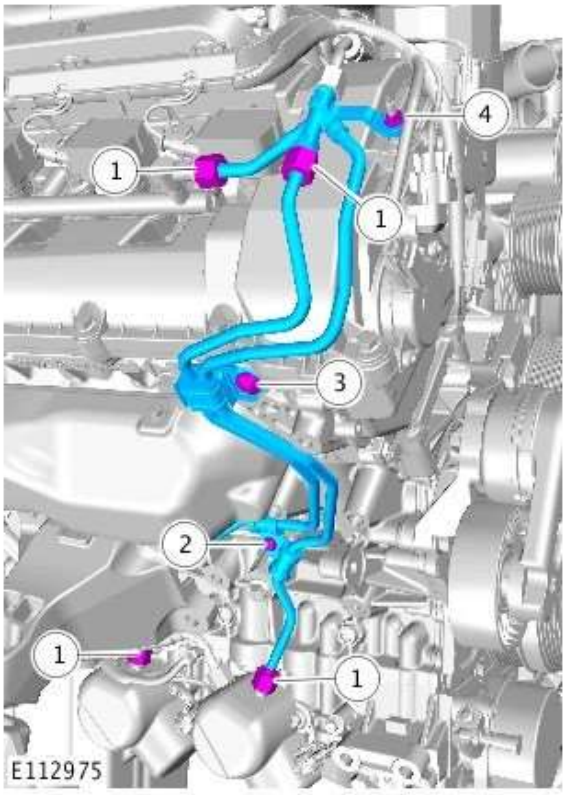
8. NOTES:

   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.

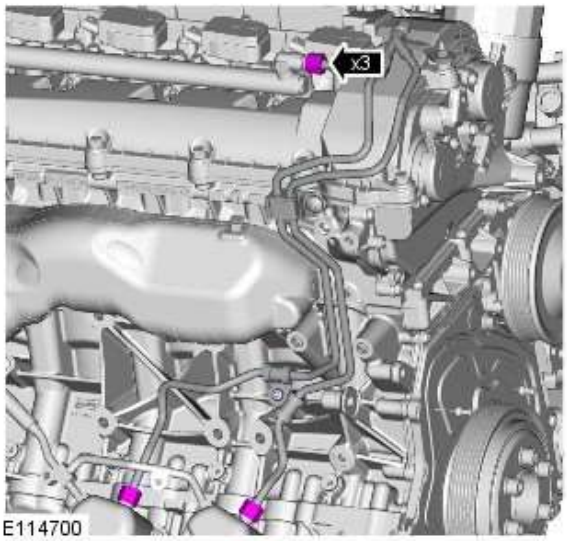
Raise and support the vehicle.



10. CAUTION: Lubricate **only** the union threads with clean engine oil.

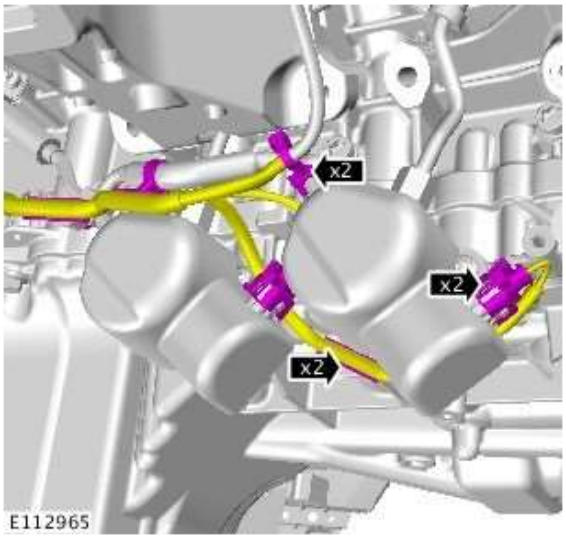
NOTE: Engine shown removed for clarity.

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

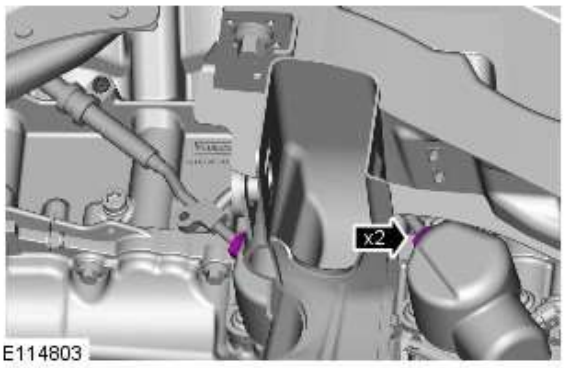


12. NOTES:

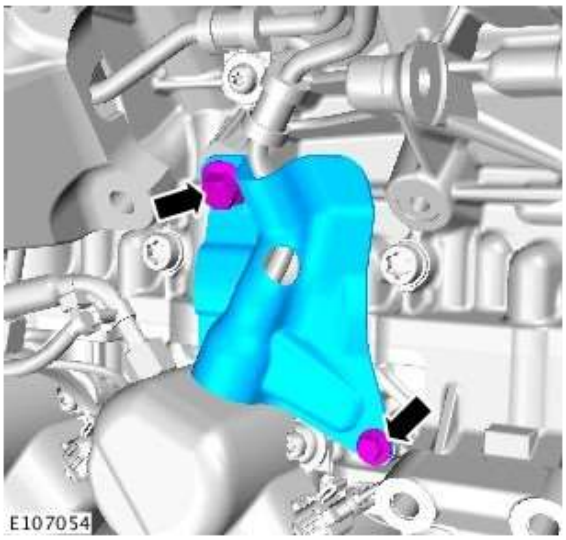
    Install the bolt and unions finger tight before final tightening.

    Remove and discard the blanking caps.

    Torque:
    Unions 21 Nm
    M6 11 Nm

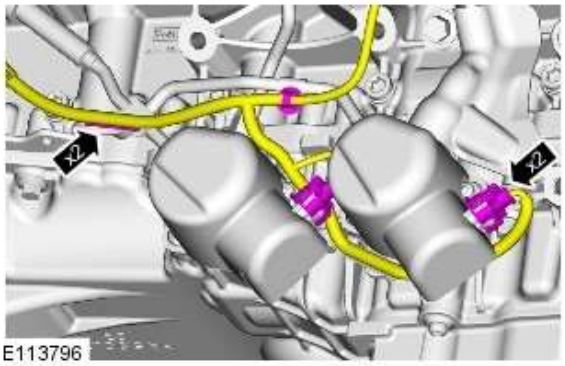


13. *Torque:* 21 Nm

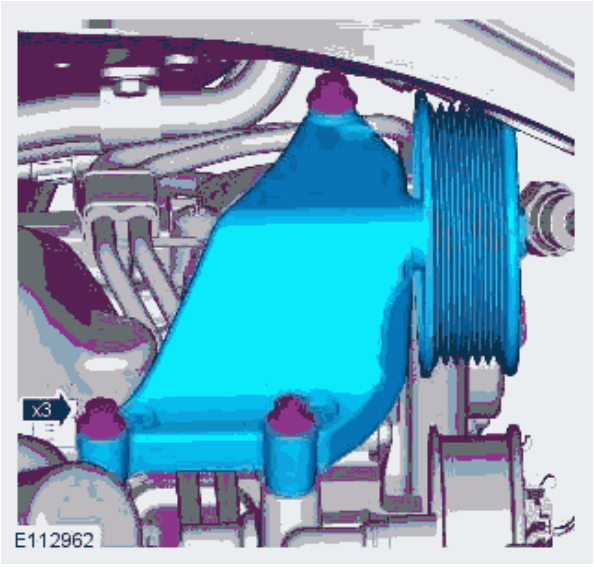


14. NOTE: Engine shown removed for clarity.

    Torque:
    M10 29 Nm
    M6 11 Nm

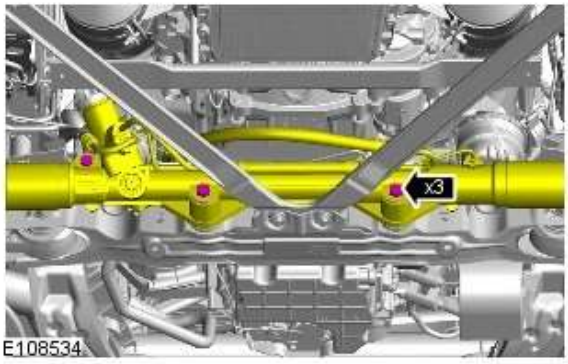


15. NOTE: Engine shown removed for clarity.

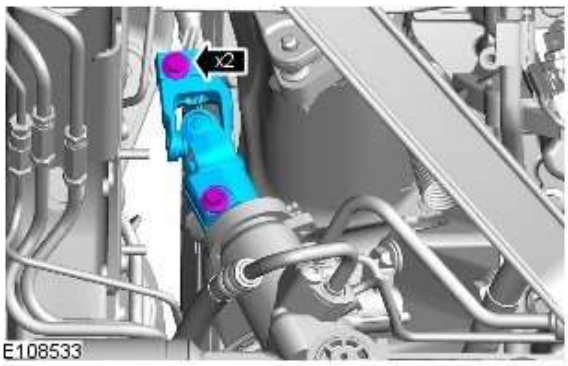


16. *Torque:* 25 Nm

Left-hand drive vehicles



17. *Torque:* 100 Nm



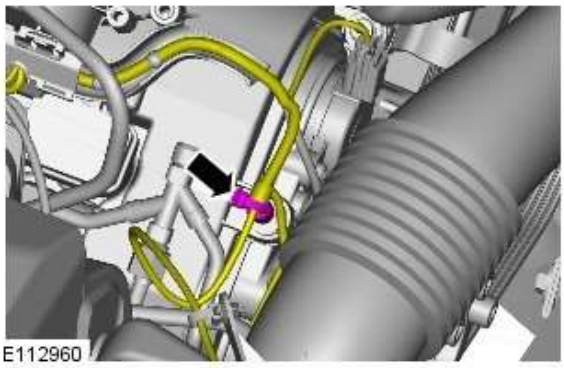
18. *Torque:* 35 Nm

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.



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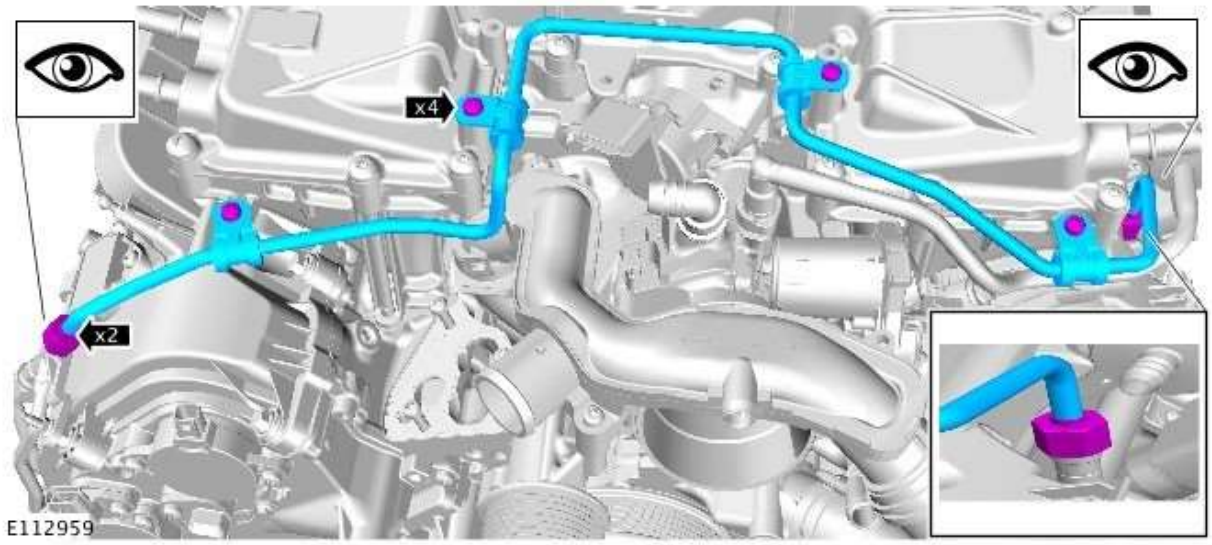
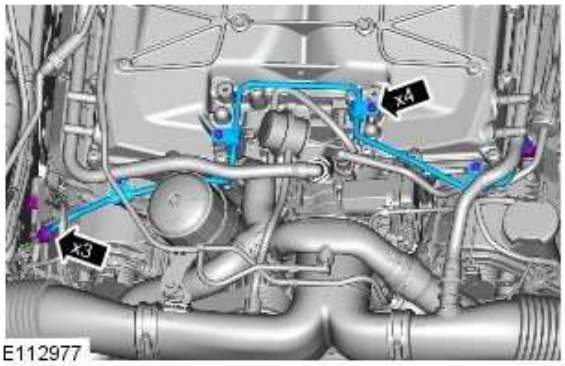


23. NOTES:

Lubricate the union threads with clean engine oil.

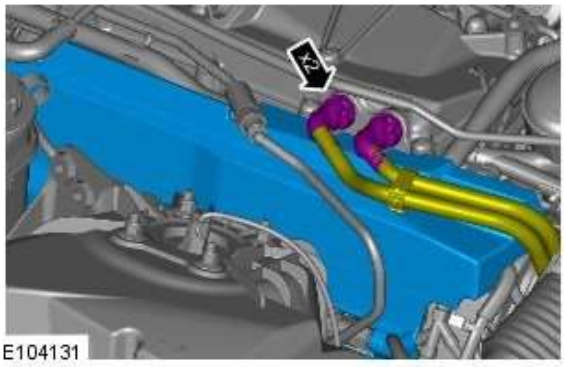
Do not tighten at this stage.

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).



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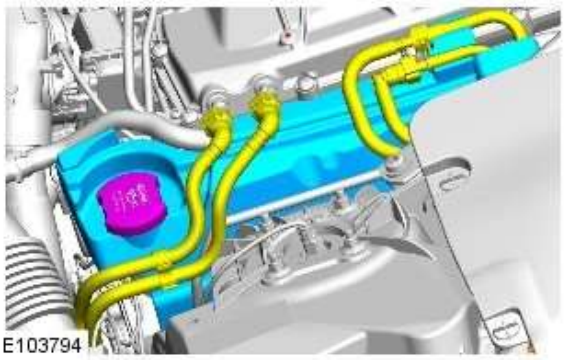

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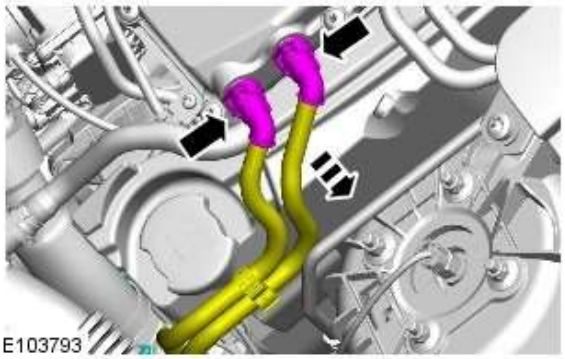


28.

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).

Published: 08-Nov-2013

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.

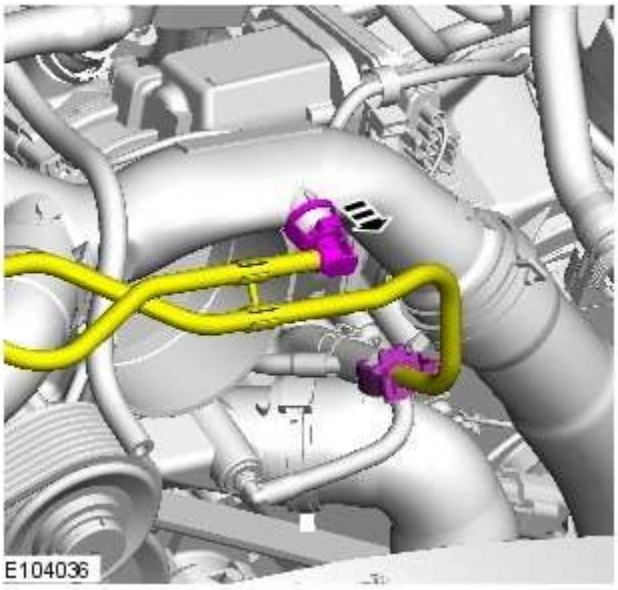
2. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

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.



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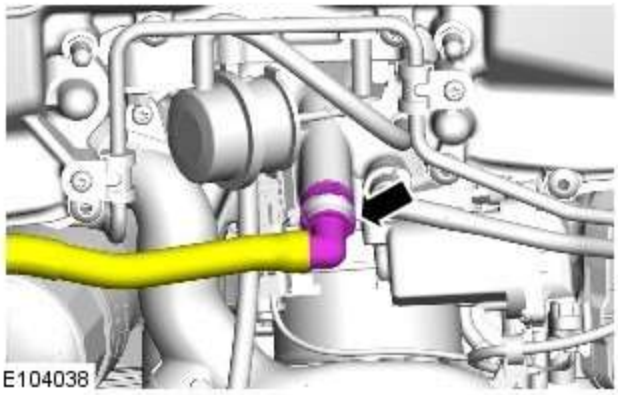

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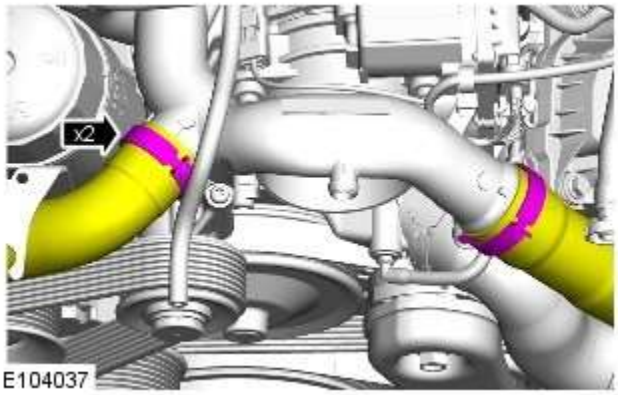
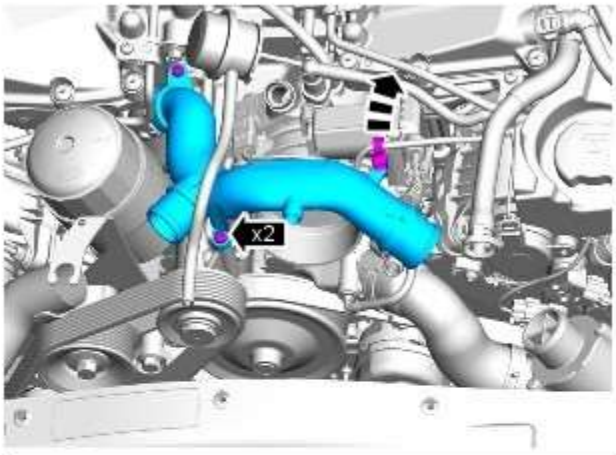
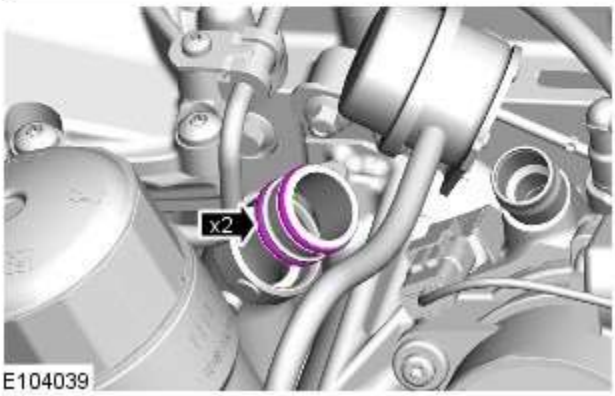
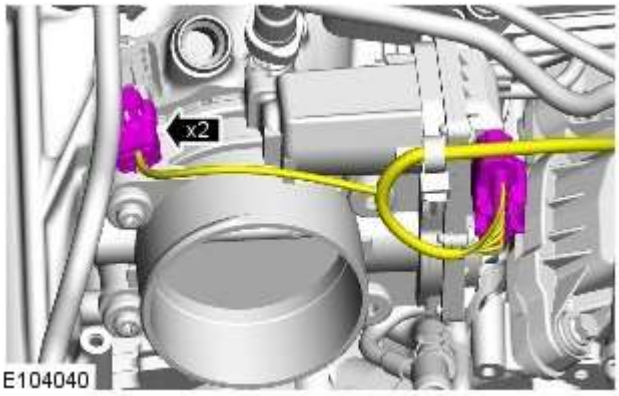


9. *Torque:* 10 Nm







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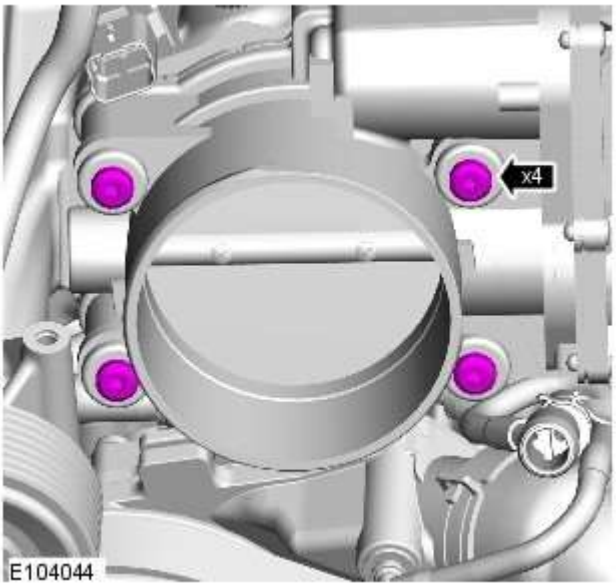
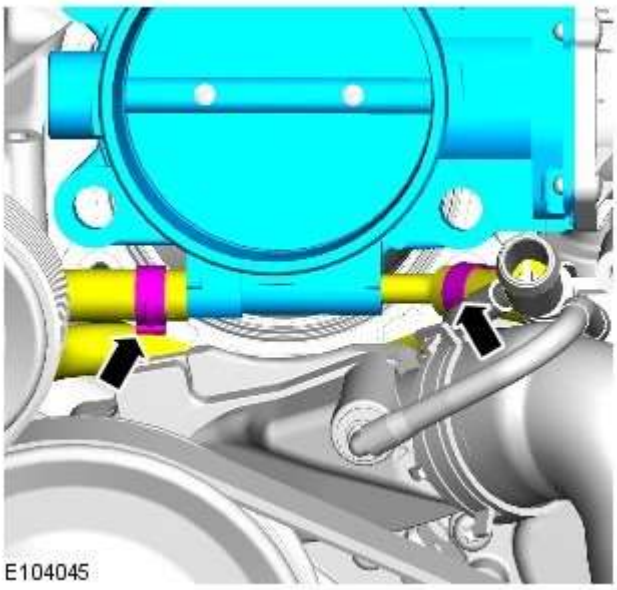


11. *Torque:* 10 Nm



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.

Published: 11-May-2011

Accessory Drive - V8 S/C 5.0L Petrol -

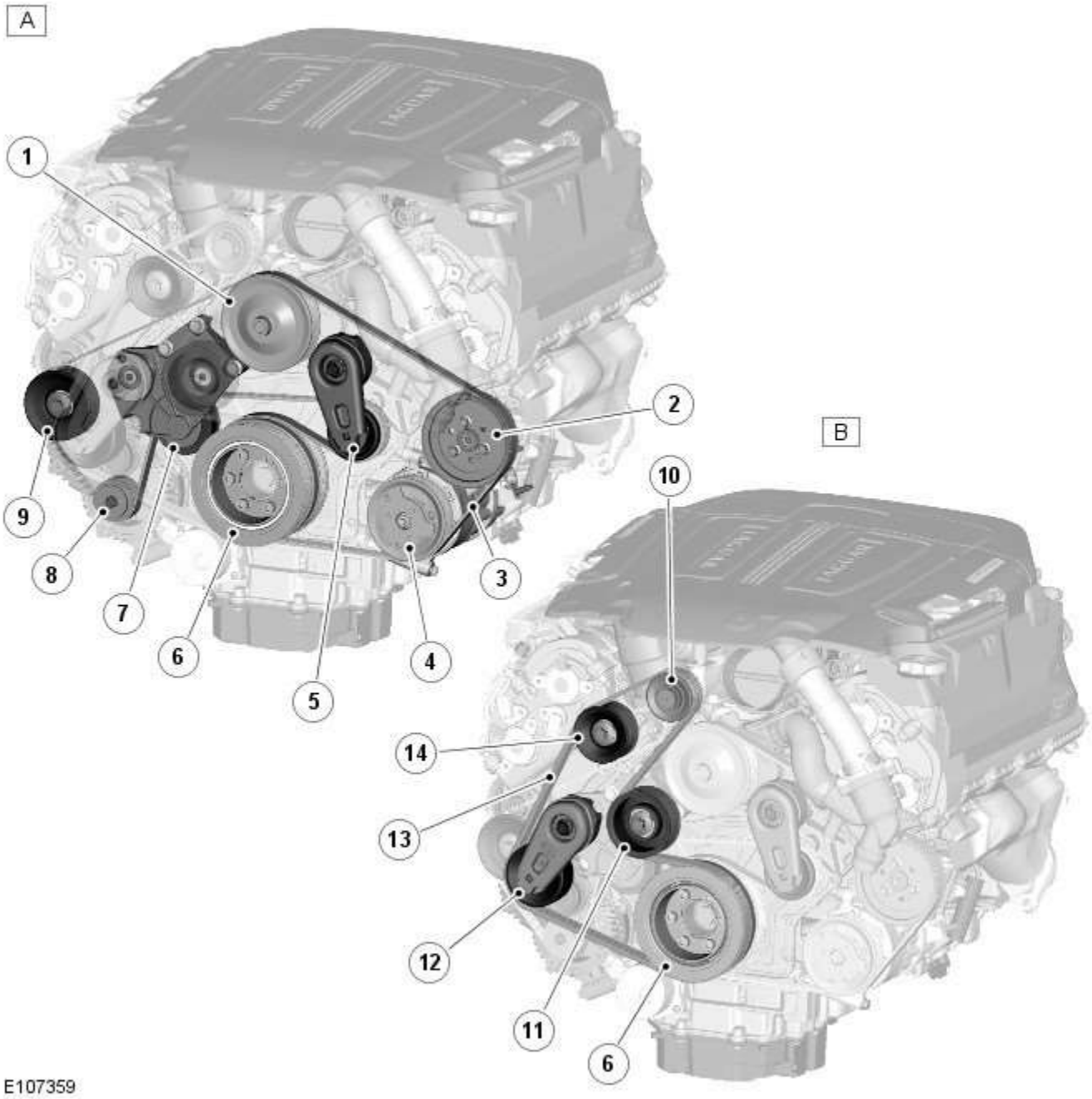
Description	Nm	lb-ft	lb-in
Accessory drive belt tensioner retaining bolt	40	30	-
Accessory drive belt idler pulley retaining bolt - all vehicles	40	30	-
Accessory drive belt center idler pulley retaining bolt - vehicles without supercharger	25	19	-
Accessory drive belt idler pulley retaining bolt to 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	-

Published: 11-May-2011

Accessory Drive - V8 S/C 5.0L Petrol - Accessory Drive - Component Location

Description and Operation

COMPONENT LOCATION



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

Published: 11-May-2011

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.

Published: 11-May-2011

Accessory Drive - V8 S/C 5.0L Petrol - Accessory Drive Belt

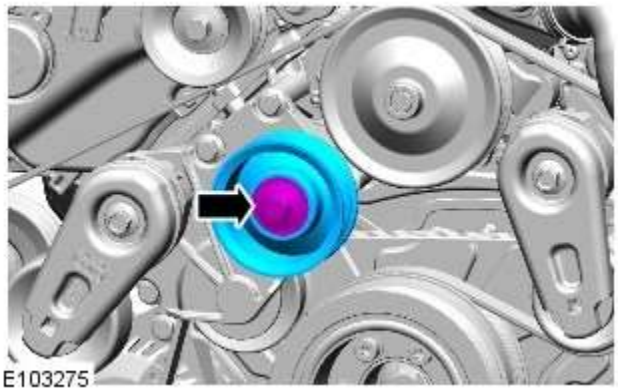
Removal and Installation

Removal

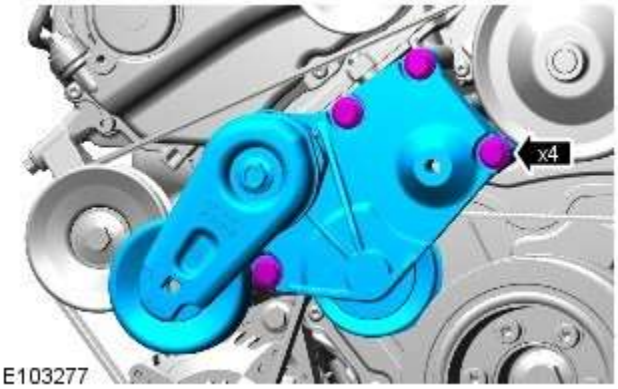
NOTE: Removal steps in this procedure may contain installation details.

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.

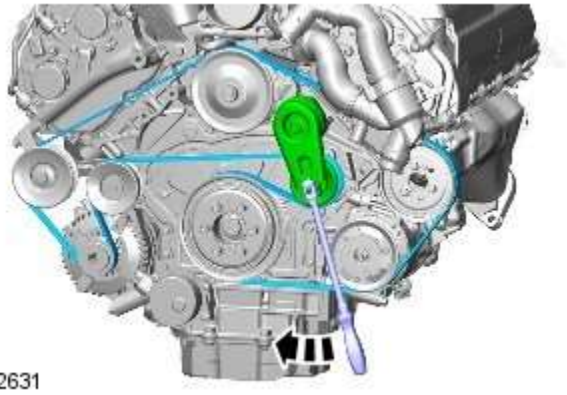
   Raise and support the vehicle.
4. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



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.

Published: 11-May-2011

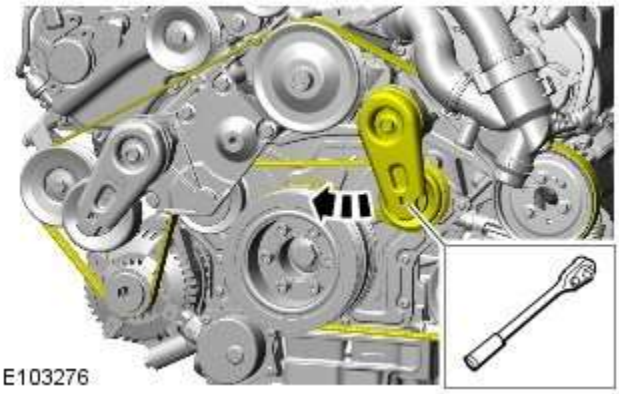
Accessory Drive - V8 S/C 5.0L Petrol - Accessory Drive Belt Idler Pulley

Removal and Installation

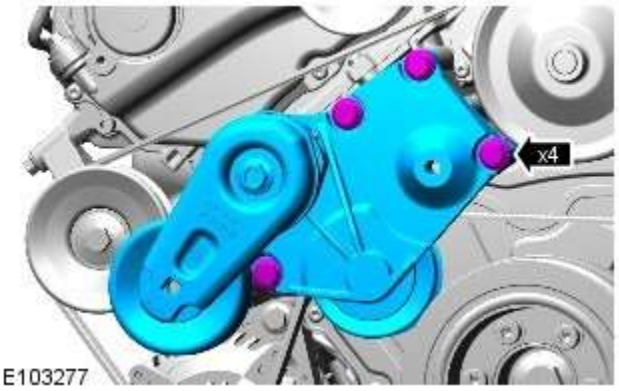
Removal

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

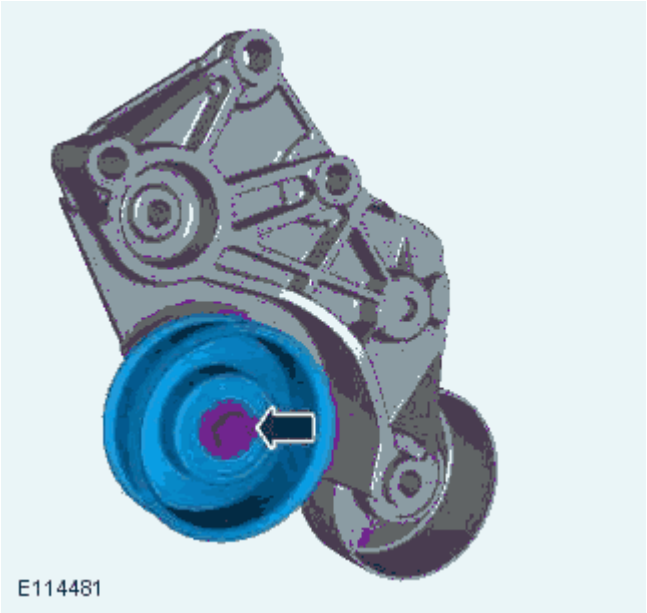
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Supercharger Belt (303-05, Removal and Installation).
3. Refer to: Air Cleaner Outlet Pipe LH (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).



4. NOTE: Note the fitted position.



5. *Torque:* 25 Nm



6. *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.

Published: 11-May-2011

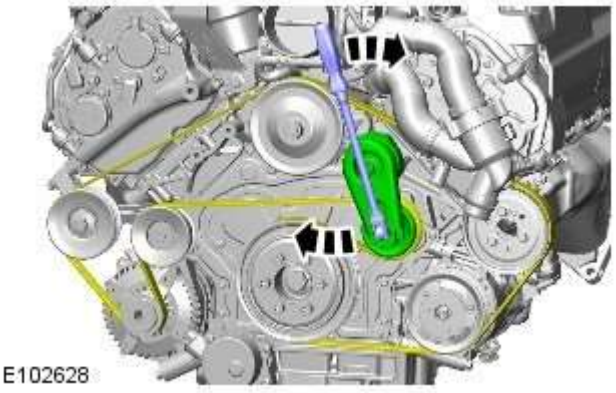
Accessory Drive - V8 S/C 5.0L Petrol - Accessory Drive Belt Tensioner

Removal and Installation

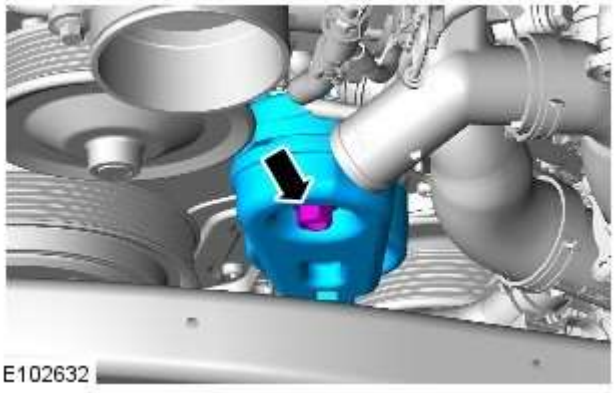
Removal

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.

Published: 11-May-2011

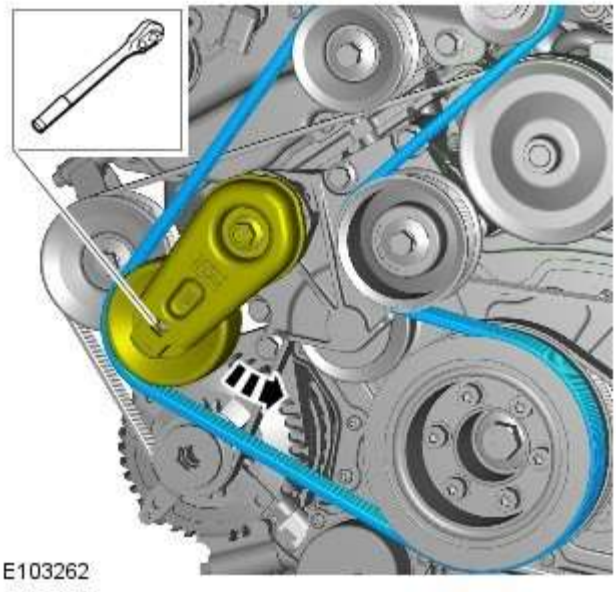
Accessory Drive - V8 S/C 5.0L Petrol - Supercharger Belt Idler Pulley

Removal and Installation

Removal

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

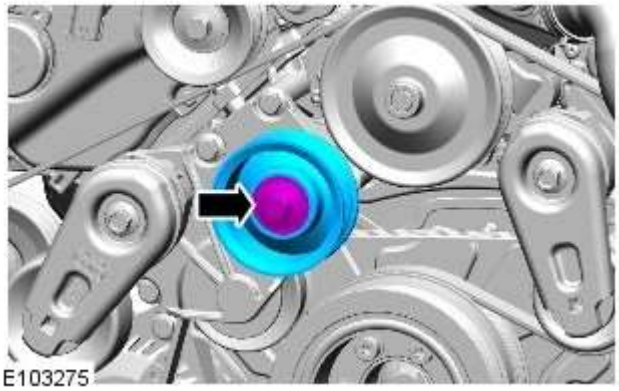
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: Air Cleaner Outlet Pipe RH (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).
3. Refer to: Air Cleaner Outlet Pipe T-Connector (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).


E103262

4. NOTES:

   Note the fitted position.

   Engine shown removed for clarity.


E103275

5. *Torque:* 40 Nm

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.

Published: 11-May-2011

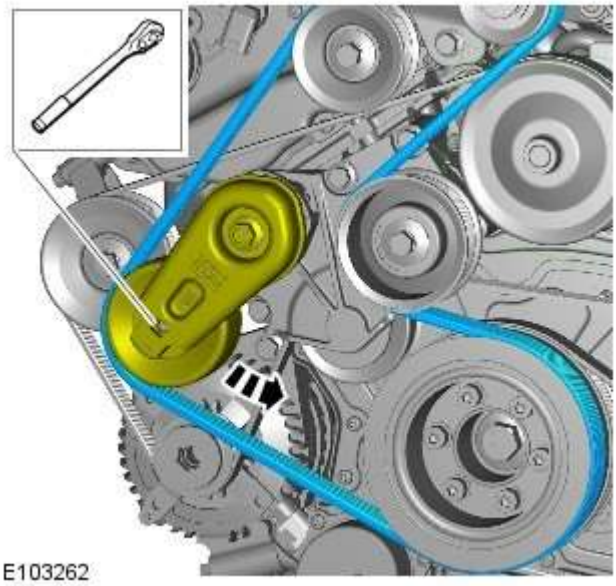
Accessory Drive - V8 S/C 5.0L Petrol - Supercharger Belt Tensioner

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.

Published: 11-May-2011

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

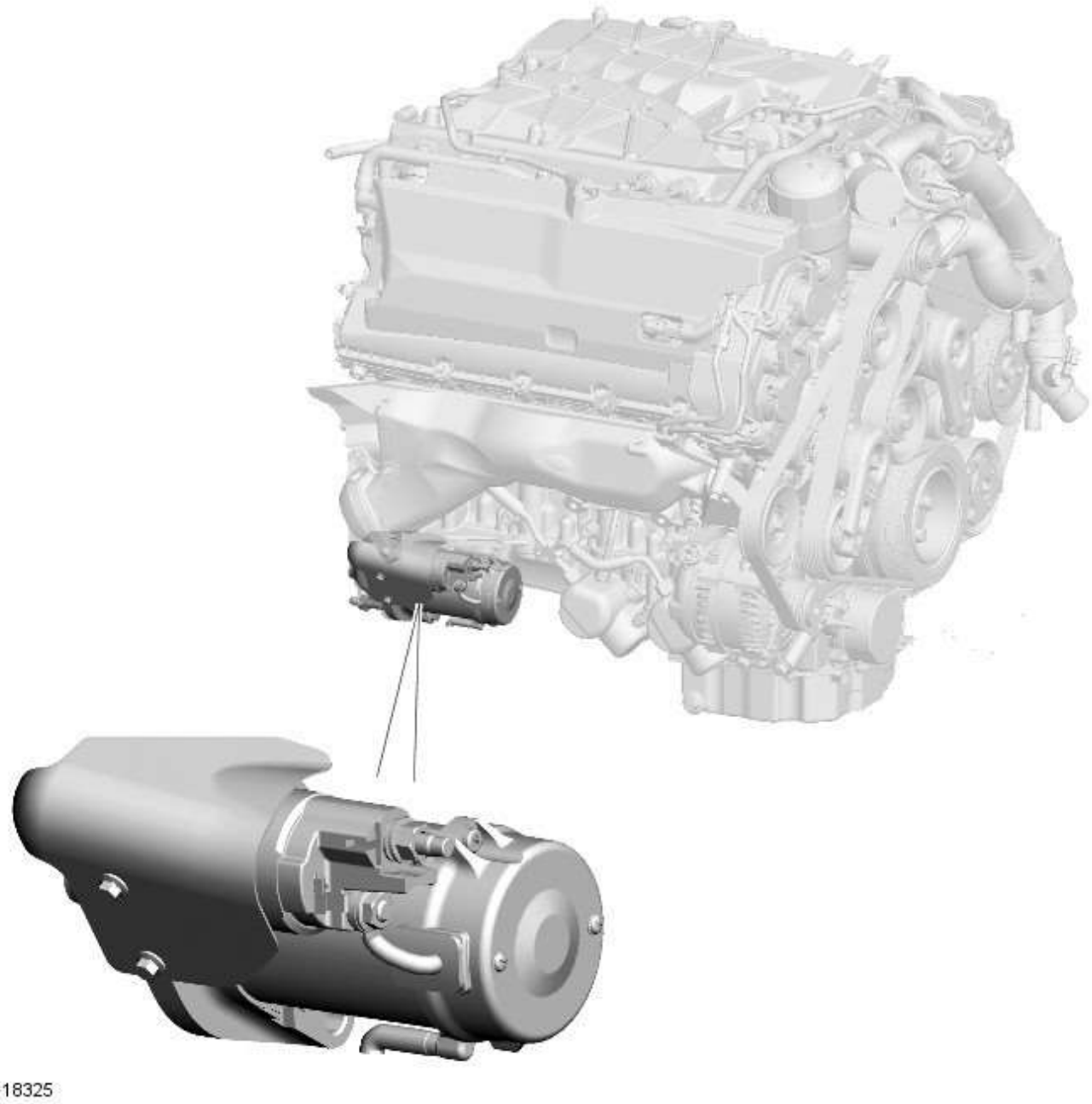
Published: 11-May-2011

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

Published: 11-May-2011

Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Starting System - Overview

Description and Operation

OVERVIEW

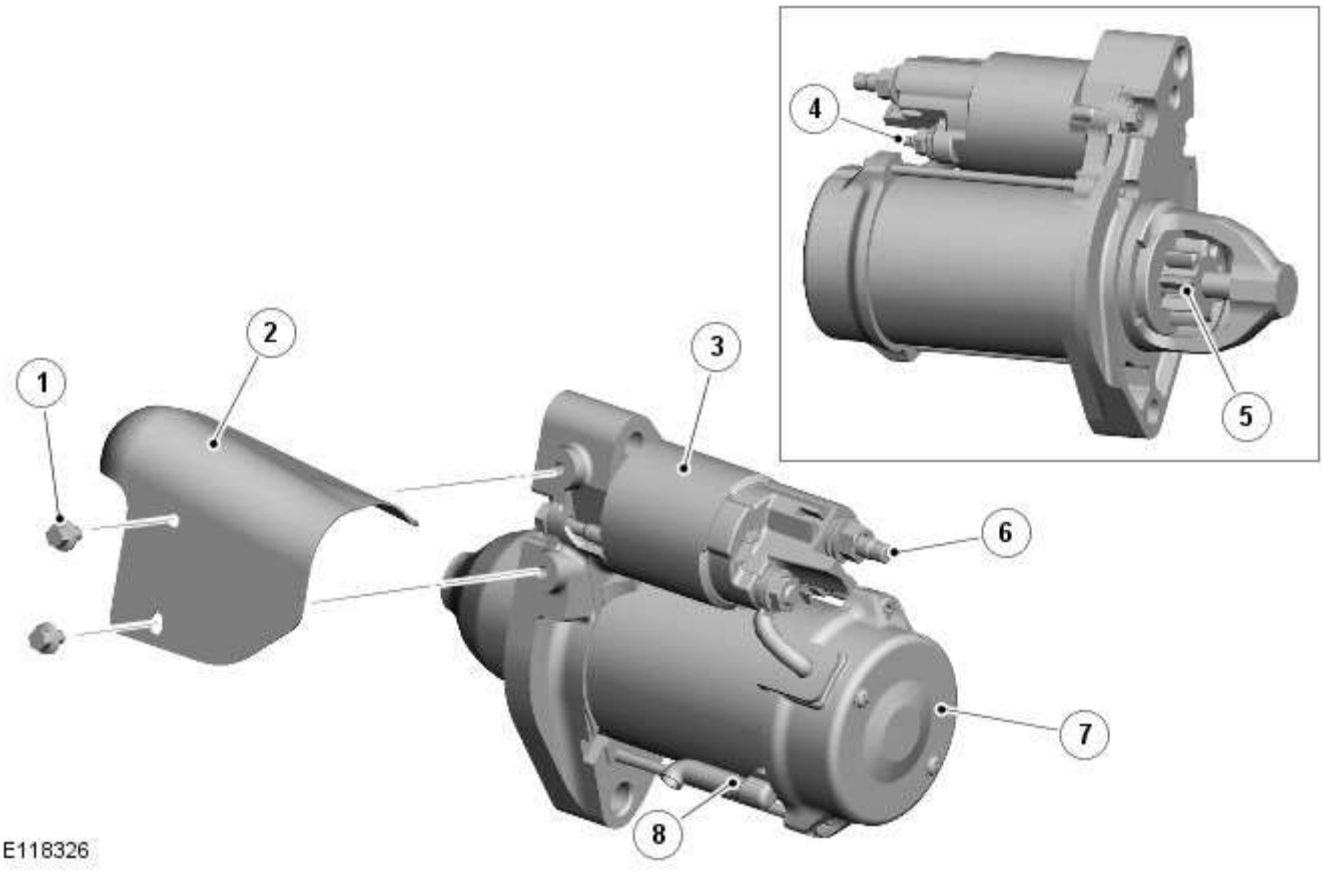
The starter motor is manufactured by Denso and is rated at 1.8 kW. The motor is geared directly to the pinion. The motor is a series wound motor with an overrunning clutch. The interior of the motor is ventilated through a breather tube attached to the underside of the motor housing.

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



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

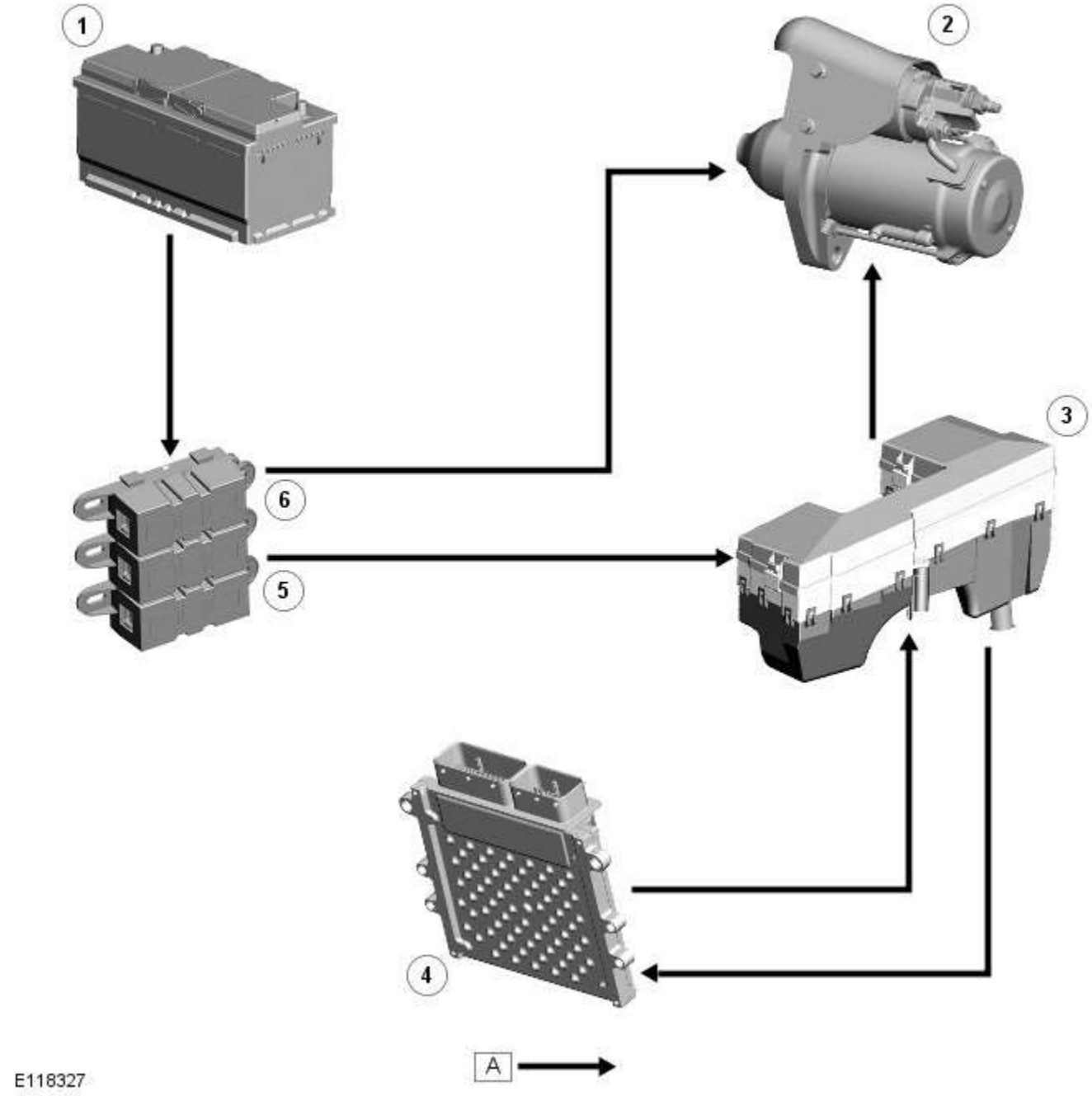
Published: 11-May-2011

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



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.

Published: 11-May-2011

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
• Gear selector lever cable adjustment (vehicles with automatic transmission) • Starter motor • Engine (turns freely)	• 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)	• 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)	• 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	• 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	• Low engine compression	Check the engine compressions.
Excessive starter motor noise	• 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).

Published: 06-Apr-2013

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
• Steering column • Brake pedal • Smart key • Steering Wheel	• 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	Ignition mode fails to switch on	GO to Pinpoint Test B.
Press start and brake	Engine fails to crank	GO to Pinpoint Test C.
Steering column locked	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

Published: 11-May-2011

Starting System - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Starter Motor

Removal and Installation

Removal

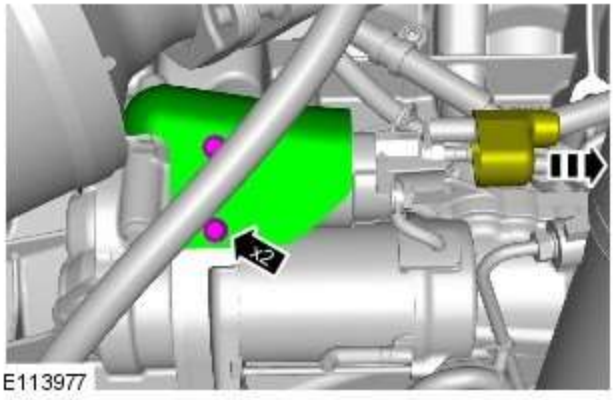
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

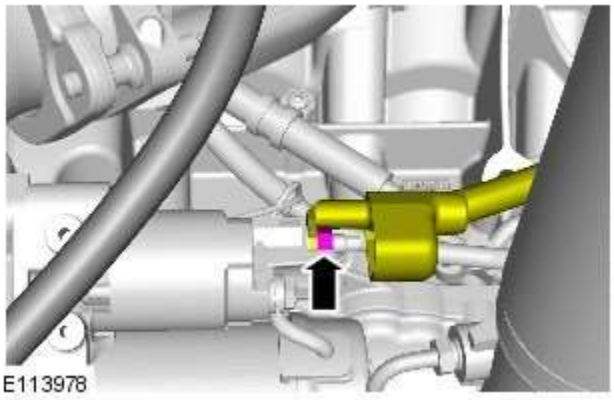
2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).

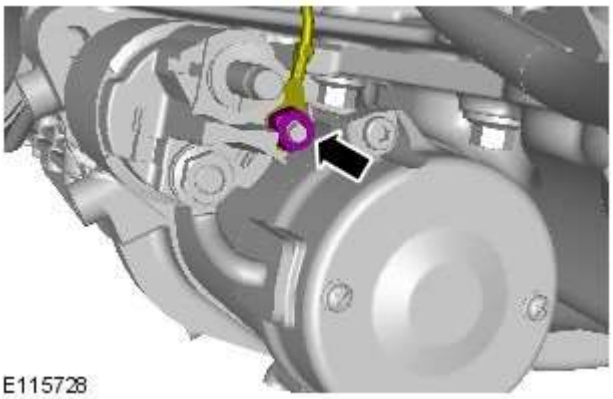


4. *Torque:* 6 Nm

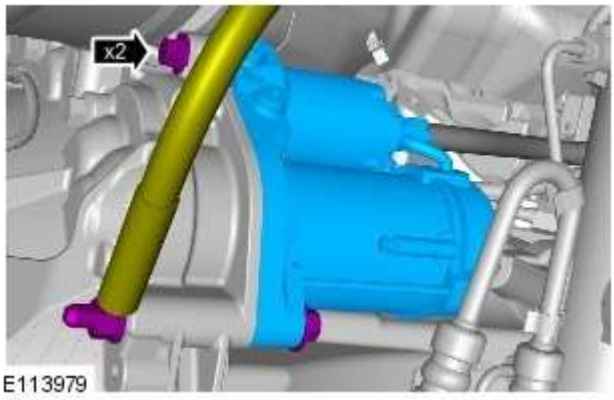


5. CAUTION: Make sure that the protective cover is correctly installed over the electrical connector.

   Torque: 12 Nm



6. *Torque:* 7 Nm



7. *Torque:* 48 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

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	-

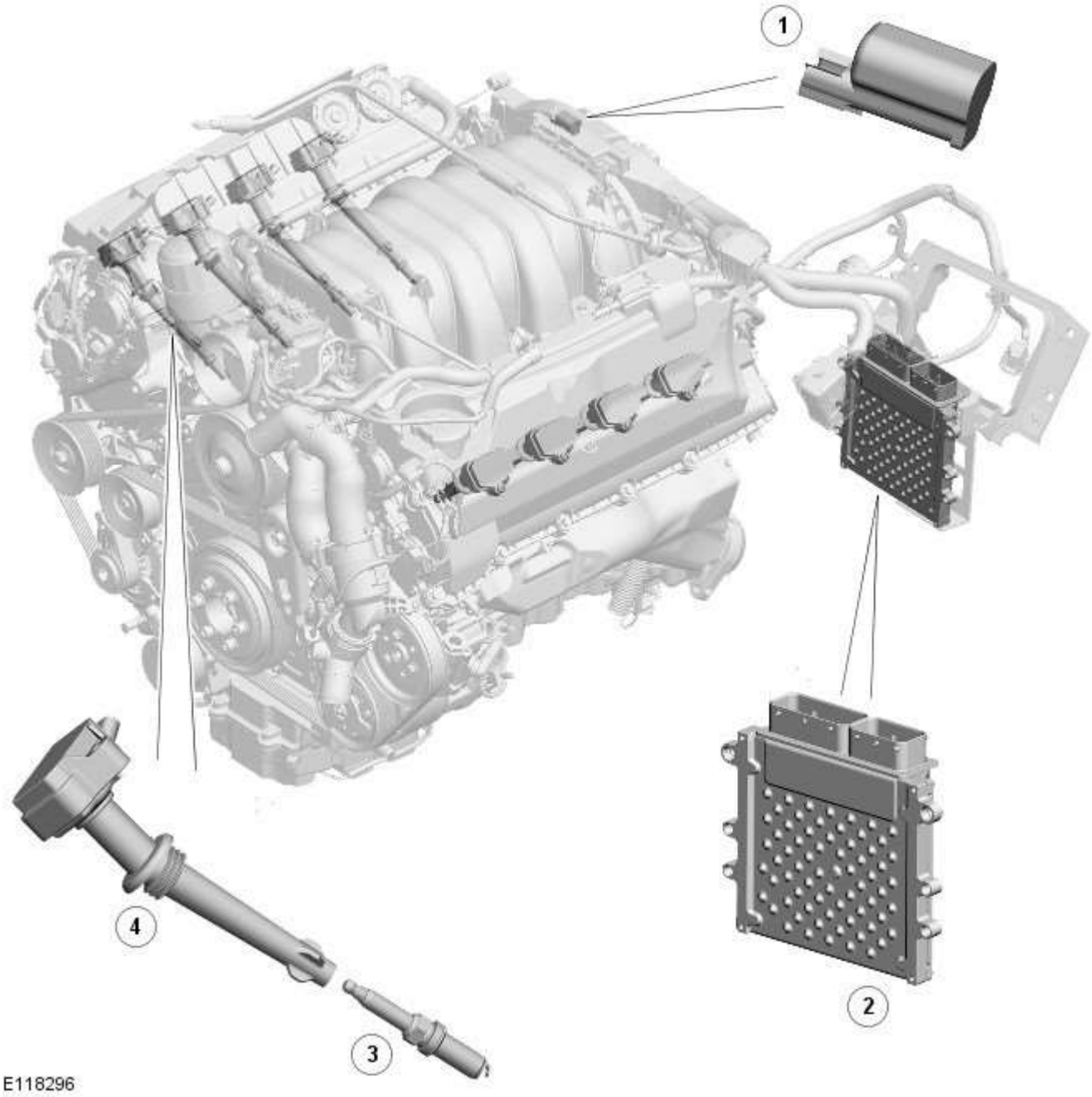
Published: 11-May-2011

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



Item	Description
1	RFI (radio frequency interference) suppressor
2	ECM (engine control module)
3	Spark plug (8 off)
4	Ignition coil (8 off)

Published: 11-May-2011

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.

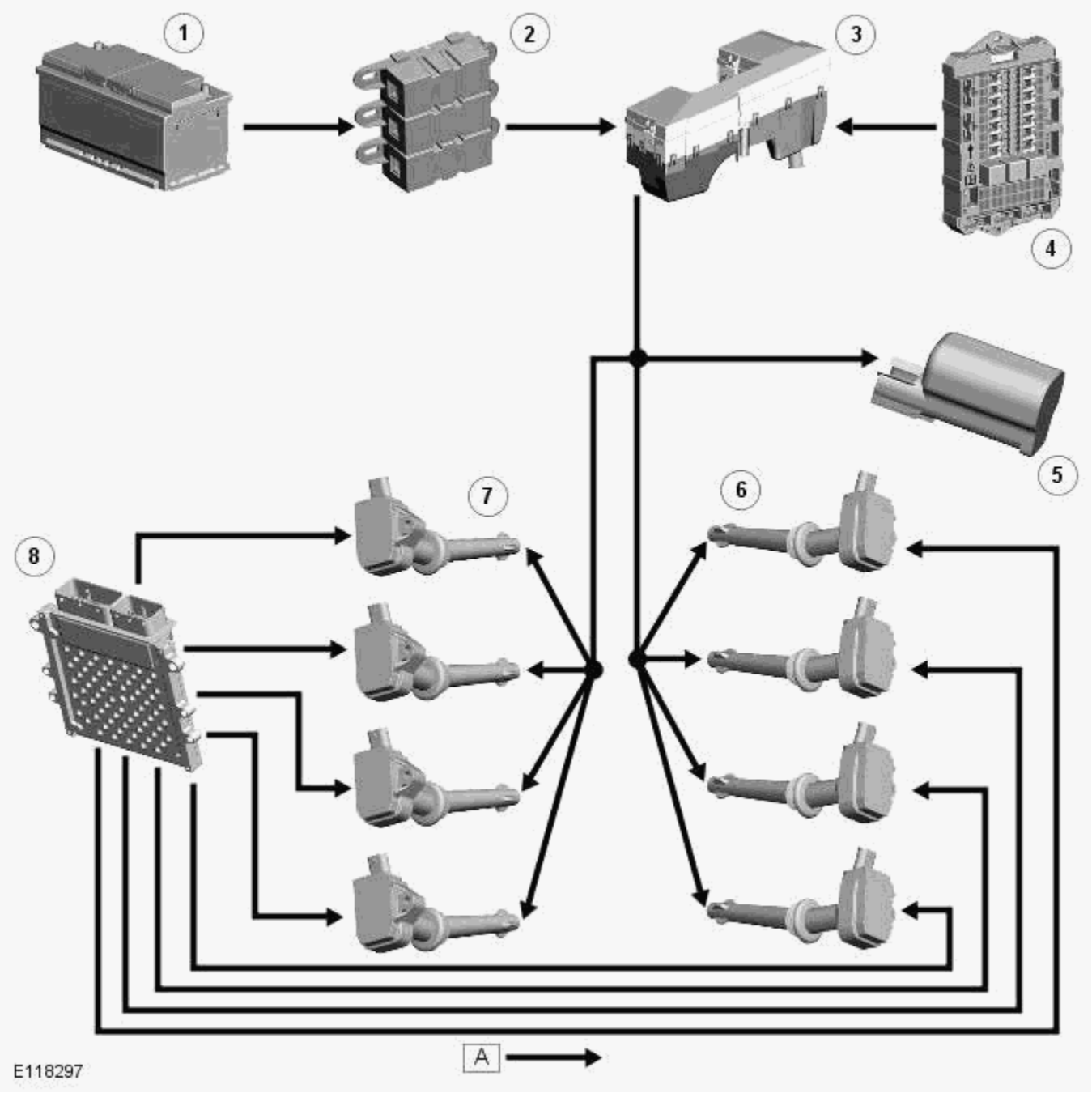
Published: 11-May-2011

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



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).

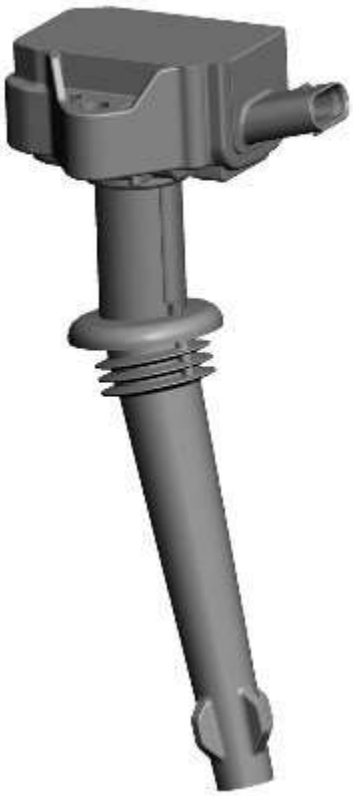
The ECM (engine control module) sends a separate signal to each ignition coil to trigger the power stage switching. The ECM calculates the dwell time from the battery voltage and engine speed, to ensure a constant energy level is produced in the secondary coil each time the power stage is switched. This 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

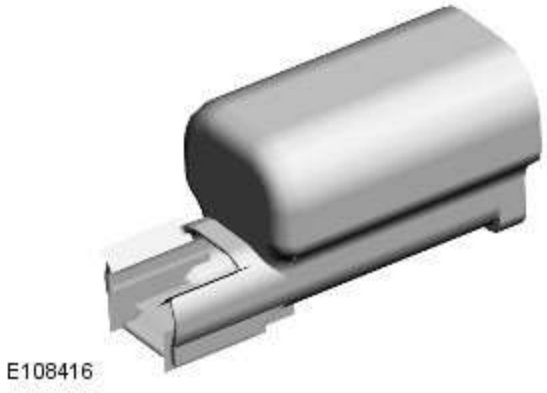


E116147

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



The RFI suppressor is installed on the engine harness carrier at the rear of the engine.

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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
• Engine oil level • Cooling system coolant level • Fuel level • Fuel contamination/grade/quality • Exhaust gas recirculation (EGR) valves	• 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	• 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	• 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	• 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	• 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)	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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).

Published: 11-May-2011

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:

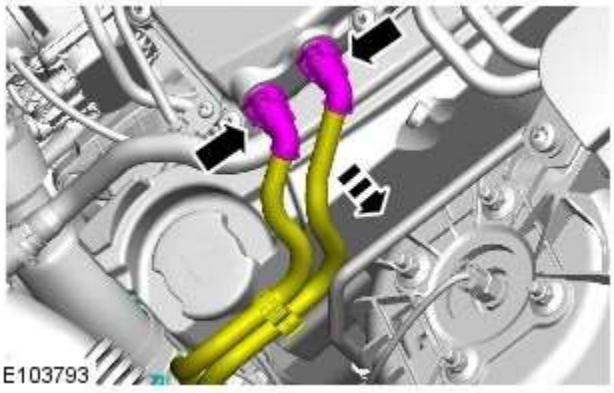
Removal steps in this procedure may contain installation details.

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).

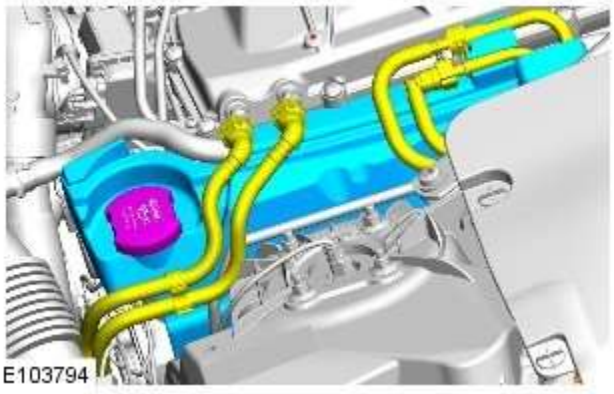
3. Refer to: Secondary Bulkhead Panel RH - 5.0L/3.0L Diesel (501-02, Removal and Installation).



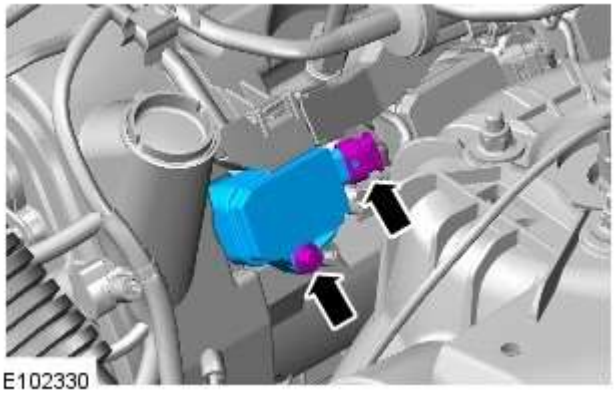
4. CAUTIONS:

   Be prepared to collect escaping coolant.

   Make sure that all openings are sealed. Use new blanking caps.



5.



6. *Torque:* 7 Nm

Installation

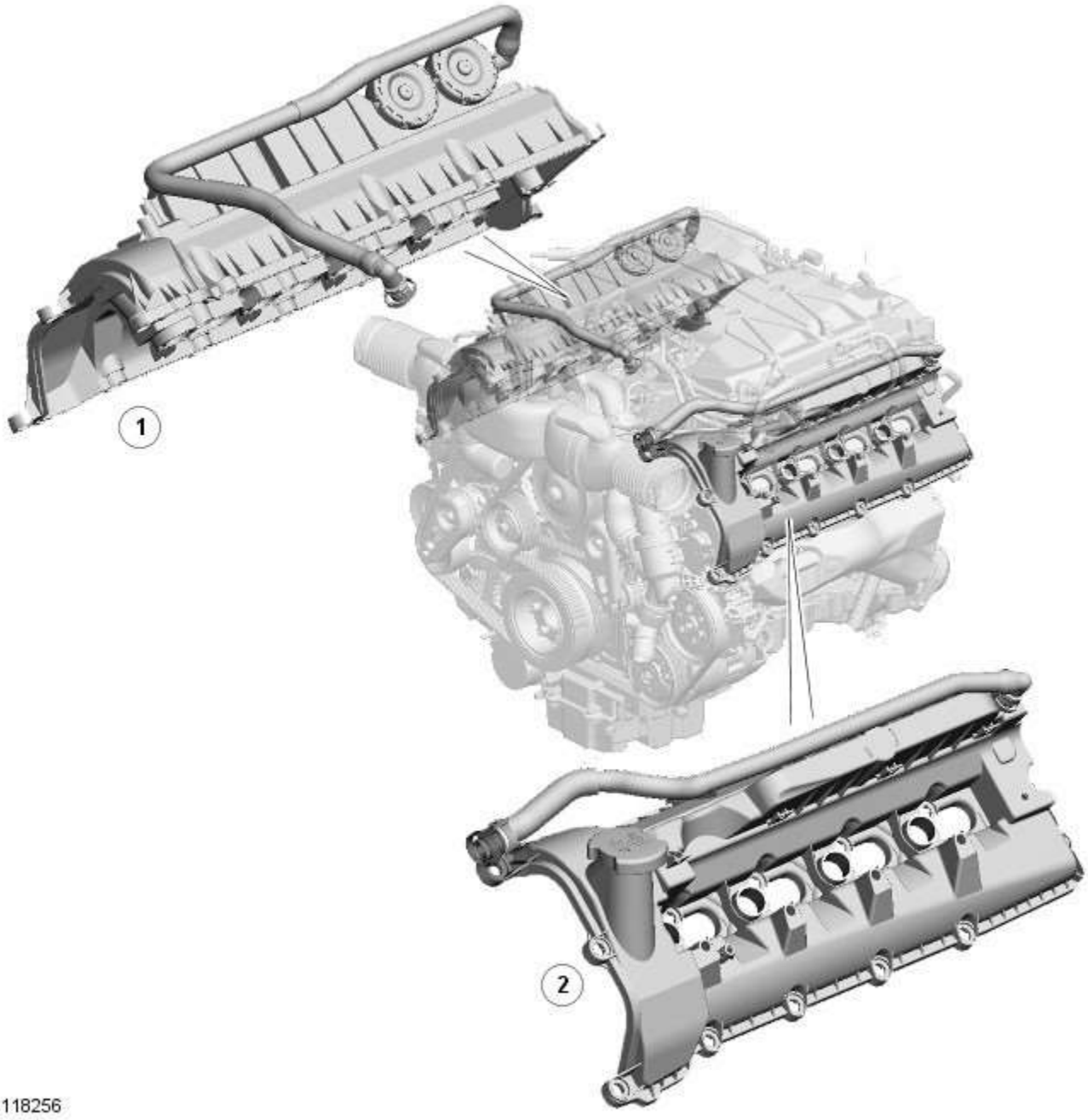
1. To install, reverse the removal procedure.

Published: 11-May-2011

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



Item	Description
1	Part load breather
2	Full load breather

Published: 11-May-2011

Engine Emission Control - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Engine Emission Control - Overview

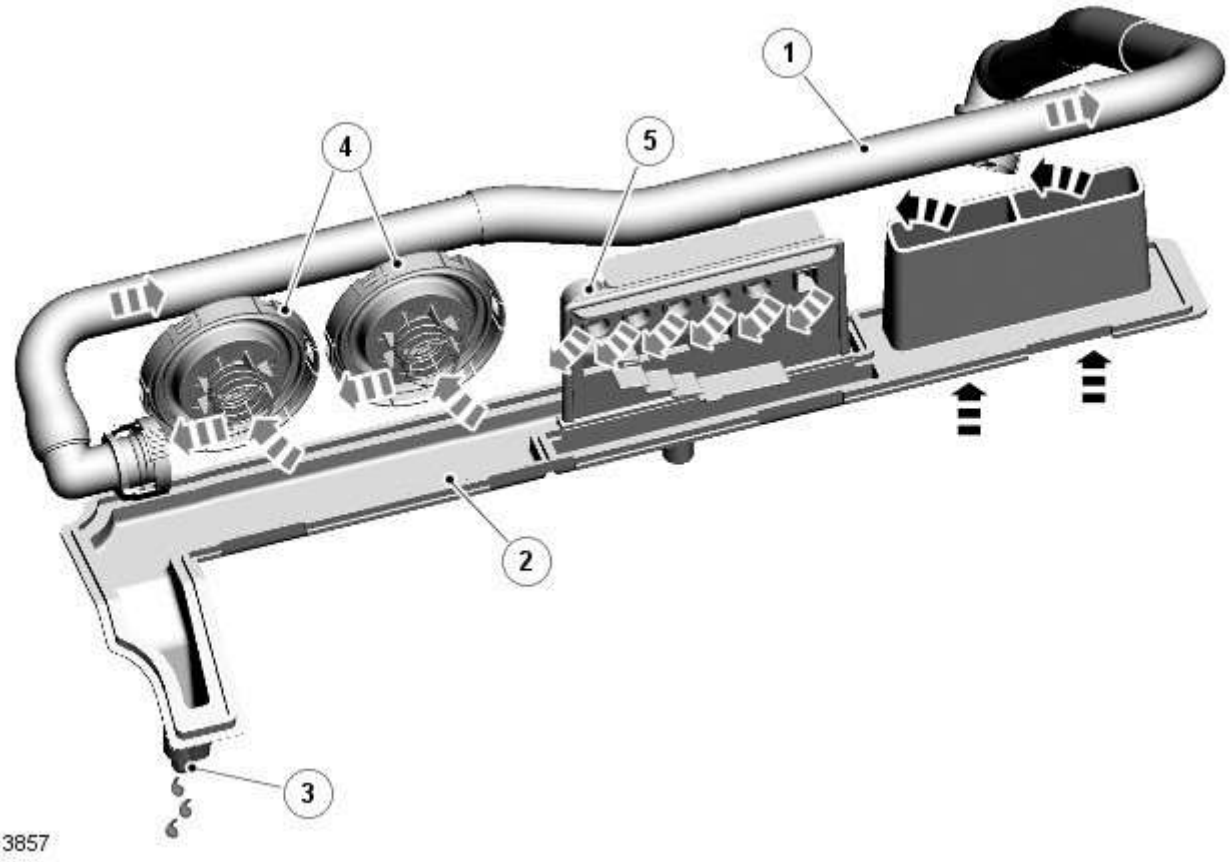
Description and Operation

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

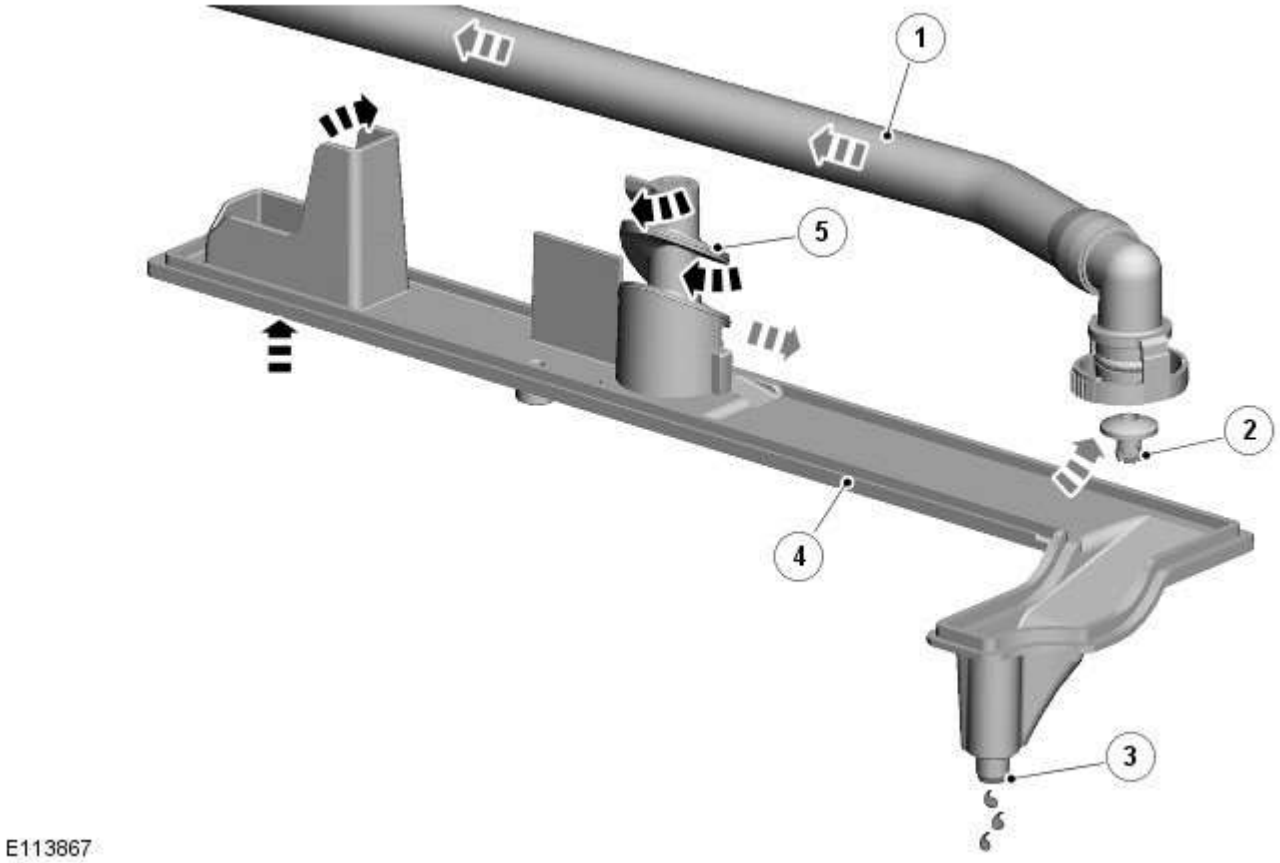


Item	Description
1	Flexible hose
2	Baffle plate
3	Oil drain
4	PCV (positive crankcase ventilation) valves
5	Oil separator

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



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.

Published: 11-May-2011

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
• Exhaust gas recirculation system • Breather hoses • Positive crankcase ventilation valve • Fuel level • Fuel contamination/grade/quality • Throttle body	• 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	• 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	• 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	• 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
	• 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).

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Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol -

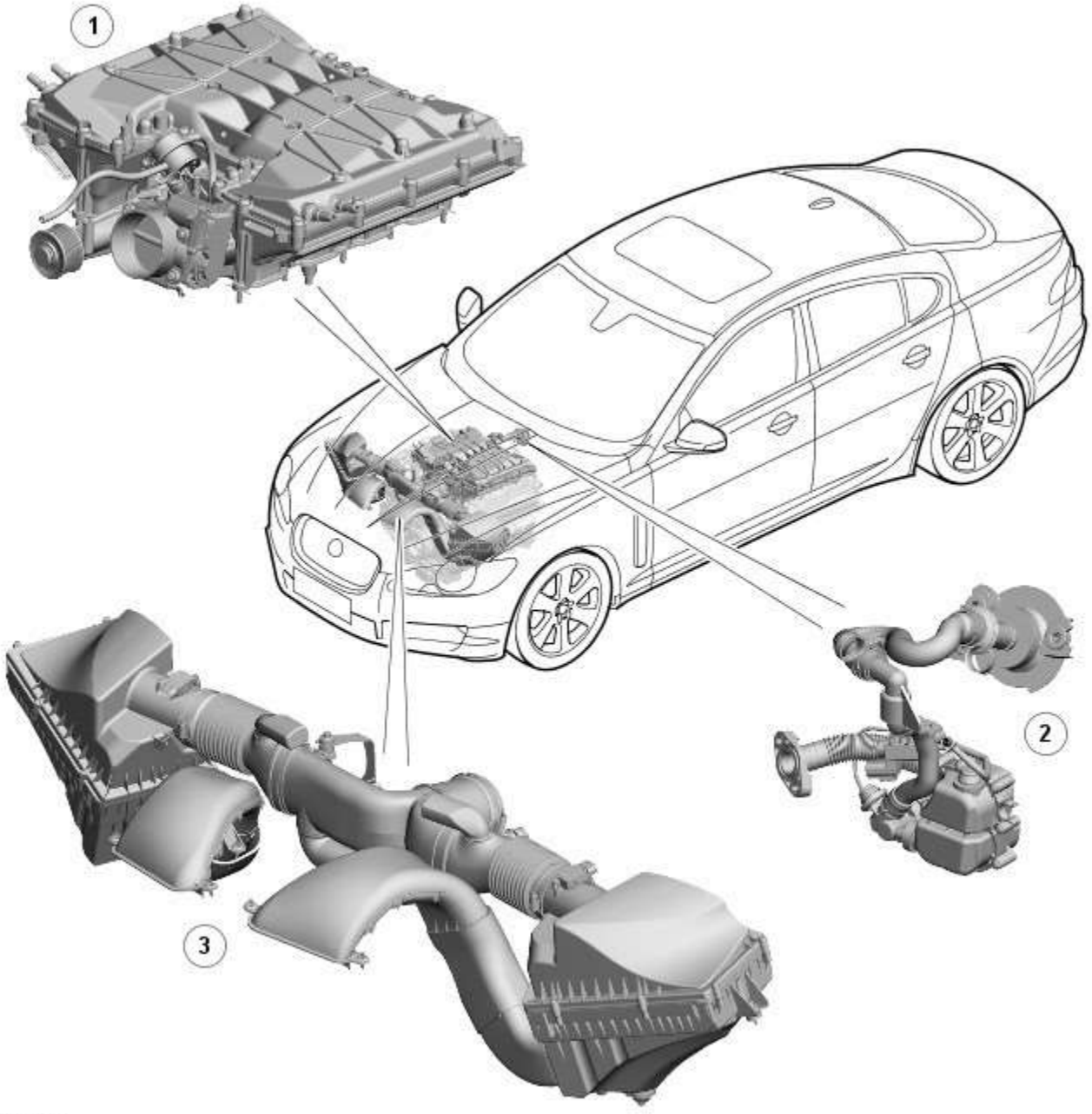
Description	Nm	lb-ft	lb-in
Air cleaner retaining bolts	8	-	71
Supercharger retaining bolts	25	18	-
Charge air cooler lower assembly retaining bolts	20	15	-
Throttle body retaining studs	10	7	-
Charge air cooler top assembly retaining bolts	25	18	-
Manifold absolute pressure and temperature (MAPT) sensor	5	-	44
Coolant outlet pipe	11	8	-

Published: 11-May-2011

Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Intake Air Distribution and Filtering - Component Location

Description and Operation

COMPONENT LOCATION



Item	Description
1	Supercharger and intake manifold
2	Noise feedback system
3	Air intakes, air cleaners and air ducts

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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.

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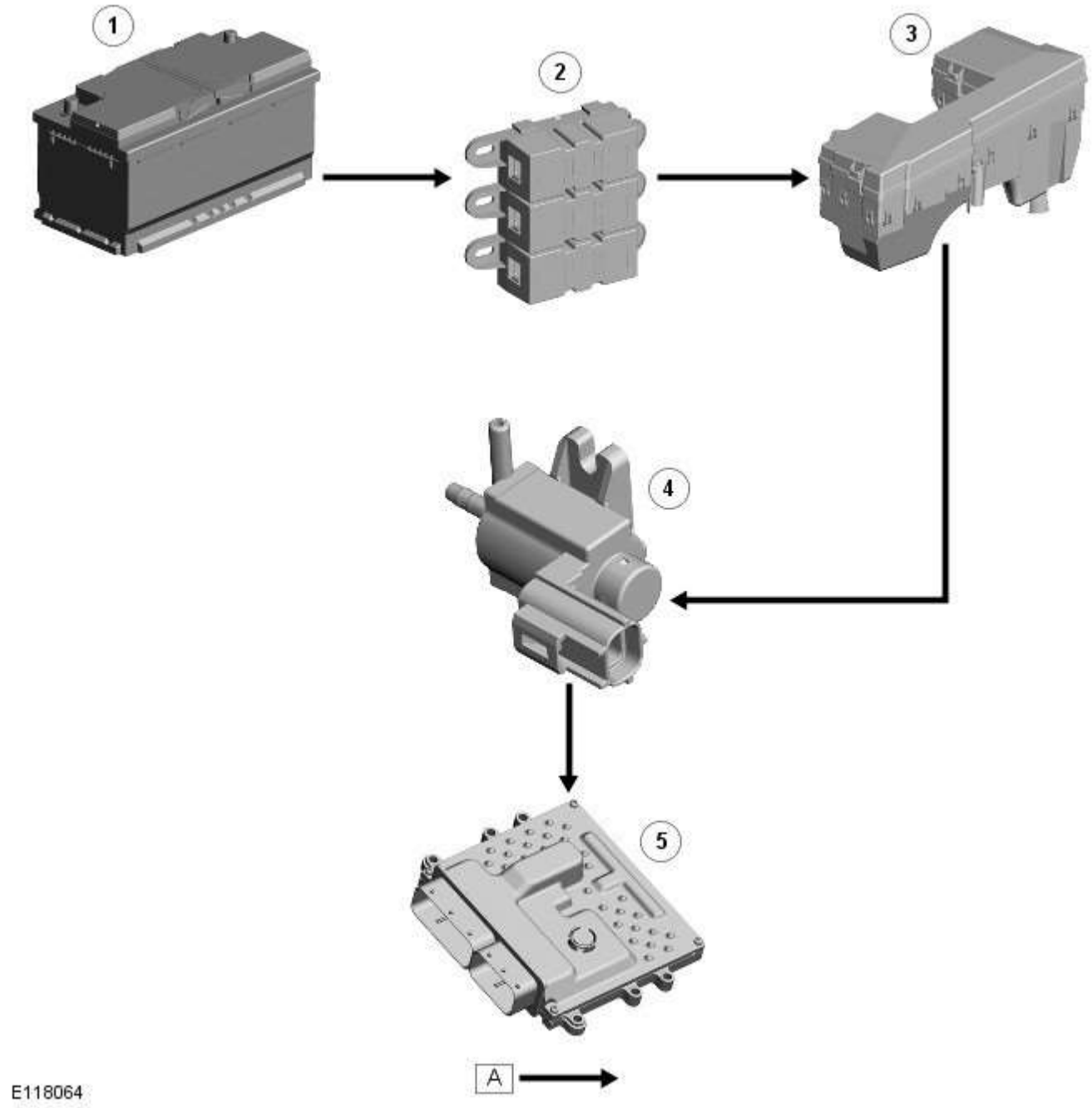
Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Intake Air Distribution and Filtering - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: **A** = Hardwired



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:

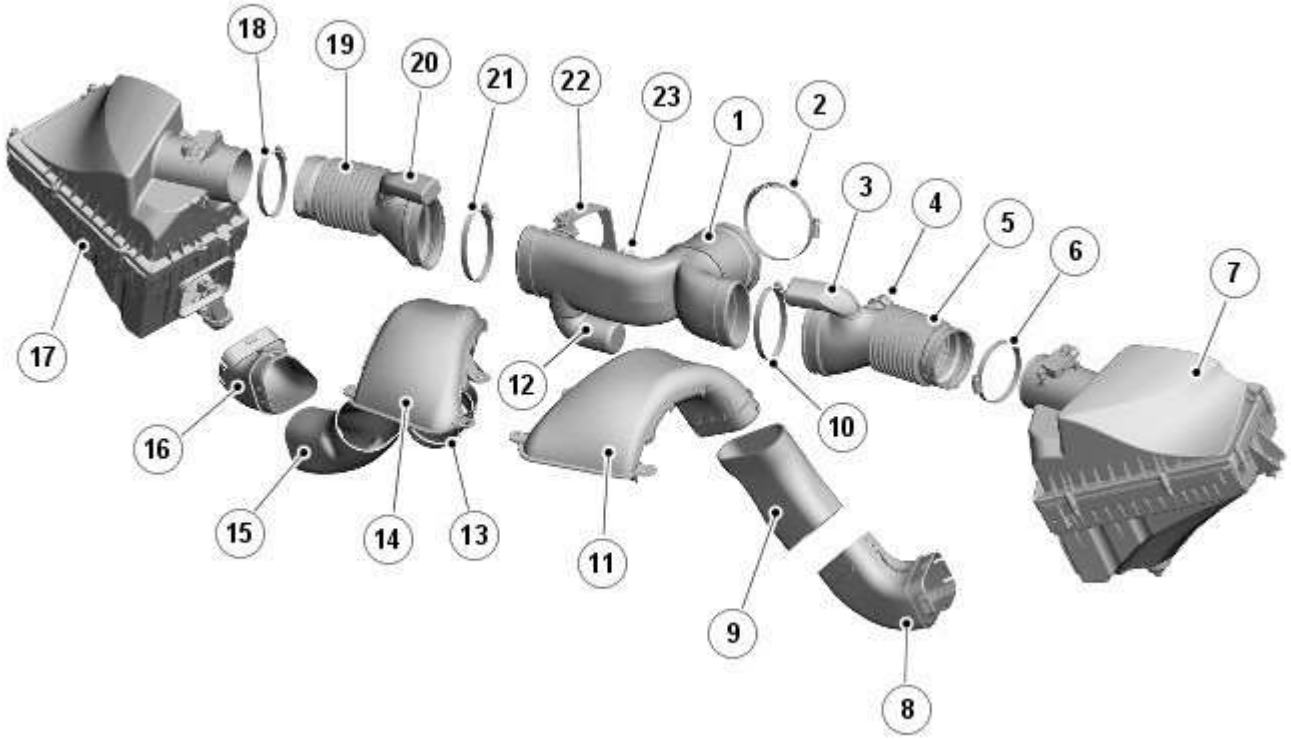
Pneumatic Valve Status

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



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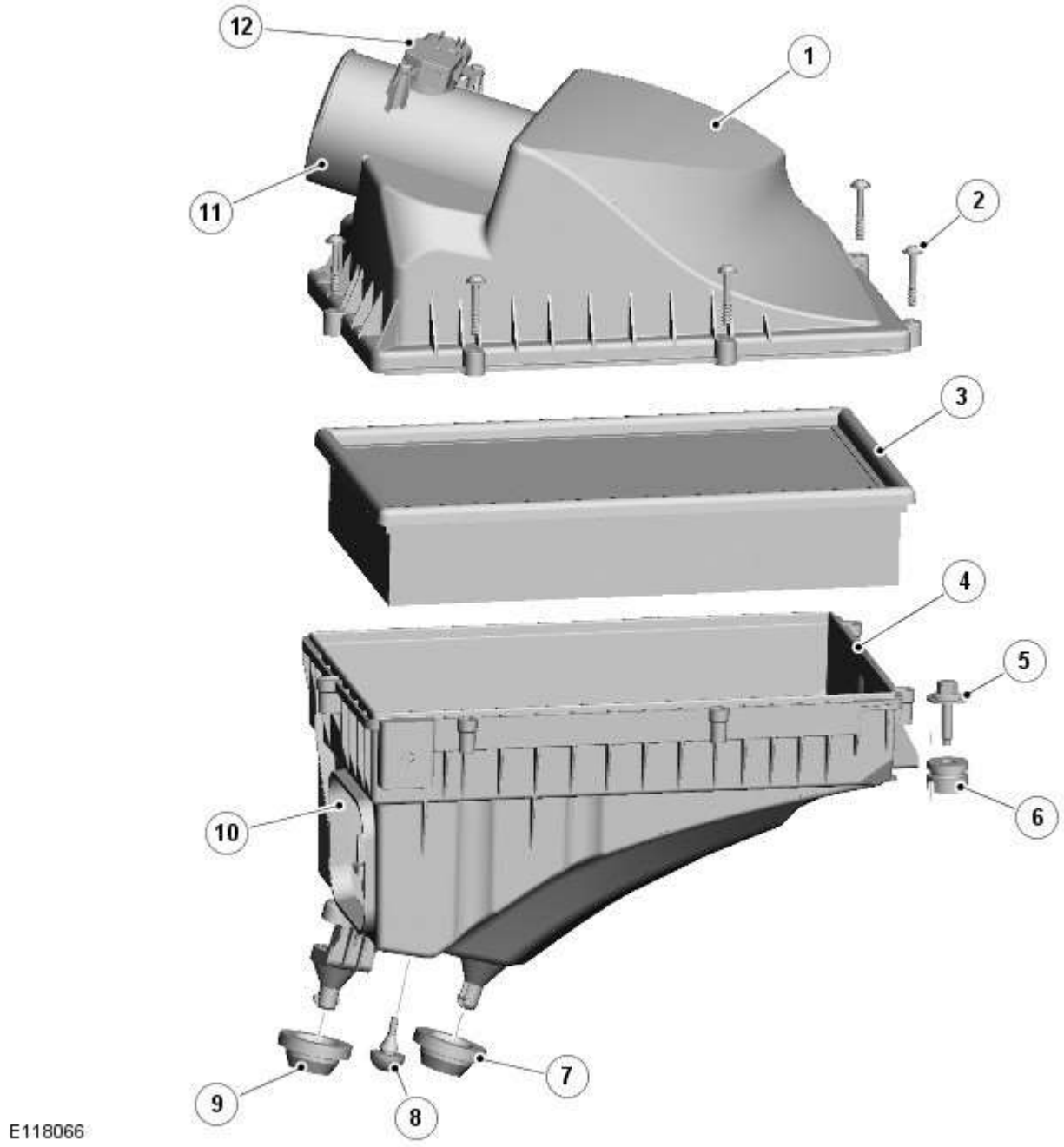
Item	Description
1	Throttle T-piece duct
2	Hose clamp
3	Quarter wave resonator
4	Full load breather connector stub
5	LH (left hand) air cleaner outlet tube
6	Hose clamp
7	LH air cleaner
8	LH air cleaner lower intake duct
9	LH air cleaner center intake duct
10	Hose clamp
11	LH air cleaner intake scoop
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



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.

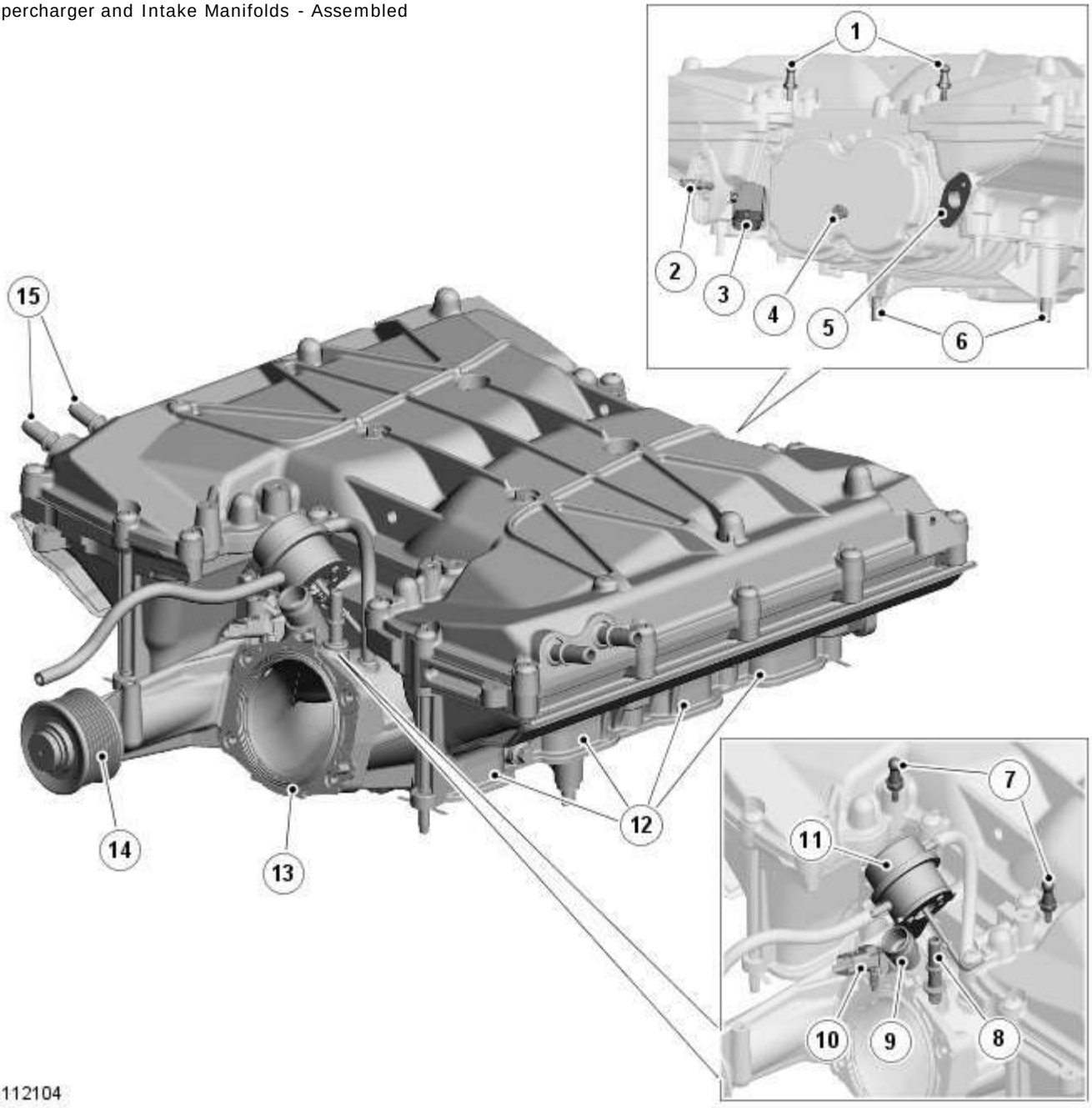
SUPERCHARGER AND INTAKE MANIFOLDS

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.

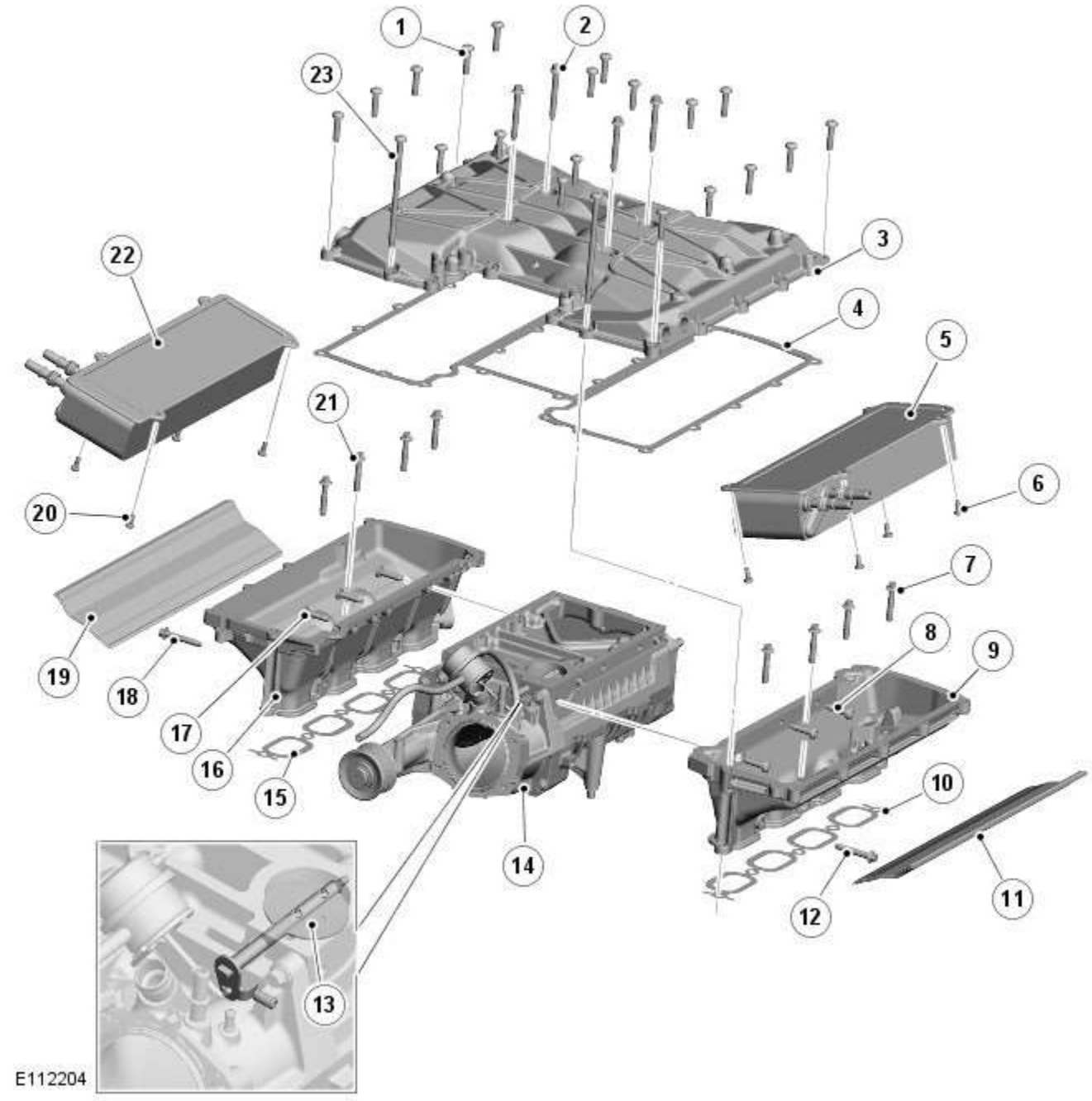
The charge air cooler tank top incorporates four studs for the attachment of the engine cover. A NVH (noise, vibration and harshness) pad is attached to the side of each intake manifold.

Supercharger and Intake Manifolds - Assembled



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



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 crew (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:

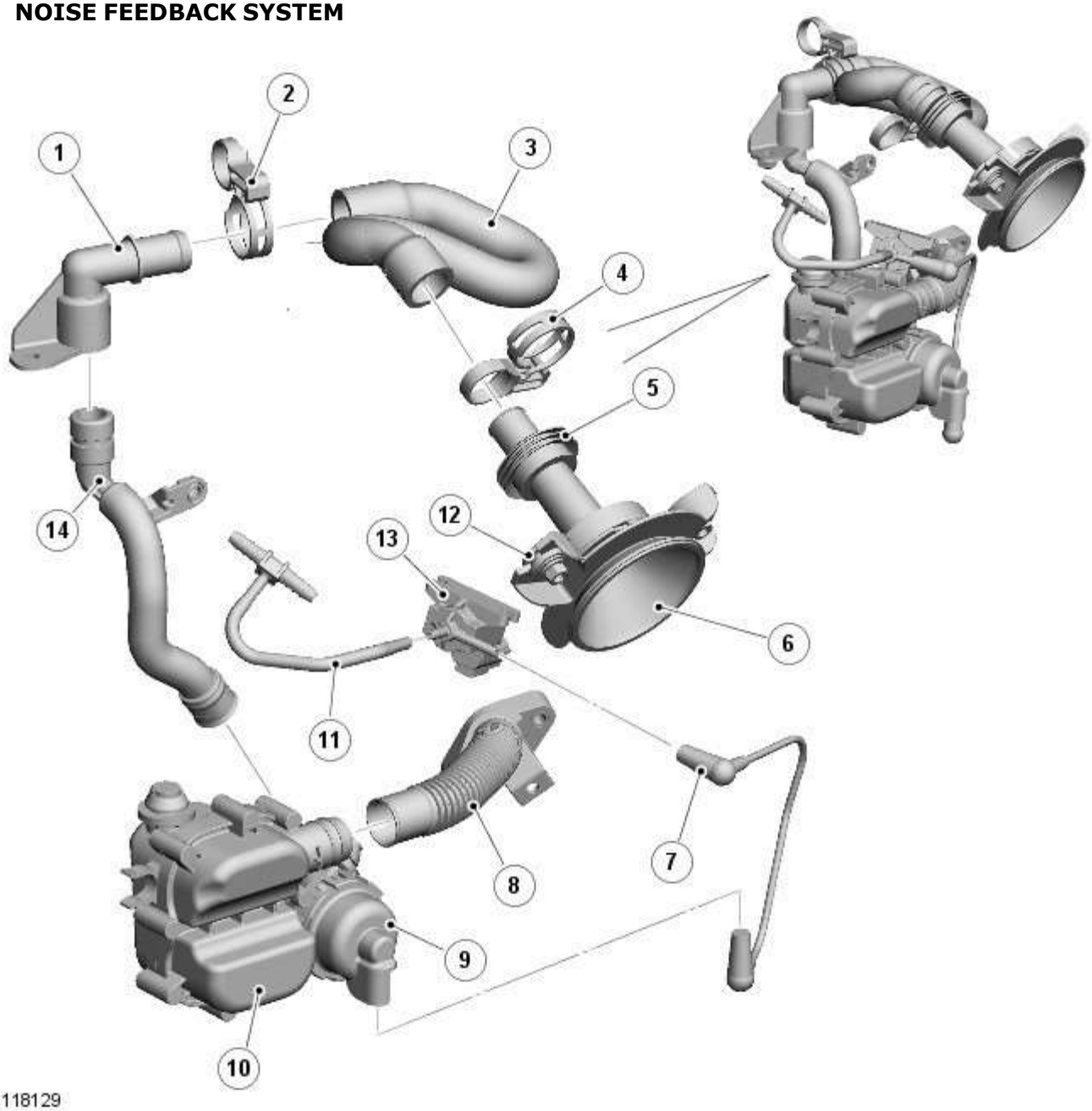
- The SC air inlet and mounting face for the electric throttle.
- A connector stub for the part load breather.
- A MAP (manifold absolute pressure) sensor.
- A connector stub for a hose from the EVAP (evaporative emission) canister purge valve.

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



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

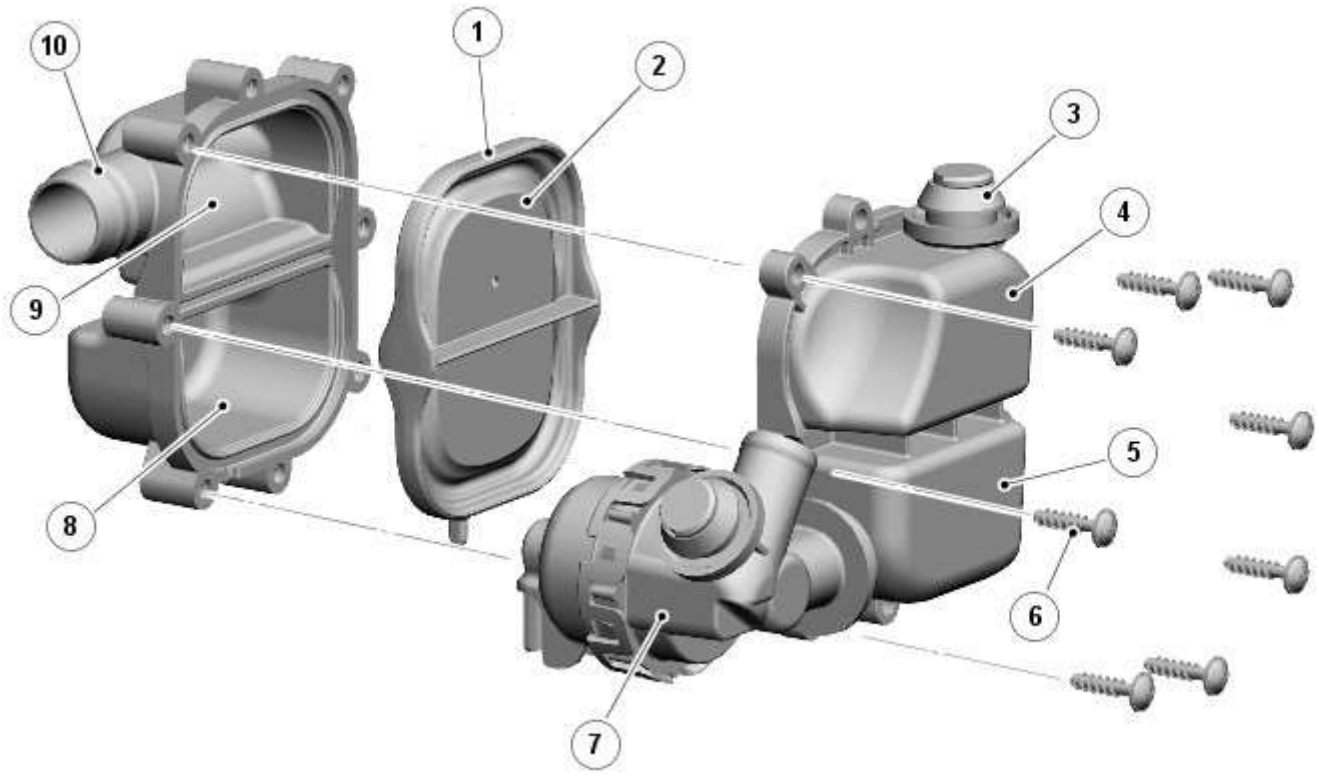
The symposer system modifies induction sound waves of a specific frequency range, at given engine settings, to produce the required engine sound. The symposer system consists of:

- 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



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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.

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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
• 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)	• 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	• 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	• 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	• 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	• 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).

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Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner Element

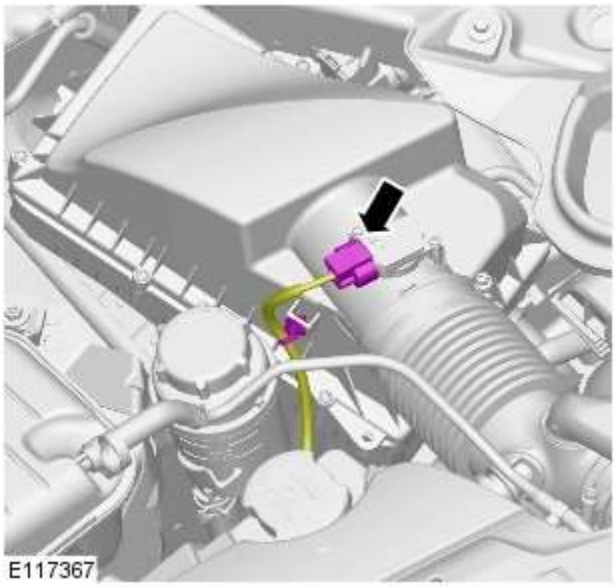
Removal and Installation

Removal

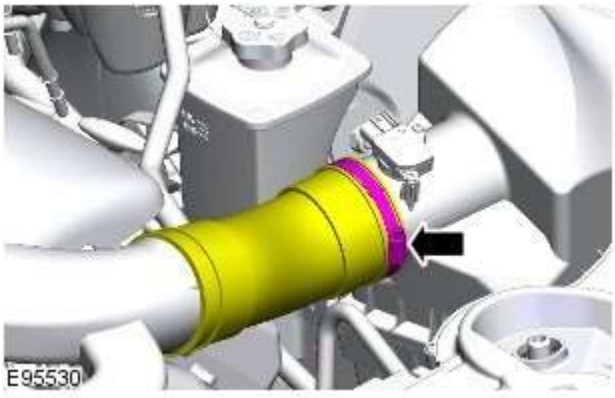
NOTES:

Removal steps in this procedure may contain installation details.

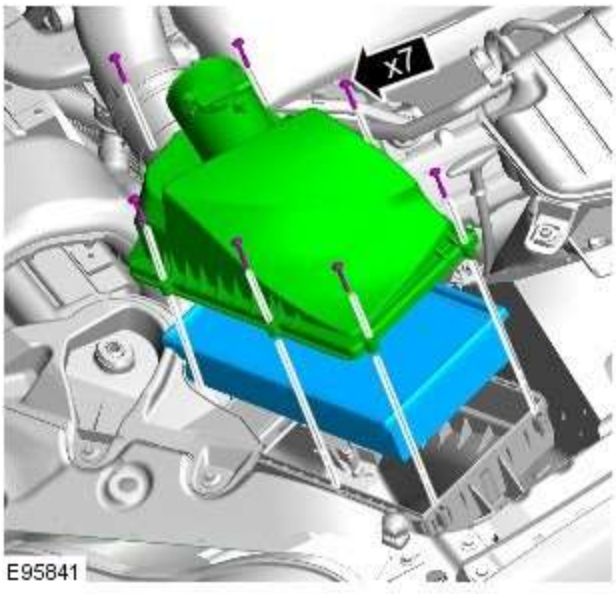
Some variation in the illustrations may occur, but the essential information is always correct.



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.

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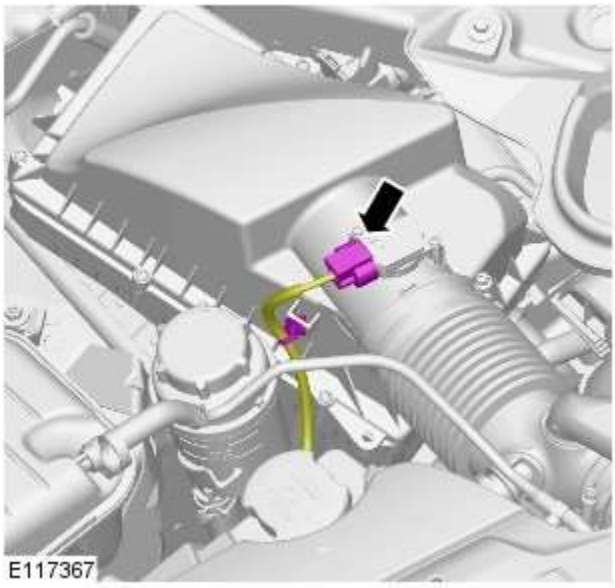
Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner LH

Removal and Installation

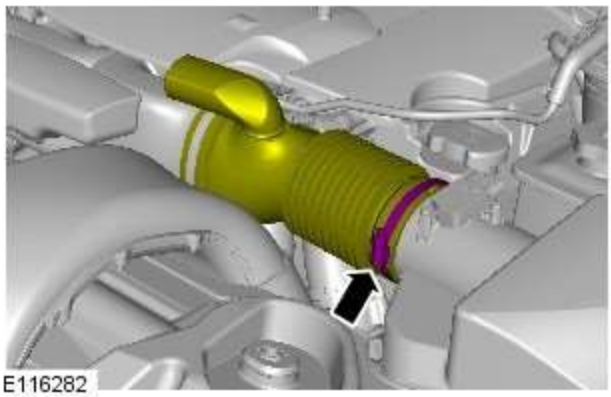
Removal

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

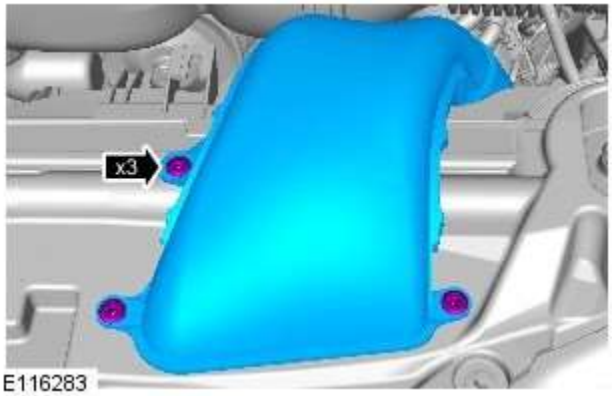
1.

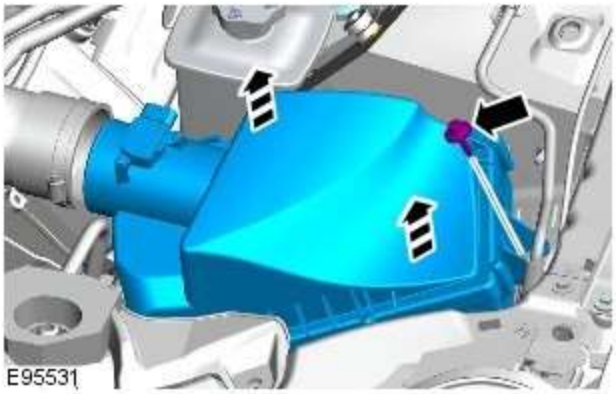


2.

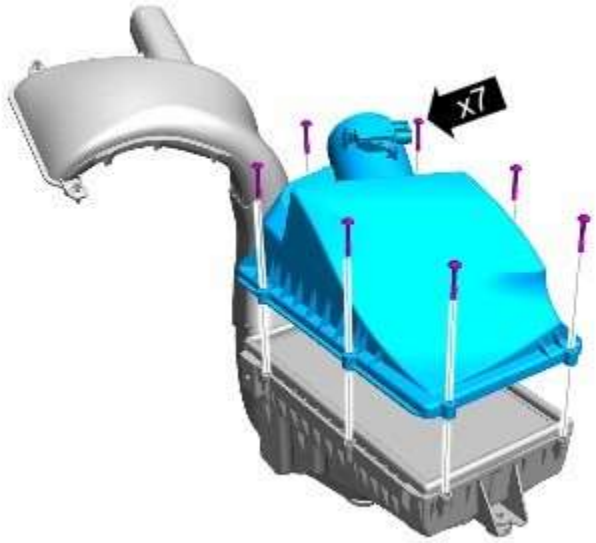


3.





4. *Torque:* 8 Nm



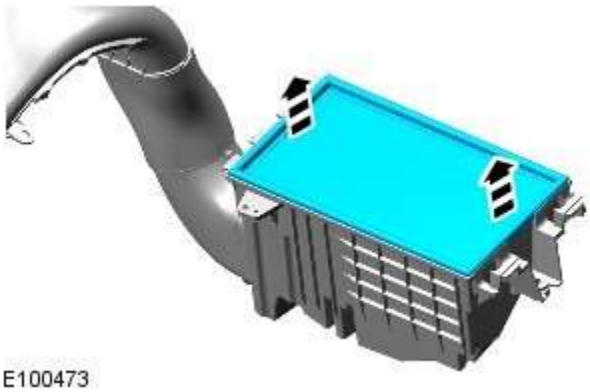
E100506

5. NOTES:

   Do not disassemble further if the component is removed for access only.

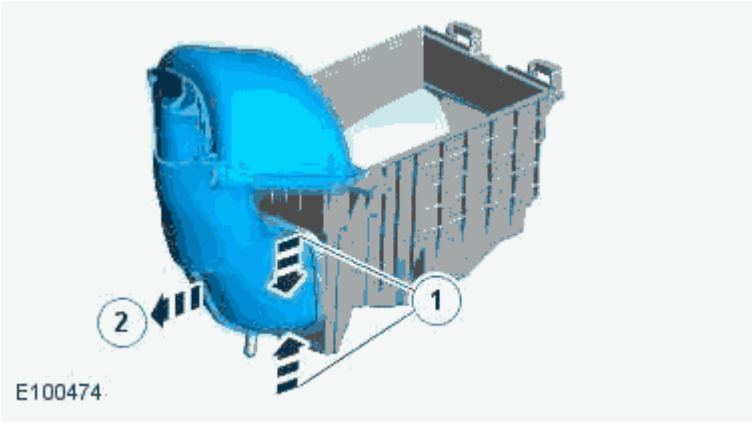
   Some variation in the illustrations may occur, but the essential information is always correct.

   LH illustration shown, RH is similar.



E100473

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.

Installation

1. To install, reverse the removal procedure.

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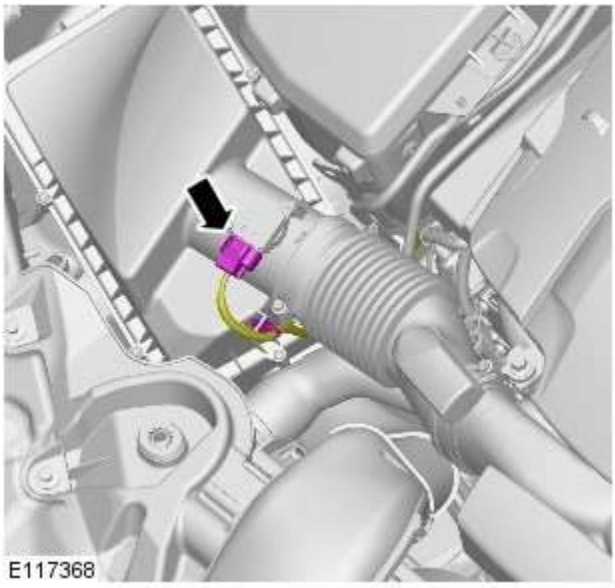
Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner RH

Removal and Installation

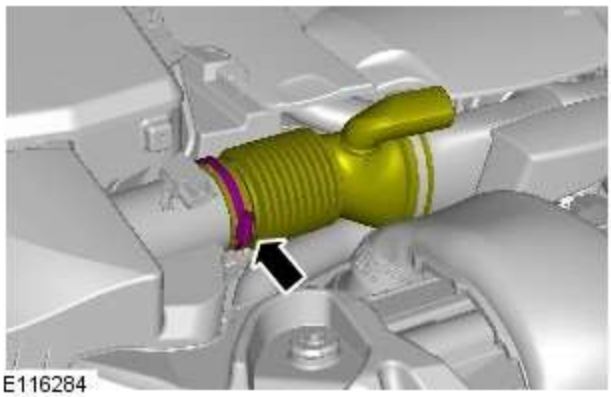
Removal

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

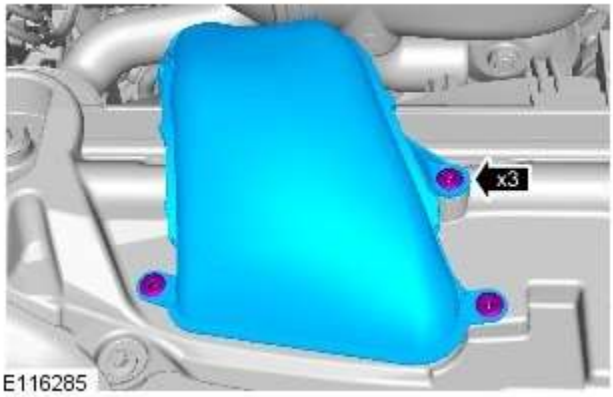
1.



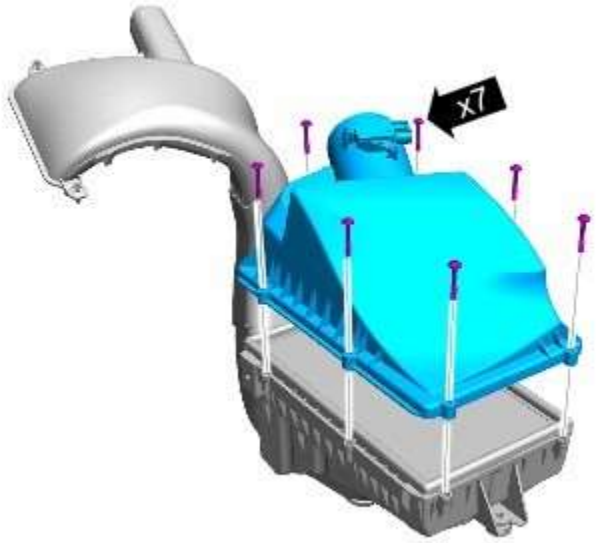
2.



3.



4. *Torque:* 8 Nm

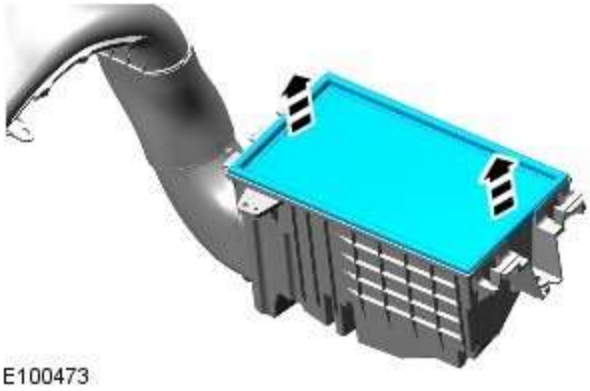


5. NOTES:

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.

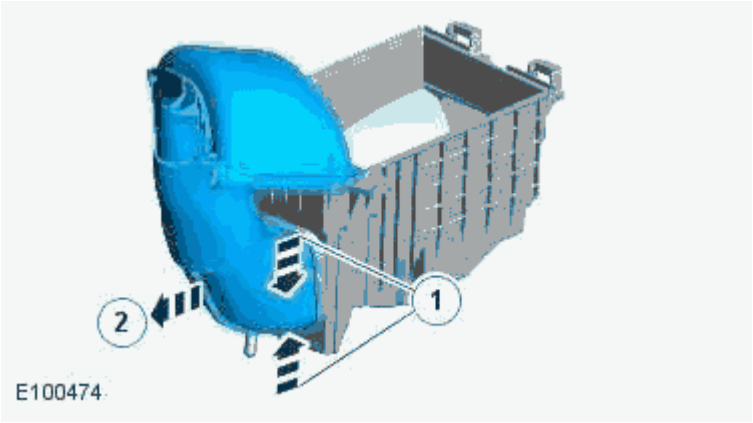
LH illustration shown, RH is similar.



6. NOTES:

Some variation in the illustrations may occur, but the essential information is always correct.

LH illustration shown, RH is similar.



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.

Published: 11-May-2011

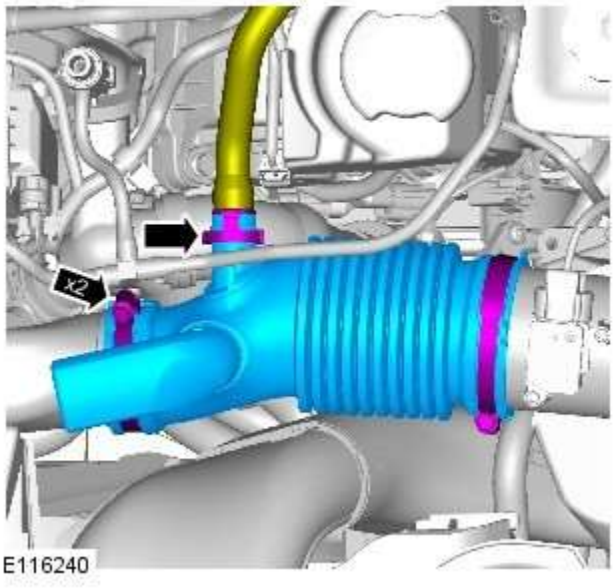
Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner Outlet Pipe LH

Removal and Installation

Removal

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

1.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

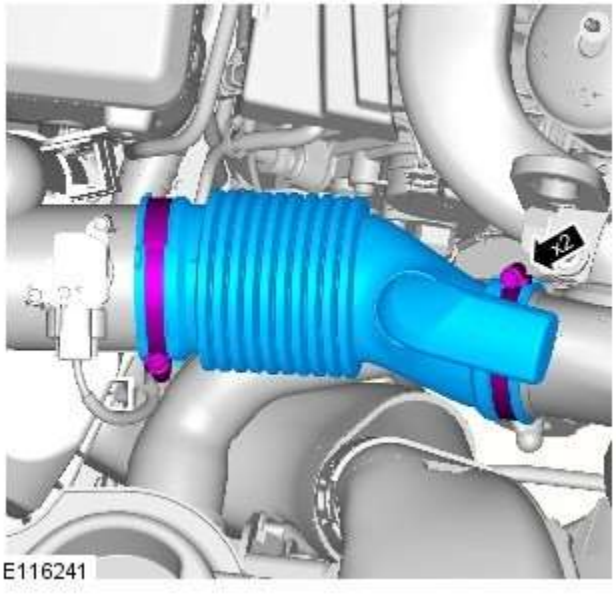
Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner Outlet Pipe RH

Removal and Installation

Removal

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

1.



Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

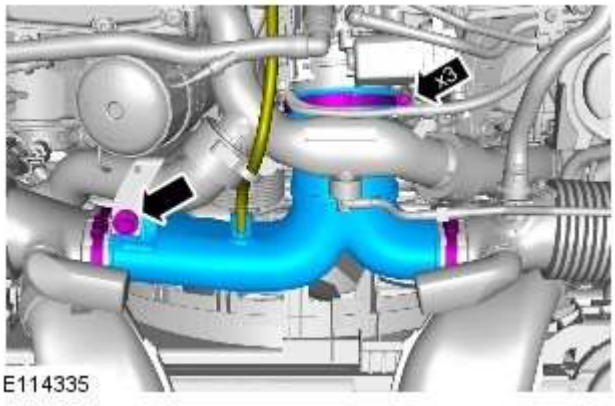
Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Air Cleaner Outlet Pipe T-Connector

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.

Published: 08-Nov-2013

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).

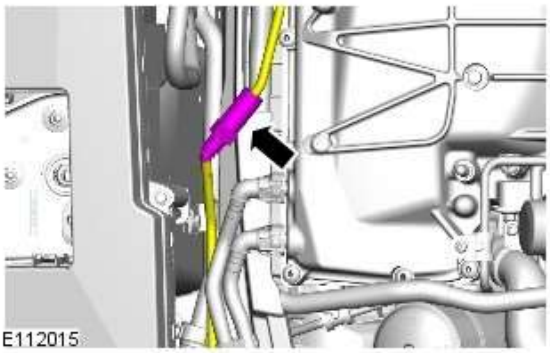
5. Refer to: Fuel Injection Component Cleaning (303-04D Fuel Charging and Controls - V8 5.0L Petrol, General Procedures).

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).

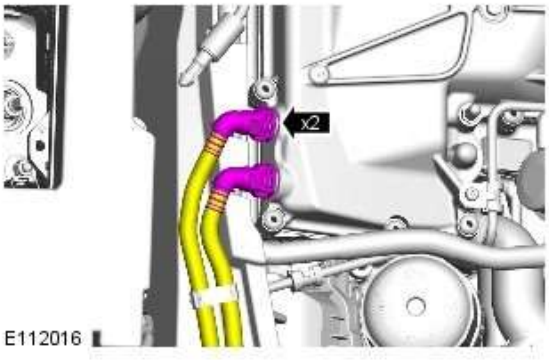
8. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Torque: 25 Nm

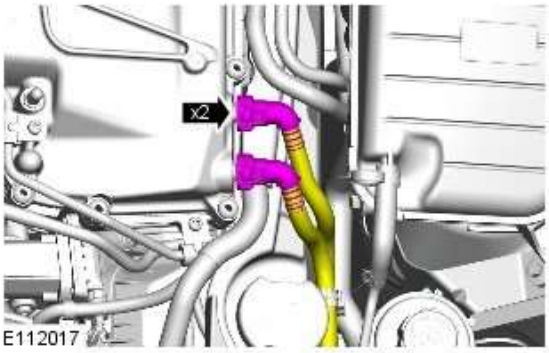


9.

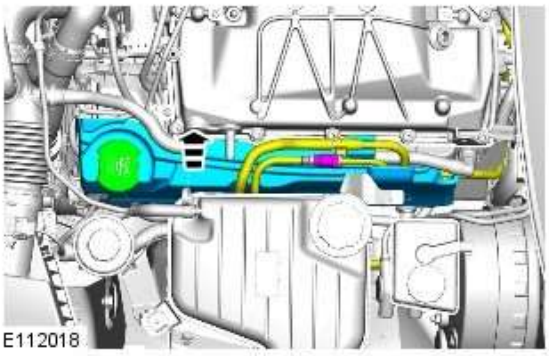
10.



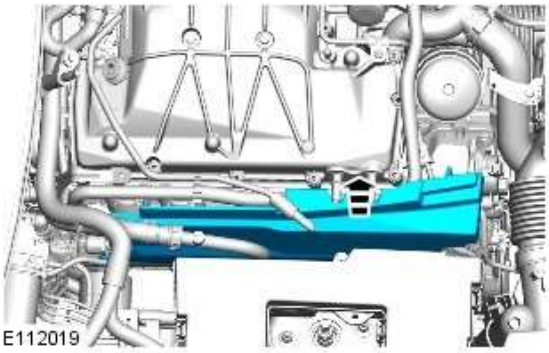
11.



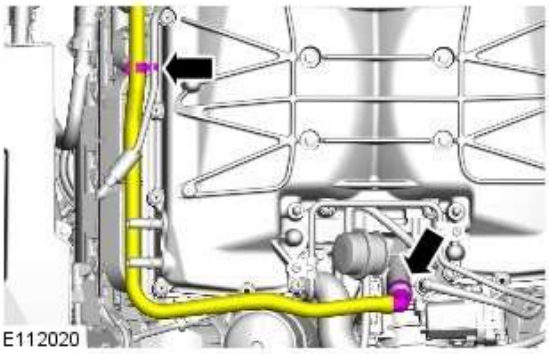
12. CAUTION: Be prepared to collect escaping fluids.

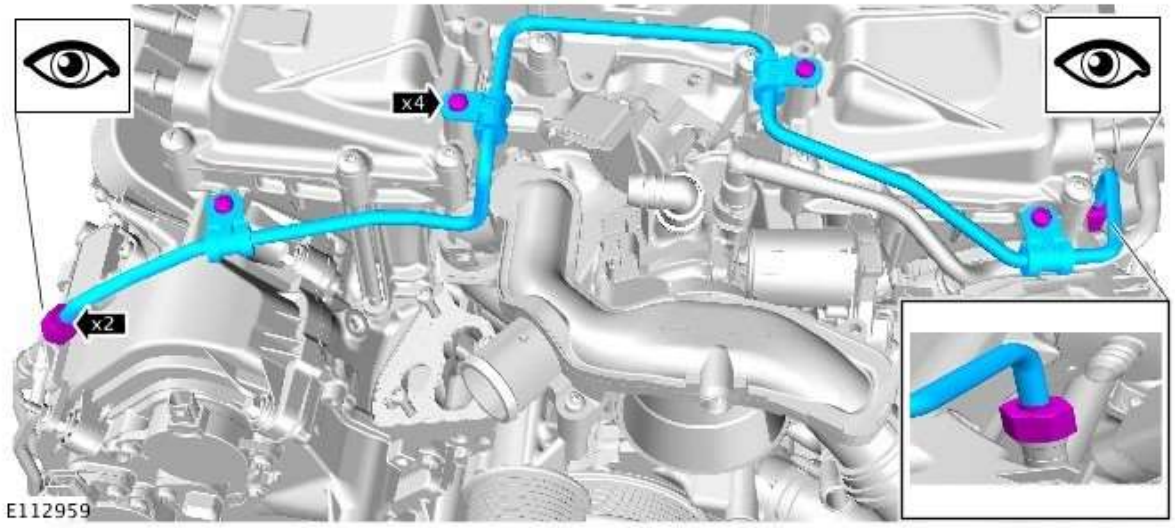


13.



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.

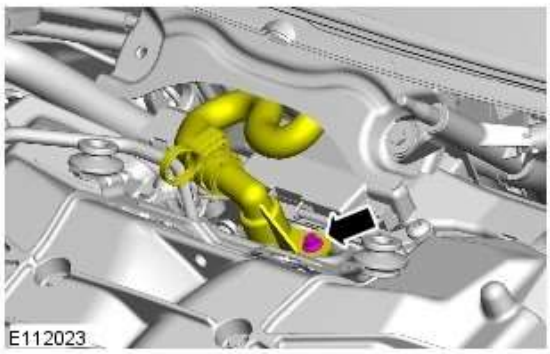
Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

CAUTIONS:

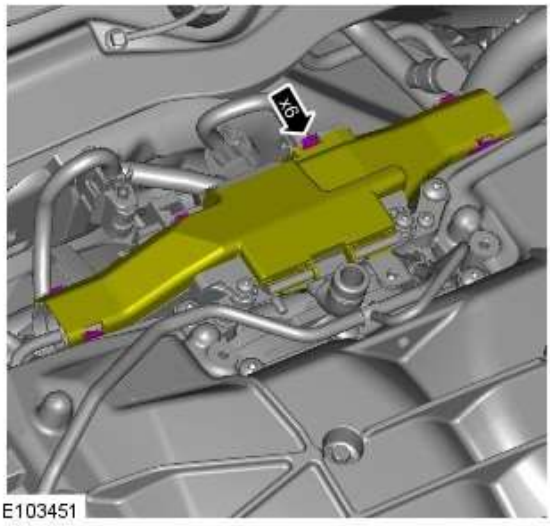
Make sure that the fuel line union does not rotate.

Be prepared to collect escaping fluids.

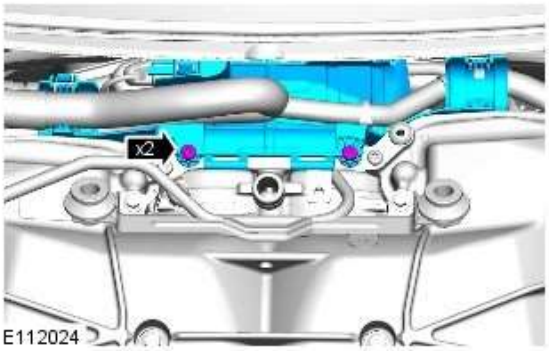
Make sure that all openings are sealed. Use new blanking caps.



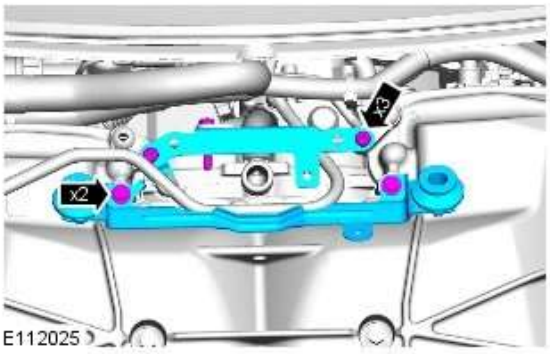
16. *Torque:* 10 Nm



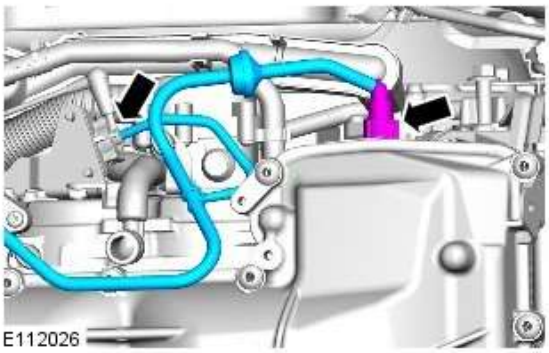
17. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.



18. *Torque:* 10 Nm



19. *Torque:* 10 Nm



20.

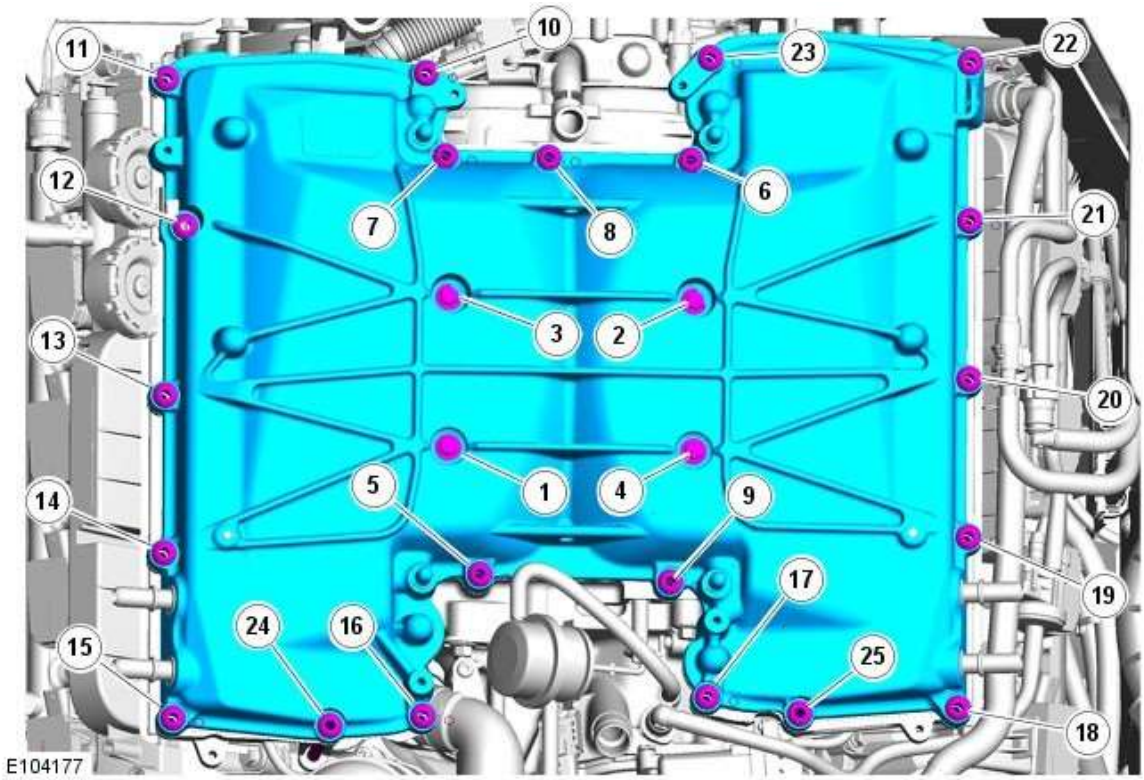
21. NOTES:

△ Install and lightly tighten bolts in sequence illustrated.

△ Complete the tightening sequence.

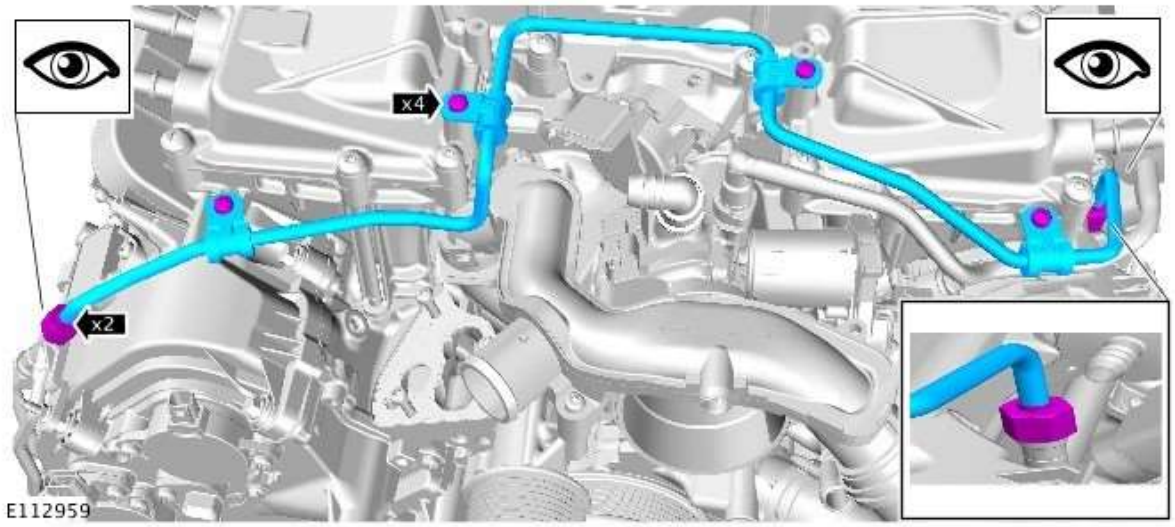
△ Remove and discard the gasket.

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.

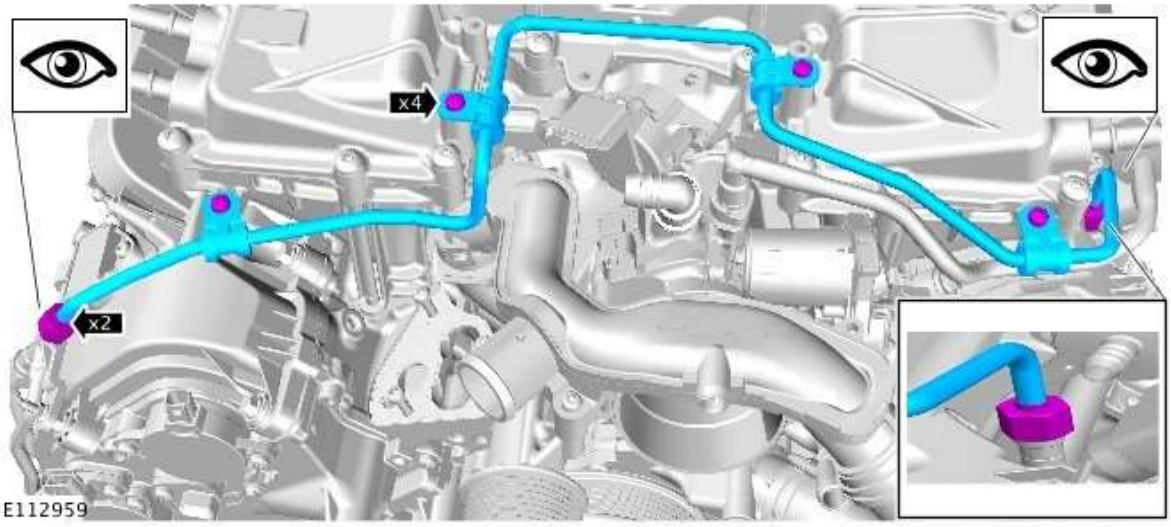
NOTES:

Lubricate only the union threads with clean engine oil.

Do not tighten at

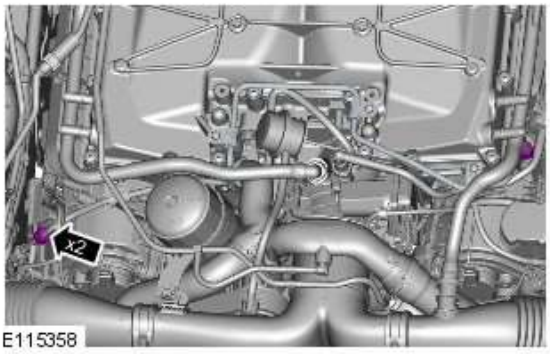
this stage.

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

Published: 30-Jan-2014

Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol - Supercharger

Removal and Installation

Special Tool(s)

 E115267	303-1449-01 Supercharger Installation Guide Pins - Threaded
 E115267	303-1449-02 Supercharger Installation Guide Pins - Unthreaded

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.

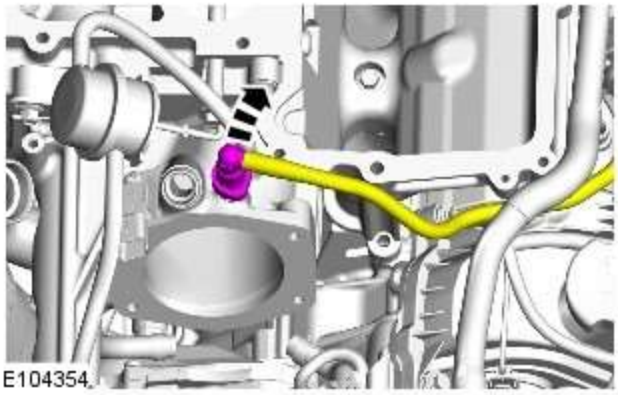
3. Refer to: Charge Air Cooler (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

4. Refer to: Throttle Body (303-04E Fuel Charging and Controls - V8 S/C 5.0L Petrol, Removal and Installation).

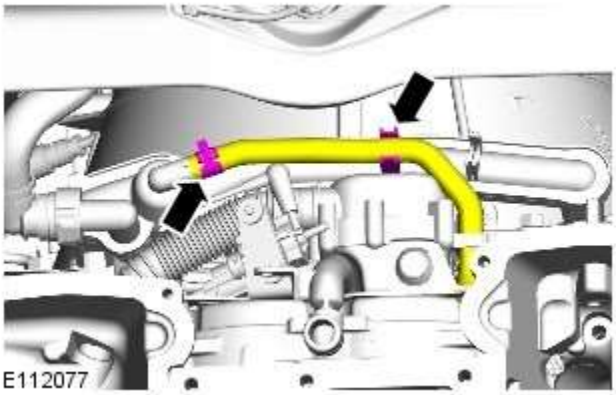
5. Refer to: Supercharger Belt (303-05 Accessory Drive - 5.0L, Removal and Installation).

6. Refer to: Manifold Absolute Pressure (MAP) Sensor (303-14D Electronic Engine Controls - V8 S/C 5.0L Petrol, Removal and Installation).

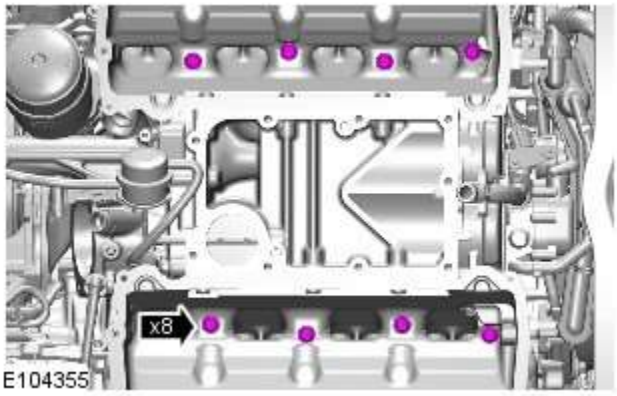
7.



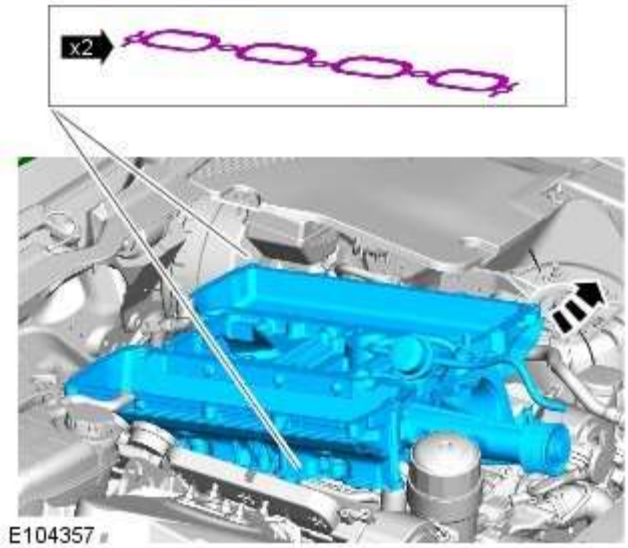
8.

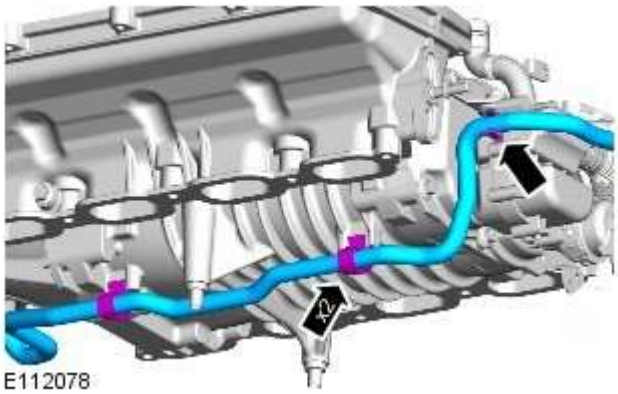


9.



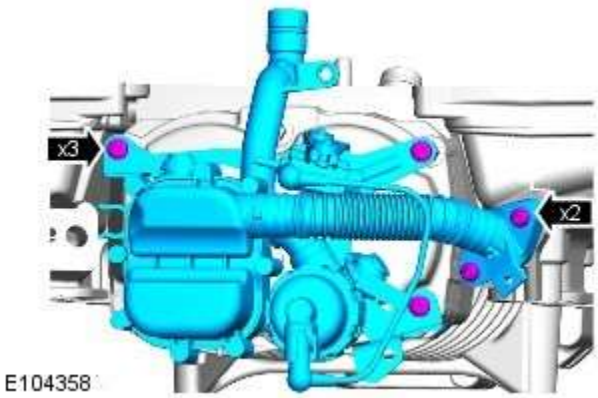
10. Discard the gaskets.

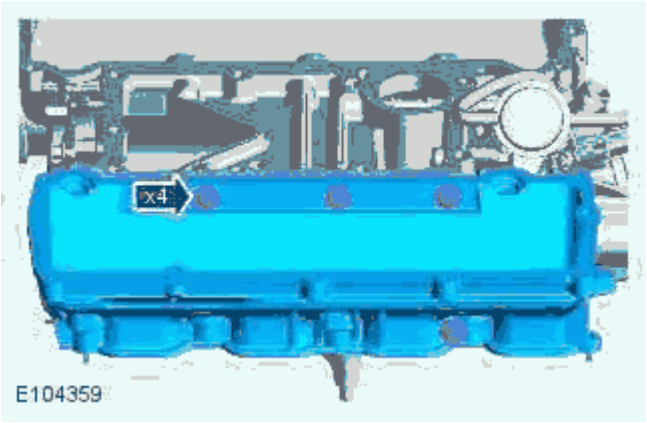




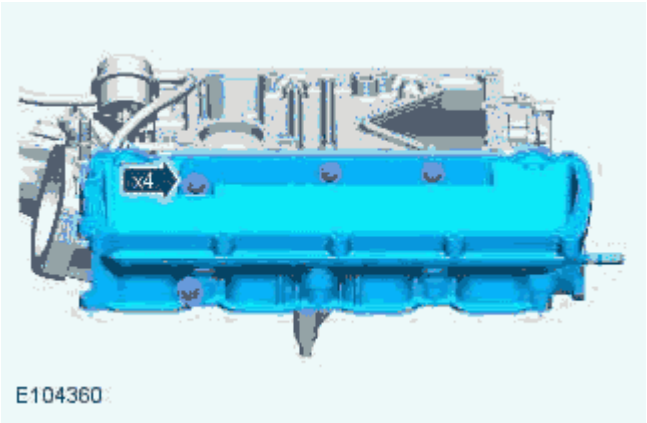
11. NOTE: Do not disassemble further if the component is removed for access only.

12.





13.



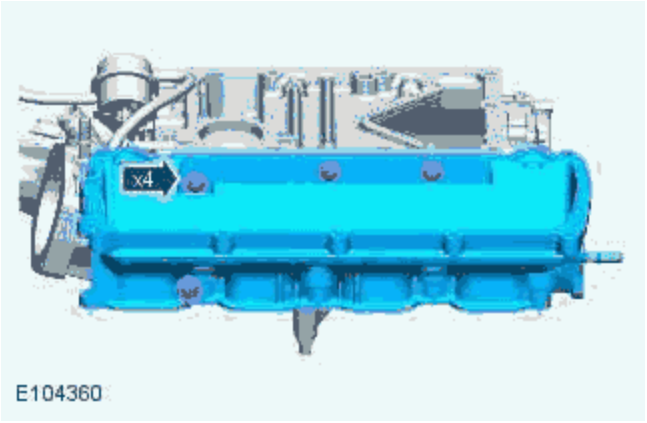
14.

Installation

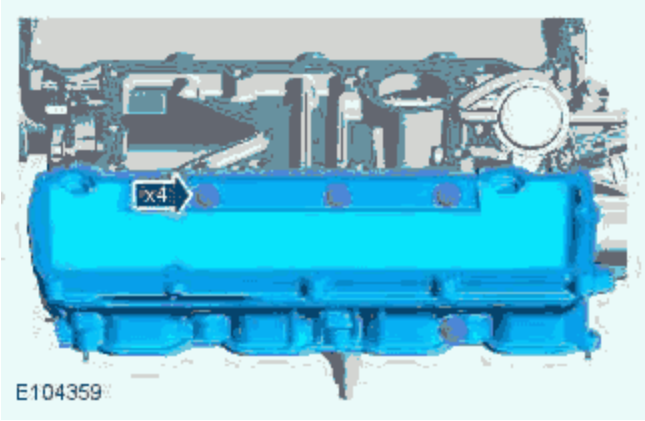
1. CAUTION: If a new cylinder head has been installed, then new taptite bolts must be used to install the supercharger.

   NOTE: New taptite bolts when used cut their own threads on the first application.

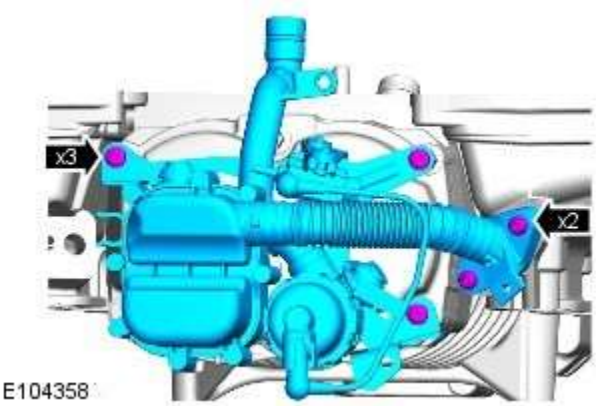
   To install, reverse the removal procedure.



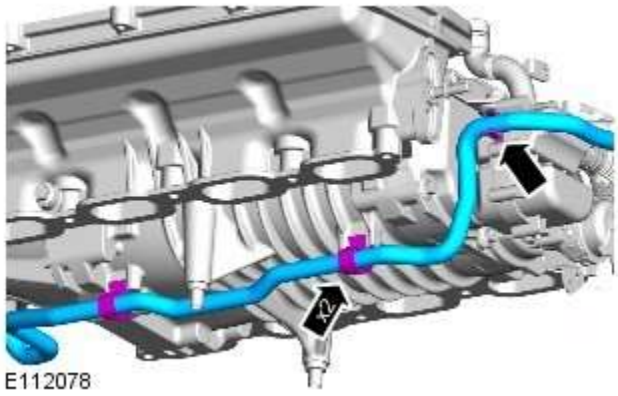
2. *Torque:* 25 Nm



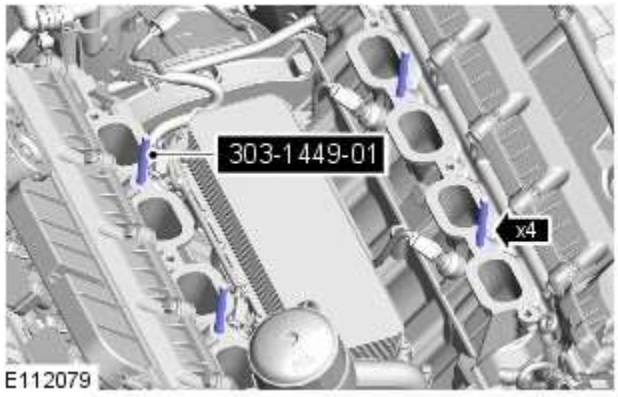
3. *Torque:* 25 Nm



4. *Torque:* 10 Nm



5.



6.

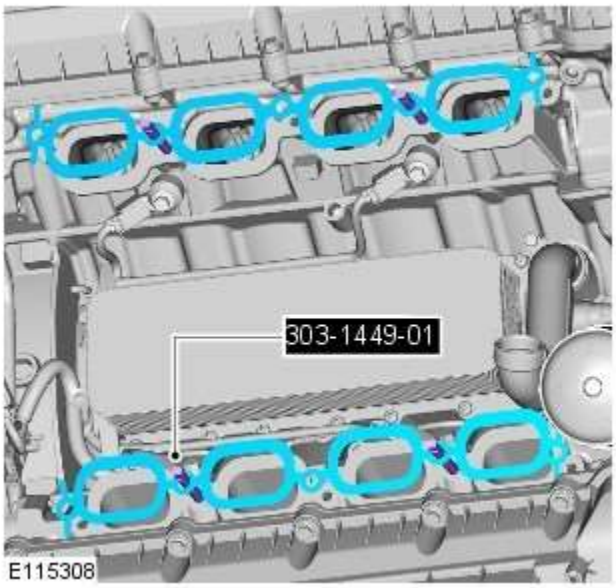
- CAUTIONS:

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.

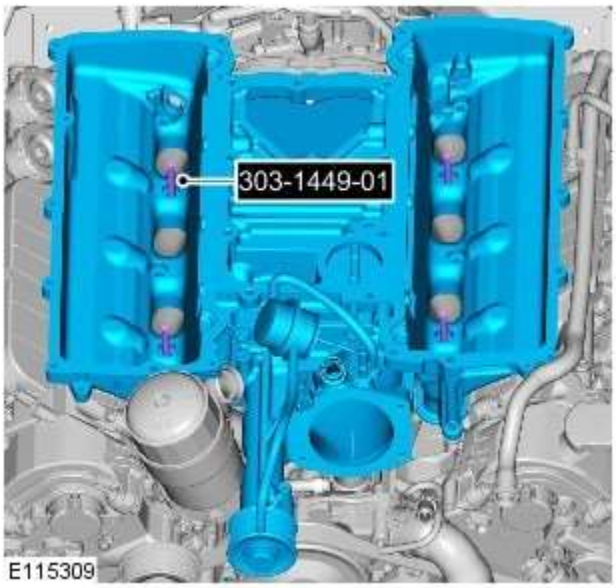
If a new cylinder head has been installed, then new taptite bolts must be used to install the supercharger.

NOTE: New taptite bolts when used cut their own threads on the first application.

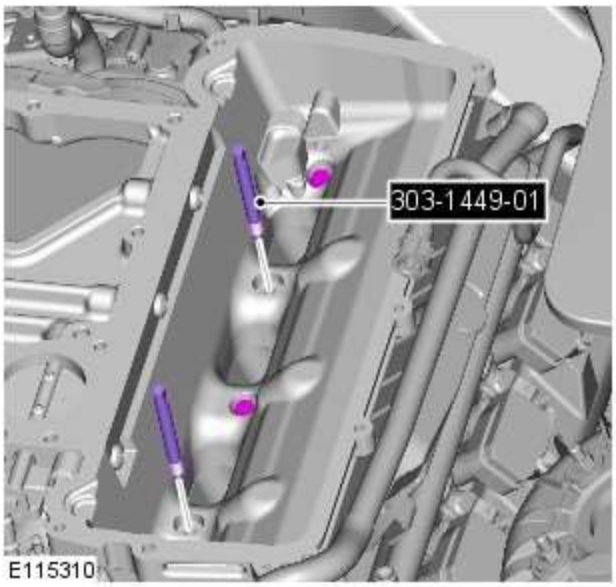
Special Tool(s): 303-1449-01, 303-1449-02



7. CAUTION: Make sure that the mating faces are clean and free of foreign material.
    - Install new gaskets.

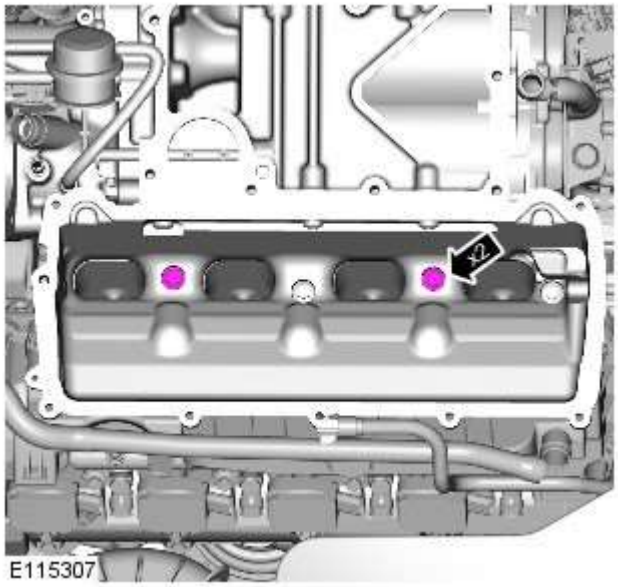


8. CAUTION: Make sure that the mating faces are clean and free of foreign material.



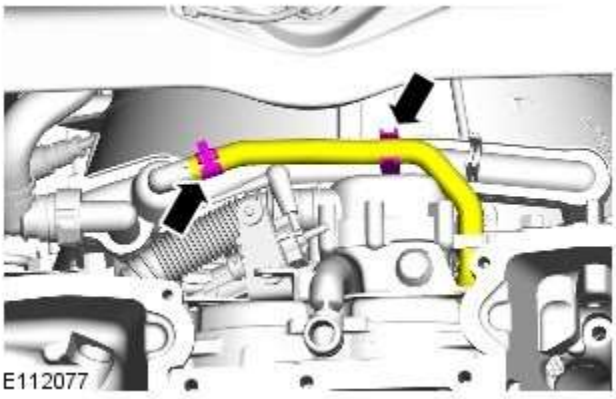
9. NOTE: Left-hand shown, right-hand similar.

   Special Tool(s): 303-1449-01, 303-1449-02
   Torque: 25 Nm



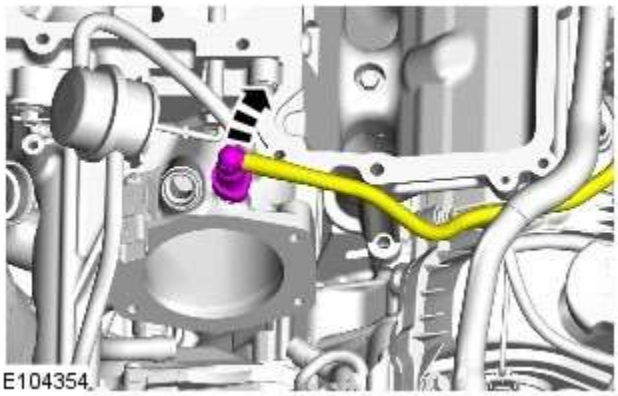
10. NOTE: Left-hand shown, right-hand similar.

    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).

Published: 20-Jun-2014

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.

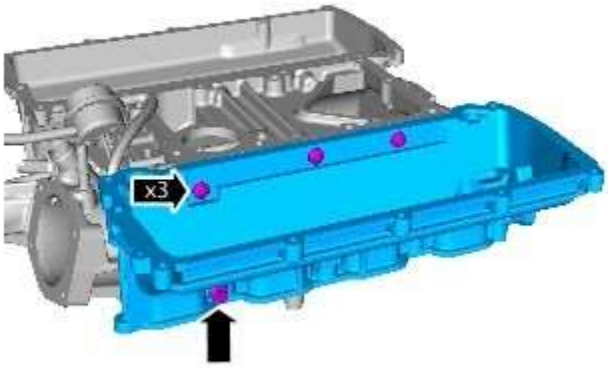
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. WARNING: Make sure to support the vehicle with axle stands.

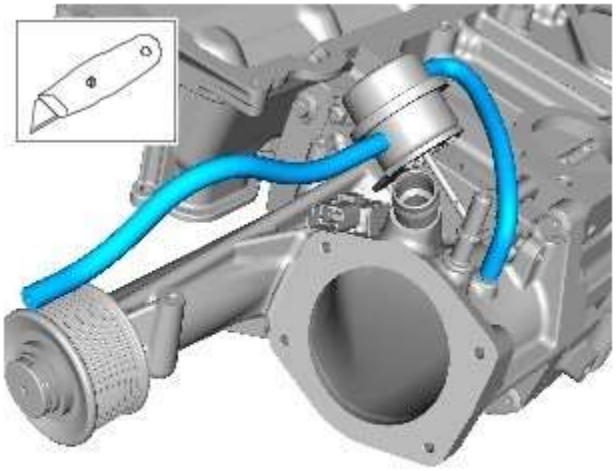
   Raise and support the vehicle.

2. Refer to: Supercharger (303-12D Intake Air Distribution and Filtering - V8 S/C 5.0L Petrol, Removal and Installation).

3.



E160352

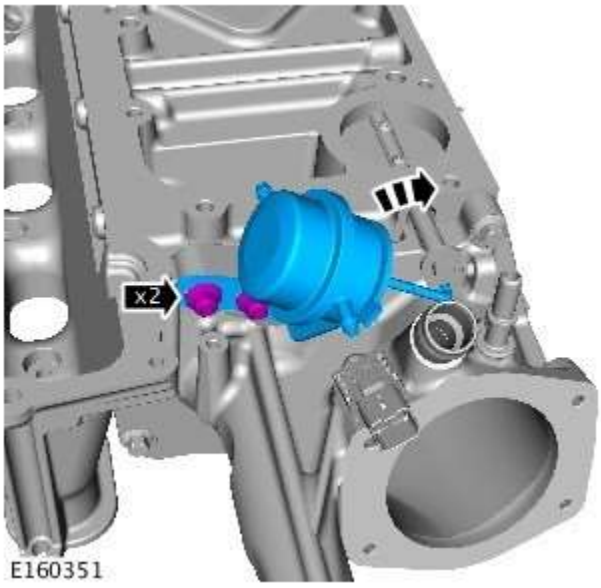


E160350

4. NOTES:

   Note the orientation prior to removal.

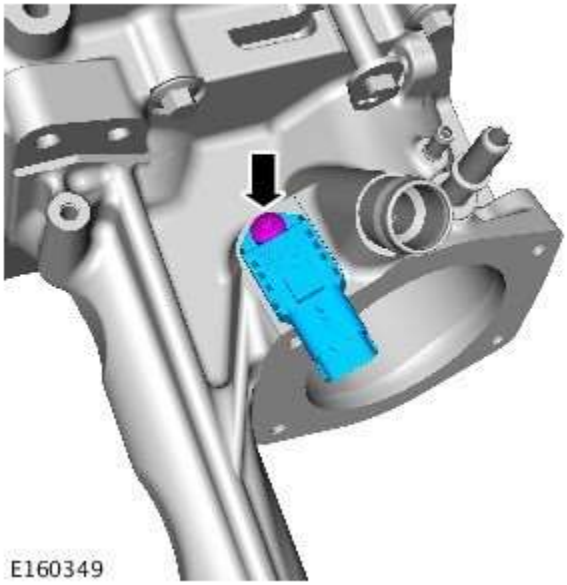
   Hoses must be cut off to prevent damage to the actuator.



E160351

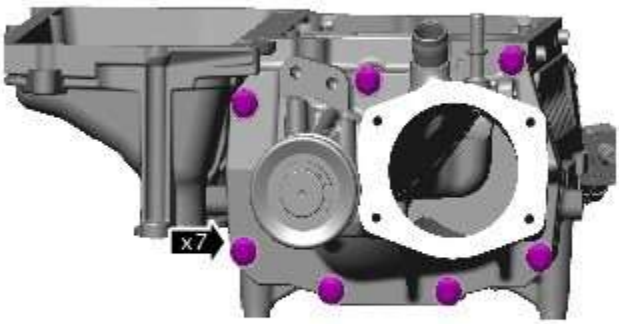
5.

6.

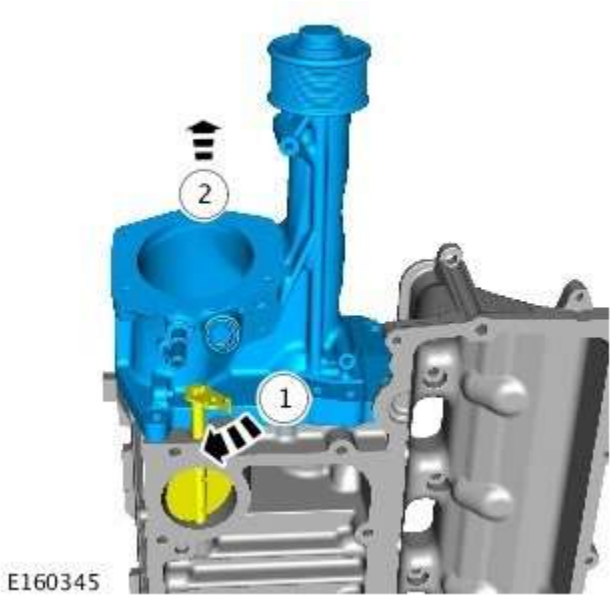


E160349

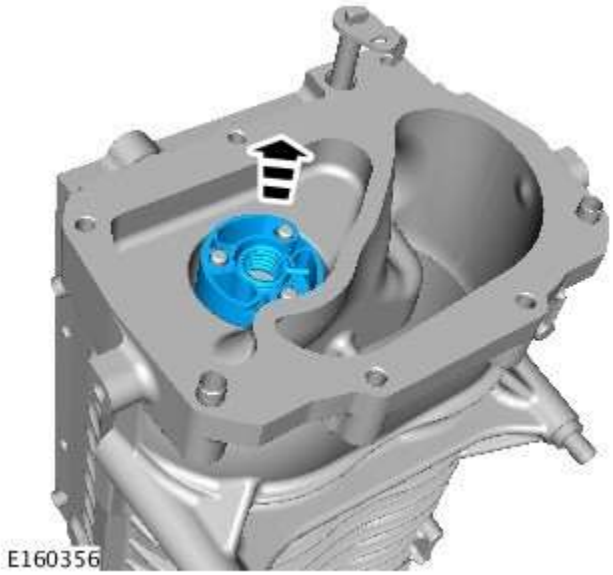
7.



E160344



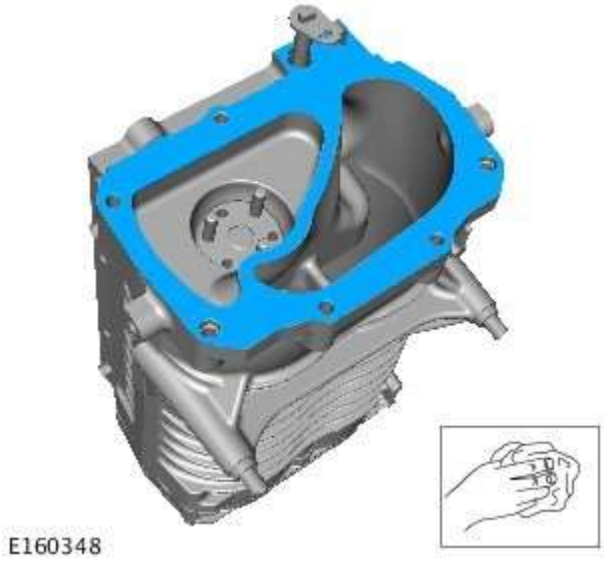
8. CAUTION: Make sure the actuator arm is rotated to allow the front cover to be removed. Failure to follow this instruction may result in damage to the component.



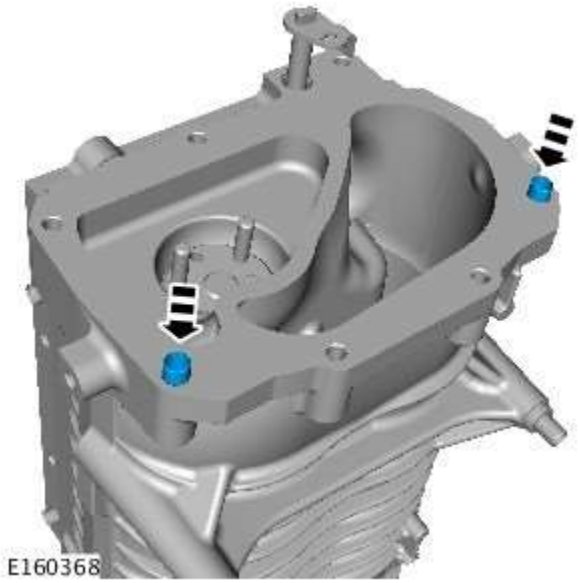
9. CAUTION: Make sure that all open ports are covered to prevent any foreign material ingress.

10.

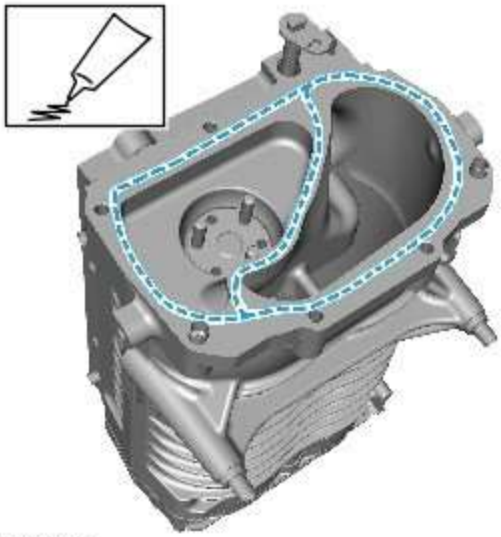
11. CAUTION: Make sure that all open ports are covered to prevent any foreign material ingress.



Installation

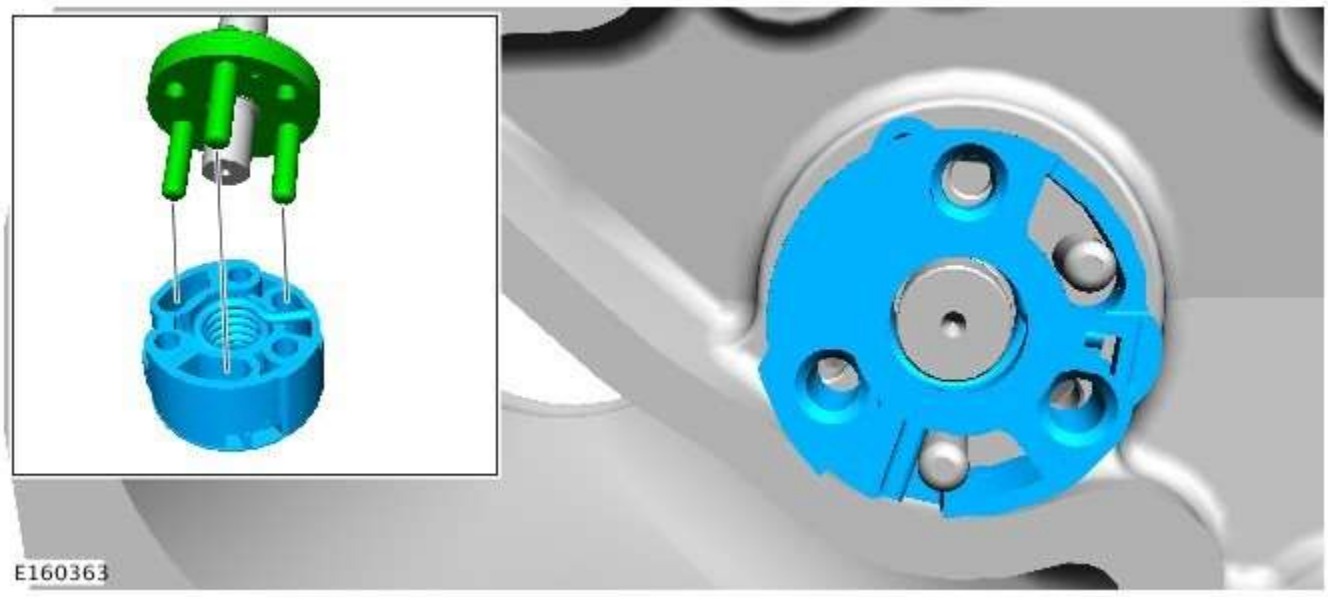

E160368

1. CAUTION: Make sure that all open ports are covered to prevent any foreign material ingress.


E160360

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.



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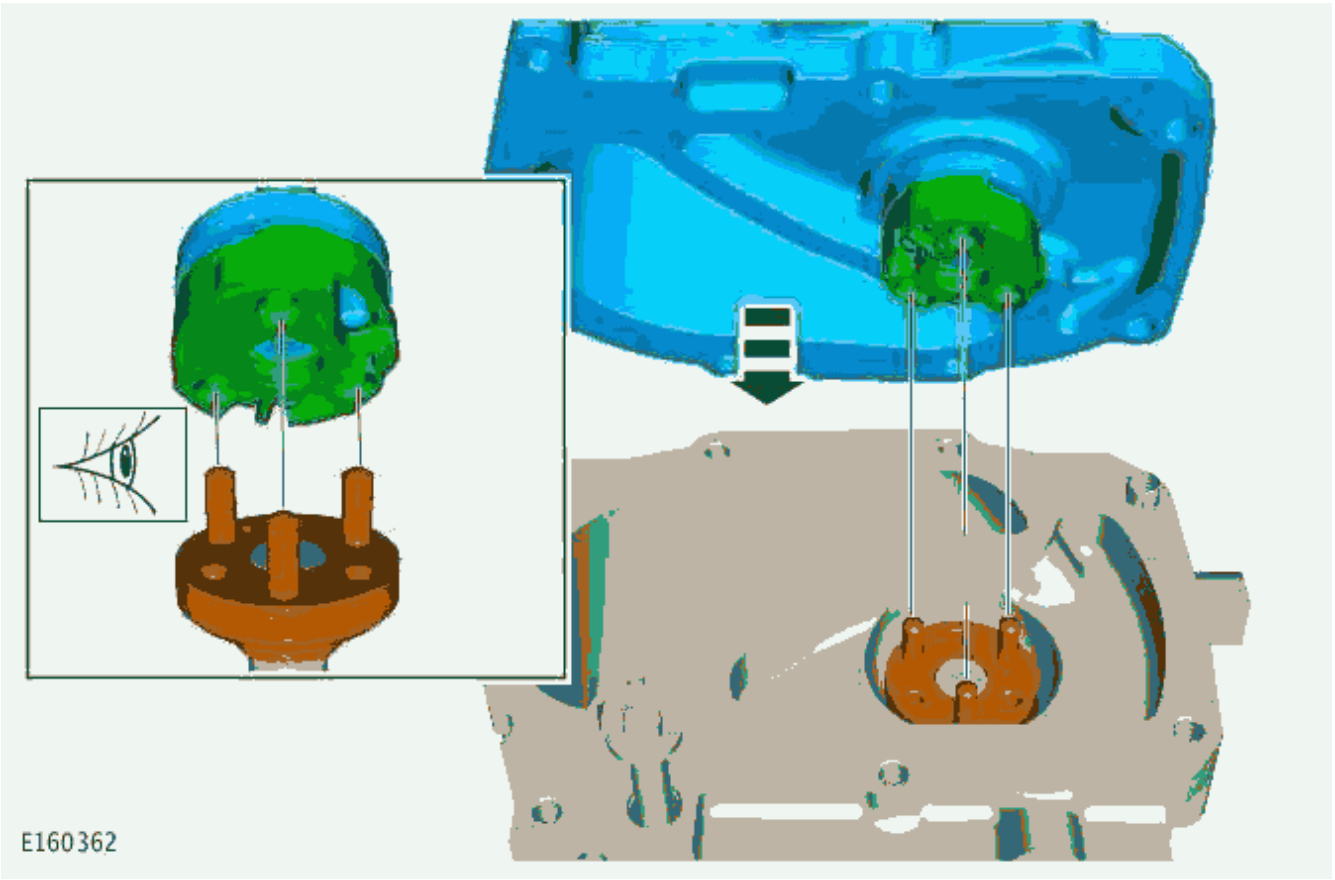
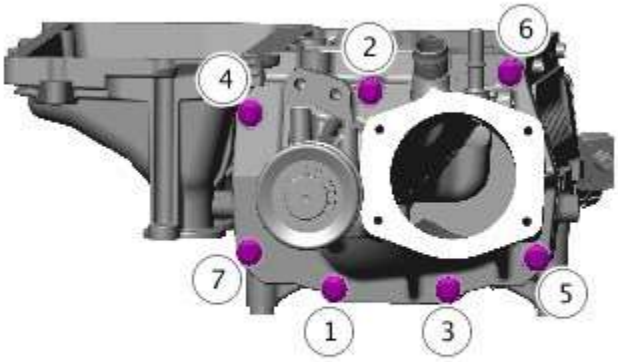
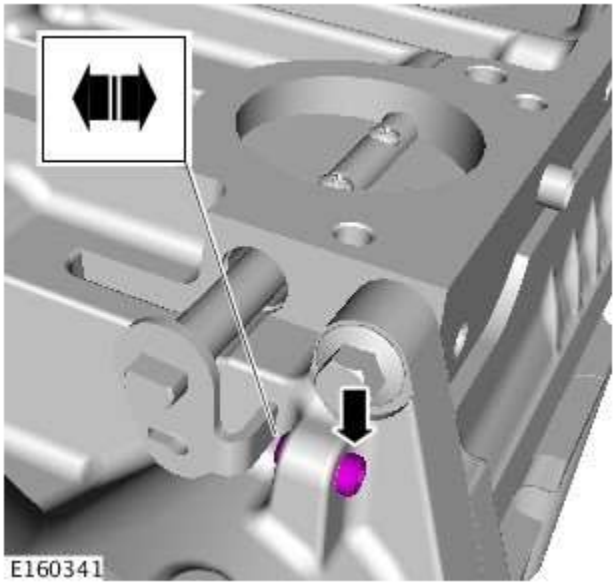


5. *Torque:* 27 Nm

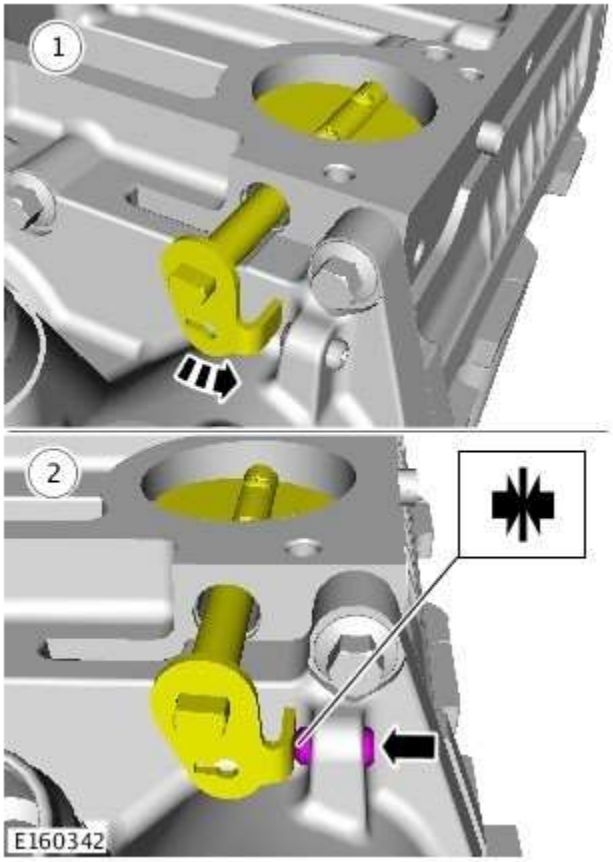


E160365



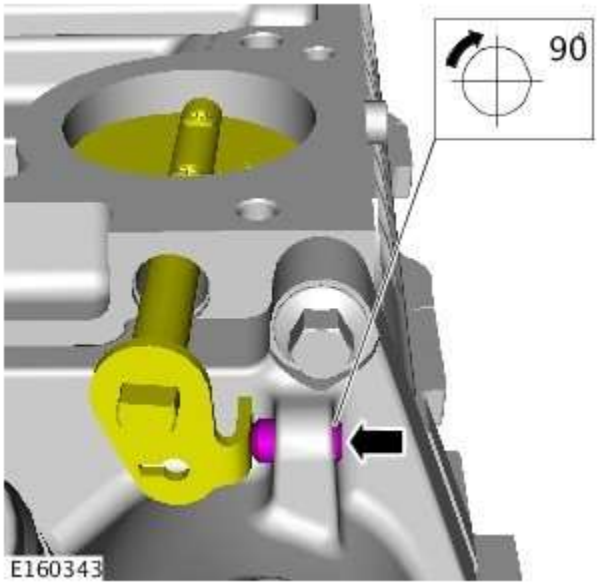
E160341

6. NOTE: Loosen the adjustment screw.

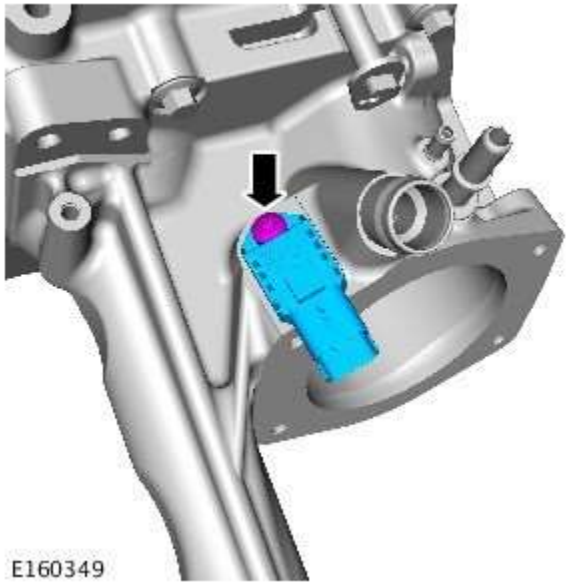


7.

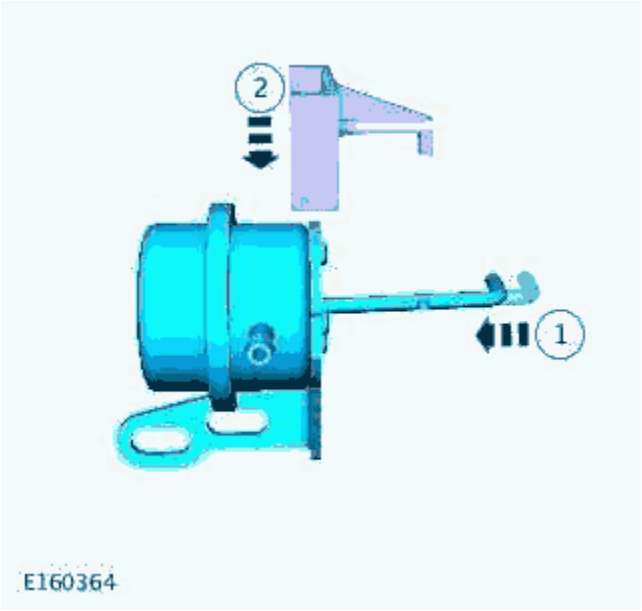
1. Using light pressure rotate the arm counter clockwise and hold.
2. Tighten the adjustment screw until no gap is visible.



8.

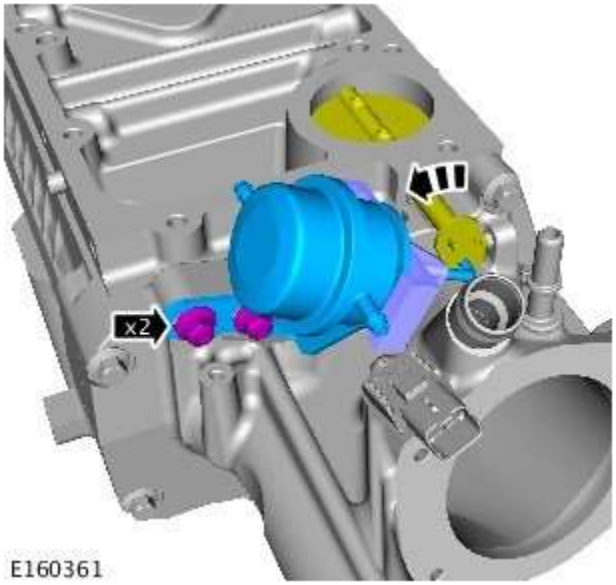


9. *Torque:* 5 Nm

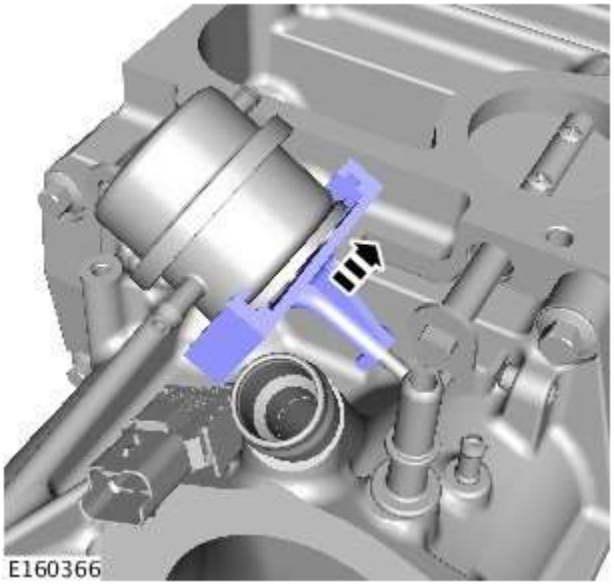


10. Assemble the installation tool, supplied, to the actuator.

11. *Torque:* 20 Nm



12. Remove the installation tool.

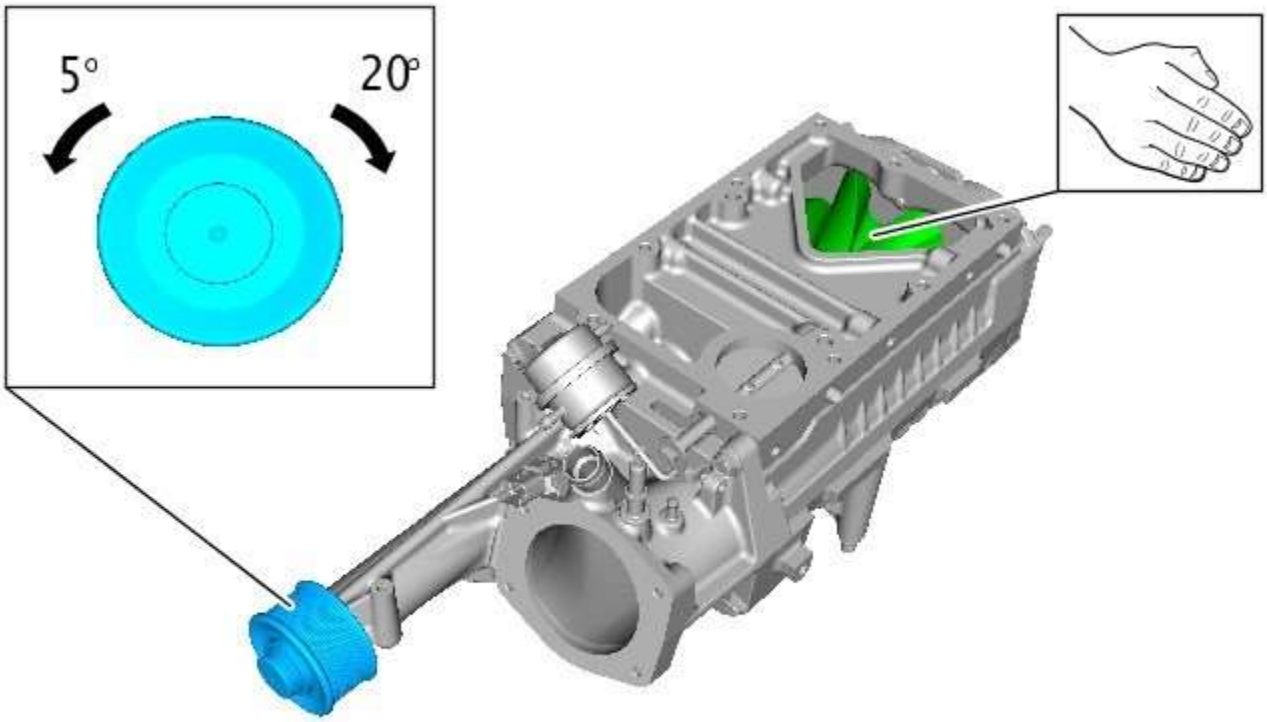


13. CAUTIONS:

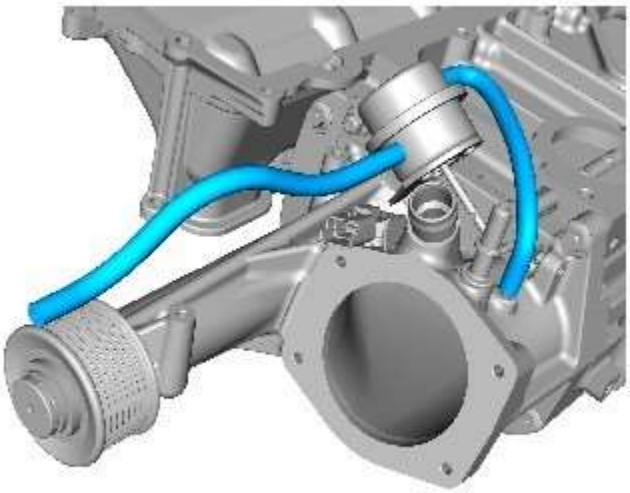
Make sure that spring resistance is felt in both directions of the pulley as shown.

Make sure that all open ports are covered to prevent any foreign material ingress.

NOTE: Supercharger rotors will appear polished, this is normal.



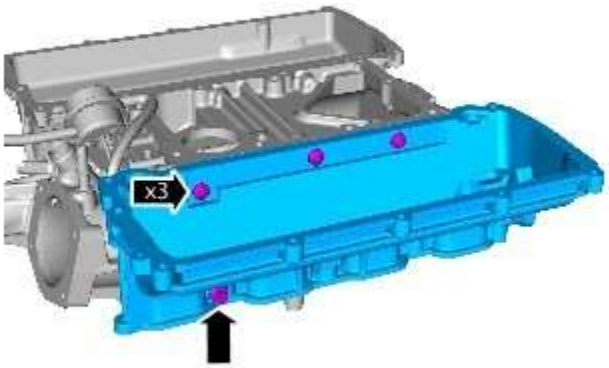
E160353



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).

Published: 11-May-2011

Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol -

Torque Specifications

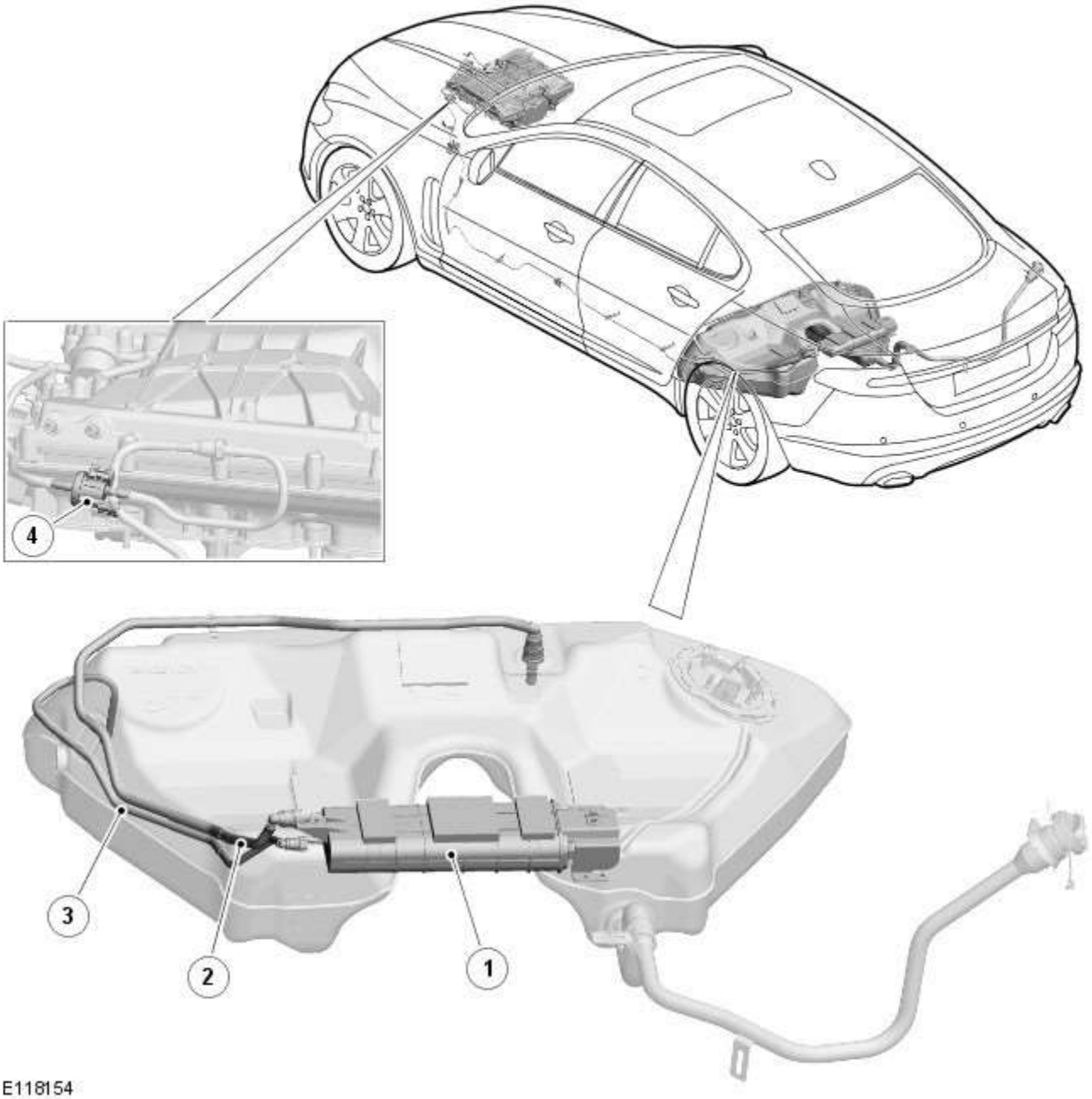
Description	Nm	lb-ft	lb-in
Evaporative emission canister retaining nut	9	-	80

Published: 11-May-2011

Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Evaporative Emissions - Component Location

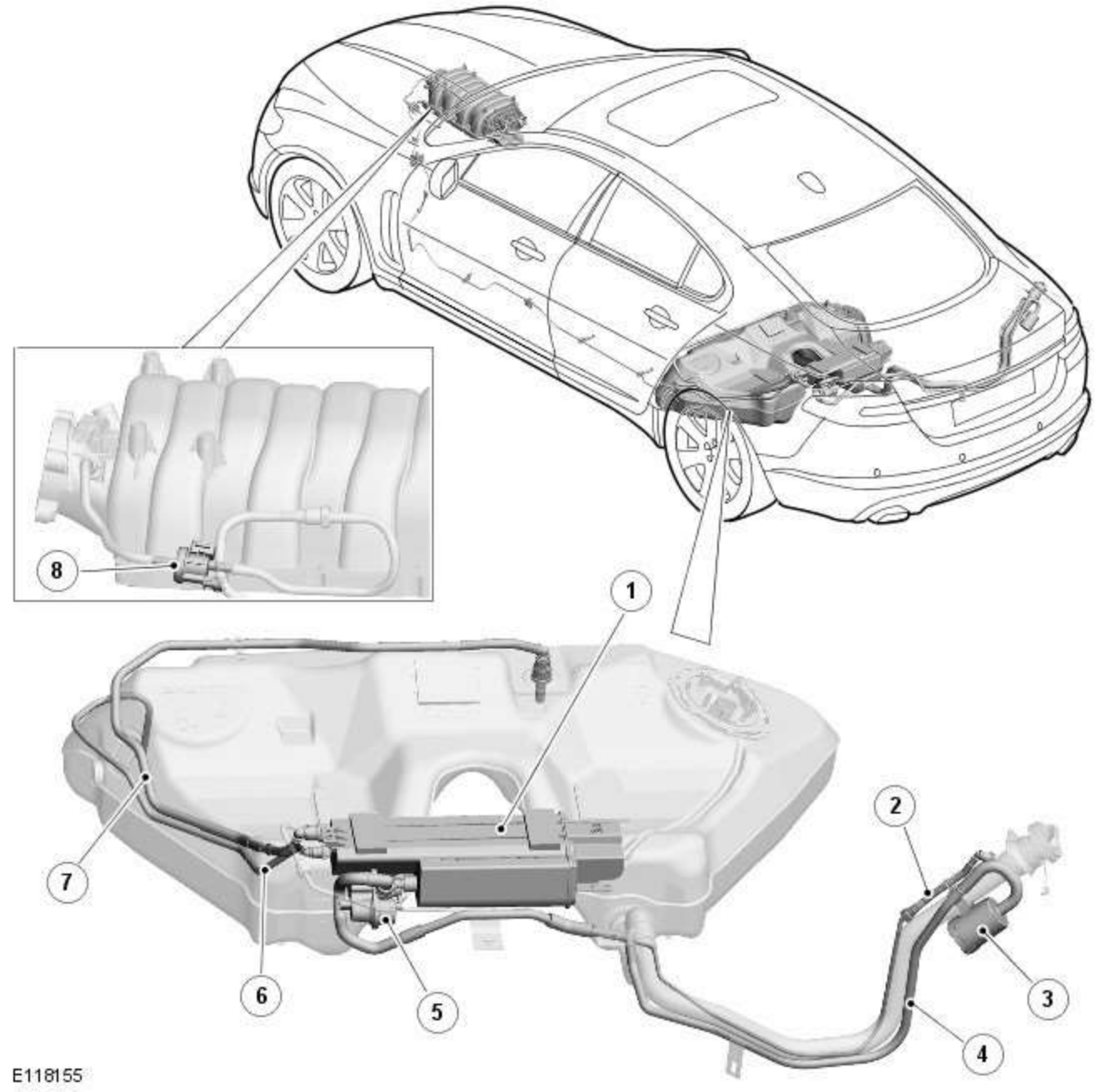
Description and Operation

COMPONENT LOCATION (ALL EXCEPT NORTH AMERICAN SPECIFICATION)



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)



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

Published: 11-May-2011

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.

Published: 11-May-2011

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/in^2), 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)

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.

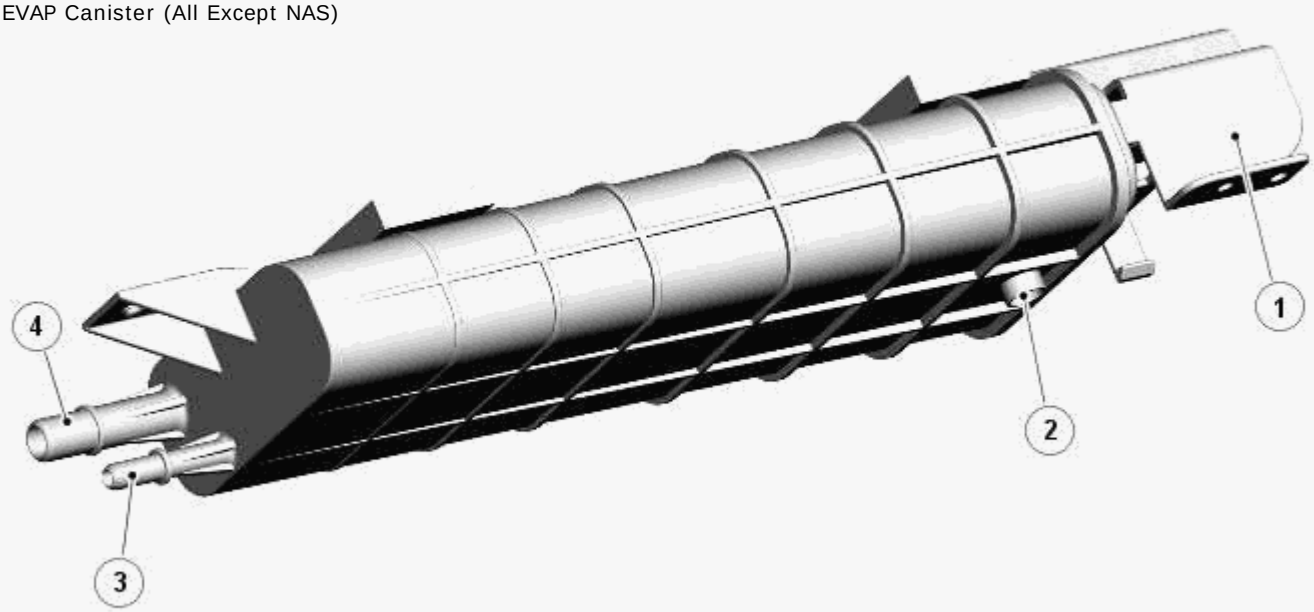
The DMTL test is performed after the engine has stopped following a run of 10 minutes or more, providing that the vehicle fuel tank is between 15 and 85% full, the ambient temperature is above 0 °C (32 °F) and less than 40 °C (104 °F) and the vehicle was not started for at least 180 minutes prior to 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

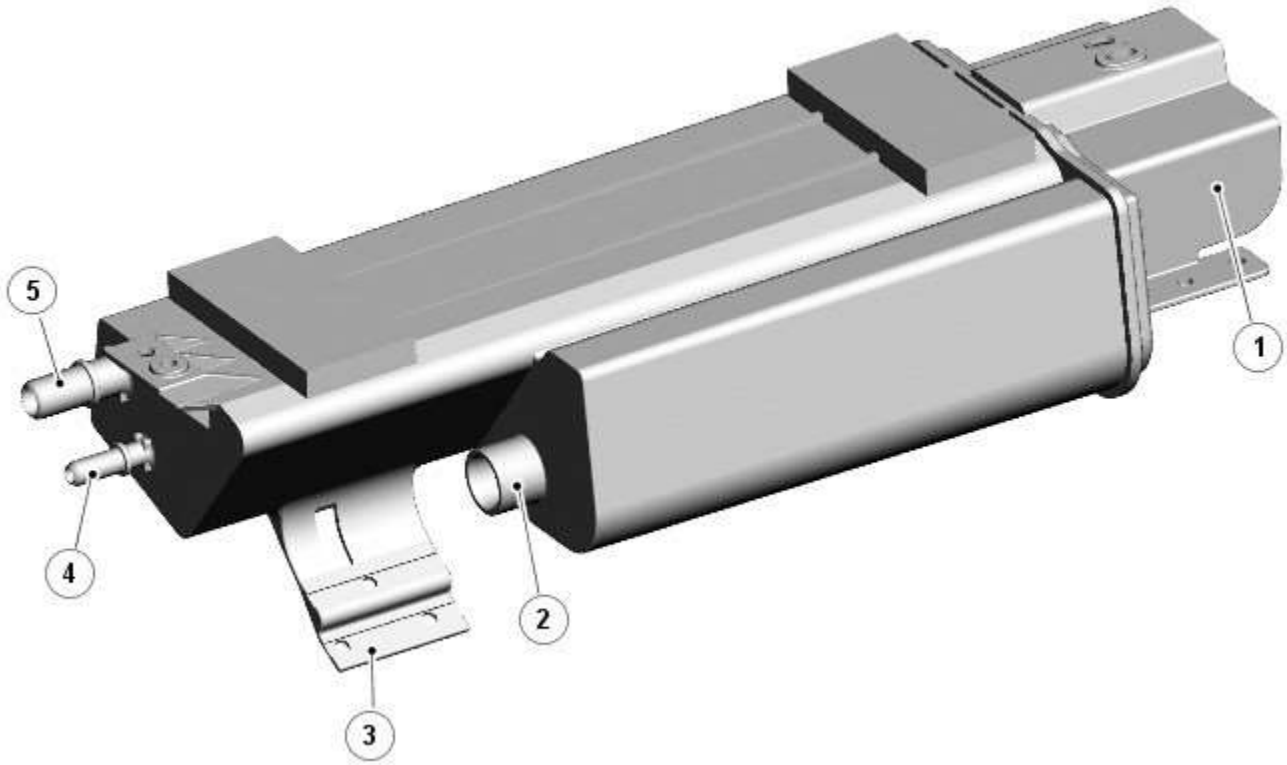
EVAP Canister (All Except NAS)



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.

Published: 03-Jun-2014

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
• Fuel filler cap and seal • Fuel filler neck • Fuel pipes • Fuel tank • Evaporative emissions canister • Purge valve	• 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	• Restriction in the vapour line between the fuel tank and the carbon canister outlet/atmospheric port	• Check for restrictions/damage
Fuel smell	• System leak • Purge valve inoperative	• 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.

Published: 11-May-2011

Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Evaporative Emission Canister

Removal and Installation

Removal

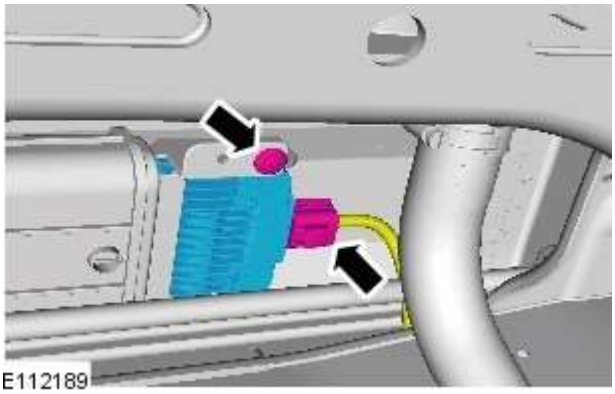
NOTE: Removal steps in this procedure may contain installation details.

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).



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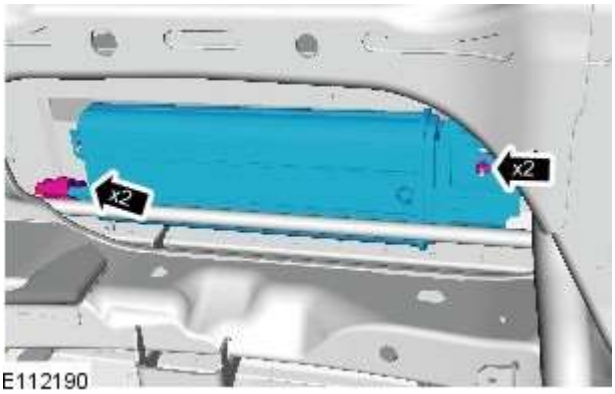


5. *Torque:* 9 Nm

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

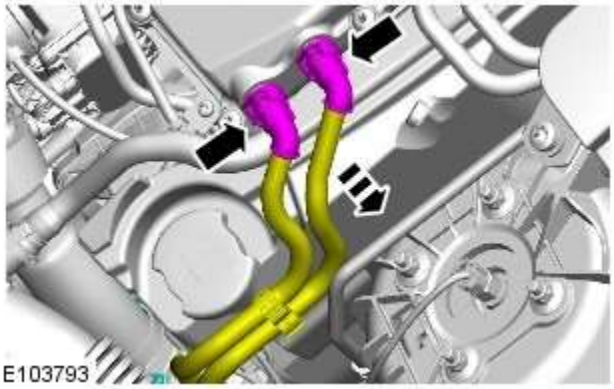
Evaporative Emissions - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Evaporative Emission Canister Purge Valve V8 S/C 5.0L Petrol

Removal and Installation

Removal

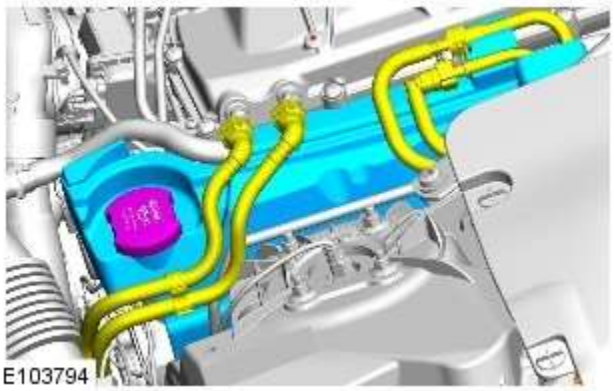
NOTE: Removal steps in this procedure may contain installation details.

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).

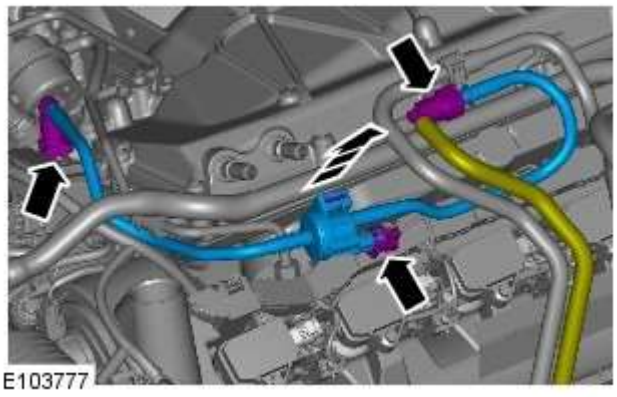


4. CAUTION: Be prepared to collect escaping coolant.

   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.



6. CAUTION: Be prepared to collect escaping fluids.

Installation

1. To install, reverse the removal procedure.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol -

Torque Specifications

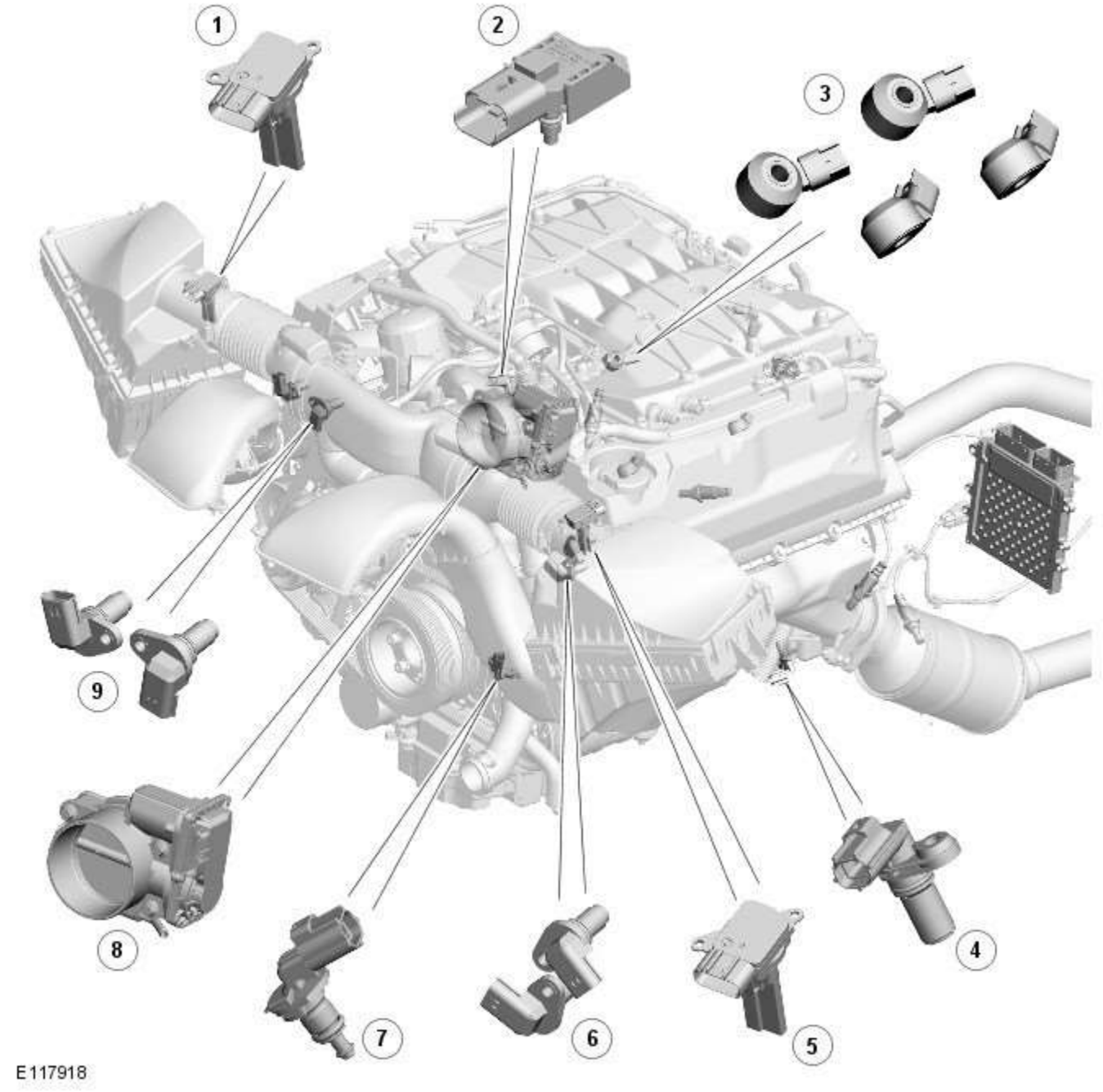
Description	Nm	lb-ft	lb-in
Camshaft position (CMP) sensor(s) retaining bolt	10	7	-
Crankshaft position (CKP) sensor retaining bolt	10	7	-
Heated oxygen sensor(s) (HO2S)	48	35	-
Catalyst monitor sensor(s)	48	35	-
Knock sensor(s) (KS) retaining bolt	20	15	-
Fuel rail pressure (FRP) sensor	32	24	-
Manifold 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

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Electronic Engine Controls - Component Location

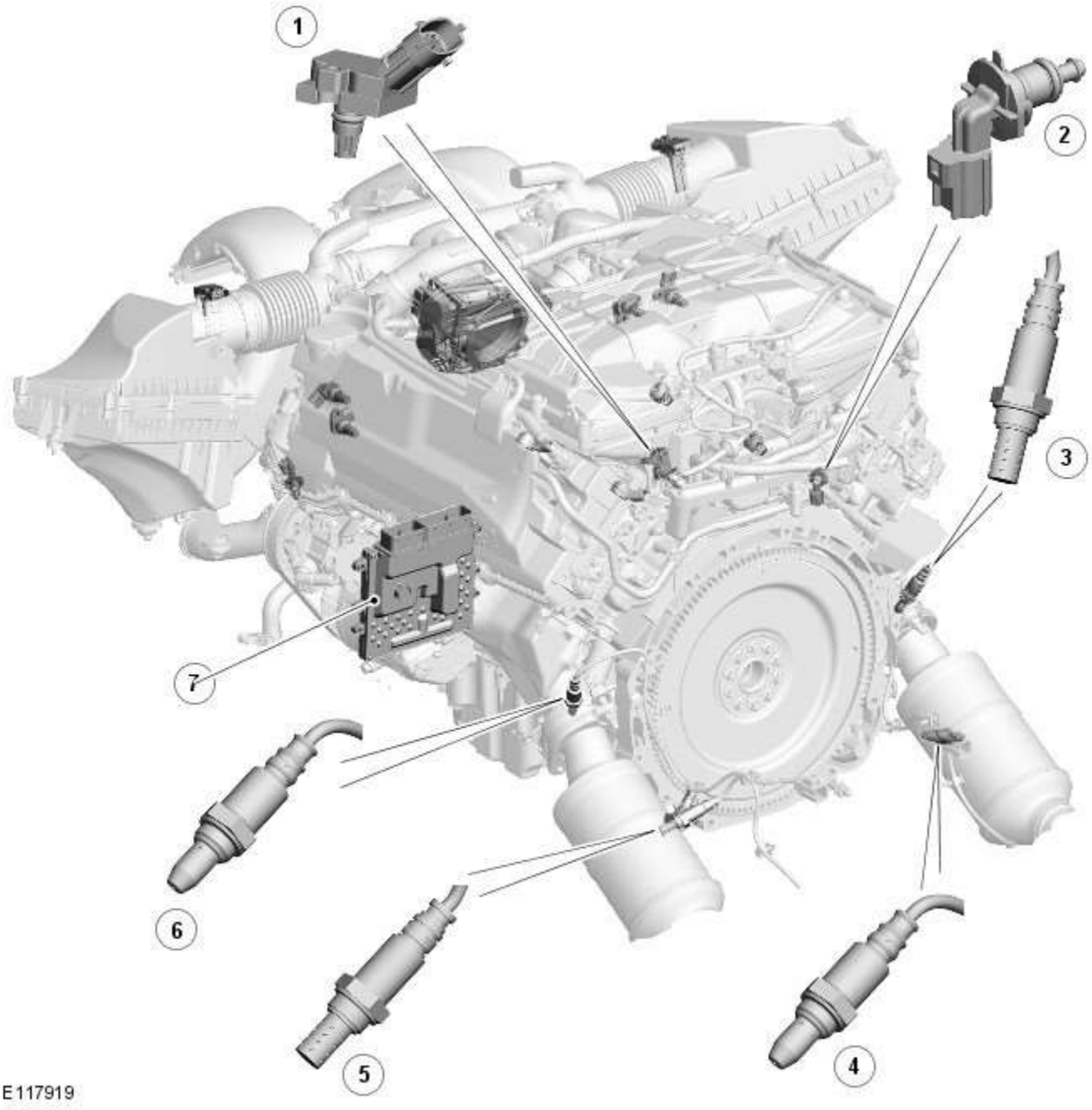
Description and Operation

COMPONENT LOCATION - SHEET 1 OF 3



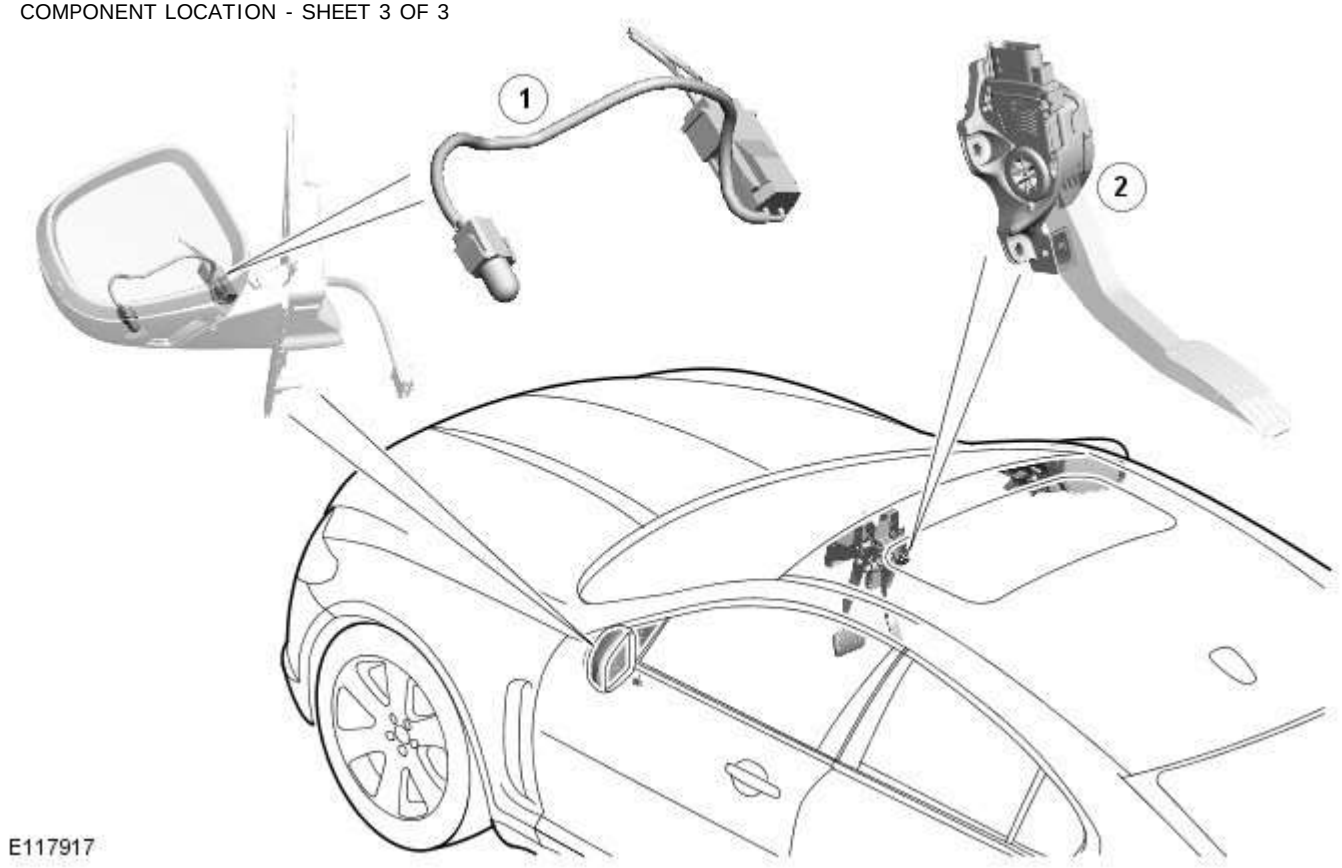
Item	Description
1	MAFT (mass air flow and temperature) sensor
2	MAP (manifold absolute pressure) sensor
3	Knock sensors
4	CKP (crankshaft position) sensor
5	MAFT sensor
6	CMP (camshaft position) sensors
7	ECT (engine coolant temperature) sensor (ECT 2)
8	Electronic throttle
9	CMP sensors

COMPONENT LOCATION - SHEET 2 OF 3



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)

COMPONENT LOCATION - SHEET 3 OF 3



Item	Description
1	AAT (ambient air temperature) sensor
2	APP (accelerator pedal position) sensor

Published: 11-May-2011

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.

Published: 11-May-2011

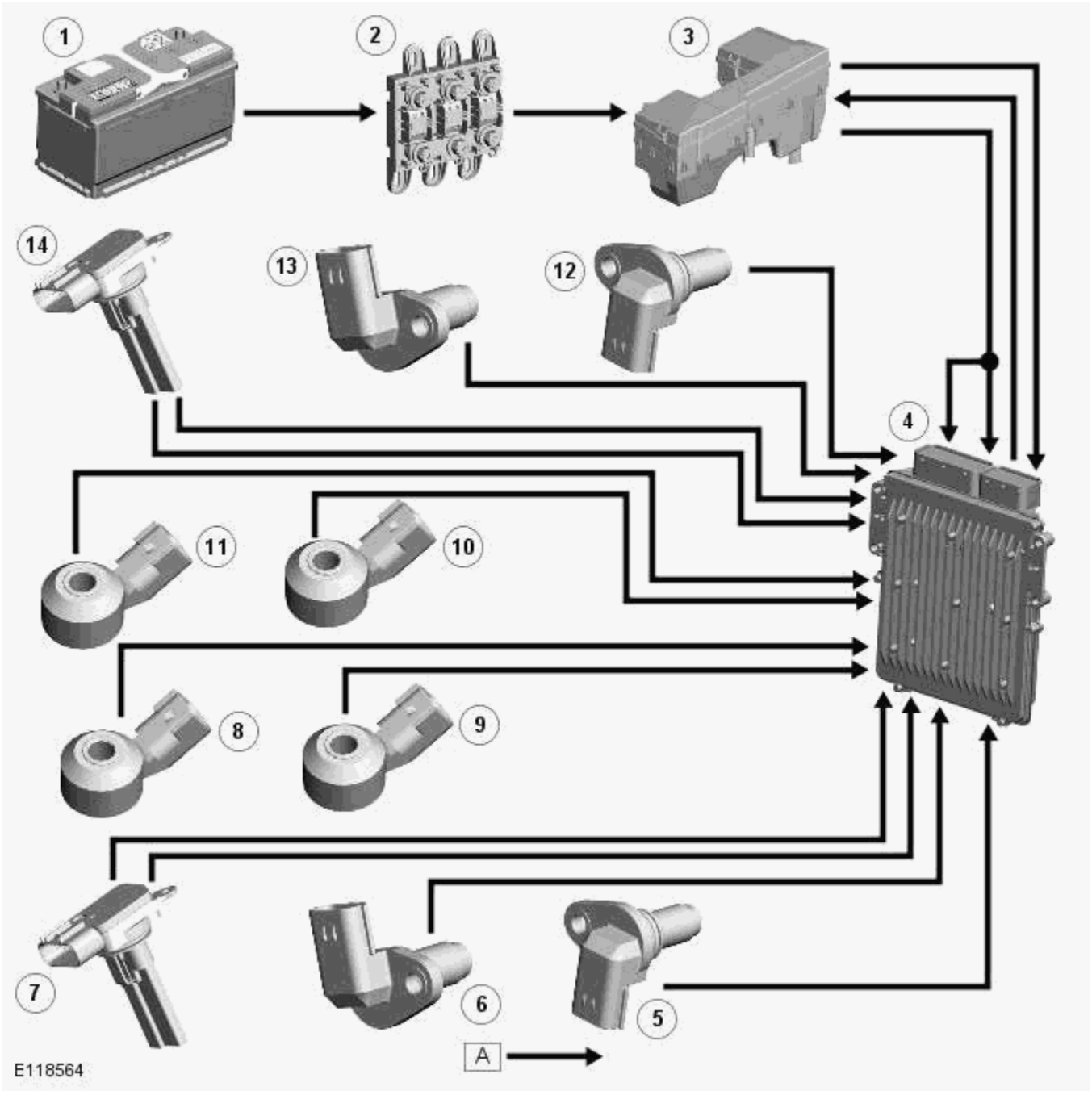
Electronic Engine Controls - V8 S/C 5.0L Petrol - Electronic Engine Controls - System Operation and Component Description

Description and Operation

Control Diagram

NOTE: A = Hardwired; D = High speed CAN (controller area network) bus.

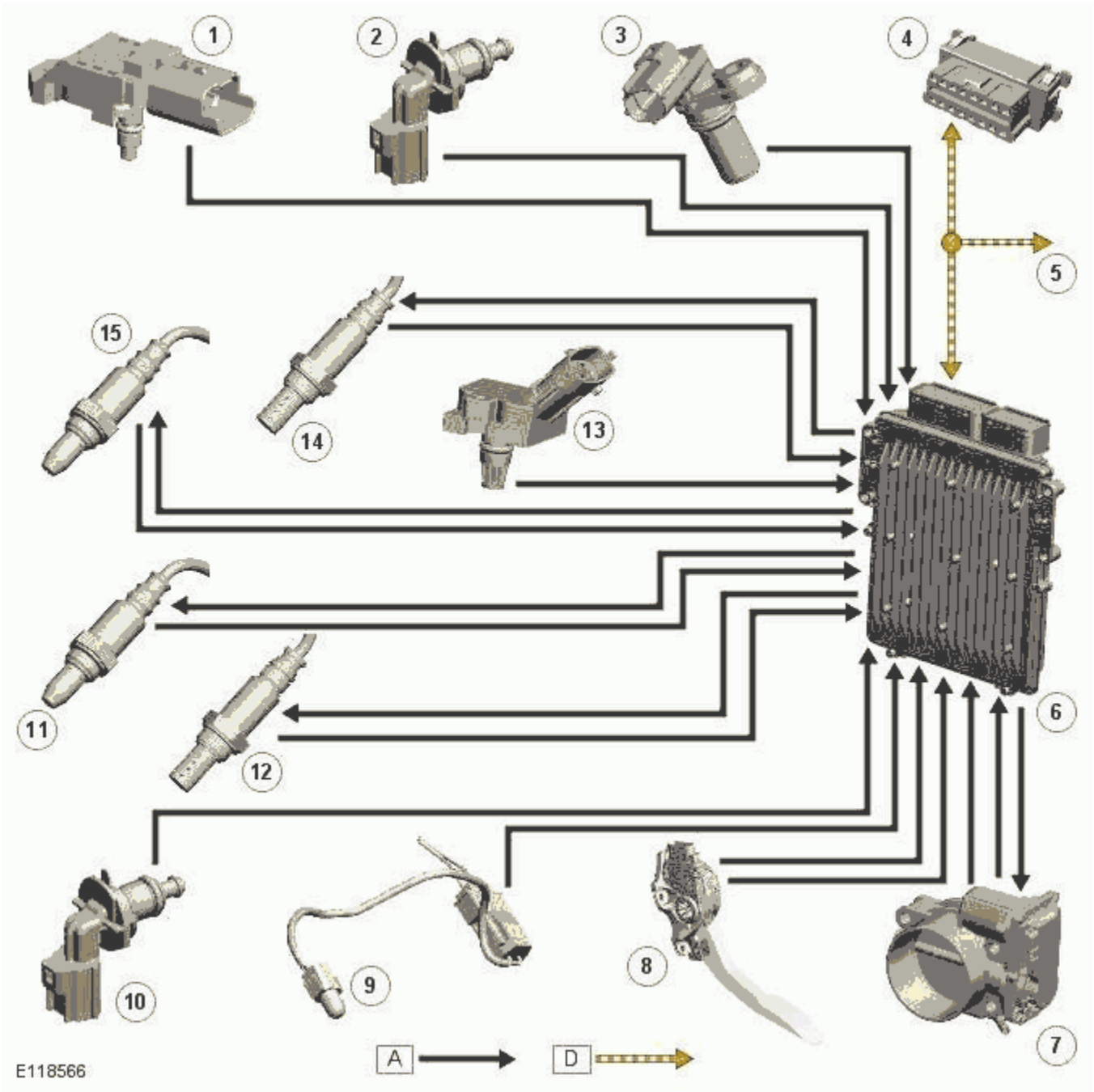
CONTROL DIAGRAM SHEET 1 OF 2



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



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 ADAPTIONS

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.

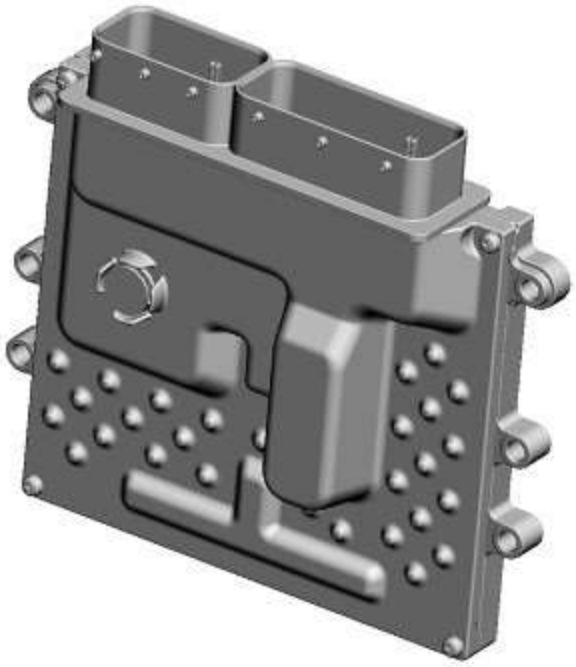
The signal from the CKP sensor indicates how fast the poles on the drive plate are passing the sensor tip. A sine wave is generated each time a pole passes the sensor tip. The ECM can detect variations in drive plate speed by monitoring the sine wave signal supplied by the crankshaft position sensor. 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. TheECM 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.

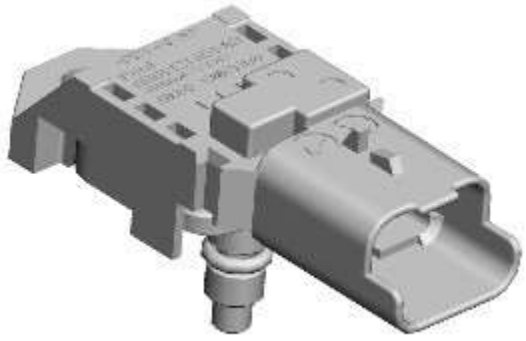
Two knock sensors are installed on the inboard side of each cylinder head, one mid-way between cylinders 1 and 2, and one mid-way between cylinders 3 and 4. Each knock sensor is secured with a single screw. On each knock sensor, a two pin electrical connector provides the interface with the engine harness.

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.

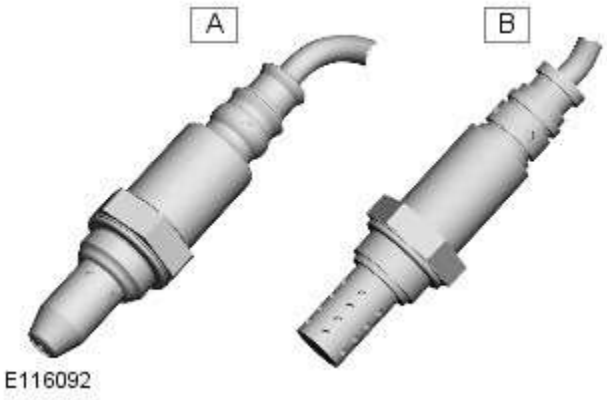
There are two TP sensors located in the electronic throttle. See below for details of the electronic throttle.

If aTP 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.

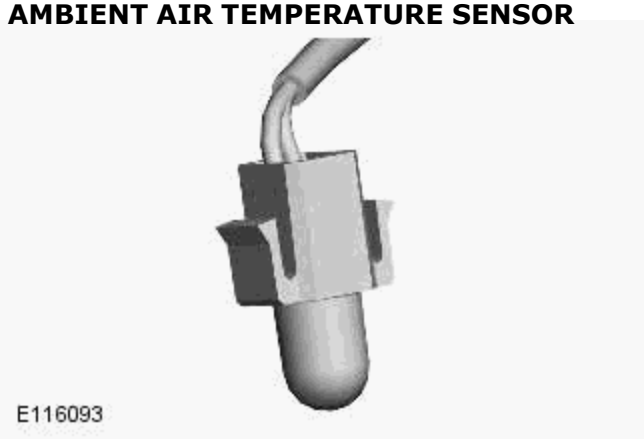
The APP sensor is installed on the pedal box and secured with three screws. A six pin electrical connector provides the interface with the vehicle harness. The accelerator pedal is connected to a spindle on the RH side of the APP sensor.

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



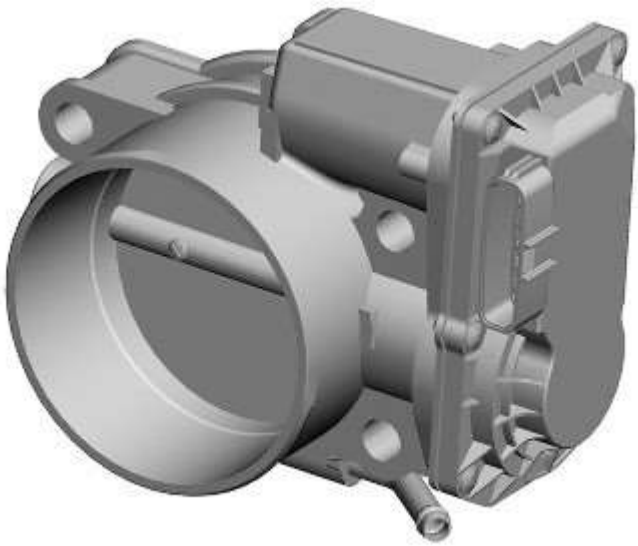
The AAT (ambient air temperature) sensor is a NTC thermistor that allows the ECM to monitor the temperature of the air around the vehicle. The ECM uses the AAT input for a number of functions, including engine cooling fan control. The ECM also transmits the ambient temperature on the high speed CAN bus 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



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.

Published: 16-Sep-2013

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
• 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	• 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	• Security system /Immobilizer engaged • Engine in shut-down mode • ECM relay • Battery • Starting system • Engine seized	• 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	• Engine breather system disconnected/restricted • Ignition system • Fuel system • Electronic engine controls	• 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	• Evaporative emissions purge valve • Fuel pump • Spark plugs • Ignition coil failure(s)	• 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	• Check engine coolant level/anti-freeze content • Battery • Electronic engine controls • Exhaust gas recirculation	• 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 • Fuel pump • Evaporative emissions purge valve	care manual and the relevant sections of the workshop manual. • 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	• Injector leak • Electronic engine controls • Evaporative emissions purge valve • Fuel pump • Ignition system • EGR valve stuck open	• 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)	• Injector leak • Electronic engine controls • Evaporative emissions purge valve • Fuel pump • Ignition system • EGR valve stuck open	• 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	• Compressions high/low • Battery • Starting system	• 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	• Breather system disconnected/restricted • ECM relay • Electronic engine controls • Ignition system • Air intake system restricted • Air leakage • Fuel lines	• 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	• ECM relay • Throttle position (TP) sensors	• Read DTCs and refer to DTC Index in this section for ECM relay and TP sensor tests
Engine stalls at steady speed	• ECM relay • crankshaft position sensor • TP sensors	• 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	• ECM relay	• Read DTCs and refer to DTC Index in this section for ECM relay tests
Engine stalls when manoeuvring	• ECM relay • TP sensors • Additional engine loads (PAS, air conditioning, etc) • Transmission malfunction • CAN malfunction	• 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	• 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)	• 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	• Fuel pump, fuel lines • Air leakage • Electronic engine controls • Ignition system • Sticking variable camshaft timing (VCT) hub	• 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	• Fuel pump, fuel lines • Electronic engine controls • Ignition system	• 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	• Electronic engine controls • Fuel pump, fuel lines, fuel quality • Air leakage • Sticking VCT hub	• 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	• Electronic engine controls	• Read DTCs and refer to DTC Index in this section for electronic engine control tests
Speed control inhibited or disabled	• Default mode enabled • Speed control, brake switch • Electronic engine controls • CAN fault	• 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	• Breather system disconnected/restricted • Electronic engine controls • Transmission malfunction • Traction control event • Air leakage	• 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	• Electronic engine controls	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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.

Published: 11-May-2011

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 ºC (140 ºF).

   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.

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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 70ºC (158 ºF) 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.

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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.

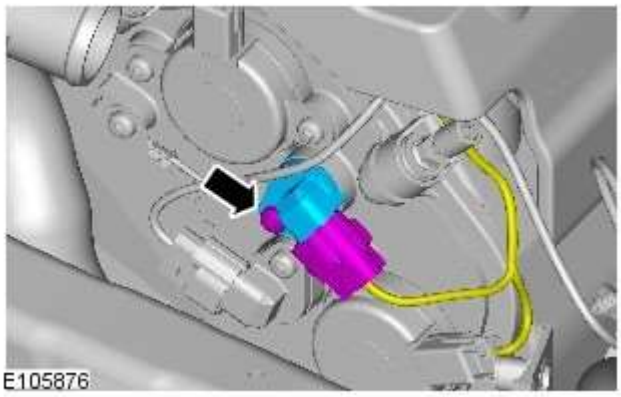
1. Disconnect the battery ground cable.

   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.

Published: 11-May-2011

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.

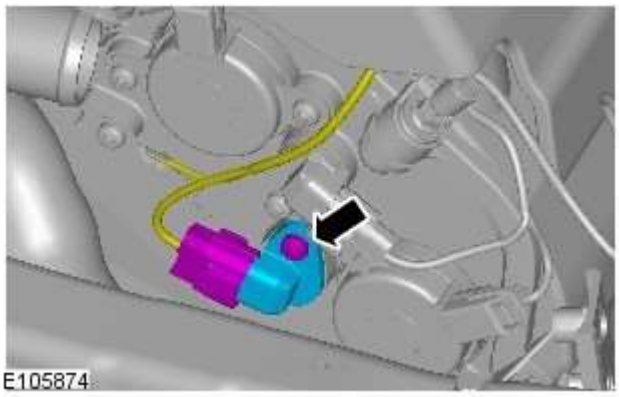
1. Disconnect the battery ground cable.

   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.

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Electronic Engine Controls - V8 S/C 5.0L Petrol - Catalyst Monitor Sensor LH

Removal and Installation

Removal

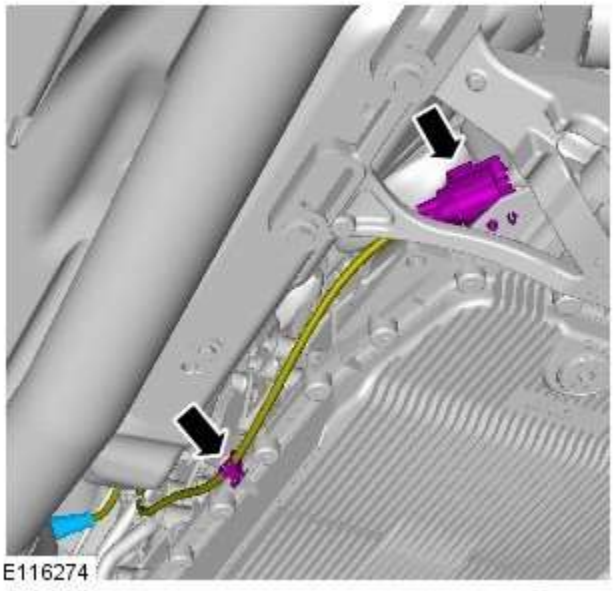
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

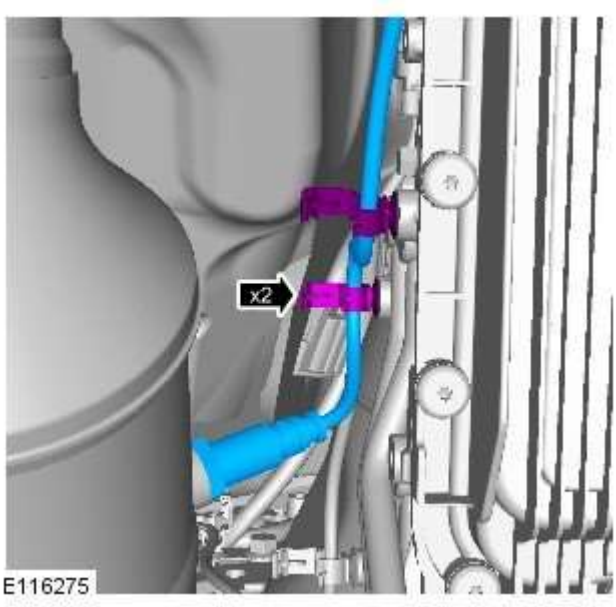
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   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.



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).

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Electronic Engine Controls - V8 S/C 5.0L Petrol - Catalyst Monitor Sensor RH

Removal and Installation

Removal

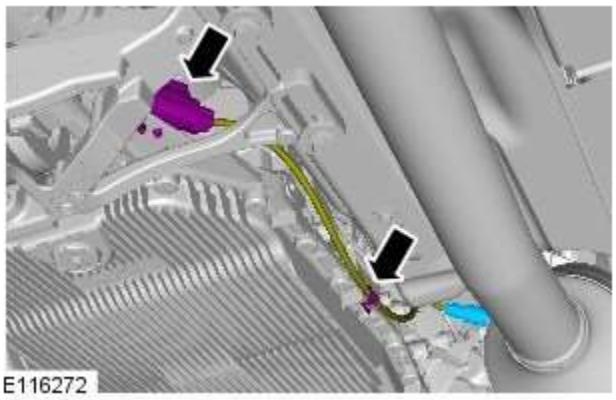
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

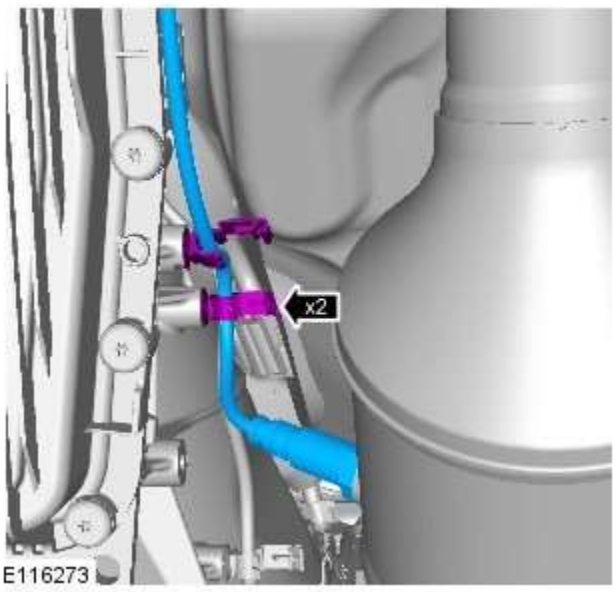
2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

   Raise and support the vehicle.

3. Refer to: Air Deflector (501-02 Front End Body Panels, Removal and Installation).



4. CAUTION: Note the fitted position of the component prior to removal.



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).

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Crankshaft Position (CKP) Sensor

Removal and Installation

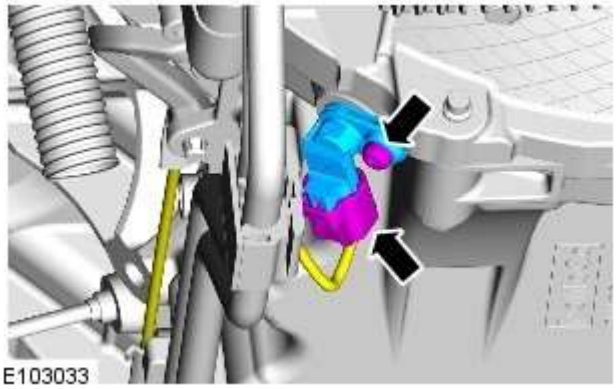
Removal

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.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Engine Control Module (ECM)

Removal and Installation

Removal

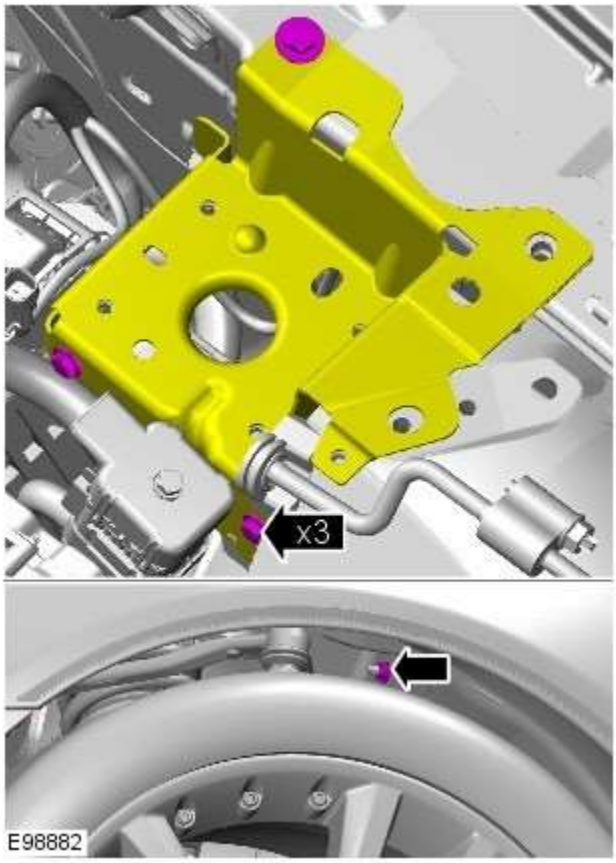
NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

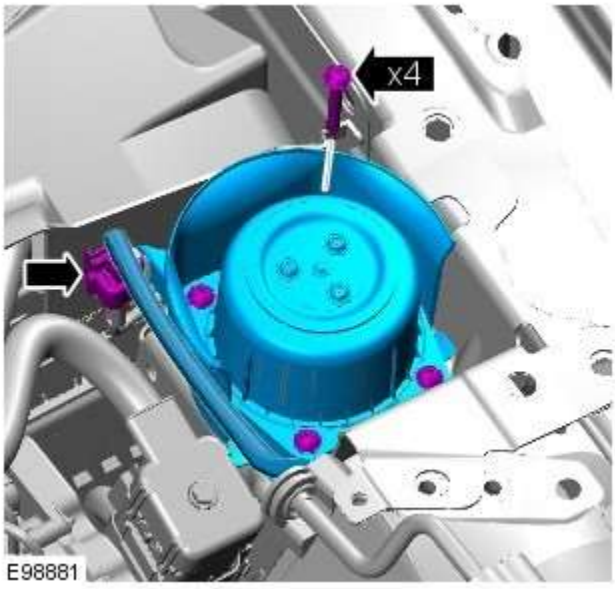
2. Refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).

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).

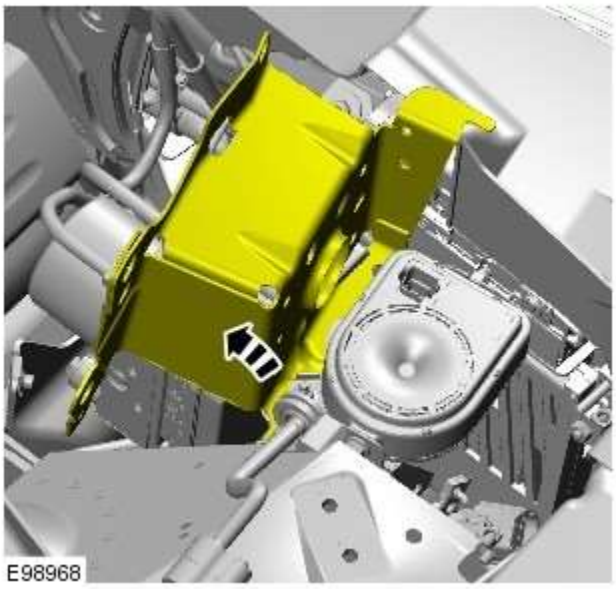
4. *Torque:* 25 Nm



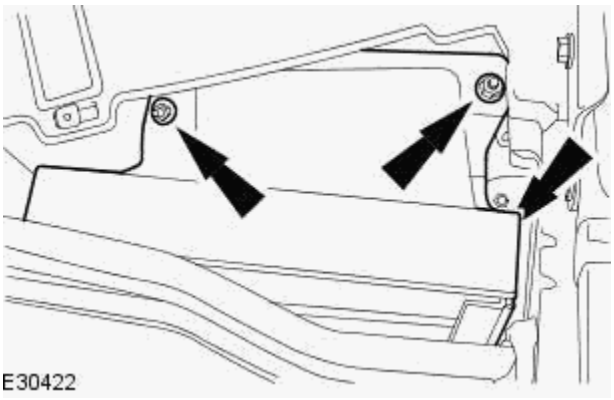
5. *Torque:* 25 Nm



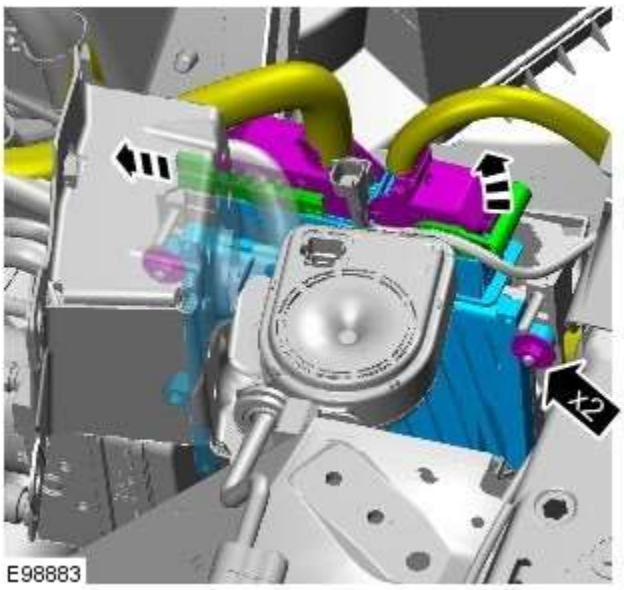
6. *Torque:* 8 Nm



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.

Published: 19-Aug-2013

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.

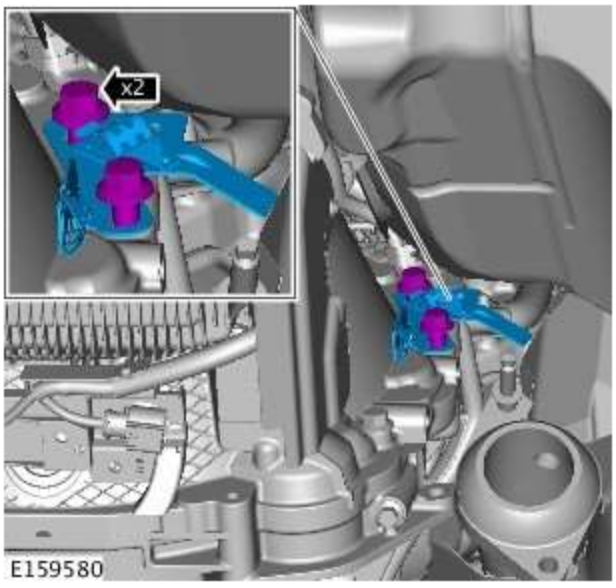
Removal steps in this procedure may contain installation details.

1. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

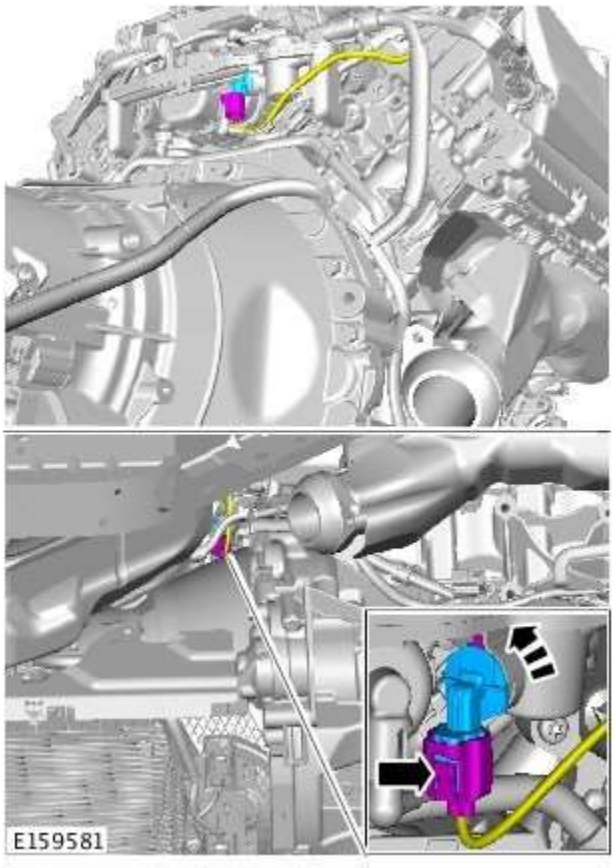
   Raise and support the vehicle.

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.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Engine Oil Level Sensor

Removal and Installation

Removal

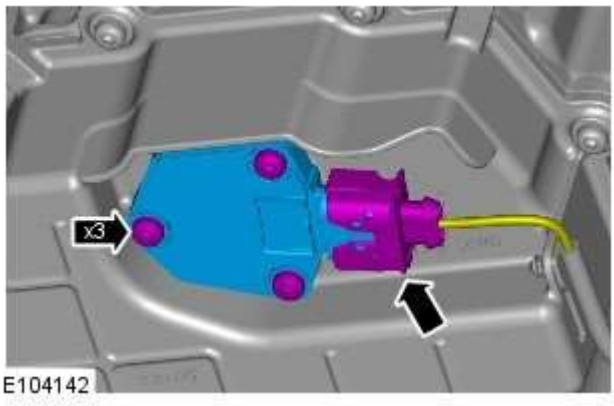
NOTE: Removal steps in this procedure may contain installation details.

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.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Front Knock Sensor (KS) LH

Removal and Installation

Removal

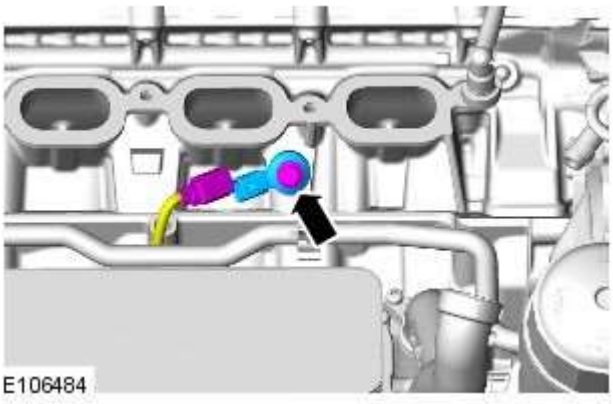
NOTE: Removal steps in this procedure may contain installation details.

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.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Front Knock Sensor (KS) RH

Removal and Installation

Removal

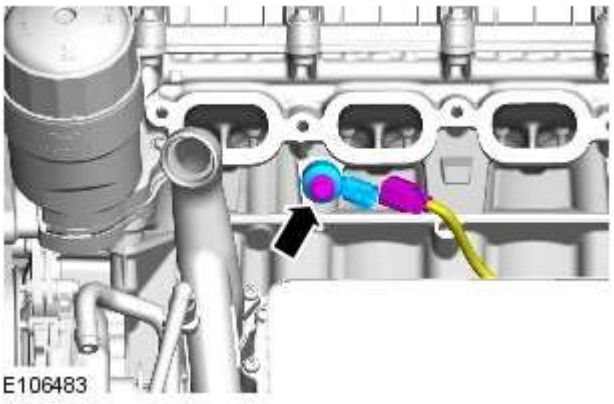
NOTE: Removal steps in this procedure may contain installation details.

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.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Fuel Rail Pressure (FRP) Sensor

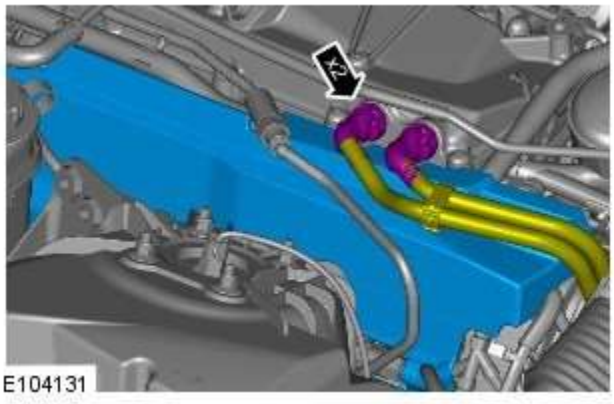
Removal and Installation

Removal

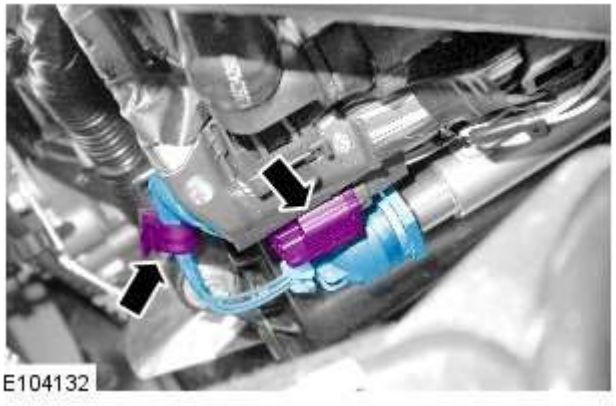
NOTE: Removal steps in this procedure may contain installation details.

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.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Heated Oxygen Sensor (HO2S) LH

Removal and Installation

Special Tool(s)

	310-121 Wrench, H02S

Removal

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

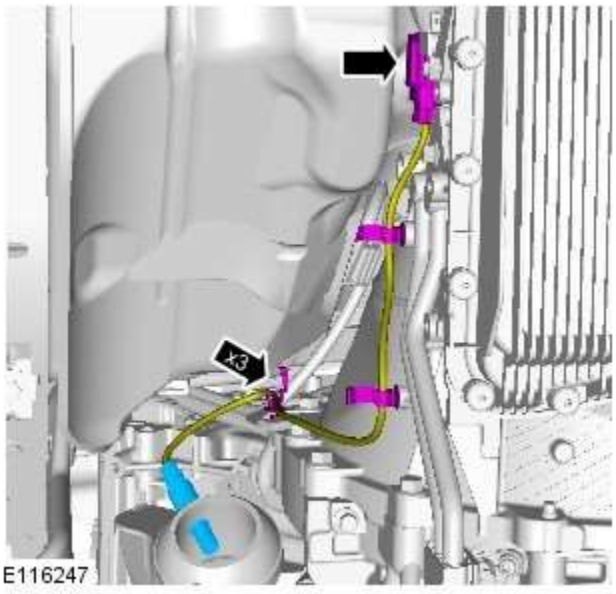
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

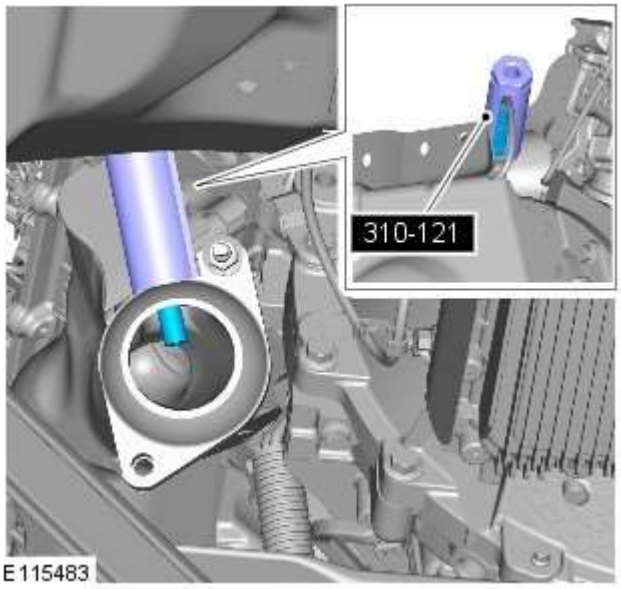
   Raise and support the vehicle.

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).

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Heated Oxygen Sensor (HO2S) RH

Removal and Installation

Special Tool(s)

	310-121 Wrench, H02S

Removal

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

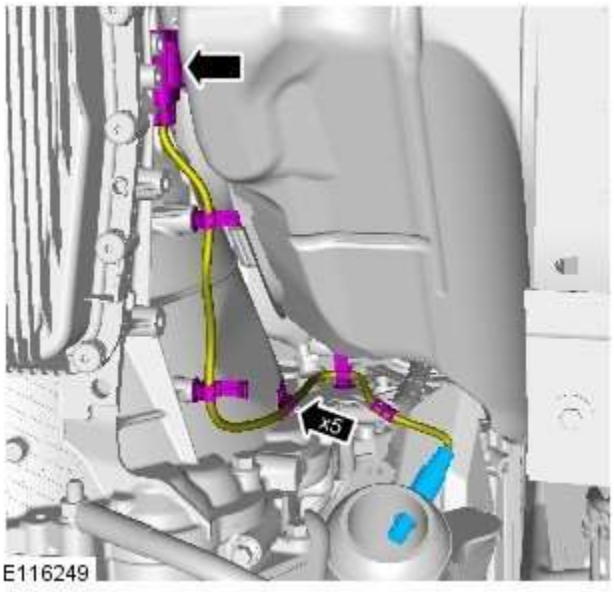
1. Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables, General Procedures).

2. WARNING: Do not work on or under a vehicle supported only by a jack. Always support the vehicle on safety stands.

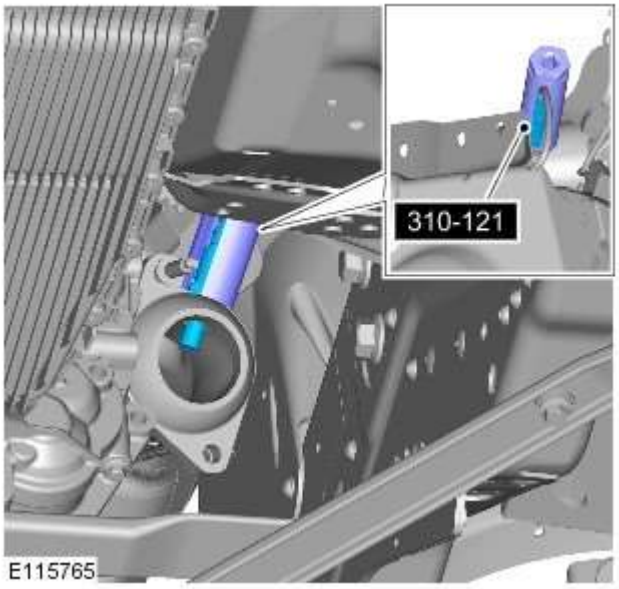
   Raise and support the vehicle.

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).

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Electronic Engine Controls - V8 S/C 5.0L Petrol - Manifold Absolute Pressure (MAP) Sensor

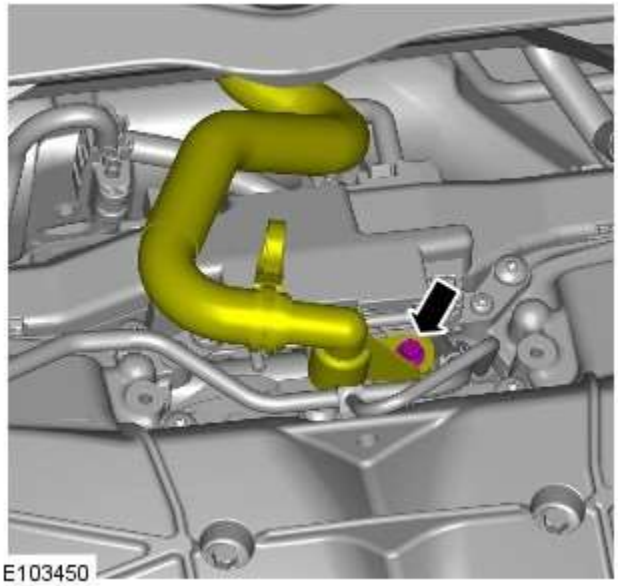
Removal and Installation

Removal

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

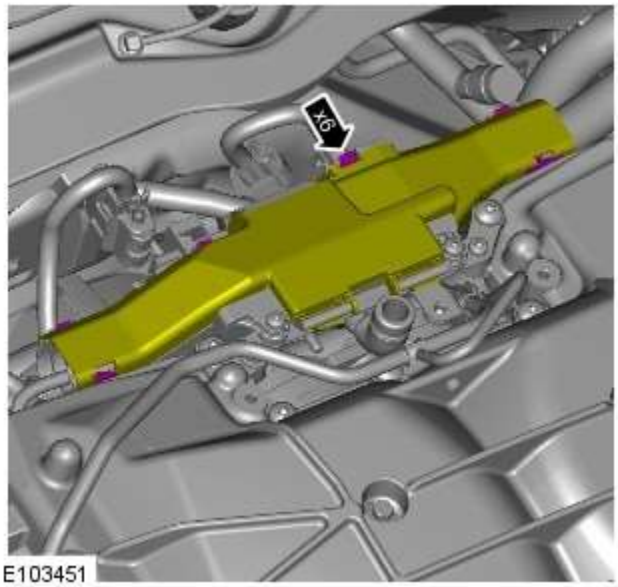
1. Refer to: Engine Cover - V8 5.0L Petrol/V8 S/C 5.0L Petrol (501-05 Interior Trim and Ornamentation, Removal and Installation).

2. Refer to: Cowl Vent Screen (501-02 Front End Body Panels, Removal and Installation).

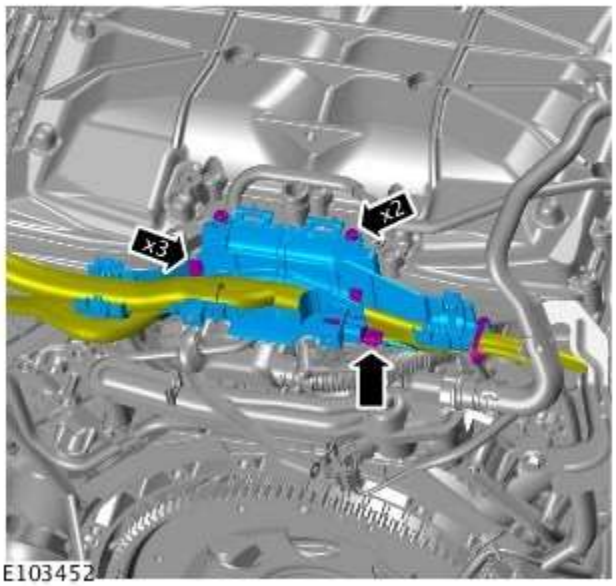


3. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Torque: 10 Nm

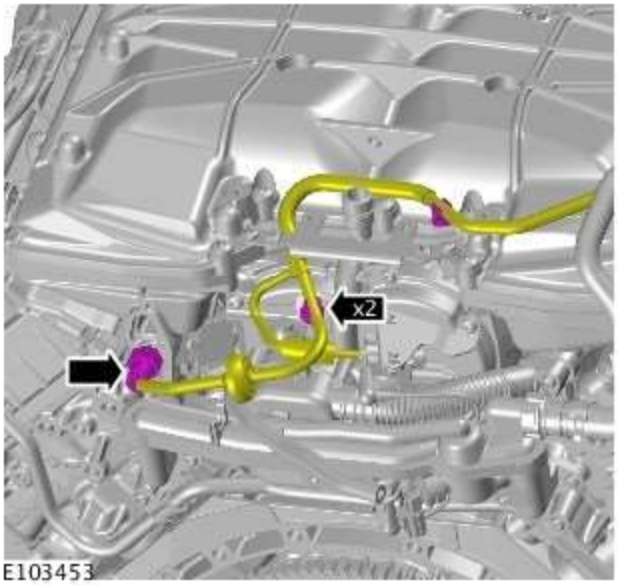


4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

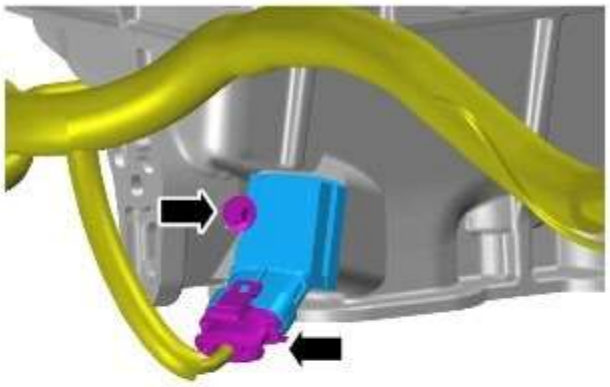


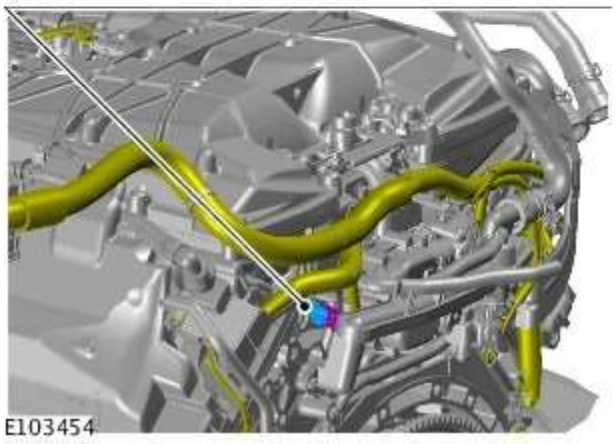
5. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Torque: 10 Nm



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).

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Mass Air Flow (MAF) Sensor

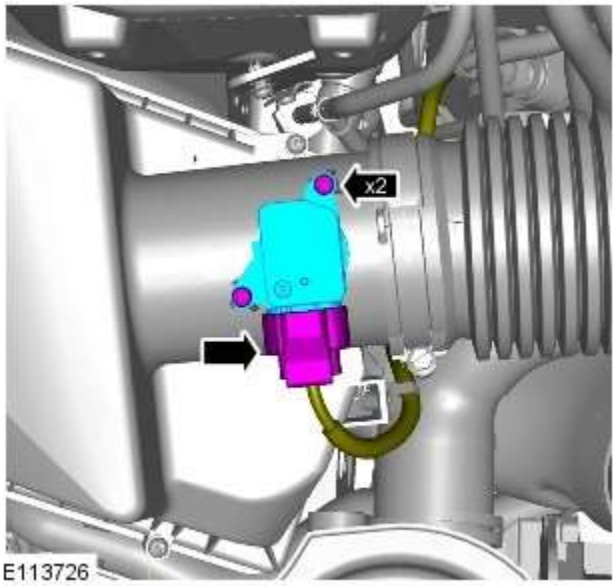
Removal and Installation

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).

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Rear Knock Sensor (KS) LH

Removal and Installation

Removal

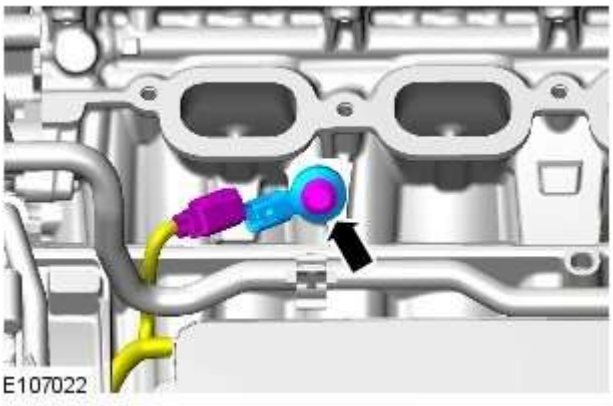
NOTE: Removal steps in this procedure may contain installation details.

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.

Published: 11-May-2011

Electronic Engine Controls - V8 S/C 5.0L Petrol - Rear Knock Sensor (KS) RH

Removal and Installation

Removal

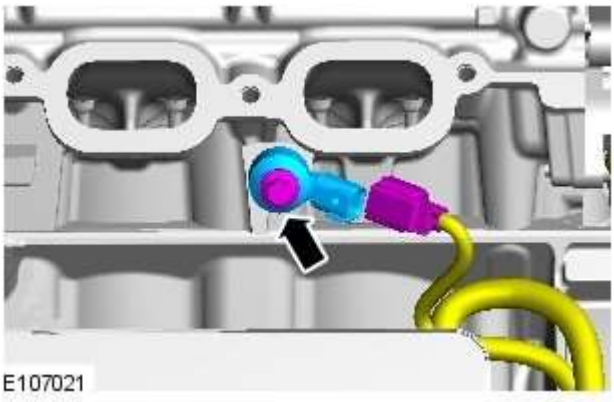
NOTE: Removal steps in this procedure may contain installation details.

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.

Published: 11-May-2011

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.

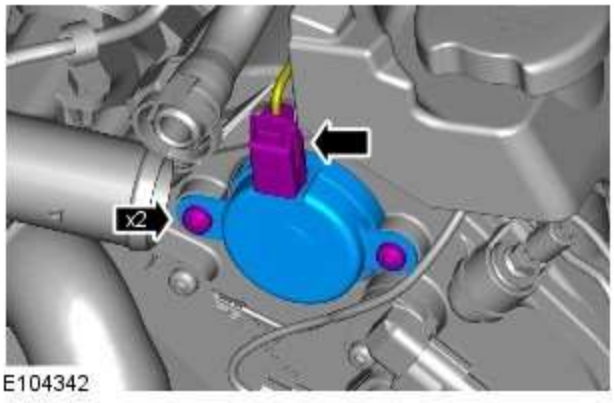
1. Disconnect the battery ground cable.

   Refer to: Specifications (414-00, Specifications).

2. WARNING: Make sure to support the vehicle with axle stands.

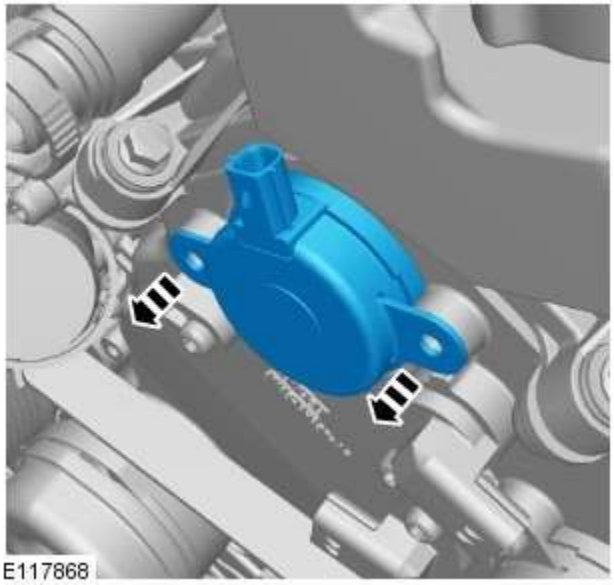
   Raise and support the vehicle.

3. Refer to: Thermostat Housing - Vehicles With: Supercharger (303-03, Removal and Installation).



4. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

   Torque: 10 Nm



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).

Published: 11-May-2011

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.

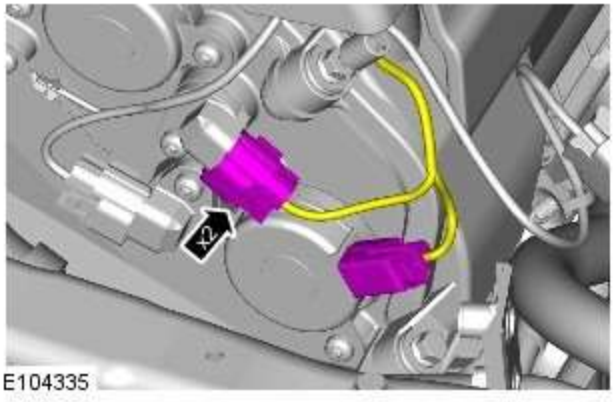
1. Disconnect the battery ground cable.

   Refer to: Specifications (414-00, Specifications).

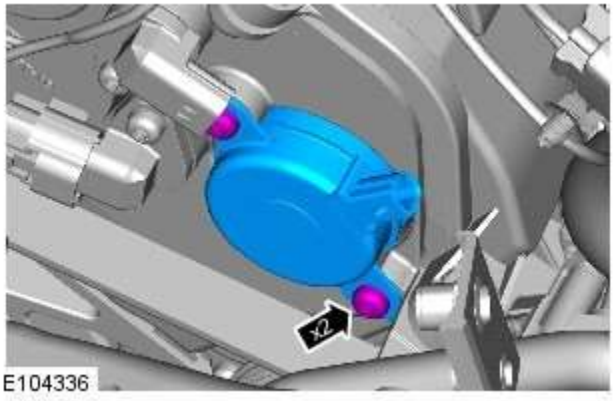
2. WARNING: Make sure to support the vehicle with axle stands.

   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