

|   |  |  |
|---|--|--|
|   |  | <ul style="list-style-type: none"> <li>Check the operation of the cooling fan. GO to Pinpoint Test</li> </ul>  |
| Engine not reaching normal temperature                      | <ul style="list-style-type: none"> <li>Thermostat stuck open</li> </ul>  | <ul style="list-style-type: none"> <li>Check the operation of the thermostat. Rectify as necessary</li> </ul>  |
| Cooling fan operating at maximum speed - Engine not running | <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Circuit reference - PWM -</div> <ul style="list-style-type: none"> <li>Cooling fan control module PWM signal circuit short circuit to ground, short circuit to power, open circuit, high resistance</li> </ul>      | <ul style="list-style-type: none"> <li>Refer to the electrical circuit diagrams and check the cooling fan control module PWM signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Repair the wiring harness as necessary</li> </ul>      |
| Cooling fan is stationary - Engine running                  | <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Circuit reference - IGN -</div> <ul style="list-style-type: none"> <li>Cooling fan control module ignition signal circuit short circuit to ground, short circuit to power, open circuit, high resistance</li> </ul> | <ul style="list-style-type: none"> <li>Refer to the electrical circuit diagrams and check the cooling fan control module ignition signal circuit for short circuit to ground, short circuit to power, open circuit, high resistance. Repair the wiring harness as necessary</li> </ul> |

---

## PINPOINT TESTS

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.



|  |   |
|--|---|
|  | Check the operation of the cooling fan  |
|  | Is the cooling fan inoperative?<br><br>No fault found. Verify customer concern of cooling fan operation   |
|  | Using the manufacturer approved diagnostic system, check datalogger signal - Electric Fan PWM Control Commanded (0x03F9)  |
|  | Is the datalogger signal value between 5% and 16% whilst the cooling fan is operating?  |
|  | Using the manufacturer approved diagnostic system, set datalogger signal - Electric Fan PWM Control Commanded (0x03F9) - to 30% (using output state control)                        |
|  | Does the cooling fan operate?   |
|  | Using the manufacturer approved diagnostic system, set datalogger signal - Electric Fan PWM Control Commanded (0x03F9) - to 90% (using output state control)                        |
|  | Did the cooling fan speed increase?<br><br>No fault found. Verify customer concern of cooling fan operation.  |
|  | Refer to the electrical circuit diagrams and check the cooling fan motor control module circuits for short circuit to ground, short circuit to power, open circuit, high resistance |
|  | Were any circuit faults present?<br><br>Repair the wiring harness as necessary.   |

|  |   |
|--|---|
|  |   |
|  | Ensure that the hood is closed  |
|  | Start the engine  |
|  | Set the air conditioning to on, set the temperature to cold and the fan speed to fast   |
|  | Allow the engine to reach normal operating temperature (approximately 90°C)   |
|  | Using the manufacturer approved diagnostic system, check datalogger signals - Engine Coolant Temperature (0xF405) - and - Electric Fan PWM Control Commanded (0x03F9). As the engine coolant temperature reaches normal operating temperature, the fan speed should increase between the values of 9% and 90% |
|  | <p>Did the cooling fan speed increase speed as engine coolant temperature increased?</p> <p>Return vehicle to customer</p> <p>Contact Dealer Technical Support</p>  |

---

## DTC INDEX

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel , DTC: B10A2-01 to P02D7-32 (100-00 General Information, Description and Operation).

# ENGINE COOLING - TDV6 3.0L DIESEL

---

Coolant must be collected into a clean container and can be reused if not contaminated.

|                                     |              |
|-------------------------------------|--------------|
| Jaguar Premium Cooling System Fluid | WSS M97B44-D |
| Jaguar Premium Cooling System Flush | EGR-M14P7-A  |

|      |              |            |
|------|--------------|------------|
| 3.0D | 12.53 Liters | 9.7 Liters |
|------|--------------|------------|

|   |    |    |    |
|---|----|----|----|
| Coolant expansion tank retaining bolt       | 7  | -  | 62 |
| Coolant expansion tank bleed bolt           | 3  | -  | 27 |
| Cooling fan motor and shroud retaining nuts | 7  | -  | 62 |
| Thermostat housing to shroud bolt           | 7  | -  | 62 |
| Coolant pump retaining bolts                | 25 | 18 | -  |
| Thermostat housing upper to lower bolts     | 4  | -  | 35 |
| Radiator panel bolts                        | 9  | -  | 80 |
| Radiator drain plug                         | 2  | -  | 18 |



# ENGINE COOLING - TDV6 3.0L DIESEL RADIATOR [C1269153]

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## REMOVAL

Removal steps in this procedure may contain installation details.

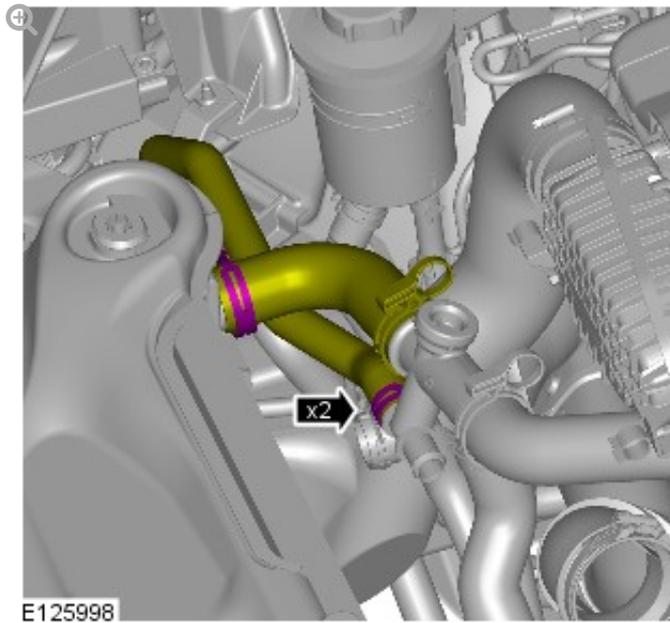
1.

Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

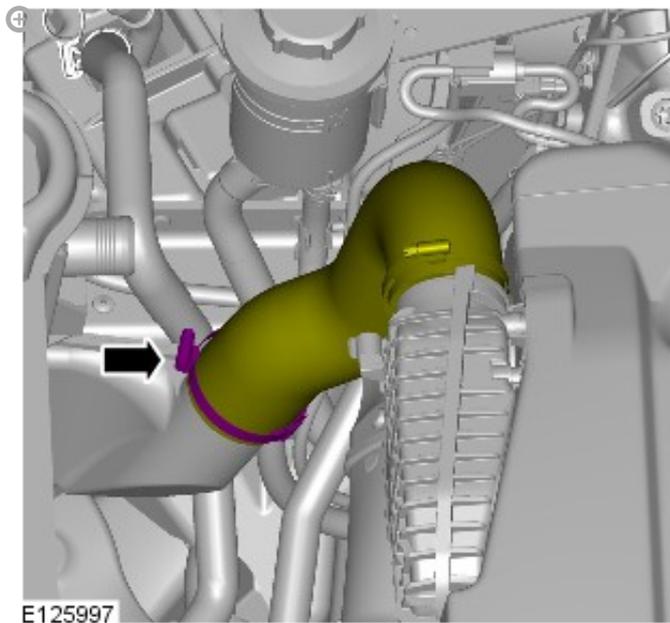
2. Refer to: [Cooling Fan Motor and Shroud](#) (303-03A Engine Cooling - TDV6 3.0L Diesel, Removal and Installation).
3. Refer to: [Cooling System Partial Draining and Vacuum Filling](#) (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

4.



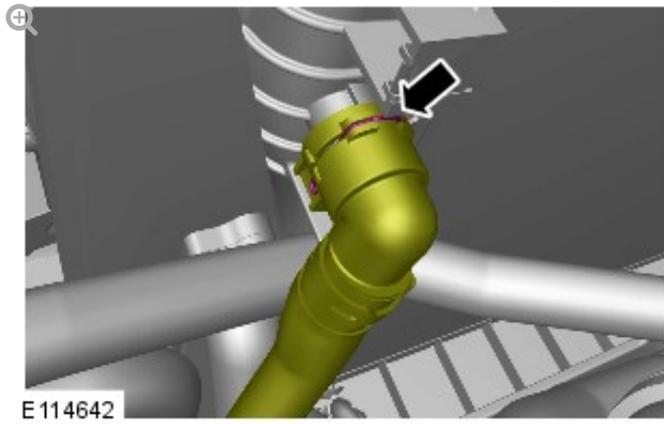
E125998

5.

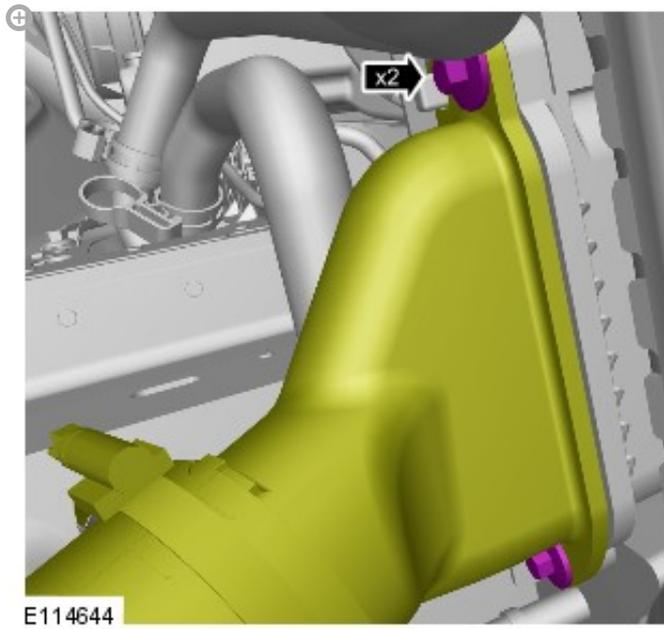


E125997

6.



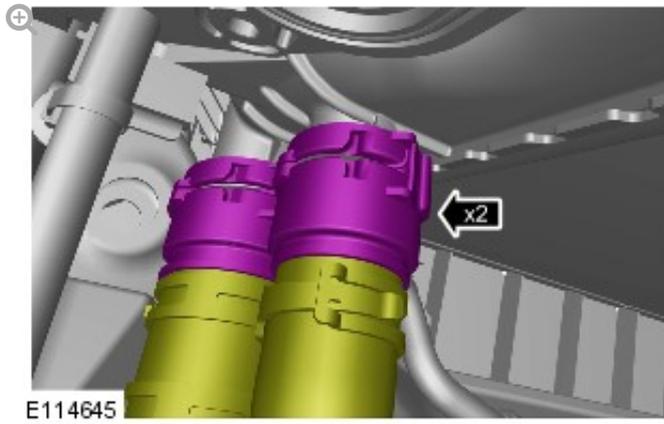
7.



*Torque: 7 Nm*

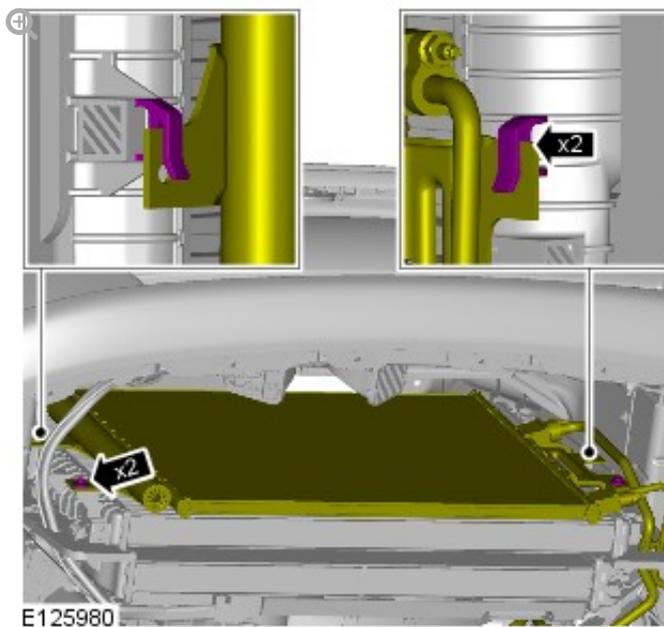
8.

Be prepared to collect escaping coolant.



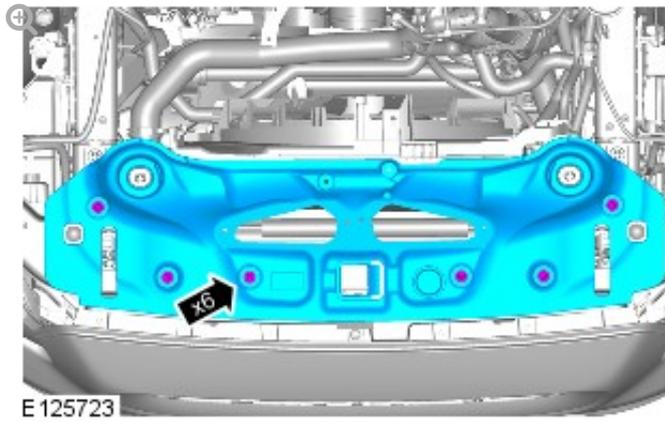
9.

- Protect the air conditioning (A/C) condenser.
- Using suitable cable tie secure the A/C condenser away from the radiator.



*Torque: 7 Nm*

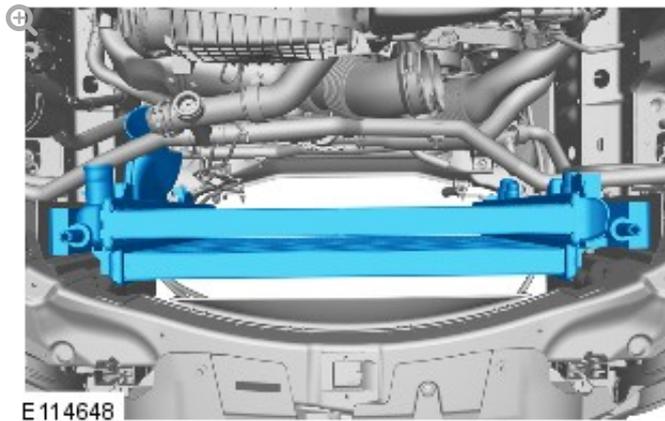
10.



*Torque: 9 Nm*

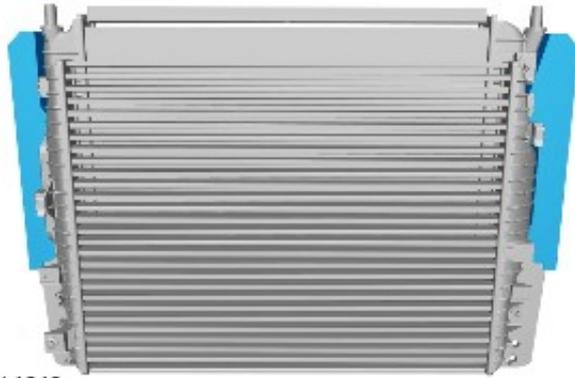
11.

Be prepared to collect escaping coolant.



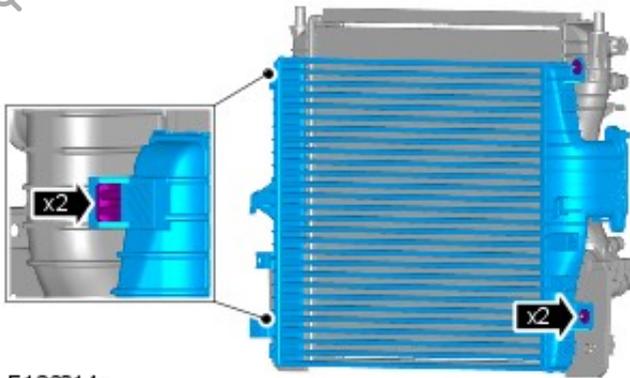
12.

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



E114649

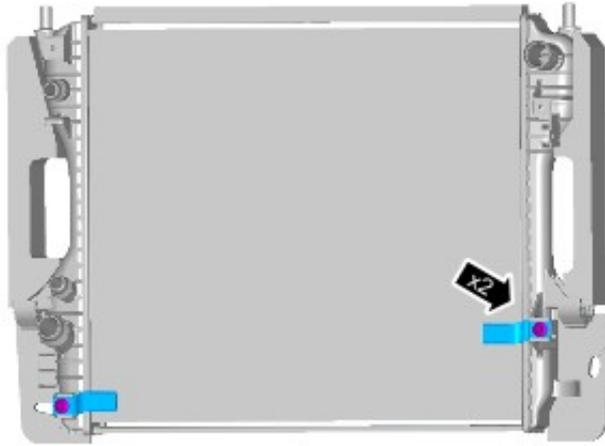
13.



E126014

*Torque: 7 Nm*

14.



E125996

*Torque: 7 Nm*

---

## INSTALLATION

1. To install, reverse the removal procedure.

# ENGINE COOLING - TDV6 3.0L DIESEL THERMOSTAT [G1269228]

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## REMOVAL

Removal steps in this procedure may contain installation details.

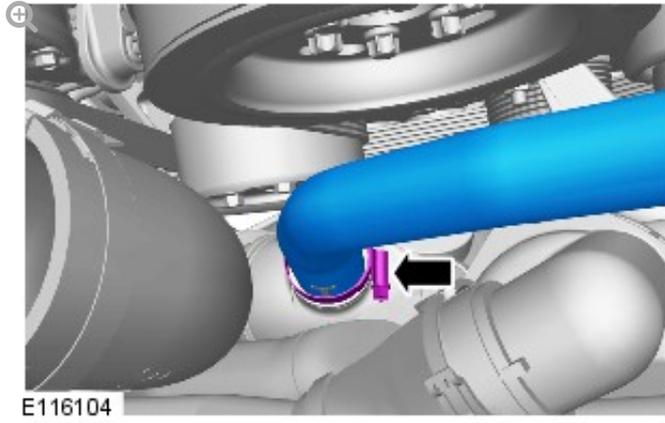
1.

Make sure to support the vehicle with axle stands.

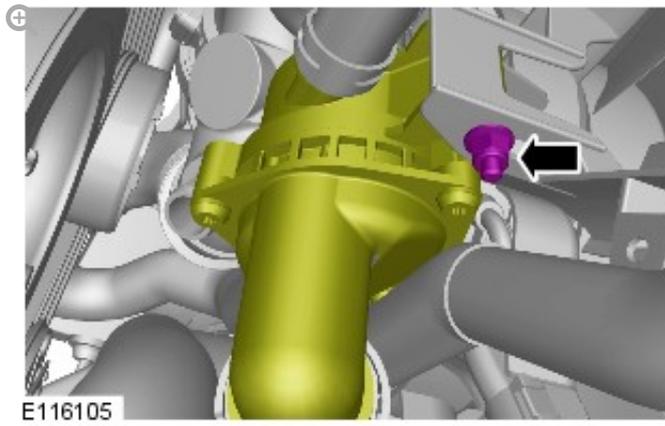
Raise and support the vehicle.

2. Refer to: [Turbocharger Bypass Valve](#) (303-04B Fuel Charging and Controls - Turbocharger - TDV6 3.0L Diesel, Removal and Installation).
3. Refer to: [Cooling System Partial Draining and Vacuum Filling](#) (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).

4.

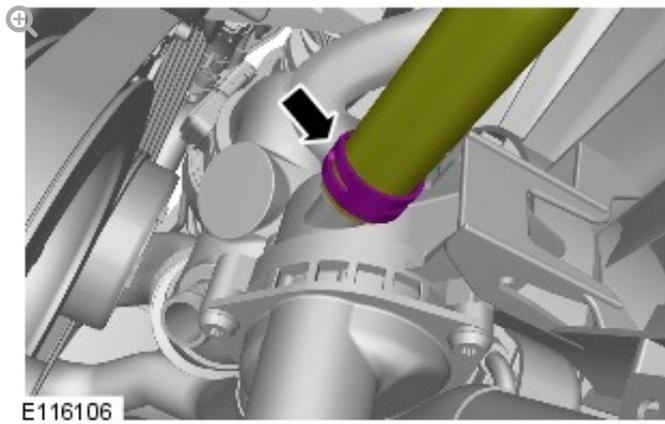


5.

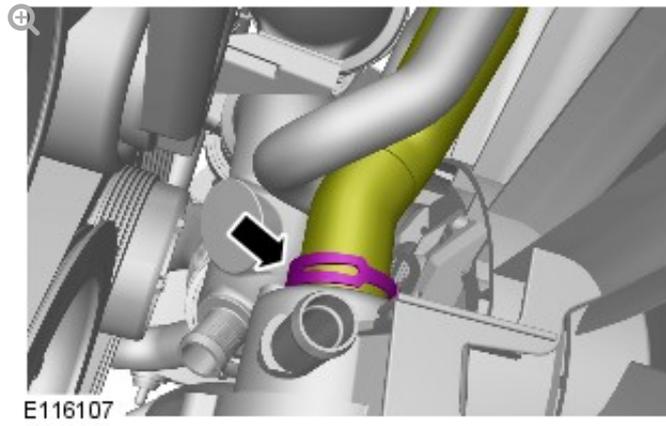


*Torque: 7 Nm*

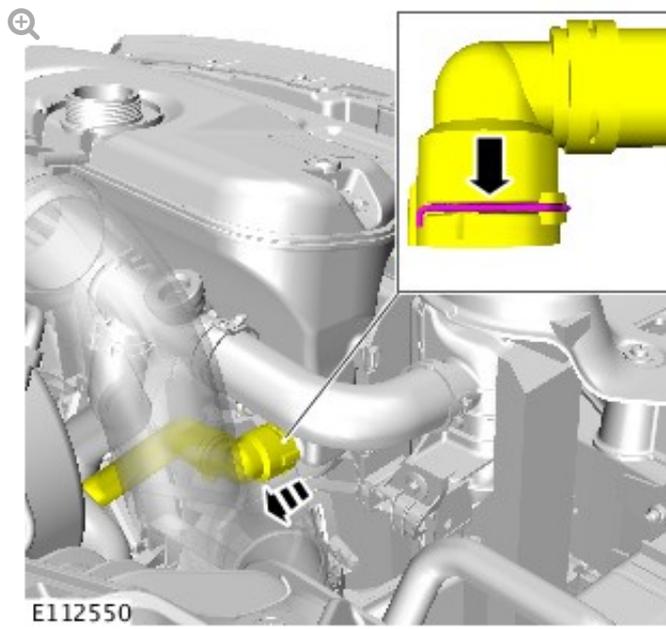
6.



7.

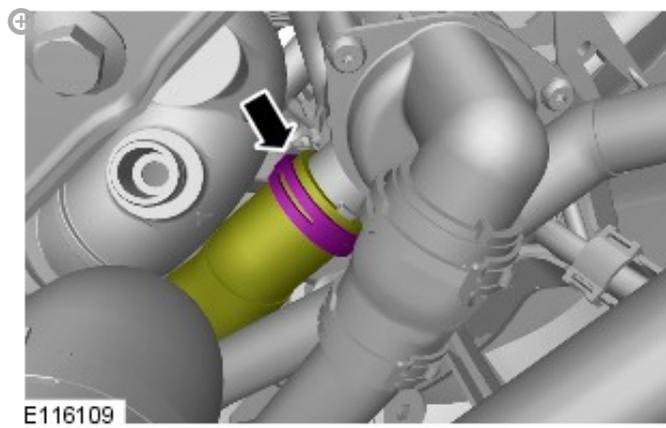


8.



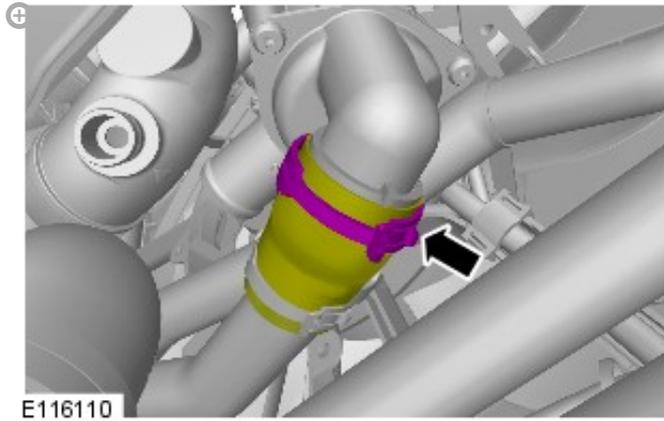
Release the clip and disconnect the coolant hose.

9.

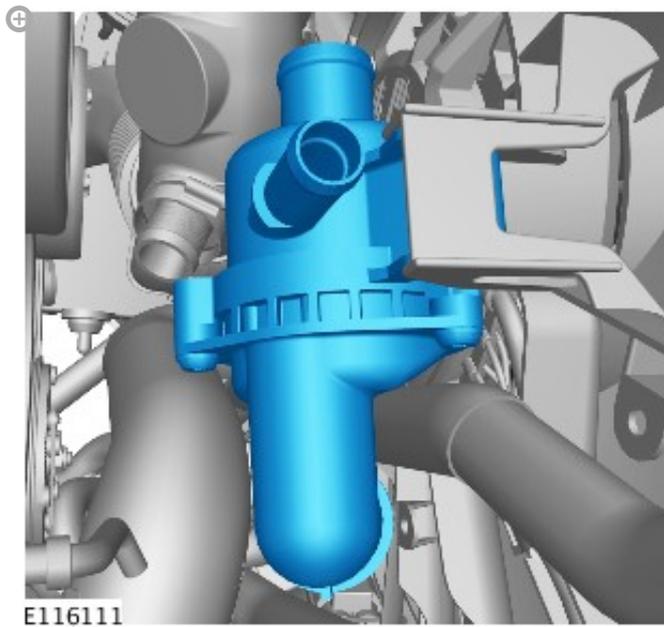


10.

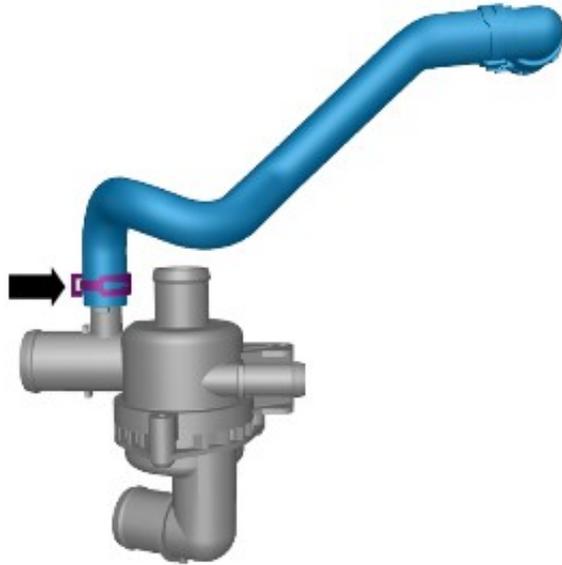
Be prepared to collect escaping fluids.



11.

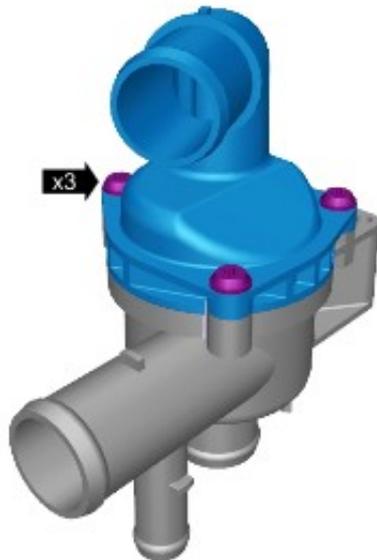


12.



E116112

13.

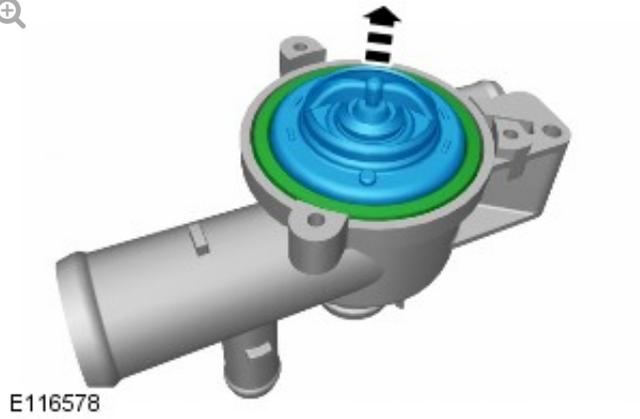


E116577

*Torque: 4 Nm*

14.

Discard the seal.



---

## INSTALLATION

1. To install, reverse the removal procedure.

## ENGINE EMISSION CONTROL - TDV6 3.0L DIESEL

# CRANKCASE VENT OIL SEPARATOR [G1272063]



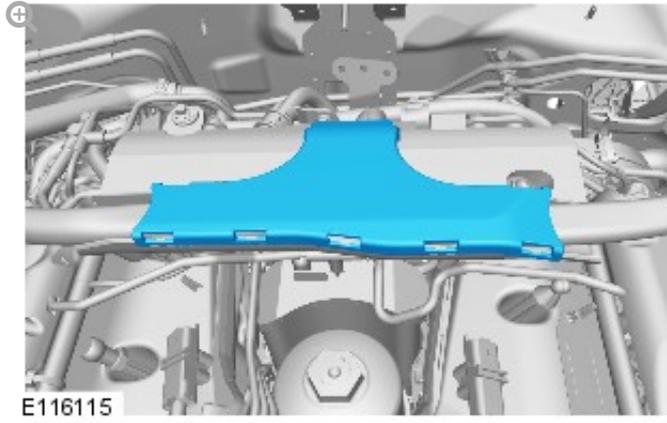
---

### REMOVAL

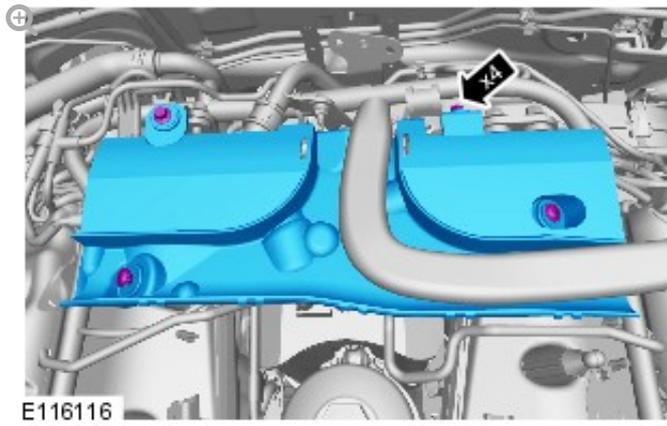
- Removal steps in this procedure may contain installation details.
- Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Engine Cover - TDV6 3.0L Diesel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

2.

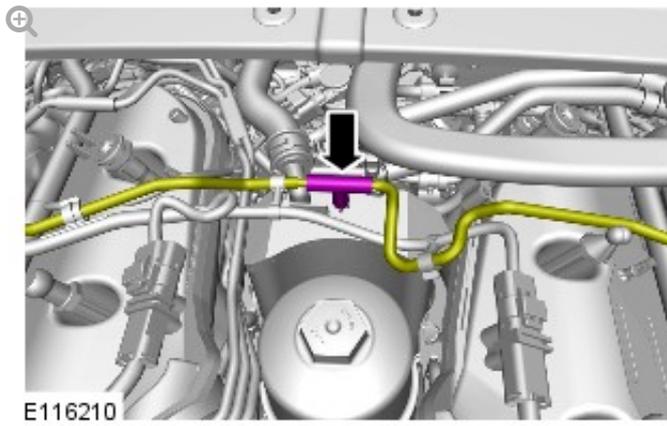


3.

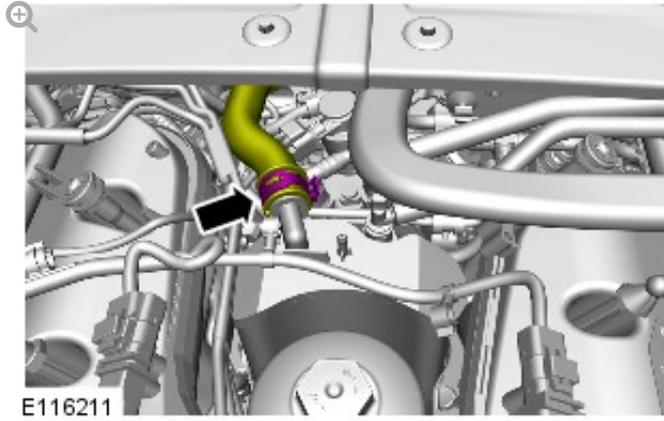


*Torque: 10 Nm*

4.

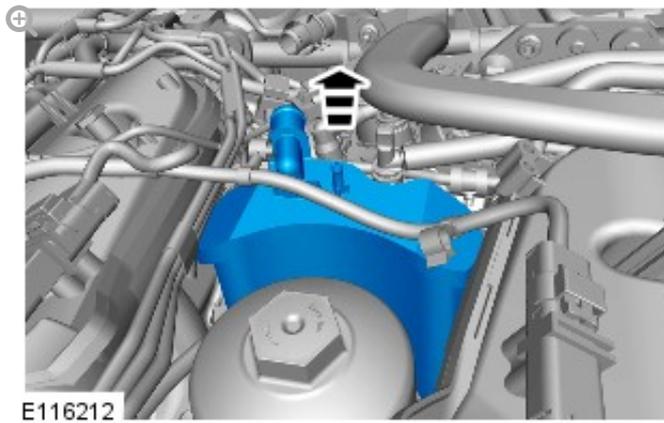


5.



6.

- Discard the seals.
- Make sure that all openings are sealed.



---

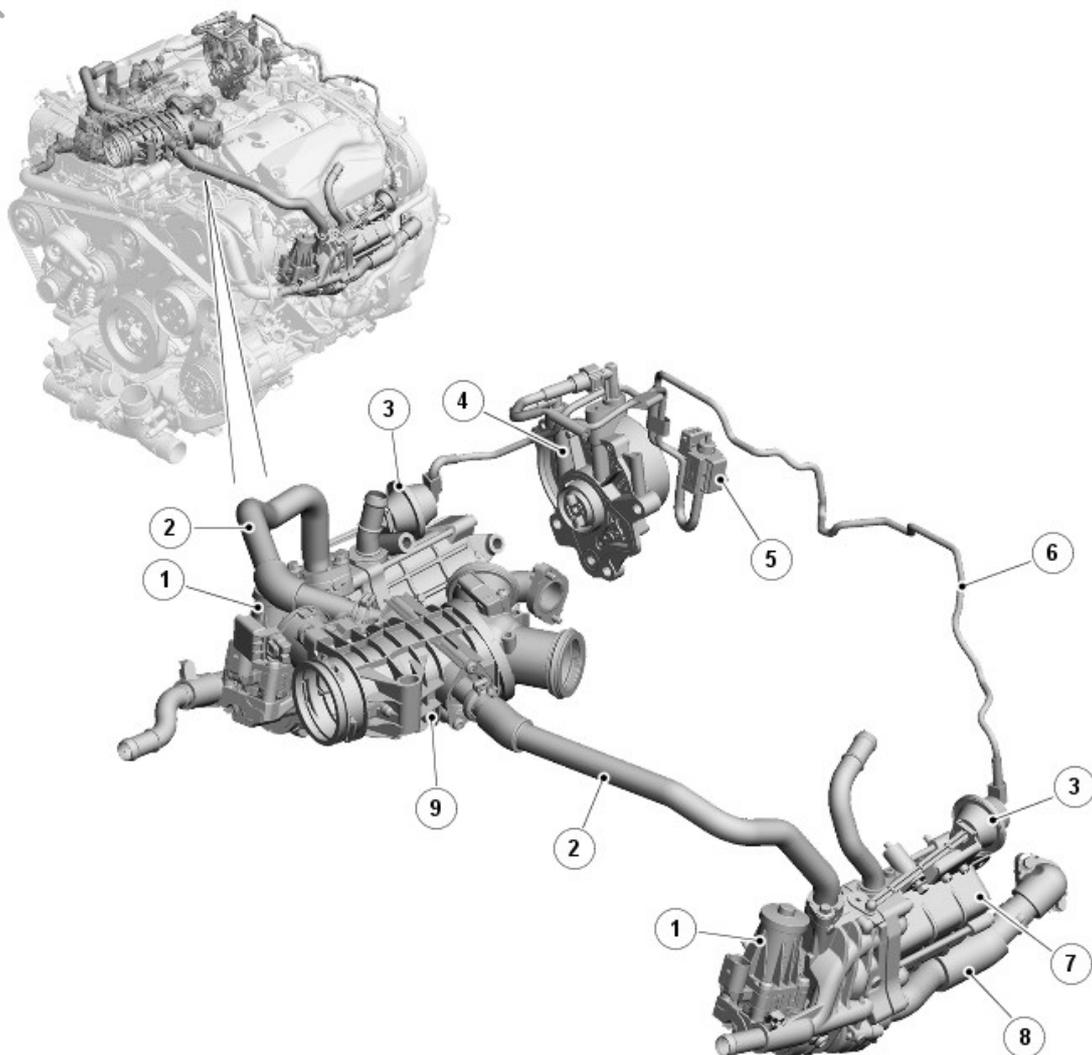
## INSTALLATION

1. To install, reverse the removal procedure.

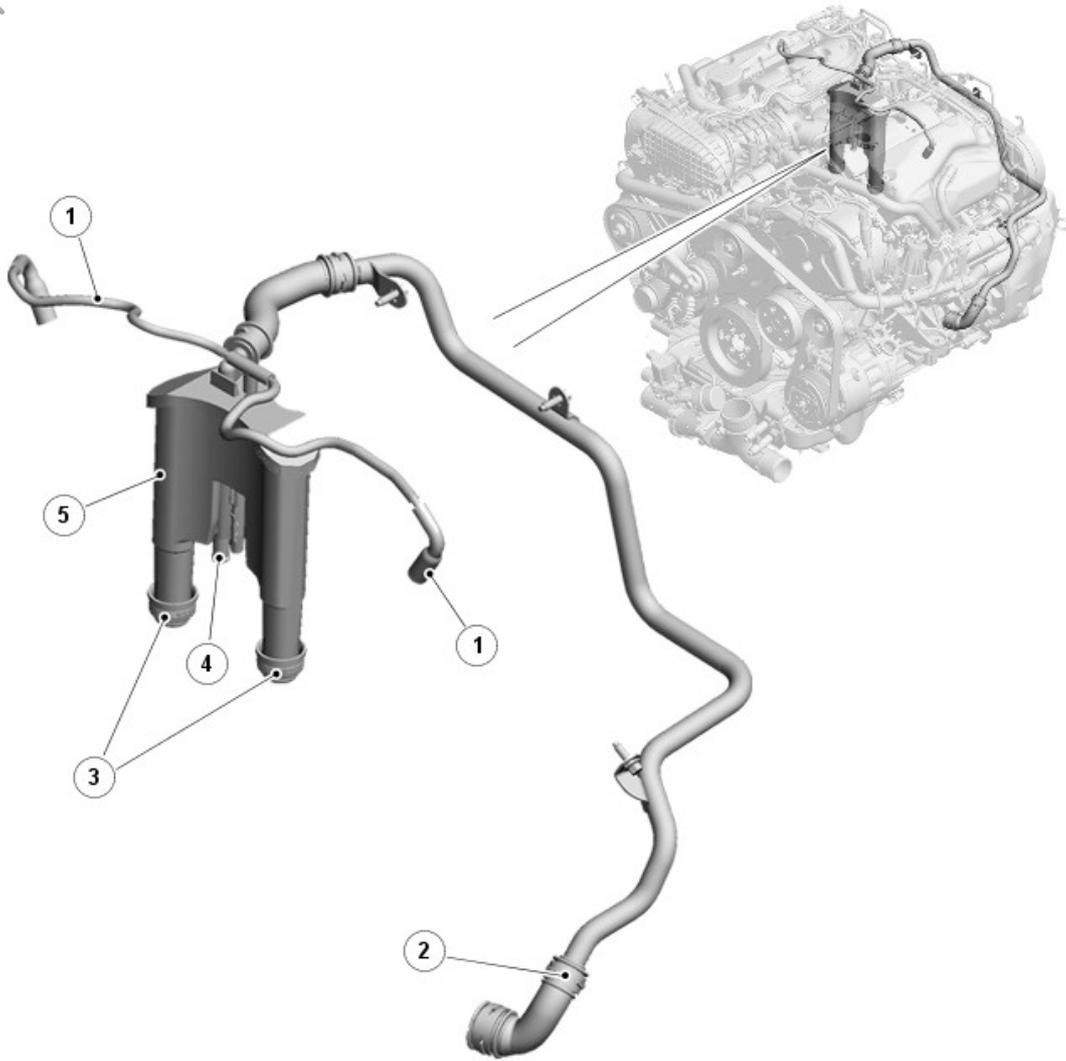
# ENGINE EMISSION CONTROL - TDV6 3.0L DIESEL

## ENGINE EMISSION CONTROL - COMPONENT LOCATION [G1245401]

---



|   |   |
|---|---|
| 1 | EGR (exhaust gas recirculation) valve motor |
| 2 | EGR outlet pipe                             |
| 3 | By-pass valve vacuum actuator               |
| 4 | Vacuum pump                                 |
| 5 | Solenoid valve                              |
| 6 | Vacuum pipe (2 off)                         |
| 7 | EGR cooler                                  |
| 8 | EGR inlet pipe from exhaust manifold        |
| 9 | Throttle intake manifold                    |



E115760

|   |   |
|---|---|
| 1 | Cylinder ventilation scavenger hose (2 off)   |
| 2 | Crankcase gas to air intake hose              |
| 3 | Crankcase breather cylinder block connections |
| 4 | Oil drain to oil filter housing               |
| 5 | Crankcase breather and oil separator          |

## ENGINE EMISSION CONTROL - TDV6 3.0L DIESEL

# ENGINE EMISSION CONTROL - OVERVIEW [G1245402]

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### OVERVIEW

The EGR (exhaust gas recirculation) system is used to control the amount of exhaust gas being recirculated in order to reduce exhaust emissions and combustion noise. EGR is enabled when the engine is at normal operating temperature and under cruising conditions.

The crankcase ventilation system ensures that all gasses emitted from the crankcase during engine running are separated from any oil particles and recirculated via the clean air induction system.

## ENGINE EMISSION CONTROL - TDV6 3.0L DIESEL

# ENGINE EMISSION CONTROL - SYSTEM OPERATION AND COMPONENT DESCRIPTION

[G1245403]

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### SYSTEM OPERATION

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#### EXHAUST GAS RECIRCULATION (EGR) SYSTEM OPERATION

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If small volumes of fuel are injected into a combustion chamber full of pure air, the effect is to create a very lean mixture. This burns at a high temperature, which in turn causes the excess oxygen in the mixture to combine with the naturally occurring nitrogen in the air to create nitrogen oxides (NO<sub>x</sub>), a noxious class of pollutants associated with acid rain. This is a particular problem for diesel engines at low to medium loads (as the engine has no throttle, the cylinder is replenished with a full charge of 'air' at every induction stroke). Exhaust gas is blended into the intake air charge to create the cylinder charge. As the exhaust gas effectively contains no oxygen, it prevents the formation of a very lean mixture, so lowering combustion temperatures and minimizing the formation of NO<sub>x</sub>.

At low engine speeds and loads, over 50 percent of the cylinder charge can be made up of recycled exhaust gas. This is routed directly from the exhaust

manifold and passes through a gas-water heat exchanger before being supplied to the inlet manifold. The volume of exhaust gas added to the intake charge is regulated by an electronically controlled EGR (exhaust gas recirculation) valve, actuated according to precise engine speed and load by the engine management system.

---

## **CRANKCASE VENTILATION SYSTEM OPERATION**

Crankcase gasses are drawn into the oil separator unit from the crankcase and the cylinder head covers (both banks) by a vacuum created by a connection into the air induction system.

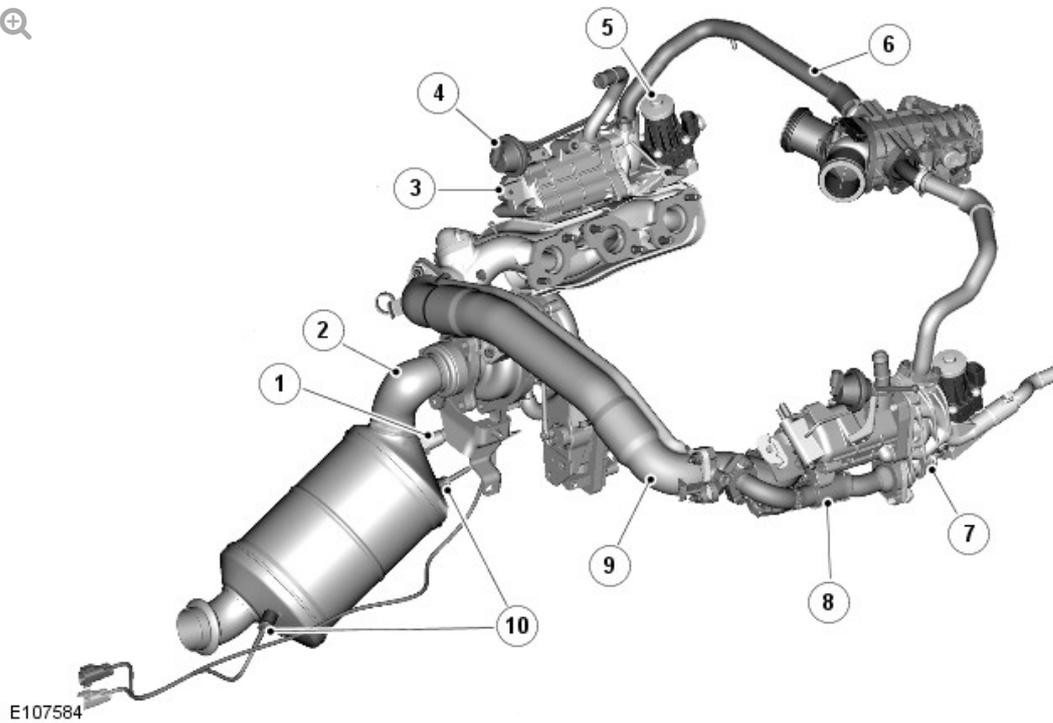
The crankcase gasses are circulated around the oil separator where the gas and oil are separated. The gas is returned to the inlet side of the air induction system prior to the primary turbocharger. The collected oil is drained down to the sump via the oil cooler and filter housing on the cylinder block.

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## **COMPONENT DESCRIPTION**

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## **EXHAUST GAS RECIRCULATION (EGR) SYSTEM**



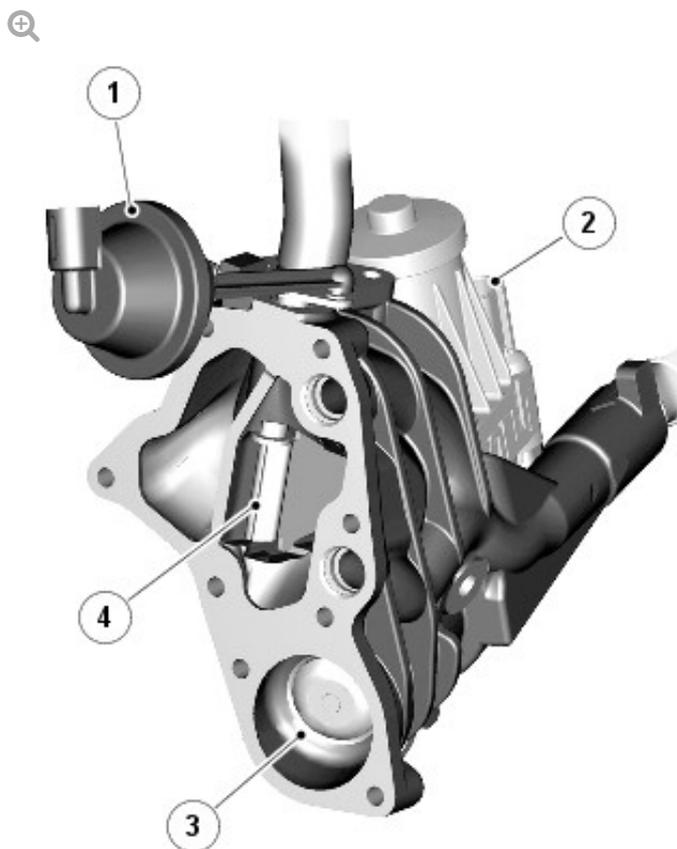
|    |   |
|----|---|
| 1  | HO2S (heated oxygen sensor)                           |
| 2  | LH (left-hand) exhaust pipe                           |
| 3  | EGR cooler  |
| 4  | By-pass valve vacuum actuator                         |
| 5  | EGR valve motor                                       |
| 6  | EGR outlet pipe                                       |
| 7  | EGR cooler and valve housing                          |
| 8  | EGR inlet pipe  |
| 9  | Exhaust system cross-over pipe                        |
| 10 | Pre and post catalyst exhaust gas temperature sensors |

The EGR system comprises an EGR cooler and housing assembly which is bolted to the cylinder head, above the exhaust manifold. Each EGR assembly comprises an EGR cooler, a by-pass housing, a by-pass valve motor and a by-pass valve vacuum actuator.

A pipe is connected to the exhaust manifold and directs exhaust gasses into the by-pass housing. A second pipe from the by-pass housing connects to the throttle intake manifold and passes the cooled exhaust gasses into the intake manifold to mix with the clean air entering the engine from the air filter.

The EGR cooler is attached to the by-pass housing with a gasket and 5 screws. The by-pass housing has an engine coolant connection which allows coolant to flow from the engine oil cooler into the by-pass housing. Engine coolant flows from the by-pass housing into a water jacket within the cooler which in cools the exhaust gasses by heat transfer within the cooler. The engine coolant flows from the cooler through an outlet pipe and is passed back into the cooling system via the heater core.

The by-pass housing contains the EGR valve motor, the EGR valve and the by-pass valve.

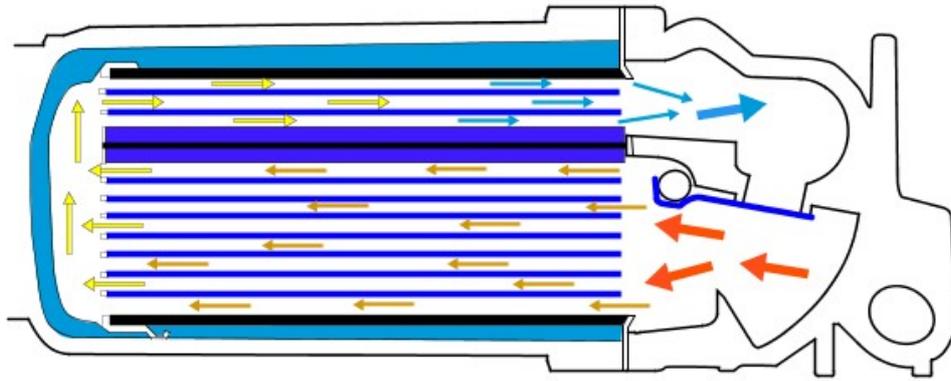


|   |                               |
|---|-------------------------------|
| 1 | By-pass valve vacuum actuator |
| 2 | EGR valve motor               |
| 3 | EGR valve                     |
| 4 | By-pass valve                 |

The by-pass valve is a vacuum operated valve which directs the flow of exhaust gasses either through the EGR cooler or by-passes the cooler and directs the gasses directly to the intake manifold.

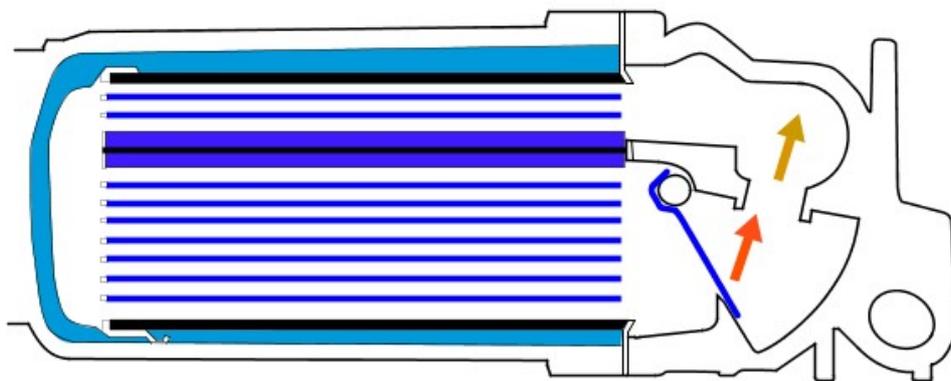
A vacuum actuator is located on a bracket attached to each EGR cooler. The actuator receives a vacuum which is produced by the vacuum pump located at the rear of the engine. The vacuum actuator is connected to the by-pass valve within the by-pass housing by a connecting rod.

The vacuum supply to the actuator is controlled by the ECM (engine control module). When by-pass control is required, the ECM energizes a vacuum solenoid valve which applies vacuum to the vacuum actuators. The vacuum causes the actuators to move the connecting rods in a linear direction. The linear movement of the rod is transferred to rotary movement of the by-pass valve within the by-pass housing.



E112407

When the by-pass valve is closed, exhaust gasses are directed through the cooler before being passed to the intake manifold.



E112408

When the by-pass valve is open, exhaust gasses are passed directly through the by-pass housing into the intake manifold with no cooling applied to the gasses.

The EGR valve motor is located on the by-pass housing. A 5 pin connector provides the power, ground and ECM signal and feedback connections for the motor.

The motor is secured to the by-pass housing with 4 torx screws. A pinion gear

on the motor spindle drives a geared rack which is connected to the EGR valve in the by-pass housing.

The motor is controlled by the ECM which provides power supply to operate the motor as required. A 5 Volt feedback signal is passed to the ECM which is used to establish motor position for precise control.

---

## CRANKCASE VENTILATION

The crankcase ventilation system comprises an oil breather and separator. The breather receives crankcase directly from the crankcase and also from the cylinder heads.

The breather is connected to the top of the cylinder block with two seals. Two scavenge pipes located on the top of the breather are connected to the cylinder head covers. A breather pipe is connected from the top of the breather to the clean air intake hose at a point prior to the primary turbocharger.

Clean air being drawn into the engine when it is running creates a vacuum in the breather pipe. This vacuum in turn creates a vacuum in the oil breather and separator which draws gasses from the crankcase and cylinder heads into the breather. These gasses are circulated around the breather, allowing oil particles to be separated from the gas. The gasses are drawn into the breather pipe and are mixed with the clean air being drawn into the turbocharger.

The oil particles separated from the gasses accumulate in the oil separator and drain through a third connection at the bottom of the oil breather and separator, through a connection on the oil cooler housing to the oil pan.

# ENGINE EMISSION CONTROL - TDV6 3.0L DIESEL

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## PRINCIPLES OF OPERATION

For a detailed description of the engine emission system and operation, refer to the relevant Description and Operation section in the workshop manual.

REFER to: (303-08A Engine Emission Control - TDV6 3.0L Diesel )

[Engine Emission Control](#) (Description and Operation),

[Engine Emission Control](#) (Description and Operation),

[Engine Emission Control](#) (Description and Operation).

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## INSPECTION AND VERIFICATION

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.

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

Verify the customer concern.

Visually inspect for obvious signs of mechanical or electrical damage.

|   |   |
|---|---|
| <ul style="list-style-type: none"> <li>▪ Engine breather hoses</li> <li>▪ Oil separator</li> <li>▪ Exhaust gas recirculation (EGR) pipes (check for cracks)</li> <li>▪ EGR valve(s)</li> <li>▪ EGR cooler(s)</li> </ul> | <ul style="list-style-type: none"> <li>▪ Fuse(s)</li> <li>▪ Wiring harness</li> <li>▪ Loose or corroded electrical connector(s)</li> <li>▪ Intake air shut off throttle</li> <li>▪ Exhaust gas recirculation (EGR) valve(s)</li> <li>▪ Engine Control Module (ECM)</li> </ul> |
|---|---|

If an obvious cause for an observed or reported condition is found, correct the cause (if possible) before proceeding to the symptom chart.

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

|                                 |  |  |
|---------------------------------|--|--|
| Difficult to start              | <ul style="list-style-type: none"> <li>▪ Exhaust gas recirculation (EGR) valve stuck open</li> </ul> | <ul style="list-style-type: none"> <li>▪ Check the Exhaust gas recirculation (EGR) valve.</li> <li>▪ Using the manufacturer approved diagnostic system, perform routine - Inline diagnostic unit 2 diagnostic test - Exhaust gas recirculation valve. Clear the DTCs and retest</li> </ul> |
| Poor/Erratic idle               |  |  |
| Lack of power when accelerating |  |  |
| Engine stops/stalls             | <ul style="list-style-type: none"> <li>▪ Exhaust gas recirculation (EGR) valve stuck open</li> </ul> | <ul style="list-style-type: none"> <li>▪ Check the Exhaust gas recirculation (EGR) valve. Check the engine</li> </ul>  |

|                            |   |   |
|----------------------------|---|---|
|                            | <ul style="list-style-type: none"> <li>▪ Breather system disconnected/restricted/blocked</li> </ul>   | <p>breather system. Check the oil separator. Check for Exhaust gas recirculation (EGR) DTCs.</p> <ul style="list-style-type: none"> <li>▪ Using the manufacturer approved diagnostic system, perform routine - Inline diagnostic unit 2 diagnostic test - Exhaust gas recirculation valve. Clear the DTCs and retest</li> </ul> |
| Excessive fuel consumption | <ul style="list-style-type: none"> <li>▪ Exhaust gas recirculation (EGR) valve stuck open</li> <li>▪ Exhaust gas recirculation (EGR) not operating</li> <li>▪ Breather system restricted/blocked</li> </ul> |   |
| Excessive black smoke      |   |   |
| Excessive emissions        |   |   |
| Excessive blow-by          | <ul style="list-style-type: none"> <li>▪ Breather system restricted/blocked</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Check the engine breather hoses. Check the oil separator.</li> </ul>   |
| Engine oil leaks           | <ul style="list-style-type: none"> <li>▪ Breather system restricted/blocked</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Check the engine breather hoses. Check the oil separator.</li> </ul>   |

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## DTC INDEX

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00.

REFER to: Diagnostic Trouble Code (DTC) Index - TDV6 3.0L Diesel , DTC: Engine Control Module (100-00 General Information, Description and Operation).

# ENGINE EMISSION CONTROL - TDV6 3.0L DIESEL

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|  |    |    |    |
|--|----|----|----|
| Exhaust gas recirculation (EGR) valve to cylinder head retaining bolts | 10 | -  | 89 |
| EGR valve to EGR cooler retaining bolts                                | 10 | -  | 89 |
| EGR valve tube to exhaust manifold retaining bolts                     | 10 | -  | 89 |
| EGR valve cooler mounting bracket retaining bolt                       | 10 | -  | 89 |
| EGR valve outlet tube to EGR valve retaining bolts                     | 10 | -  | 89 |
| EGR valve outlet tube to timing cover retaining bolt                   | 4  | -  | 35 |
| Fuel filter mounting bracket retaining M8 nuts                         | 27 | 20 | -  |
| Fuel filter mounting bracket retaining M6 bolt                         | 2  | -  | 18 |

## ENGINE EMISSION CONTROL - TDV6 3.0L DIESEL

# LEFT EXHAUST GAS RECIRCULATION VALVE [G1272064]

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### REMOVAL

1.

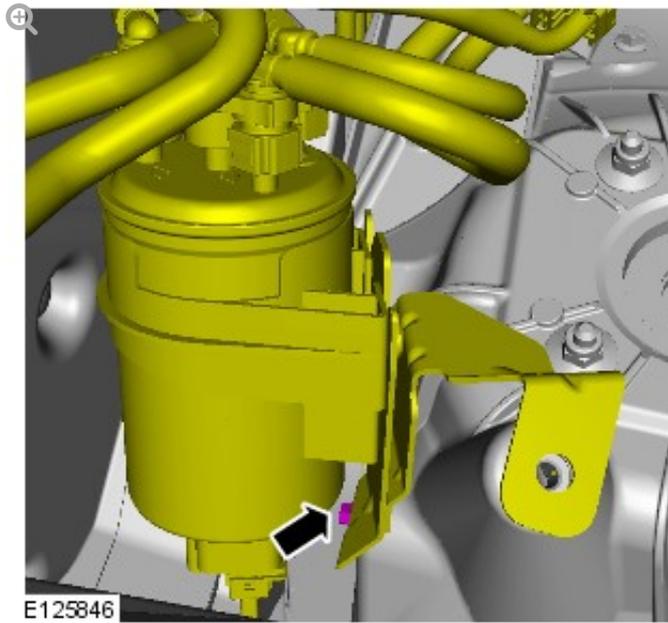
Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

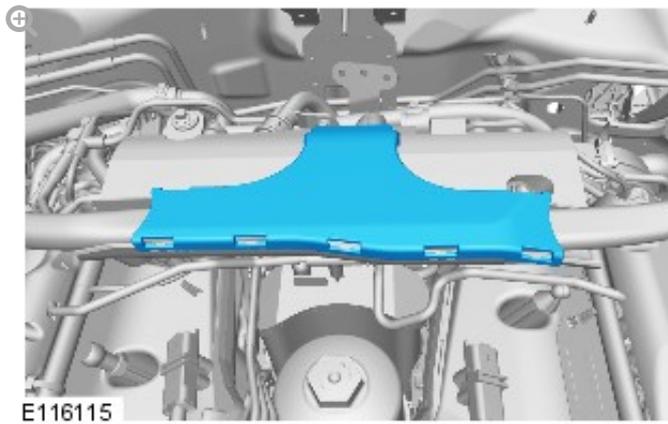
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
3. Refer to: [Cooling System Partial Draining and Vacuum Filling](#) (303-03A Engine Cooling - TDV6 3.0L Diesel, General Procedures).
4. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

5. Refer to: [Air Cleaner](#) (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).
6. Refer to: [Secondary Bulkhead Left Panel](#) (501-02 Front End Body Panels, Removal and Installation).
7. Refer to: [Left Exhaust Gas Recirculation Valve Outlet Tube](#) (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).

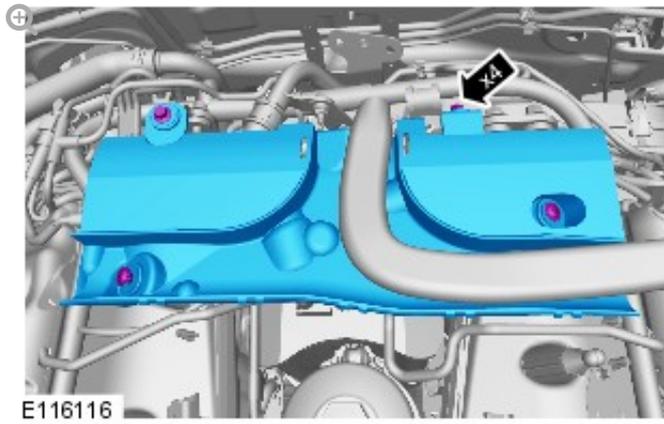
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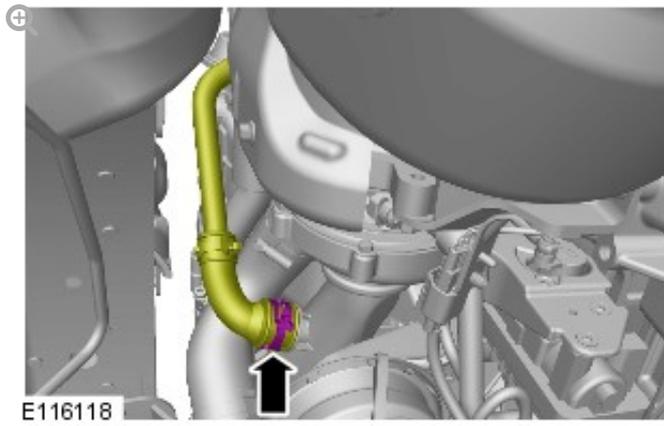
9.



10.

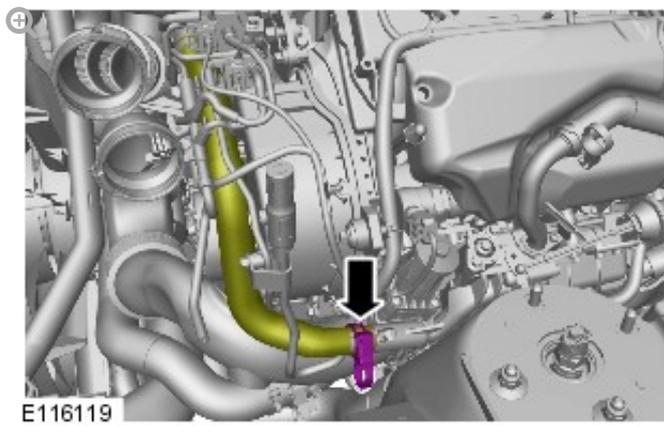


11.



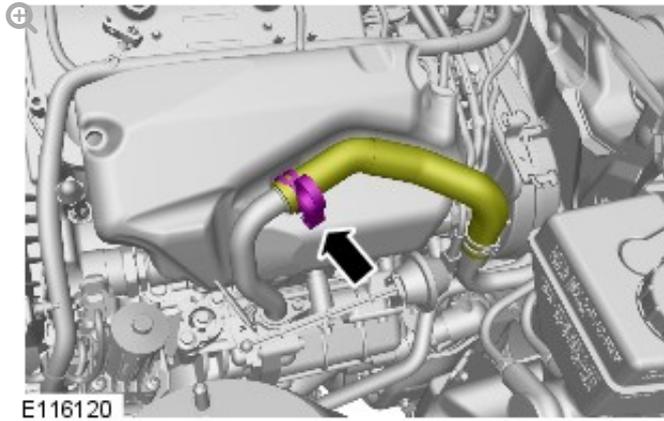
12.

Be prepared to collect escaping coolant.

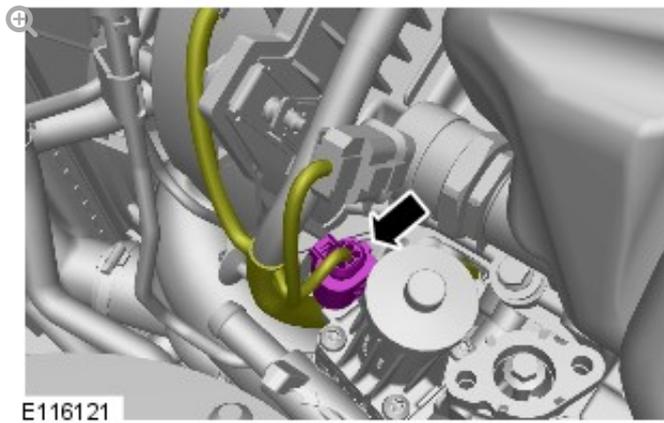


13.

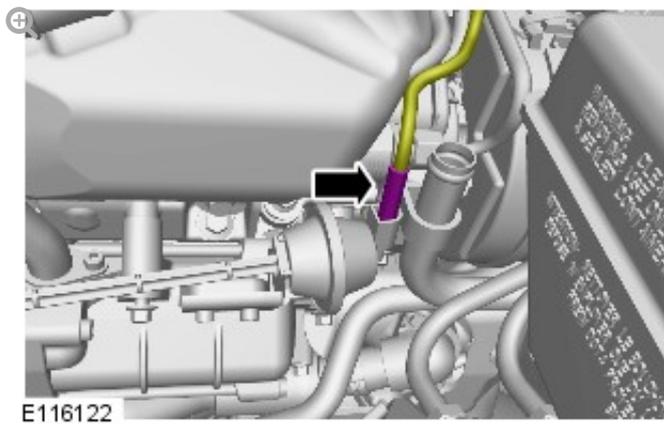
Be prepared to collect escaping coolant.



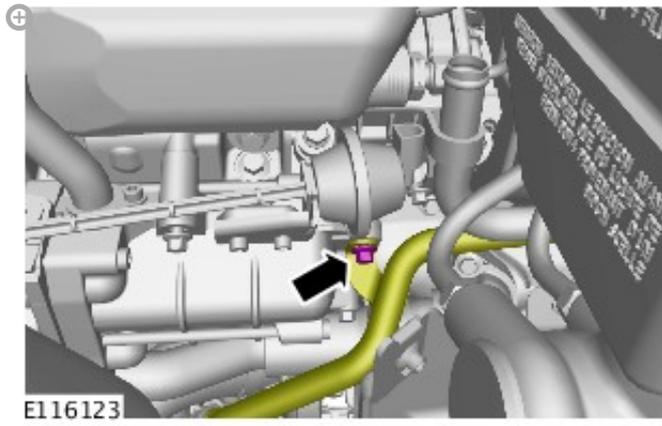
14.



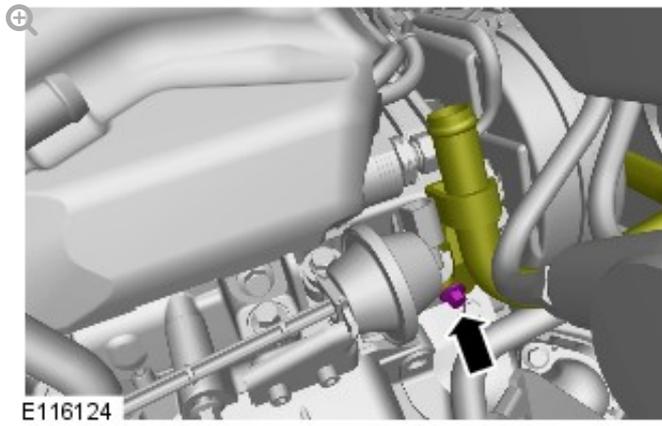
15.



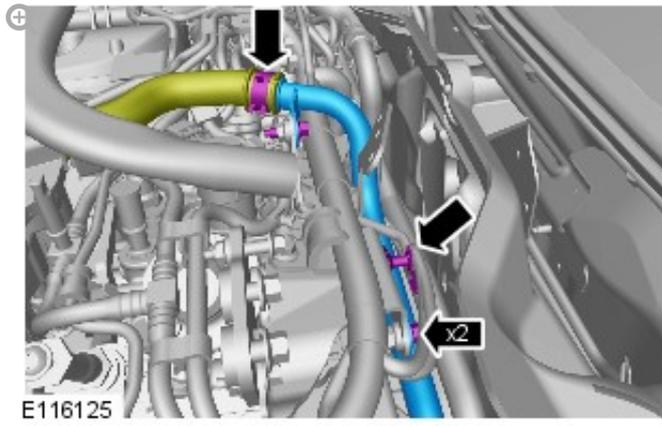
16.



17.

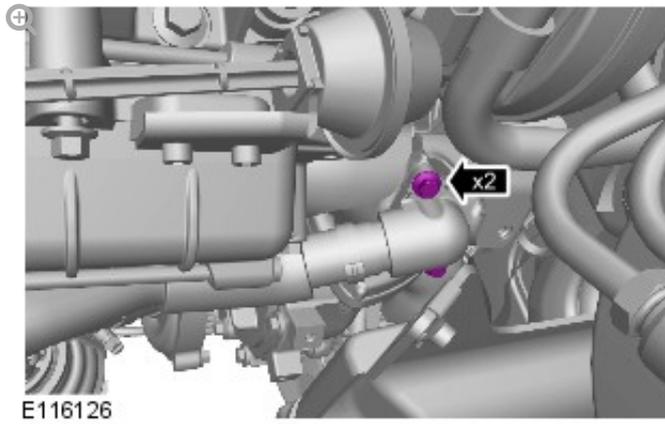


18.

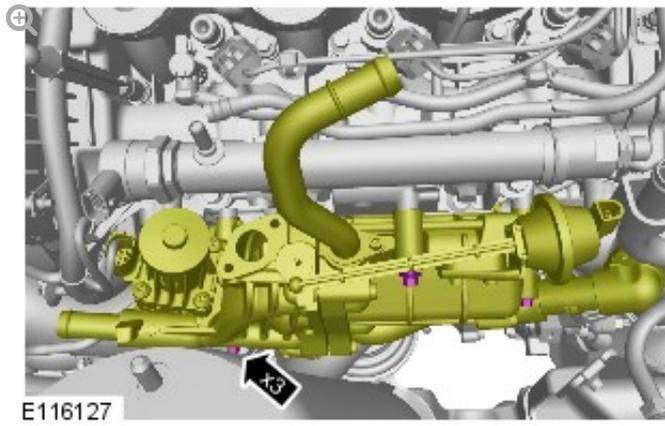


19.

Discard the gasket.

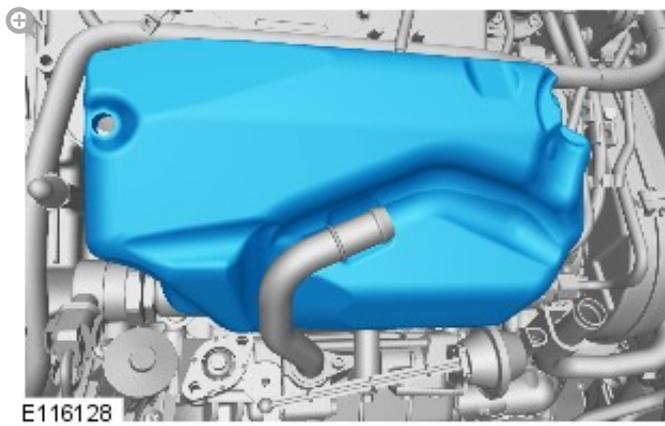


20.

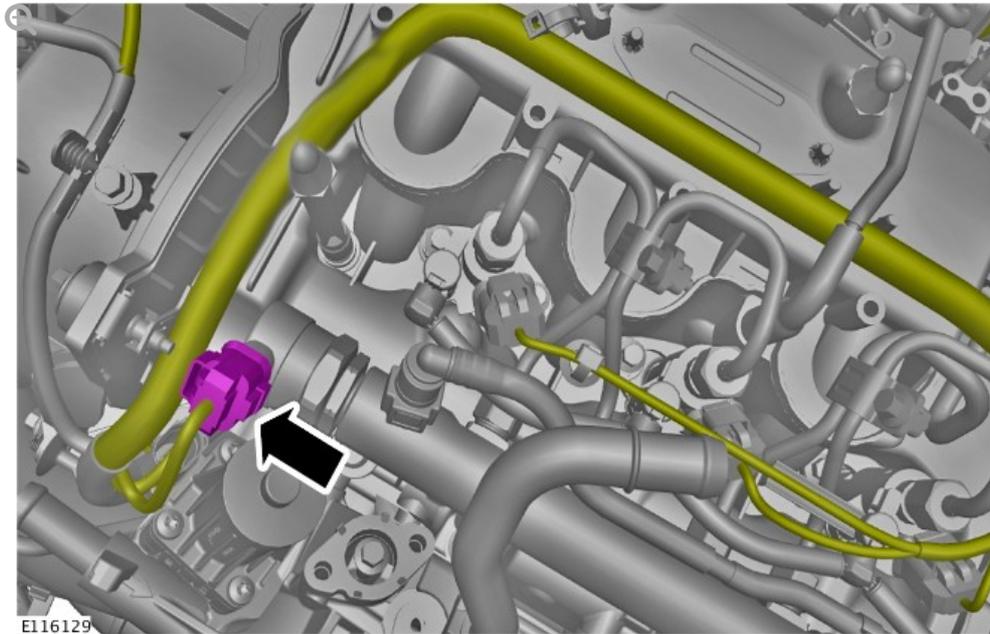


21.

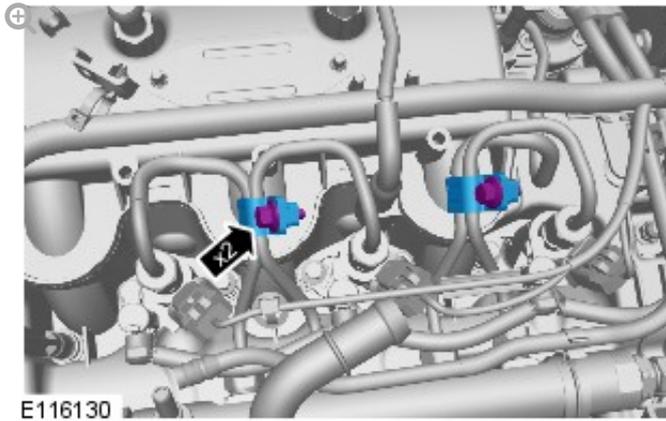
Left-hand shown, right-hand similar.



22.



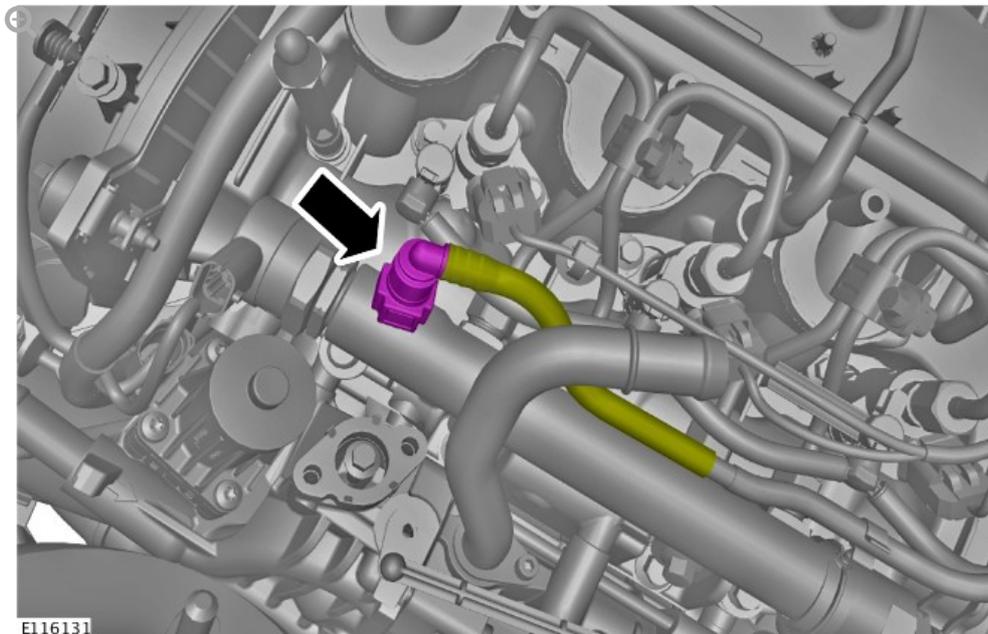
23.



24. Refer to: [Fuel Injection Component Cleaning](#) (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).

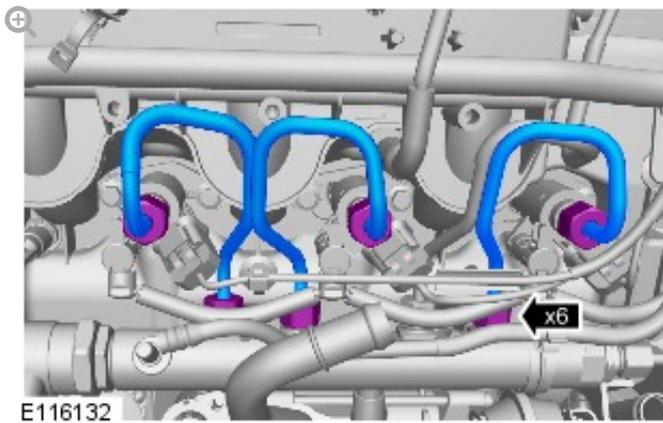
25.

Be prepared to collect escaping fuel.



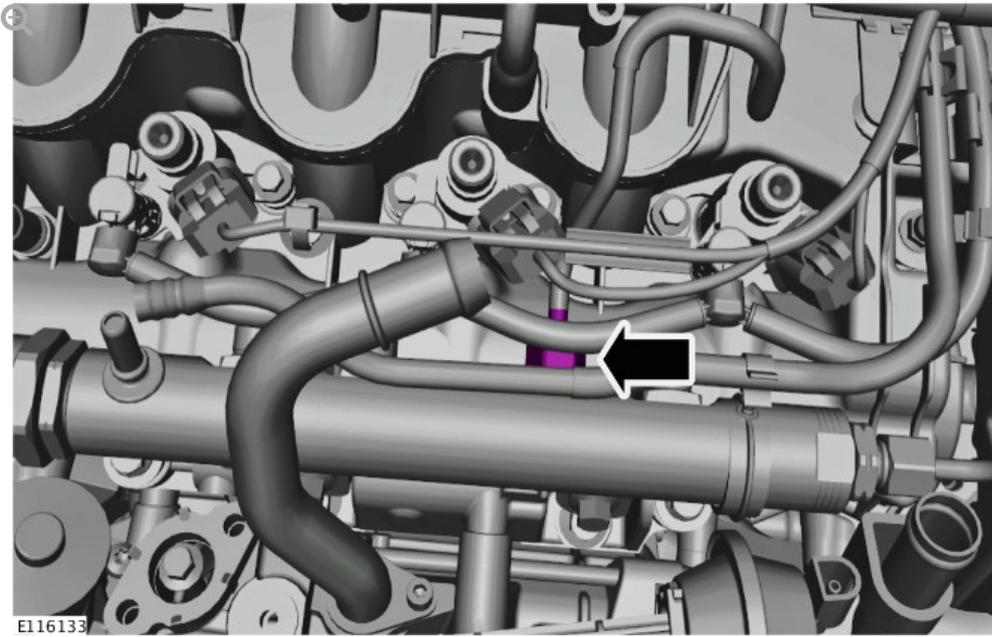
26.

Be prepared to collect escaping fuel.



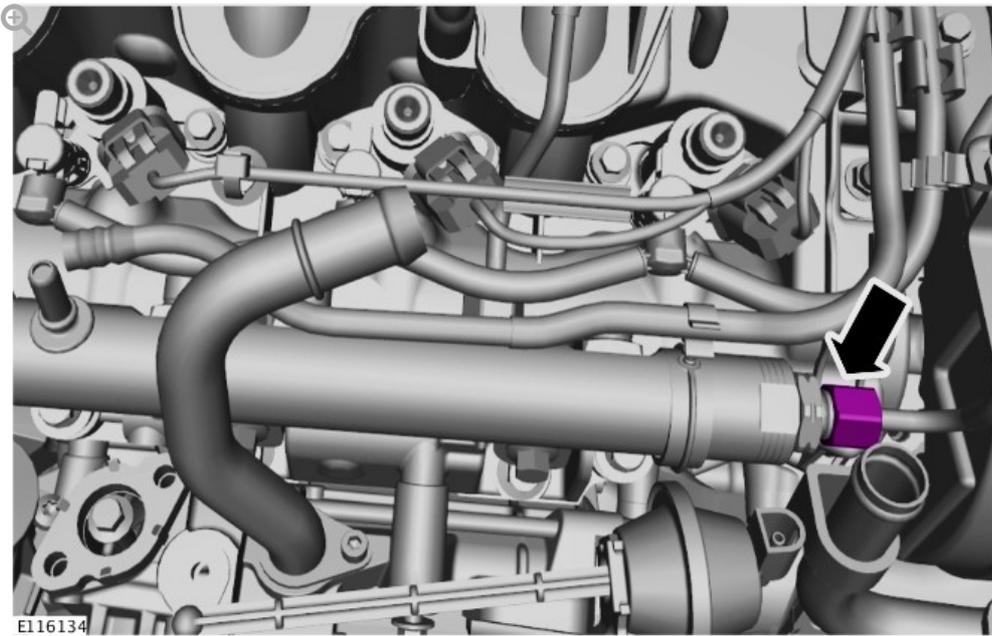
27.

Be prepared to collect escaping fuel.



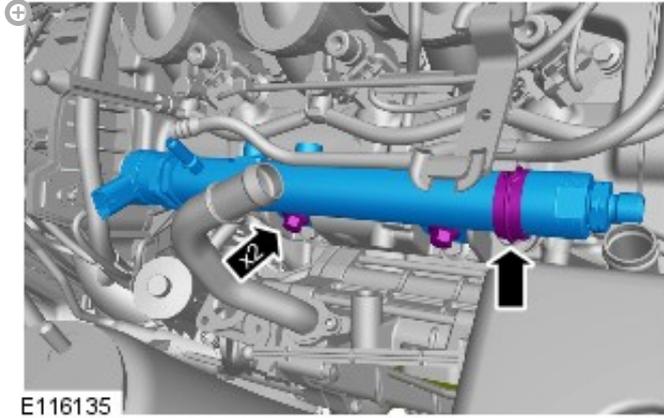
28.

Be prepared to collect escaping fuel.

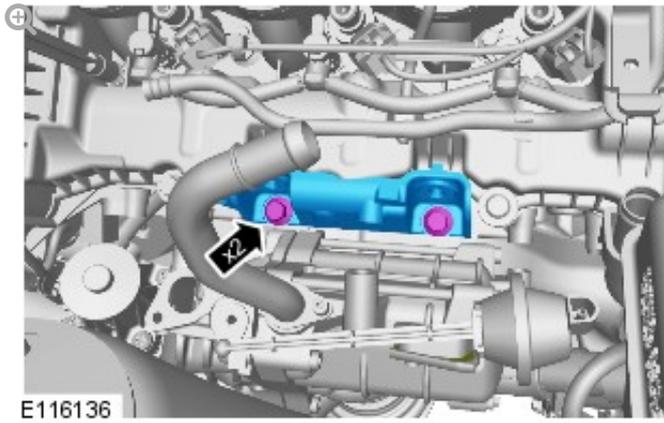


29.

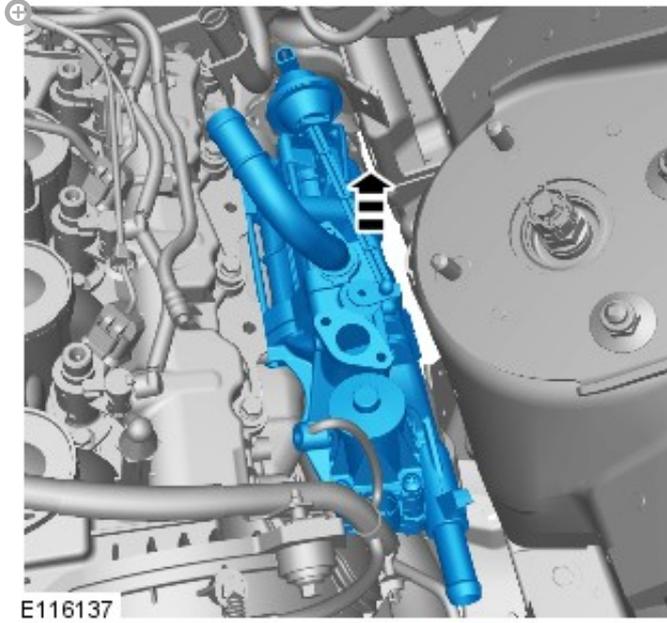
Be prepared to collect escaping fuel.



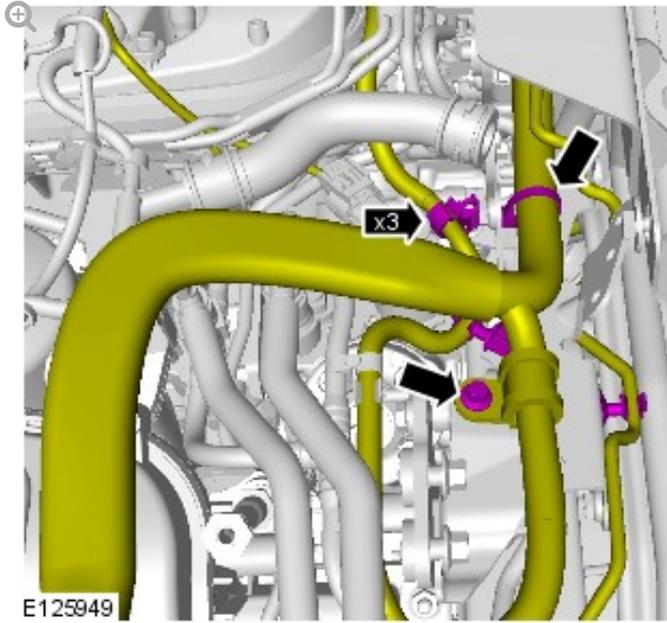
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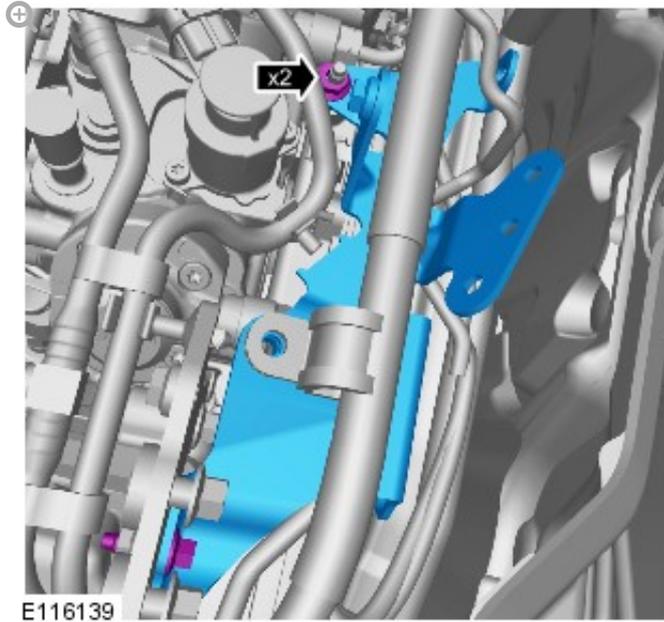
31.



32.

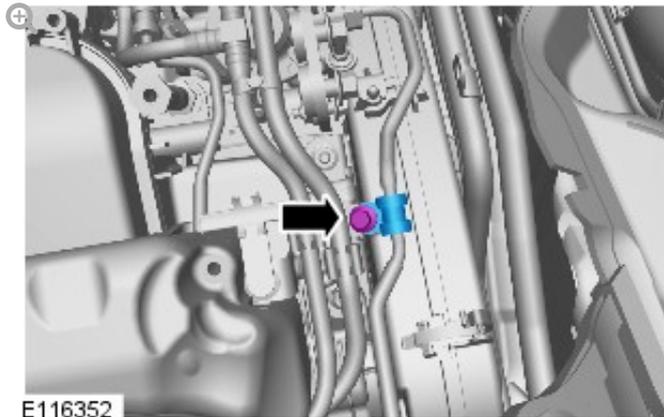


33.



E116139

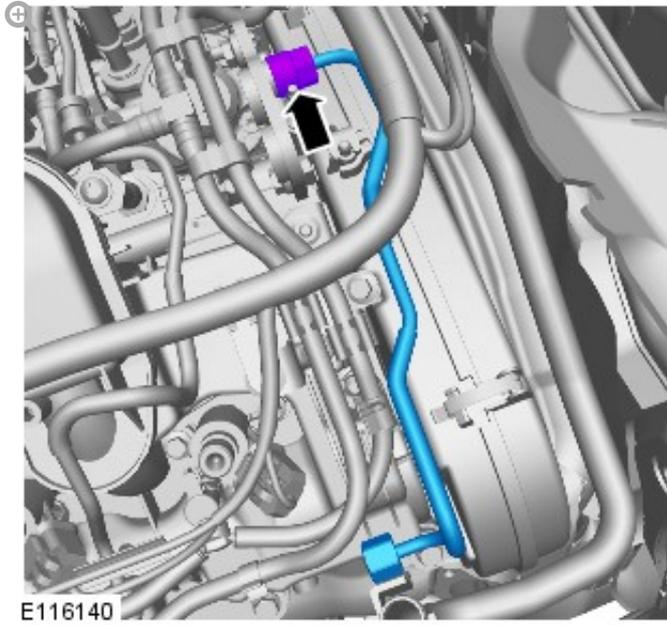
34.



E116352

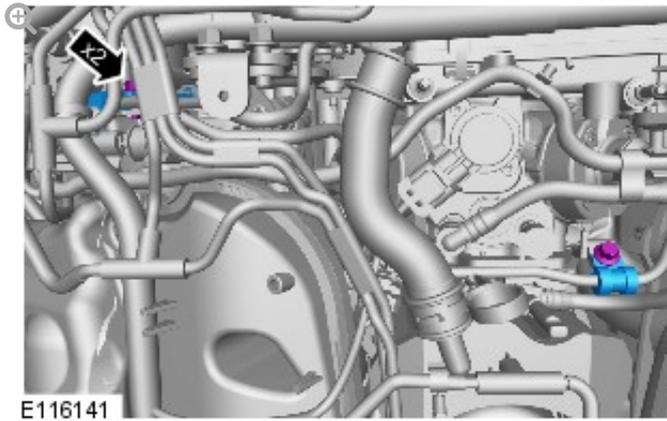
35.

Be prepared to collect escaping fuel.



E116140

36.



E116141

37.

Be prepared to collect escaping fuel.