

The ECM receives the corresponding temperature signal from the ECT sensor.

The pre heating period is dependent on the temperature signal (low temperature = longer pre heating period).

The driver is informed that pre heating is in operation by the glow plug indicator light in the instrument cluster coming on. The pre heating times become longer as the coolant temperature falls.

The BARO (barometric pressure) also has an influence on activation and deactivation of the glow plugs in the event of large altitude differences.

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## CRANK HEATING

Crank heating is carried out at every start where the coolant temperature is below the predefined threshold of 20° C. Crank heating begins if the engine speed exceeds 42 rpm for longer than 50ms, or the starter is active for longer than 4 sec. If the coolant temperature sensor is defective, a default temperature of 0° C is used.

---

## POST HEATING

Post heat is the length of time the glow plugs operate after the engine starts. The ECM controls the post heating time based on ECT sensor output. The post heat phase reduces engine noise, improves idle quality and reduces hydrocarbon emissions.

Preheating is followed by the post heating phase once the engine has started. The post heating phase depends upon how the vehicle is driven.

In addition to ECT, BARO and engine speed, the injected fuel quantity is significant in this context. For example, if the injected fuel quantity is 70 mg per piston stroke and the coolant temperature is below 20 °C, post heating is performed at engine speeds between 1100 and 3500 rpm.

In the case of greater injection quantities and considerably lower engine

temperatures, the post heating phase is also activated depending on the engine speed. At 14 mg per piston stroke and an ECT of below 0 °C, for example, post heating is performed at engine speeds between 1100 and 1500 rpm.

---

## COMPONENT DESCRIPTION

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### GLOW PLUG

The ceramic sheathed element glow plugs are made from a heat-resistant, electrically conductive ceramic material. The ceramic sheathed-element glow plugs outer layer is heated directly and is self regulating. The self regulation allows the resistance of the sheathed element to automatically increase as the heat increases preventing the glow plug from overheating. In addition, during the heating process and under the control of the glow plug relay, the glow plugs can be operated above their nominal voltages. This permits heat-up speeds of 1000°C per second. The sheathed-element glow plugs reach a maximum glow temperature of 1300°C and can hold a temperature of 1150°C for several minutes after the first-start glow or at intervening times.

The glow plug is a tubular heating element that protrudes into the combustion chamber of the engine. The heating element contains a spiral filament encased in magnesium oxide powder. At the tip of the tubular heating element is the heater coil. Behind the heater coil is a control coil. The control coil is connected in series and regulates the heater coil to ensure that it does not overheat.

Each cylinder bank has a separate harness connecting the three glow plugs. The harness connects into the engine wiring harness and each harness has a connector block which attaches to each of the glow plugs for that bank.

The glow plug module receives a battery voltage feed via a 250A megafuse in the BJB and a 100A midi-fuse in the EJB (engine junction box). Operation of the glow plug module is controlled by the ECM, which also controls the

illumination of the glow plug indicator in the instrument cluster.

The system has been designed as a low-voltage glow system. At 7 volts, the nominal voltage of the sheathed-element glow plugs is significantly lower than the 12 volts of the main electrical circuit. The electronic glow plug module matches the voltage to the sheathed-element glow plugs and controls their glow temperature precisely to the specific requirements of the engine. This produces the optimum glow temperature even when the main circuit voltage is interrupted during engine starting. The lower power consumption of the ceramic glow plugs and their time-staggered activation reduce to a minimum the peak load on the main circuit during the cold start and immediate post-start periods.

In the event of glow plug failure, the engine may be difficult to start and excessive smoke emissions may be observed after starting.

---

## GLOW PLUG MODULE

The glow plug module is located in the RH (right-hand) side of the engine compartment. The module is attached to the power steering reservoir bracket with a bolt and nut.

Two connectors are used on the module. One connector receives the power supplies from the battery via the BJB and EJB and also provides for the connections to/from the ECM. The second connector supplies the outputs to the glow plugs.

# GLOW PLUG SYSTEM - TDV6 3.0L DIESEL

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## PRINCIPLES OF OPERATION

For a detailed description of the glow plug system and operation, refer to the relevant Description and Operation section in the workshop manual. REFER to: (303-07B Glow Plug System - TDV6 3.0L Diesel )

[Glow Plug System](#) (Description and Operation),

[Glow Plug System](#) (Description and Operation),

[Glow Plug System](#) (Description and Operation).

---

## 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 electrical damage.

- Glow plug lamp
- Fuses
- Glow plug relays
- Engine management control relay
- Wiring harness(es)
- Electrical connector(s)
- Glow plug(s)
- Engine Control Module (ECM)

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

Poor starting (extreme weather conditions)	<ul style="list-style-type: none"><li>▪ Glow plugs inoperative/inefficient</li><li>▪ Fuel temperature too low</li></ul>	Check the glow plug harnesses at the glow plugs and at the connection to the main harness. Refer to the electrical guides. Check for glow plug DTCs. The fuel system recycles fuel until operating temperature is reached to reduce this possibility.
High cold-engine emissions	<ul style="list-style-type: none"><li>▪ After-glow phase inoperative</li></ul>	Check the glow plug harnesses at the glow plugs and at the connection to the main harness. Refer to the electrical guides. Check for glow plug DTCs. After-glow is designed to function at engine

		temperatures below 50 degrees C (122 degrees F), and below 2,500 rpm.
High cold-engine noise, vibration or harshness	<ul style="list-style-type: none"> <li>After-glow phase inoperative</li> </ul>	Check the glow plug harnesses at the glow plugs and at the connection to the main harness. Refer to the electrical guides. Check for glow plug DTCs. After-glow is designed to function at engine temperatures below 50 degrees C (122 degrees F), and below 2,500 rpm.

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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 - DTC: Engine Control Module 3.0L Tdv6 (PCM) (100-00, Description and Operation).

# GLOW PLUG SYSTEM - TDV6 3.0L DIESEL

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Glow plug	10	-	89

## GLOW PLUG SYSTEM - TDV6 3.0L DIESEL

# GLOW PLUGS [G1272062]



### REMOVAL

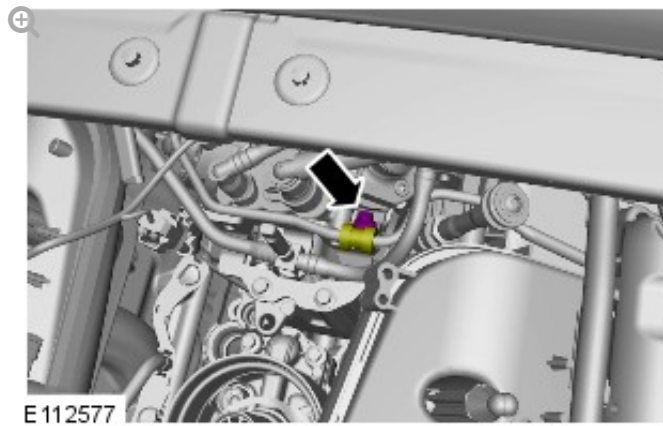
- Removal steps in this procedure may contain installation details.
- Some variation in the illustrations may occur, but the essential information is always correct.

1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Refer to: [Intake Air Shutoff Throttle](#) (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).
3. Refer to: [Crankcase Vent Oil Separator](#) (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).



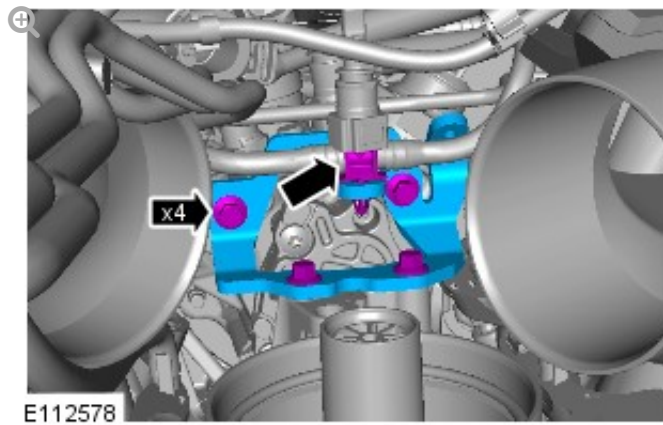
4. Refer to: [Oil Filter Element](#) (303-01A Engine - TDV6 3.0L Diesel, Removal and Installation).

5.



*Torque: 10 Nm*

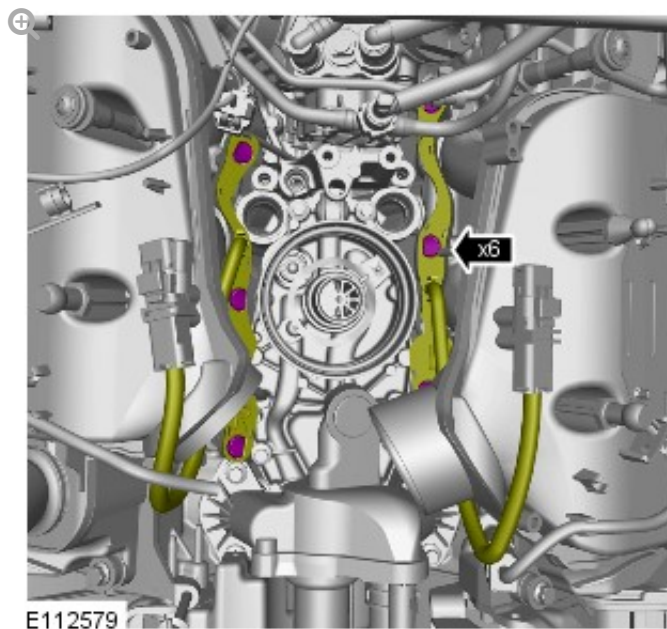
6.



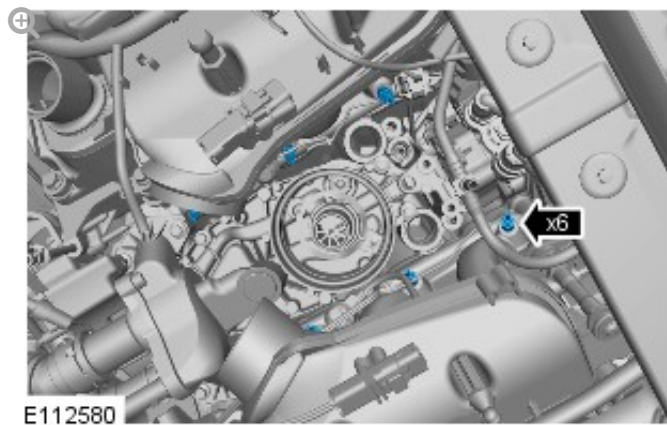
*Torque: 10 Nm*

7.

Take extra care not to damage the component.



8.



*Torque: 10 Nm*

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## INSTALLATION

1. To install, reverse the removal procedure.

# INTAKE AIR DISTRIBUTION AND FILTERING - TDV6 3.0L DIESEL

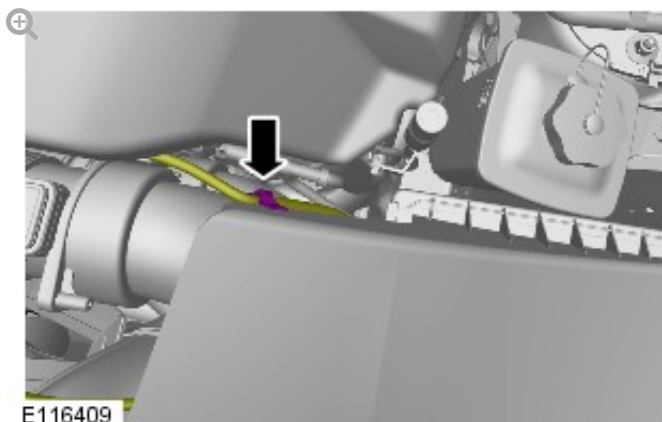
## AIR CLEANER [G1085473]



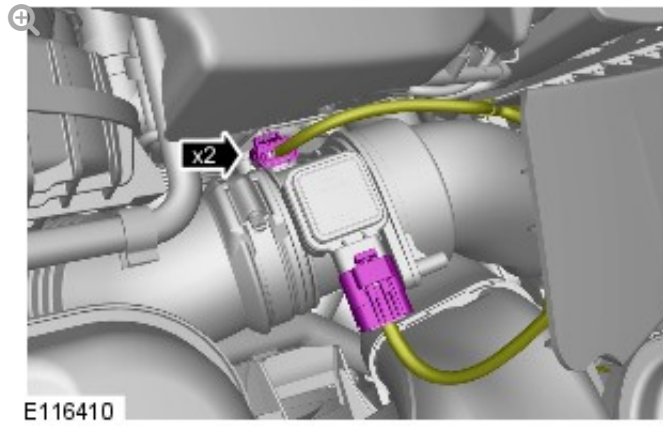
### REMOVAL

Removal steps in this procedure may contain installation details.

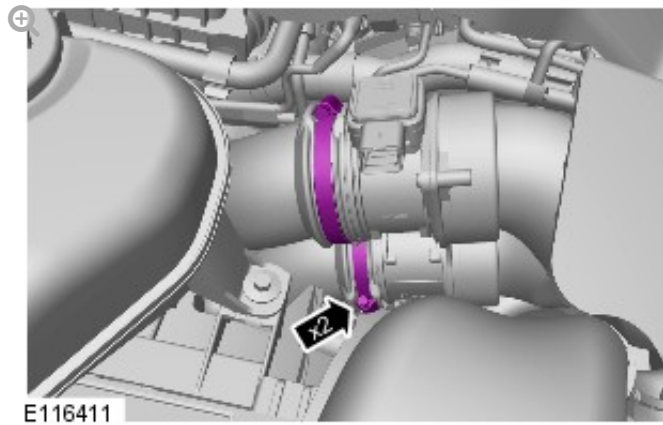
1.



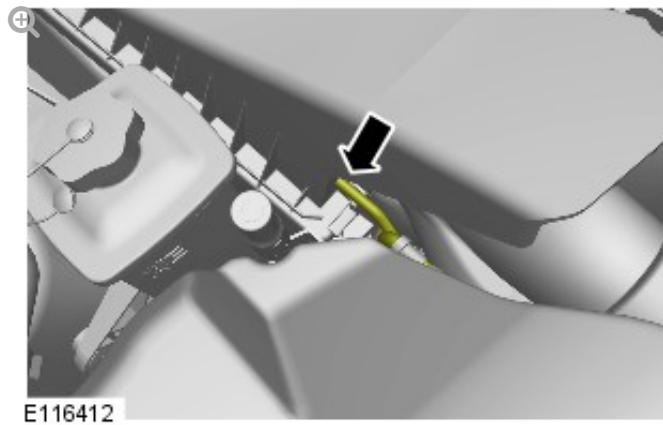
2.



3.

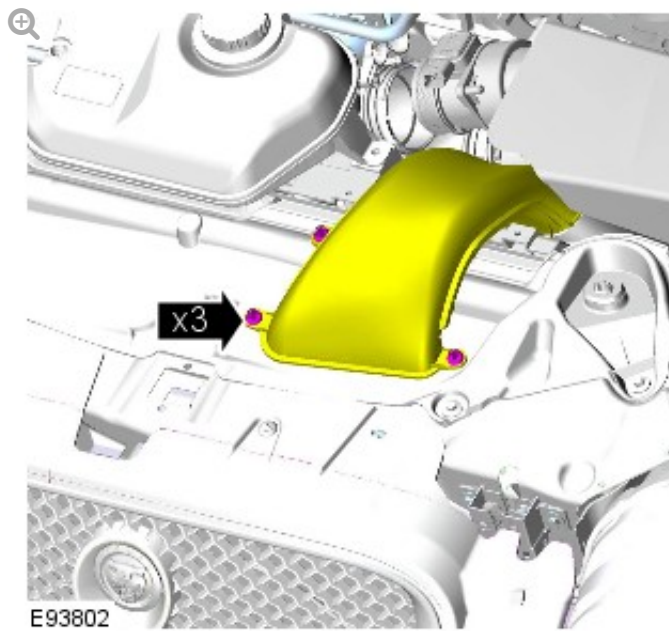


4.

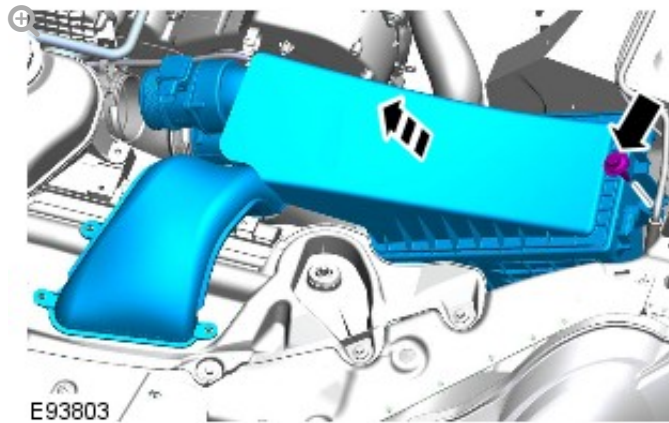


5.

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



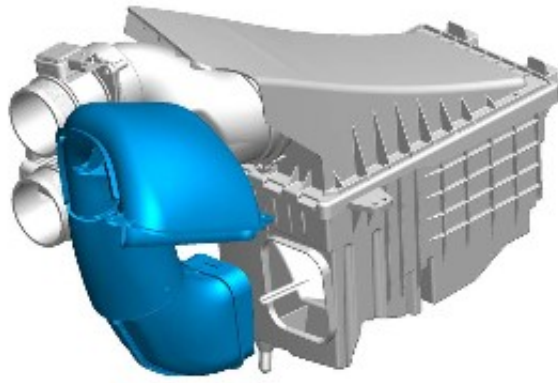
6.



*Torque: 8 Nm*

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

8.



E93804

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## INSTALLATION

1. To install, reverse the removal procedure.

## INTAKE AIR DISTRIBUTION AND FILTERING - TDV6 3.0L DIESEL

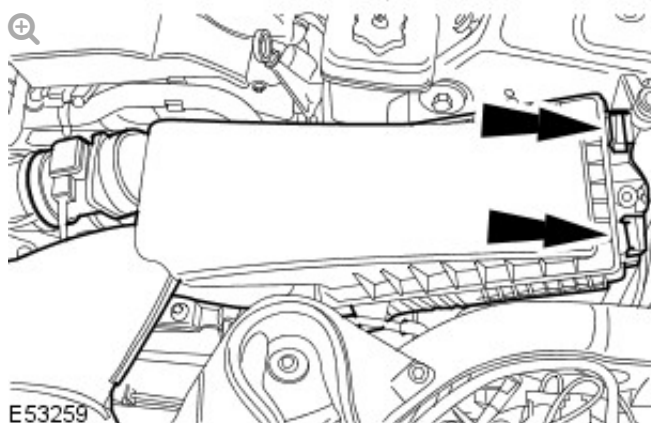
# AIR CLEANER ELEMENT [G989263]



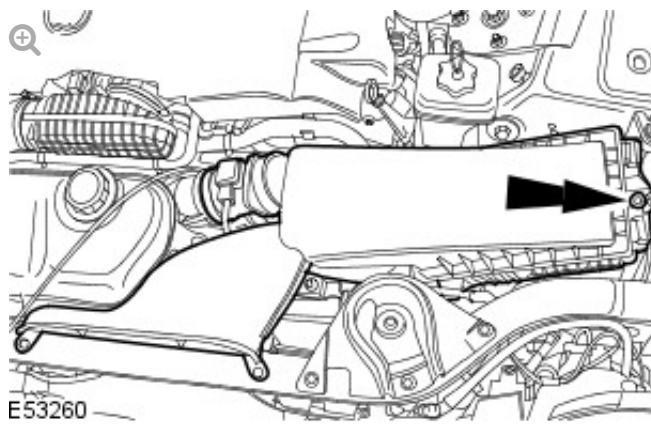
### REMOVAL

Removal steps in this procedure may contain installation details.

1.

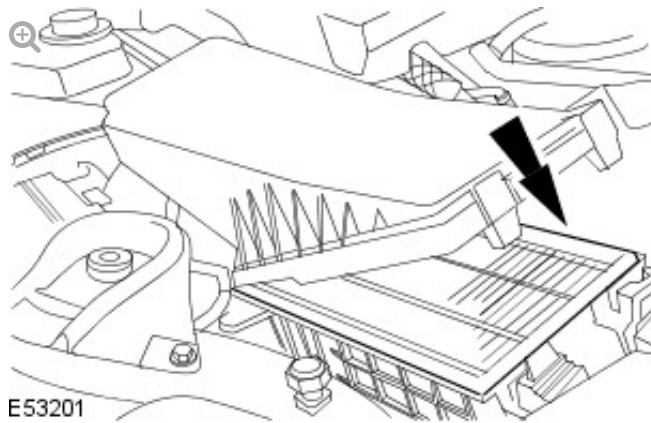


2.



TORQUE: 8 Nm

3.



## INSTALLATION

1. To install, reverse the removal procedure.



# INTAKE AIR DISTRIBUTION AND FILTERING - TDV6 3.0L DIESEL

## CHARGE AIR COOLER<sup>[G1269347]</sup>



### REMOVAL

Removal steps in this procedure may contain installation details.

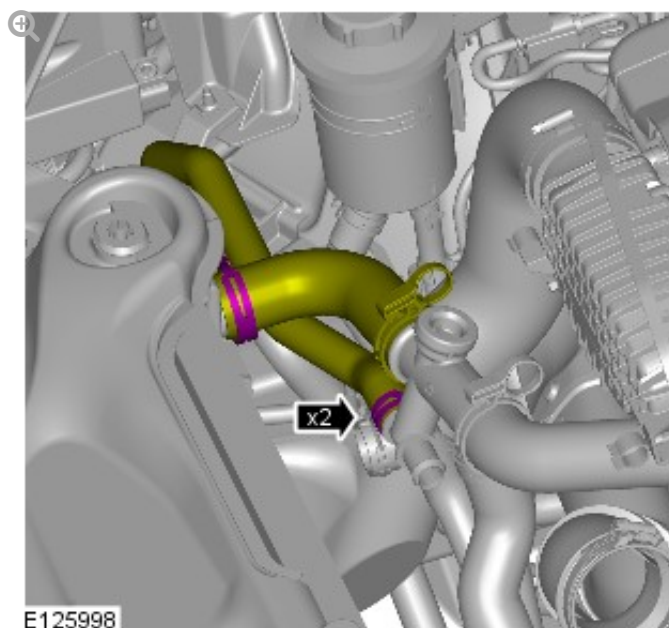
1.

Make sure to support the vehicle with axle stands.

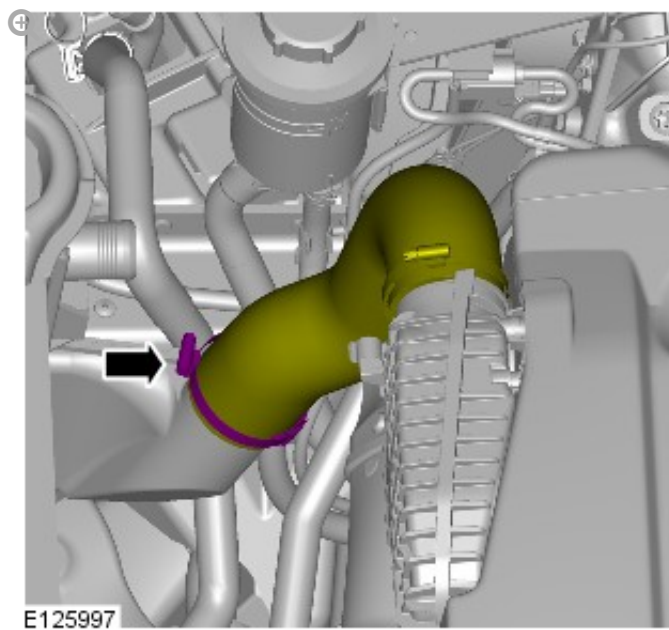
Raise and support the vehicle.

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-

4.

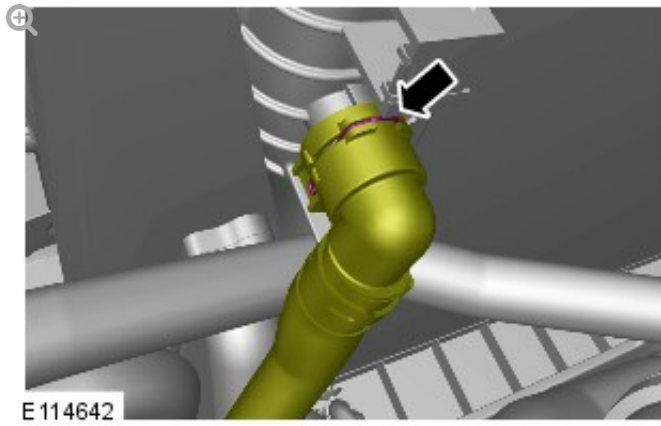


5.

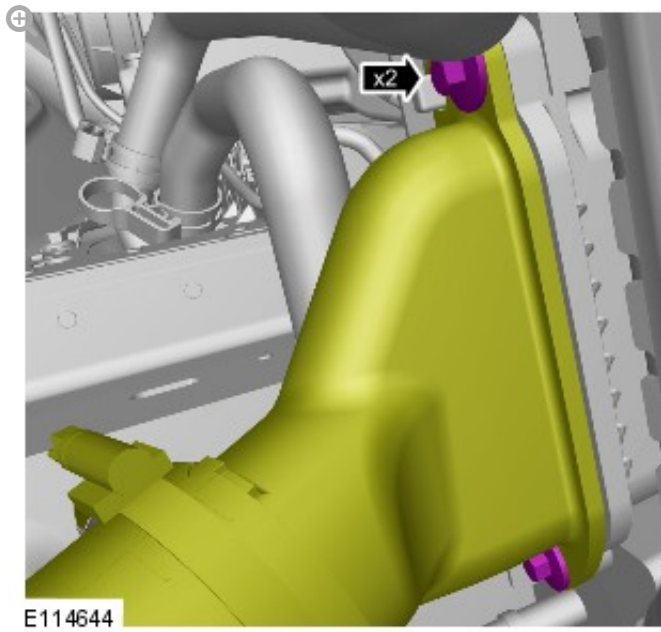


*Torque:* **4.5 Nm**

6.



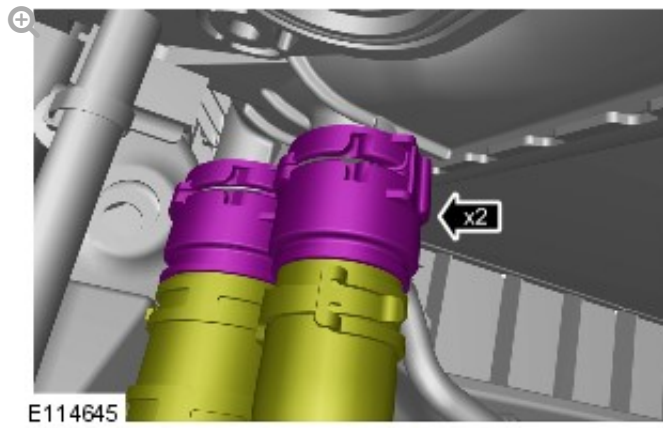
7.



*Torque: 7 Nm*

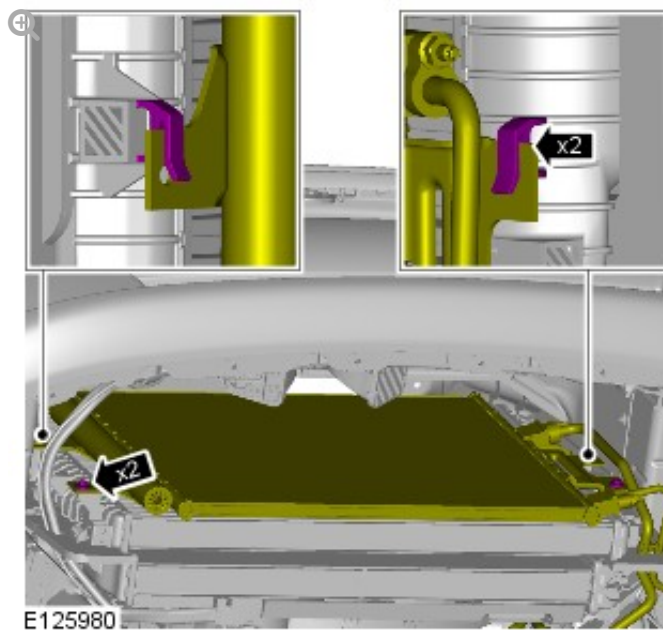
8.

Be prepared to collect escaping coolant.



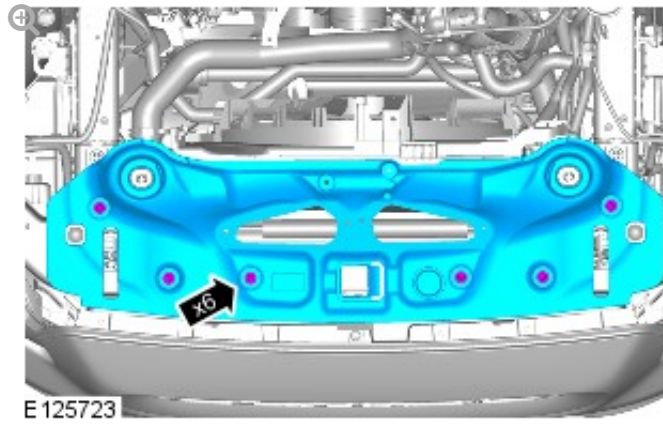
9.

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



*Torque: 7 Nm*

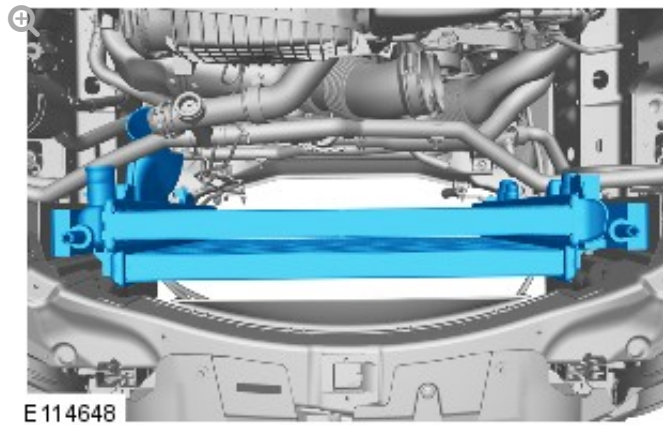
10.



*Torque: 9 Nm*

11.

Be prepared to collect escaping coolant.



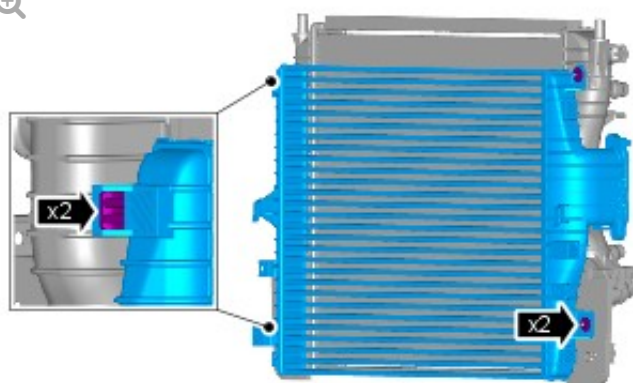
12.

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



E114649

13.



E126014

*Torque: 7 Nm*

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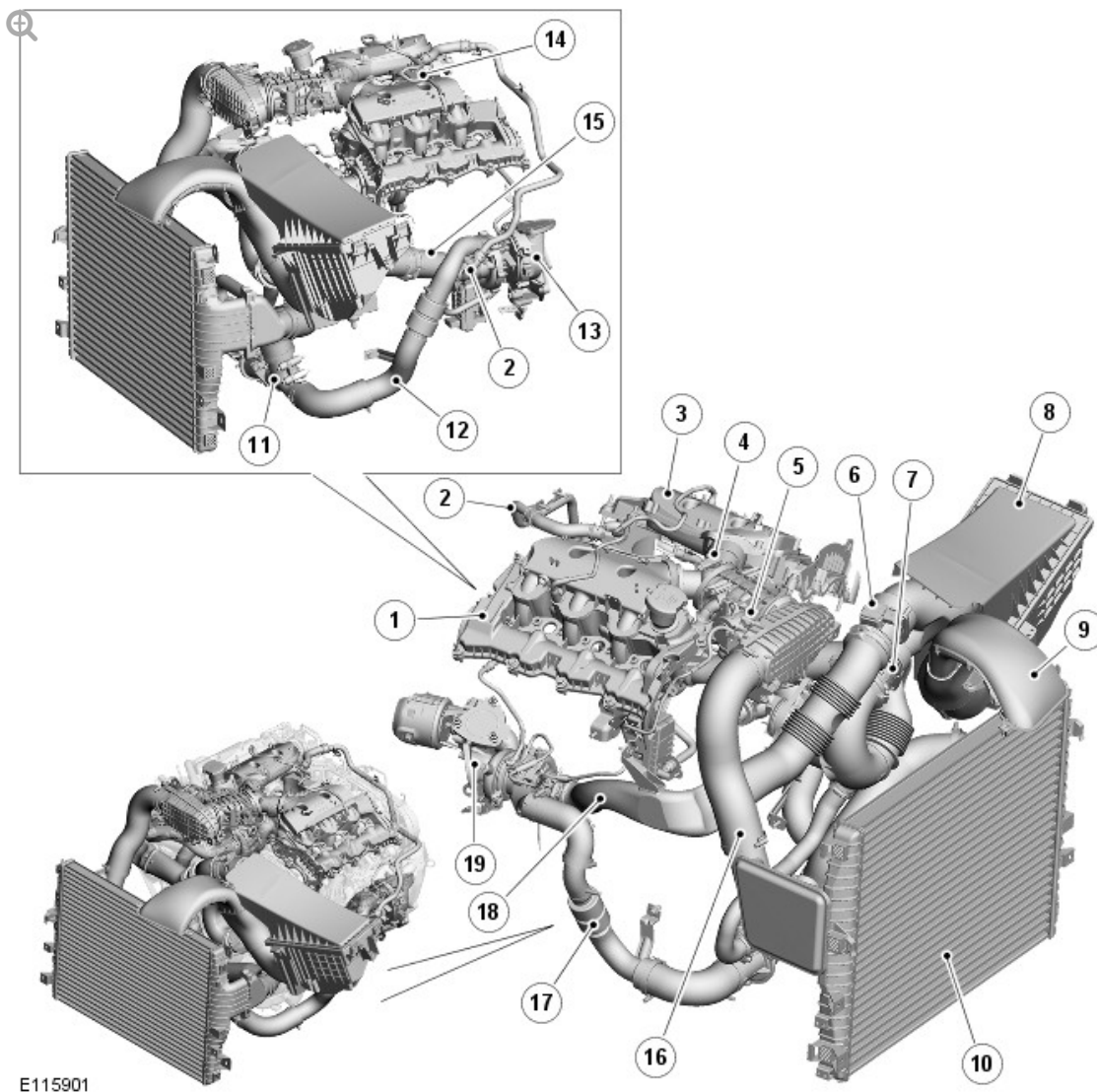
## INSTALLATION

1. To install, reverse the removal procedure.

**INTAKE AIR DISTRIBUTION AND  
FILTERING - TDV6 3.0L DIESEL**

**INTAKE AIR DISTRIBUTION  
AND FILTERING - TDV6 3.0L  
DIESEL - COMPONENT  
LOCATION**[G1245420]

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E115901

1	RH (right-hand) intake manifold
2	Crankcase gas to clean air intake pipe
3	LH (left-hand) intake manifold
4	Charge air MAPT (manifold absolute pressure and temperature) sensor
5	Intake manifold throttle actuator
6	MAF (mass air flow) sensor (secondary turbocharger)
7	MAF / IAT (intake air temperature) sensor (primary turbocharger)
8	Air cleaner housing
9	Air intake scoop
10	Charge air cooler



11	Turbocharger inlet valve assembly
12	Pipe - Compressed air from primary turbocharger to charge air cooler
13	Primary turbocharger
14	Crankcase breather and separator
15	Intake air to primary turbocharger pipe
16	Charge air cooler to throttle intake manifold pipe
17	Pipe - Compressed air from secondary turbocharger to charge air cooler
18	Intake air to secondary turbocharger pipe
19	Secondary turbocharger

# INTAKE AIR DISTRIBUTION AND FILTERING - TDV6 3.0L DIESEL

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## 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 in the workshop manual. REFER to: (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel )

[Intake Air Distribution and Filtering - TDV6 3.0L Diesel](#) (Description and Operation),

[Intake Air Distribution and Filtering - TDV6 3.0L Diesel](#) (Description and Operation),

[Intake Air Distribution and Filtering - TDV6 3.0L Diesel](#) (Description and Operation).

## 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>▪ Hoses and ducts condition and installation</li><li>▪ Air cleaner element condition and installation</li><li>▪ Restricted air intake</li><li>▪ Vacuum hoses condition and installation</li><li>▪ Pipework to turbocharger condition and installation</li><li>▪ Turbocharger condition and installation</li><li>▪ Charge air coolers</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>▪ Mass Air Flow (MAF) sensor</li><li>▪ Air Charge Temperature (ACT) sensor</li><li>▪ Manifold absolute pressure (MAP) sensor</li><li>▪ Intake Air Temperature (IAT) sensor</li><li>Intake air shut-off throttle solenoid</li></ul>

If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index.

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## SYMPTOM CHART


Vehicle does not start/hard starting	<ul style="list-style-type: none"> <li>▪ Restricted/Blocked air intake</li> <li>▪ Restricted/Blocked air cleaner element</li> </ul>	Clear the restriction. Replace the air cleaner element as necessary.
Poor performance	<ul style="list-style-type: none"> <li>▪ Turbocharger fault</li> <li>▪ Throttle body fault</li> <li>▪ Intercooler hoses</li> </ul>	Check the turbocharger. Check the intake air shutoff throttle function (make sure the throttle body returns to the open position). Check the intercooler hoses.
Excessive intake noise	<ul style="list-style-type: none"> <li>▪ Intake air leak after the turbocharger</li> <li>▪ Intake pipe disconnected/damaged after the air cleaner</li> <li>▪ Air cleaner assembly incorrectly assembled/damaged</li> </ul>	Check the joint between the air intake elbow and the intake air shutoff throttle. Check the joints between the throttle body outlets and the intake manifolds. Check the charge air cooler seals. Check the intake system and hoses for correct installation/damage.

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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 - DTC: Engine Control Module 3.0L Tdv6 (PCM) (100-00, Description and Operation).

# INTAKE AIR DISTRIBUTION AND FILTERING - TDV6 3.0L DIESEL

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Air cleaner housing retaining bolt	8	-	71
Charge air cooler to radiator retaining bolts	7	-	62

## INTAKE AIR DISTRIBUTION AND FILTERING - TDV6 3.0L DIESEL

# INTAKE AIR DISTRIBUTION AND FILTERING - TDV6 3.0L DIESEL - OVERVIEW [G1245421]

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### OVERVIEW

The intake air distribution and filtering system comprises:

- Two MAF (mass air flow) / IAT (intake air temperature) sensor
- Charge air temperature sensor
- Air cleaner and housing
- Charge air cooler
- Primary and secondary turbochargers.

The system cleans, cools and compresses the intake air. The turbochargers compress the air which is then cooled in the charge air cooler before being mixed with the injected fuel in the cylinder producing a high energy combustion increasing engine performance.

## INTAKE AIR DISTRIBUTION AND FILTERING - TDV6 3.0L DIESEL

# INTAKE AIR DISTRIBUTION AND FILTERING - TDV6 3.0L DIESEL - SYSTEM OPERATION AND COMPONENT DESCRIPTION [G1245422]

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### SYSTEM OPERATION

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### OPERATION

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Air is drawn into the air intake system via the air intake scoop located at the front of the vehicle. The air passes into the air cleaner housing and passes through the air cleaner. The air cleaner is a pleated, paper type filter which removes dust, pollen etc. from the intake air.

The filtered clean air passes from the air cleaner housing to the turbocharger inlet valve assembly. Depending on engine load and operating conditions, the intake air can be passed to only the primary turbocharger or to both the primary and secondary turbochargers.

Exhaust gasses leaving the exhaust manifolds are used to drive a turbine in the turbocharger which in turn drives a compressor. The rotational speed of the compressor is directly related to the speed of the exhaust gasses leaving the engine. Increased exhaust gas emission drives the turbine, and

subsequently the compressor, faster, further compressing the intake air delivered to the engine.

The compression of the air by the turbocharger also heats the air which increases the air volume (density). The intake air is passed into the charge air cooler which reduces the air temperature as it passes through the cooler. This in turn decreases the air volume allowing more air molecules to be passed into the cylinders. The cooled and compressed air is mixed with the injected fuel in the cylinder producing a high energy combustion increasing engine performance.

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### COMPONENT DESCRIPTION

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#### DESCRIPTION

The air cleaner housing is located in the front LH (left-hand) side of the engine compartment. The housing has a water drain with a grommet which is located in a hole in the LH chassis longitudinal structure. A bolt secures the air cleaner housing to a captive nut in a bracket on the LH inner fender.

The air cleaner element is a pleated paper type element with an rubber seal around its perimeter. The seal locates in a groove in the housing and prevents air by-passing the element. The housing upper lid can be removed by pulling back 2 plastic clips to release the lid.

The charge air cooler is located at the front of the engine compartment, between the A/C (air conditioning) condenser and the engine cooling radiator.

Turbochargers are designed to force more air mass into the engine intake manifold and combustion chambers. This compression process by the turbocharger produces heat which can reduce the performance gains of



turbocharging due to reduced density of the intake air and an increase the cylinder combustion temperature. To counteract this the charge air cooler is used to reduce the intake air temperature which increases the density of the air allowing more air molecules to be delivered to the combustion chamber.

The cooler is a cross flow type cooler and has inlet and outlet connections. The LH connection is the inlet for the compressed air deliver from the turbocharger compressors. The RH (right-hand) connection is the outlet for the cooled compressed air to be delivered to the throttle intake manifold.

The charge air cooler is an air-to-air type cooler. Heated air from the turbochargers is passed through tubes in the cooler. Ambient air passing over the tubes cools the intake air as it passes through the cooler.

The air intake components comprise 3 main components; airbox, intake manifolds and a throttle intake manifold.

## **Airbox**

The airbox allows for the connection of the cooled intake air from the charge air cooler to the throttle intake manifold. The airbox houses a charge air temperature sensor which measures the temperature of the air entering the combustion chambers and passes this information to the ECM (engine control module).

Refer to: [Electronic Engine Controls](#) (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

A single pipe from the airbox connects to the secondary turbocharger. Boost pressure is applied via this pipe to the turbine shaft of the secondary turbocharger to maintain the correct lubrication of the turbocharger during driving conditions where the secondary turbocharger is inactive.

## **Throttle Intake Manifold**

The throttle intake manifold is located between the 2 intake manifolds and the

airbox. The manifold splits the air entering the engine between the 2 intake manifolds.

The throttle intake manifold houses a DC electric throttle actuator which controls a flap in the body of the manifold. The flap is controlled by the ECM and is constantly adjusted in response to driver inputs via the throttle pedal to precisely control the amount of air allowed into the intake manifolds.

Refer to: [Electronic Engine Controls](#) (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

Pipe connections on either side of the throttle intake manifold allow for the attachment of the exhaust gas outlet pipes from the EGR (exhaust gas recirculation) valves

Refer to: [Engine Emission Control](#) (303-08A Engine Emission Control - TDV6 3.0L Diesel, Description and Operation).

A boost pressure sensor is located on the top of the manifold where the air flow splits for the 2 intake manifolds. The pressure sensor measures the pressure of the intake air as delivered from the one or both of the turbochargers and passes this information to the ECM for turbocharger control.

Refer to: [Electronic Engine Controls](#) (303-14A Electronic Engine Controls - TDV6 3.0L Diesel, Description and Operation).

## **Intake Manifolds**

The intake manifolds are an integral part of the cylinder head covers. Each intake manifold is connected to the throttle intake manifold via a push fit, sealed connection. The intake manifolds direct intake air to the inlet valves for each combustion chamber.

# STARTING SYSTEM - TDV6 3.0L DIESEL

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## PRINCIPLES OF OPERATION

For information on the operation of the system, refer to the relevant workshop manual section. REFER to: (303-06A)

Starting System (Description and Operation),  
Starting System (Description and Operation),  
Starting System (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>▪ Starter motor</li><li>▪ Engine (turns freely)</li></ul>	<ul style="list-style-type: none"><li>▪ Battery</li><li>▪ Fuses</li><li>▪ Starter relay</li><li>▪ Wiring harness(s)</li><li>▪ Damaged, loose or corroded connectors</li><li>▪ Ignition switch</li><li>▪ Generator</li><li>▪ Transmission Control Module (TCM)</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

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

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## SYMPTOM CHART

The engine does not crank (starter	<ul style="list-style-type: none"><li>▪ Gear selector not in <b>P</b> or <b>N</b> position (vehicles with automatic</li></ul>	Make sure the gear selector is in the <b>P</b> or <b>N</b> position and correctly adjusted. Check the battery condition and state of charge. Check for DTCs indicating an immobilizer fault. Check the starter motor relay,

motor does <b>not</b> turn)	<ul style="list-style-type: none"> <li>transmission)</li> <li>▪ Battery</li> <li>▪ Starter relay</li> <li>▪ Invalid key code received by Central Junction Box (CJB)</li> <li>▪ Harness/Connectors</li> <li>▪ Starter motor</li> <li>▪ Ignition switch</li> <li>▪ Generator</li> <li>▪ Transmission Control Module (TCM)</li> <li>▪ Engine Control Module (ECM)</li> <li>▪ Engine seized</li> </ul>	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 <b>does</b> turn)	<ul style="list-style-type: none"> <li>▪ Starter motor installation</li> <li>▪ Starter motor</li> <li>▪ Flywheel/Drive plate ring gear</li> </ul>	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.
Engine cranks too slowly	<ul style="list-style-type: none"> <li>▪ Battery</li> <li>▪ Harness/Connectors</li> <li>▪ Starter motor</li> <li>▪ Oil grade</li> </ul>	Check the battery condition and state of charge. Check the starter motor circuits. Refer to the electrical guides. Check the engine oil grade and condition.
Engine cranks too fast	<ul style="list-style-type: none"> <li>▪ Low engine compression</li> </ul>	Check the engine compressions.
Excessive starter motor noise	<ul style="list-style-type: none"> <li>▪ Starter motor</li> <li>▪ Flywheel/Drive plate ring gear</li> <li>▪ Starter motor installation/casing</li> </ul>	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 on this vehicle, please refer to Section 100-00.

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

# STARTING SYSTEM - TDV6

## 3.0L DIESEL

Starter motor to oil pan bolts	47	35	-
Battery positive terminal integral connector retaining nut	10	7	-
Solenoid terminal integral connector nut	7	-	62

# STARTING SYSTEM - TDV6 3.0L DIESEL STARTER MOTOR [G1272116]



## REMOVAL

Removal steps in this procedure may contain installation details.

1.

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

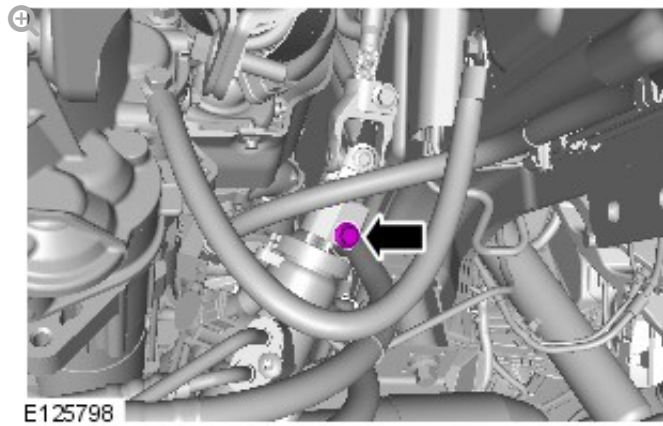
Raise and support the vehicle.

2. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).



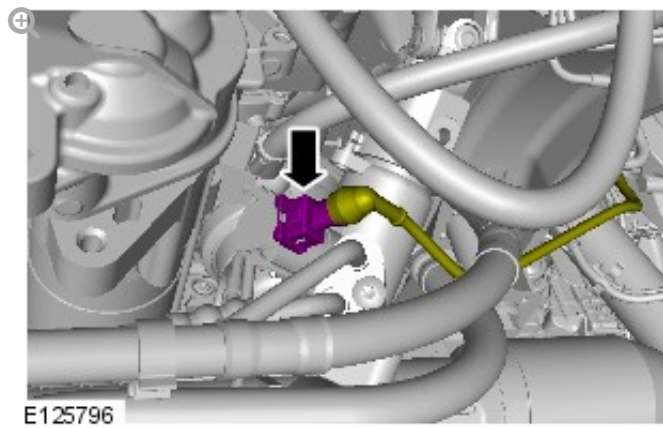
3.

Note the fitted position of the component prior to removal.



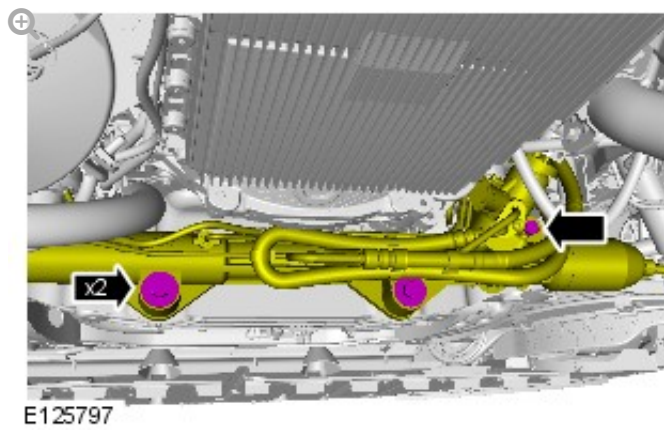
*Torque: 35 Nm*

4.



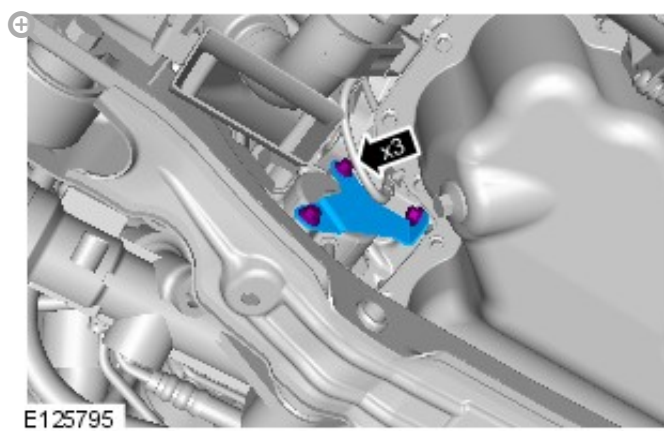
5.

Support as necessary.



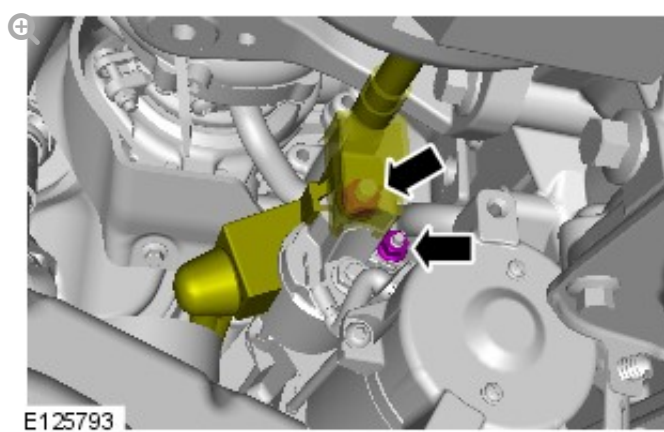
*Torque:* **100 Nm**

6.



*Torque:* **47 Nm**

7.



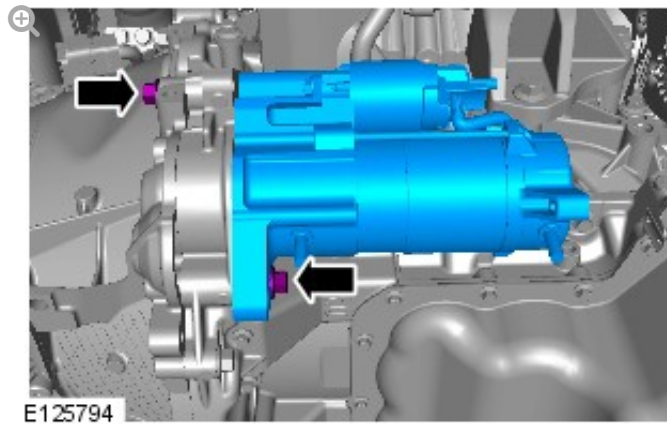
*Torque:*

**M8 10 Nm**

**M6 7 Nm**

8.

Engine shown removed for clarity.



*Torque:* **47 Nm**

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## INSTALLATION

1. To install, reverse the removal procedure.

# STARTING SYSTEM - TDV6 3.0L DIESEL

## 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

Verify the customer concern.

Visually inspect for obvious signs of mechanical or electrical damage.

<ul style="list-style-type: none"><li>▪ Steering column</li><li>▪ Brake pedal</li><li>▪ Smart key</li><li>▪ Steering Wheel</li></ul>	<ul style="list-style-type: none"><li>▪ Fuses</li><li>▪ Harnesses and connectors</li><li>▪ Warning lamp operation</li><li>▪ Smart key operation</li><li>▪ Engine start operation</li></ul>
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If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

If the cause is not visually evident, check for Diagnostic Trouble Codes

(DTC's) and refer to the DTC Index.

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.

- 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

- 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

Smart key not found - Refer to handbook	Ignition mode fails to switch on	GO to Pinpoint Test
	Ignition mode fails to switch on	GO to Pinpoint Test

<div>Back up start - 10MY onwards</div>		
Smart key not found - Refer to handbook		
Press start and brake	Engine fails to crank	GO to Pinpoint Test
Steering column locked	Ignition switches off after 3 seconds	GO to Pinpoint Test
<div>For diesel engines</div>	Ambient temperatures below zero	GO to Pinpoint Test
Engine still not cranking		

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## PIN POINT TEST

- 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

	Ensure the smart Key is within the cabin area. Check the smart key is not

	<p>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</p>
	<p>Has the vehicle started?</p> <p>No further action required</p> <p>Check and install a new battery as required. Clear the DTC and retest. If the problem persists, contact dealer technical support</p>

- 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

	<p>On pressing the start button, <b>smart key not found</b>. 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</p>
	<p>Has the vehicle started?</p> <p>No further action required</p> <p>Contact dealer technical support</p>



- 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
- For manual transmission vehicles ensure the clutch is fully depressed
- 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

	Check that there is sufficient brake pressure, (Automatic transmission only). Attempt another start making sure that the brake pedal is pressed firmly so the message is no longer displayed. In certain conditions this may require a more effort than usual
	Has the vehicle started?
	No further action required
	Contact dealer technical support

- 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
- For manual transmission vehicles ensure the clutch is fully depressed
- 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

	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 ( <b>If installed</b> ) by turning the steering wheel. Then unlock the vehicle ensuring the column Steering wheel can turn freely. Now perform another start attempt
	<p>Did the engine start?</p> <p>No further action required</p> <p>Contact dealer technical support</p>

	Hold the start button down for at least 4 seconds while starting the vehicle