

# ENGINE SYSTEM - GENERAL INFORMATION

---

## PRINCIPLES OF OPERATION

As diagnosis of the different areas of the engine is covered in other sections and by general procedures, this section is limited to an oil pressure test.

For a detailed description of the engine system, refer to the relevant Description and Operation section in the workshop manual. REFER to: (303-01A Engine - TDV6 3.0L Diesel )

[Engine](#) (Description and Operation),  
[Engine](#) (Description and Operation),  
[Engine](#) (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 damage.

- Engine oil level
- Coolant level
- Transmission fluid level
- Fuel level
- Coolant leaks
- Oil leaks
- Fuel leaks
- Visibly damaged or worn parts
- Loose or missing nuts or bolts
- Fuel contamination/grade/quality
- Sensor installation/condition
- Viscous fan and solenoid

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.

## ENGINE OIL PRESSURE CHECK

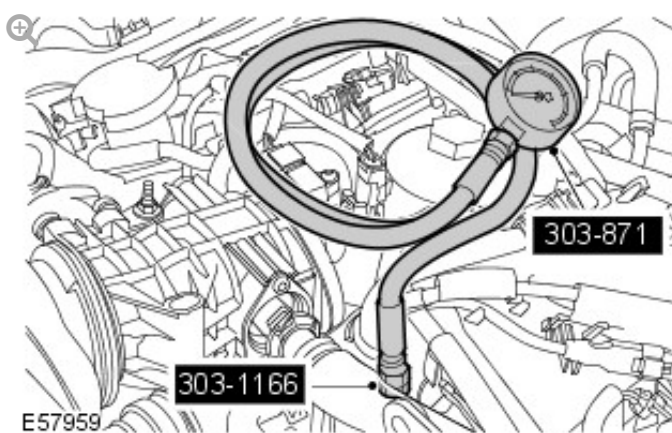
Prior to checking the engine oil pressure, a road test of 6 miles (10 kilometres), must be carried out. Do not attempt to attain engine normal operating temperature by allowing the engine to idle.

- The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.
- Wear protective gloves.

Remove the oil pressure sensor.

Install the special tool to the oil filter housing.

Install the special tool gauge and tighten the union.



Check and top-up the engine oil, if required.

Start and run the engine.

Note the oil pressure readings with the engine running at idle and 3500 RPM.

Turn off the engine.

Remove the special tools.

Install the oil pressure sensor.

Check and top-up the engine oil, if required.

---

## **COMPRESSION TEST**

### **GENERAL REMARKS**

- 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 operating temperature. Refer to section 303-00 General Procedures for further information

## **CHECK THE COMPRESSION PRESSURE**

Move gear selector lever to 'P' position. Failure to follow this instruction may result in personal injury.

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.

Remove the fuel pump relay.

Start the engine - the engine will start, run for a few seconds then stop.

Remove the glow plugs

Install the compression tester with adaptors.

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.

Repeat the test on each cylinder, cranking the engine approximately the same number of compression strokes.

Install the removed components in reverse order, observing the specified tightening torques.

Clear all DTCs from the ECM.

## **INTERPRETATION OF THE RESULTS**

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 minimum cylinder compression reading recorded must be within 10% of the maximum cylinder compression reading recorded.

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).

---

## DTC INDEX

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

## ENGINE SYSTEM - GENERAL INFORMATION

# EXHAUST MANIFOLD CLEANING AND INSPECTION

[G61240]

- 
1. Inspect the cylinder head joining flanges of the exhaust manifold for evidence of exhaust gas leaks.
- 
2. Inspect the exhaust manifold for cracks, damaged gasket surfaces, or other damage that would make it unfit for further use.

## ENGINE SYSTEM - GENERAL INFORMATION

# LEAKAGE TEST USING SMOKE TEST EQUIPMENT

[G1445299]

---

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.

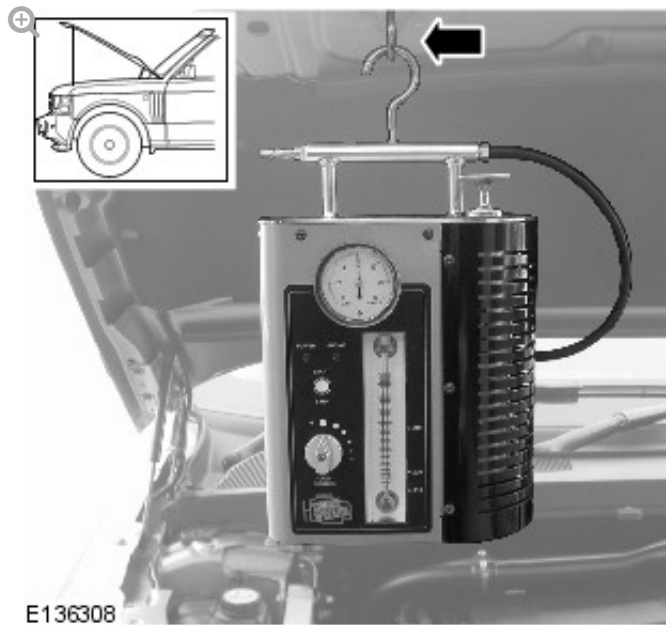


- The vehicle battery must be in good condition and fully charged before carrying out this procedure.
- On vehicles with 3.0L TDV6, it will be necessary to insert smoke at both air cleaner outlet pipes independently if the right hand turbocharger and associated hoses are to be tested.
- In some cases 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.

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.

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.

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.

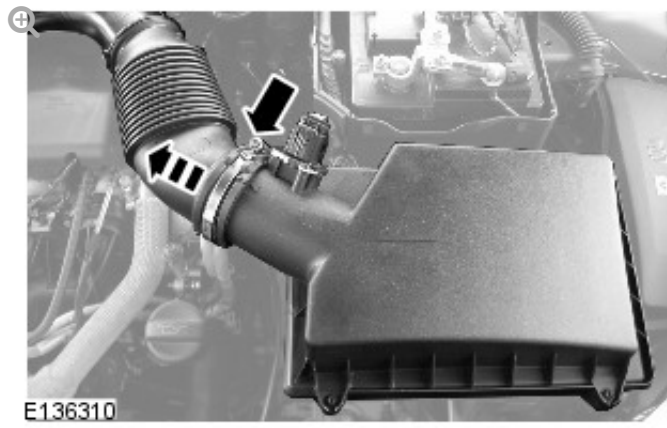


Observe the power indicator lamp on the smoke test equipment. Make sure that a continuous green light is displayed.

---

6.

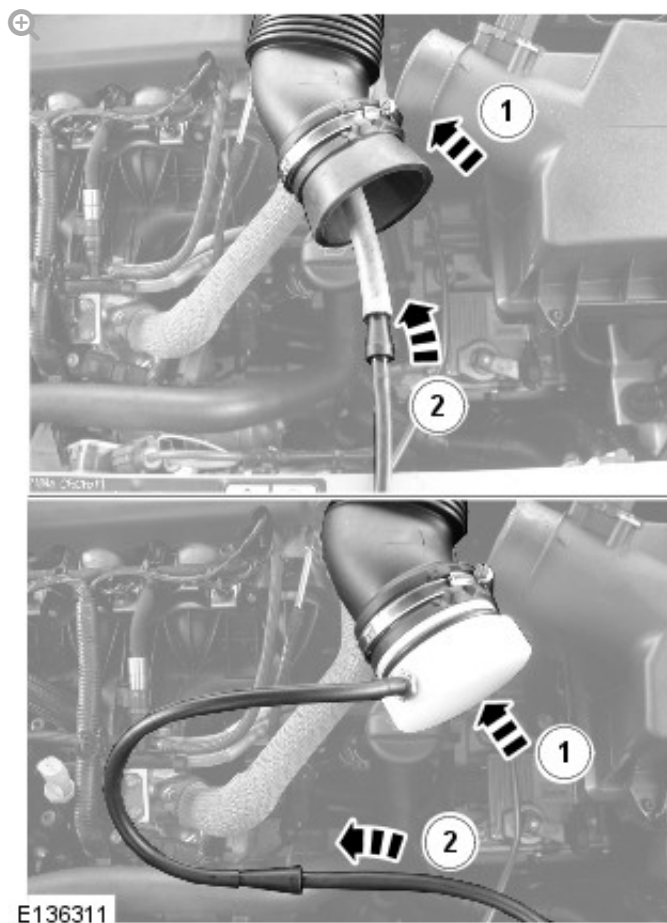
- In some cases it may be necessary to remove the air cleaner(s) to allow access to the air cleaner outlet pipes.
- In some cases it will be necessary to cap one of the air cleaner outlet pipes. Use the blanking caps supplied in the kit to cap the open orifice.



Disconnect the air cleaner outlet pipe(s).

7.

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.

Install the appropriate adapter to the air cleaner outlet pipe.

Connect the smoke test equipment supply hose to the adapter link hose.

---

8.

- 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.

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

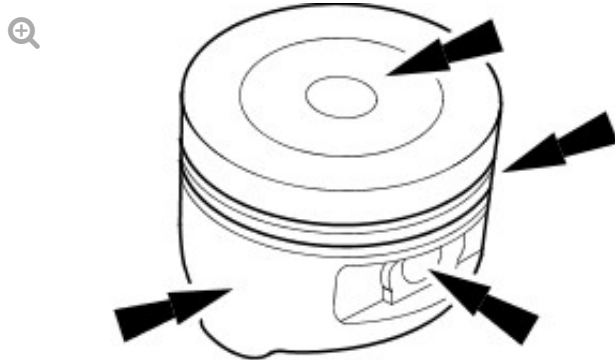
Using the torch supplied in the kit set to white light, look for escaping smoke. Alternatively, use the ultraviolet light to look for fluorescent dye deposits at the source of a leak.

## ENGINE SYSTEM - GENERAL INFORMATION

# PISTON INSPECTION [G61244]

1.

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



VUJ0002233

Carry out a visual inspection.

- Clean the piston skirt, pin bush, ring grooves and crown and check for wear or cracks.
- If there are signs of wear on the piston skirt, check whether the connecting rod is twisted or bent.



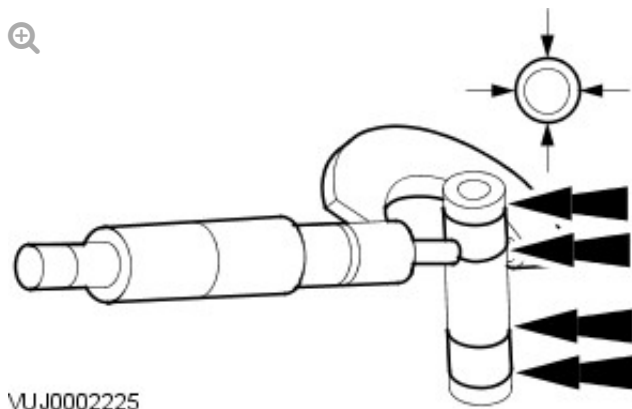


## ENGINE SYSTEM - GENERAL INFORMATION

# PISTON PIN DIAMETER [G61250]

1.

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



Measure the piston pin diameter.

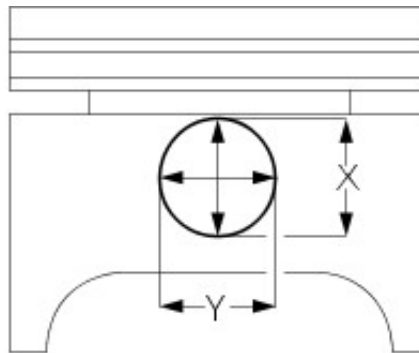
- Measure the diameter in two directions.
- If the values are not to specification, install a new piston and a new piston pin.

## ENGINE SYSTEM - GENERAL INFORMATION

# PISTON PIN TO BORE DIAMETER [G6124-5]

1.

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



VUJ0002232

Measure the diameter of the piston pin bore.

- Measure the diameter in two directions.
- If the values are not to specification, install both a new piston and a new piston pin.

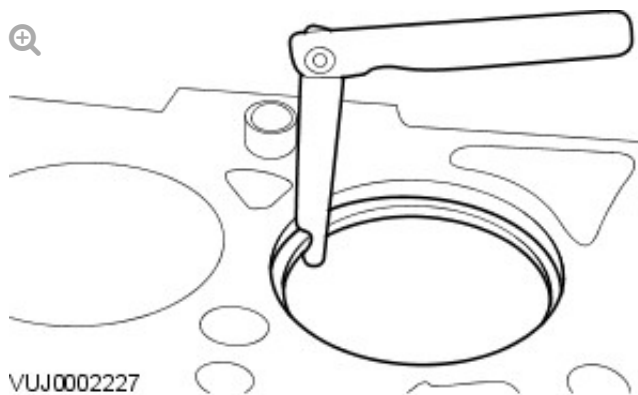


## ENGINE SYSTEM - GENERAL INFORMATION

# PISTON RING END GAP [G61248]

1.

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



Using the Feeler Gauge, measure the piston ring gap.

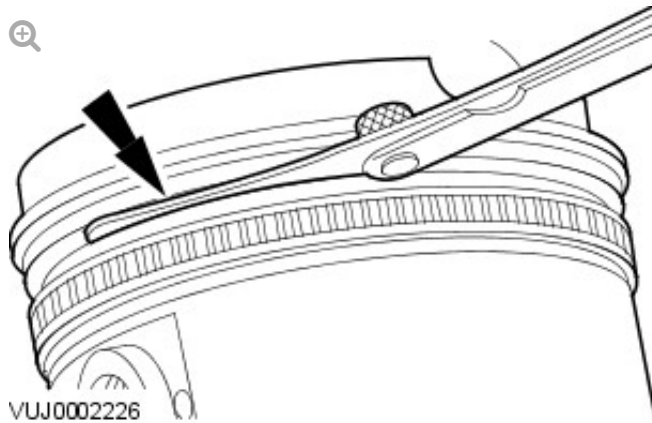
- The values given in the specification refer to a gauge ring used during production.

## ENGINE SYSTEM - GENERAL INFORMATION

# PISTON RING-TO-GROOVE CLEARANCE [G61249]

1.

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



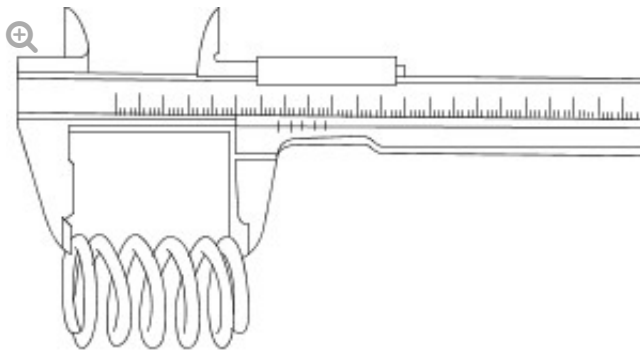
Using the Feeler Gauge, measure the piston ring clearance.

## ENGINE SYSTEM - GENERAL INFORMATION

# VALVE SPRING FREE LENGTH

[G61254]

1.



VUJ0002221

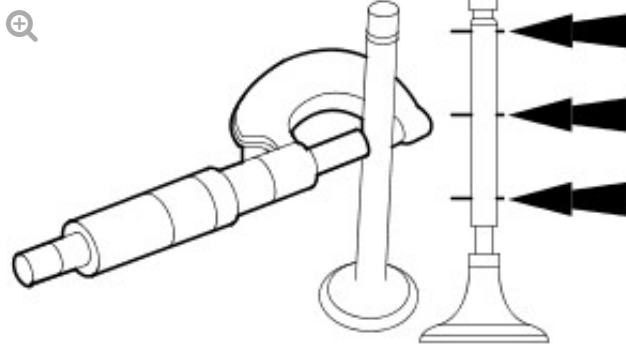
Using a vernier gauge, measure the free length of each valve spring.  
Verify the length is within specification.

## ENGINE SYSTEM - GENERAL INFORMATION

# VALVE STEM DIAMETER<sub>[G61253]</sub>

---

1.



VUJ0002220

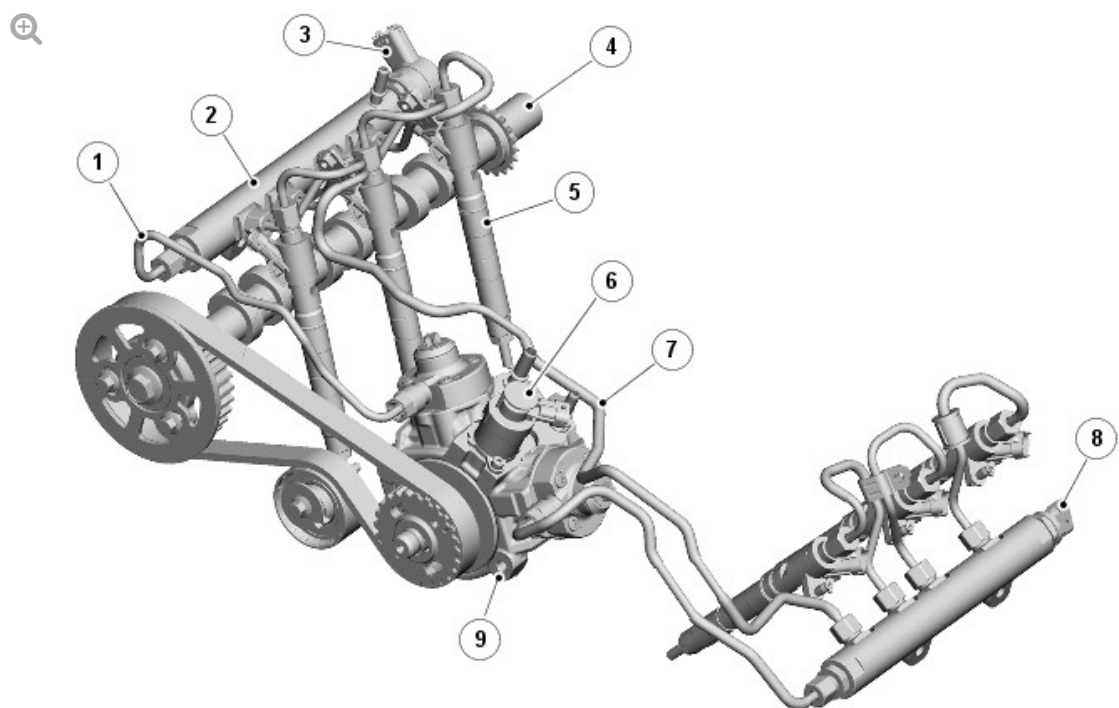
Using a micrometer measure the diameter of the valve stems.

- If the measurements are not to specification, install a new valve.

FUEL CHARGING AND CONTROLS - TDV6  
3.0L DIESEL

FUEL CHARGING AND  
CONTROLS - COMPONENT  
LOCATION [G124537]

---



E107576

1	High pressure fuel supply
2	Common fuel rail
3	Fuel pressure control valve



4	Exhaust camshaft
5	Injectors
6	Volume control valve
7	Fuel rail balance pipe
8	Fuel pressure sensor
9	High pressure fuel pump

**FUEL CHARGING AND CONTROLS - TDV6  
3.0L DIESEL**

**FUEL INJECTION  
COMPONENT CLEANING** [G418572]

---

- Do not carry out any repairs to the fuel system with the engine running. The fuel pressure within the system can be as high as 2000 bar. 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.
- Wait at least 30 seconds after the engine stops before commencing any repair to the high-pressure fuel injection system. Failure to follow this instruction may result in personal injury.
- 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.

- 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 and fresh cleaning fluid, 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.

#### Pneumatic vacuum gun

1. Using a new brush that will not lose its bristles, brush cleaning fluid onto the components being removed and onto the surrounding area.
2. Using a pneumatic vacuum gun, remove all traces of cleaning fluid and foreign material.
3. Dispose of any used cleaning fluid and the brush after completing the repair.

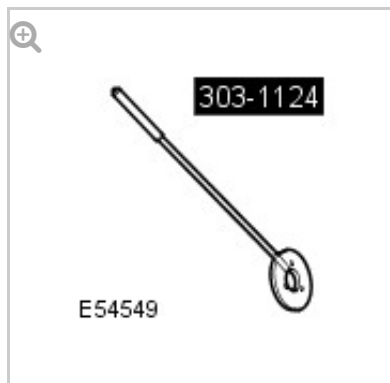


## FUEL CHARGING AND CONTROLS - TDV6 3.0L DIESEL

# FUEL INJECTION PUMP<sup>[G1272057]</sup>

---

### SPECIAL TOOL(S)



### **303-1124**

Holding Tool,  
Camshaft Front  
Pulley

---

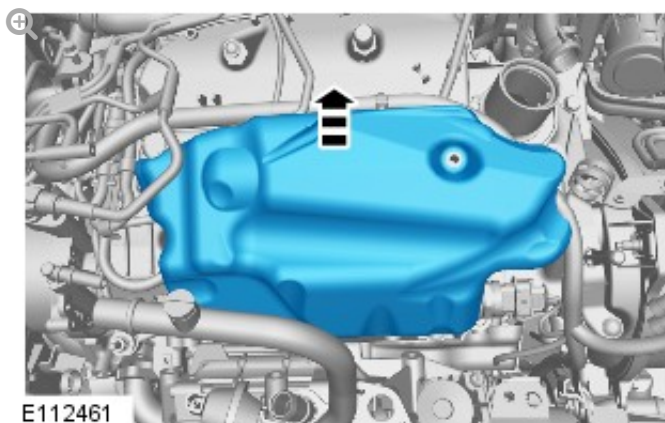
### REMOVAL

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

3.

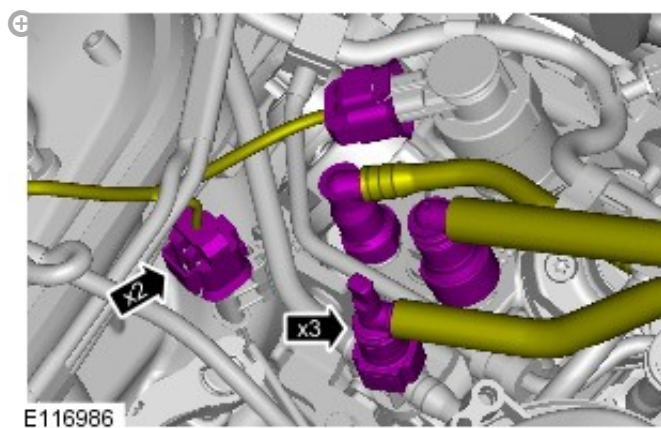
Left-hand shown, right-hand similar.



4. Refer to: [Fuel Injection Component Cleaning](#) (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, General Procedures).
5. Refer to: [Fuel Injection Pump Pulley](#) (303-05A Accessory Drive - TDV6 3.0L Diesel, Removal and Installation).
6. Refer to: [Crankcase Vent Oil Separator](#) (303-08A Engine Emission

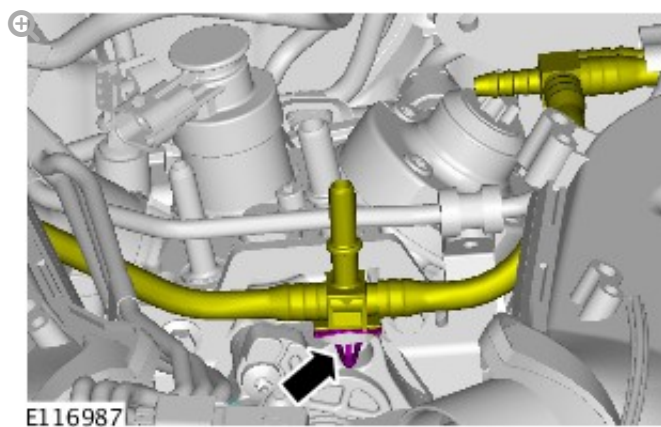
7.

Be prepared to collect escaping fuel.



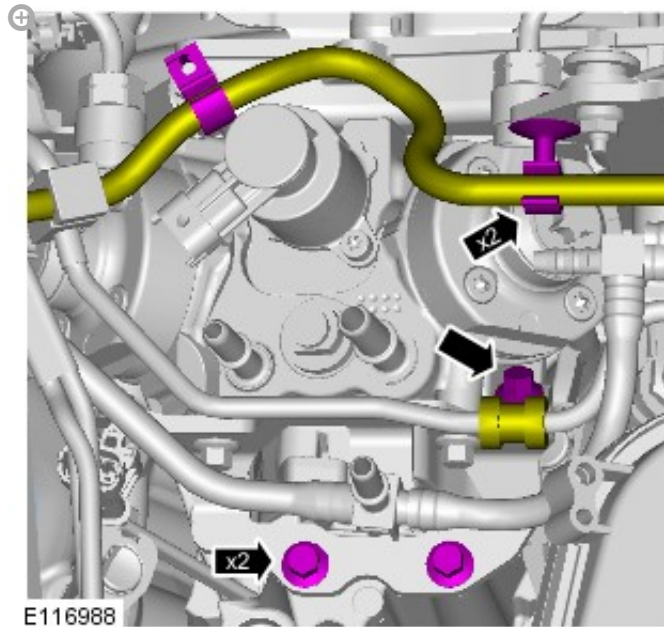
8.

Be prepared to collect escaping fuel.





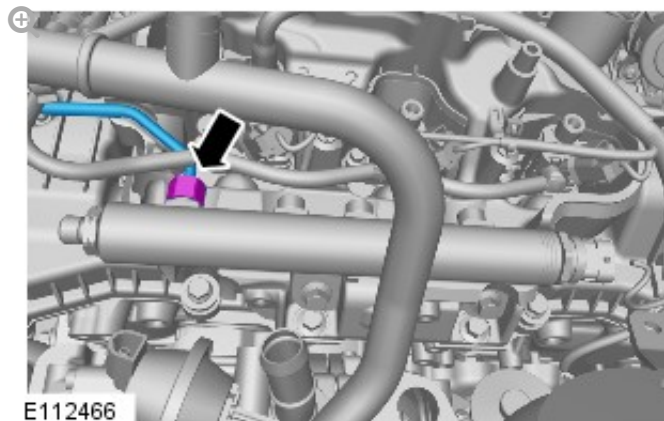
9.



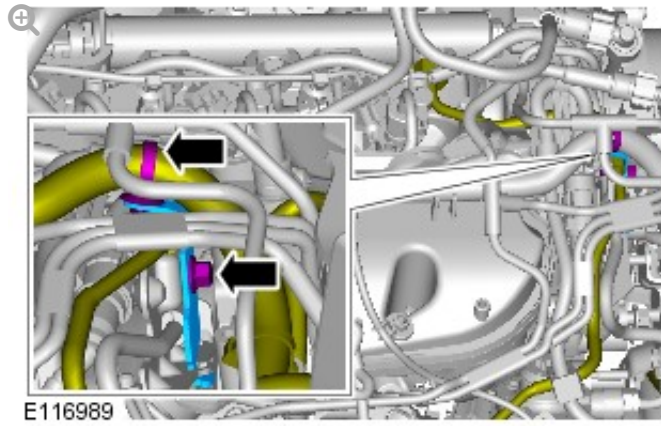
10.

- Be prepared to collect escaping fuel.
- Discard the component.

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

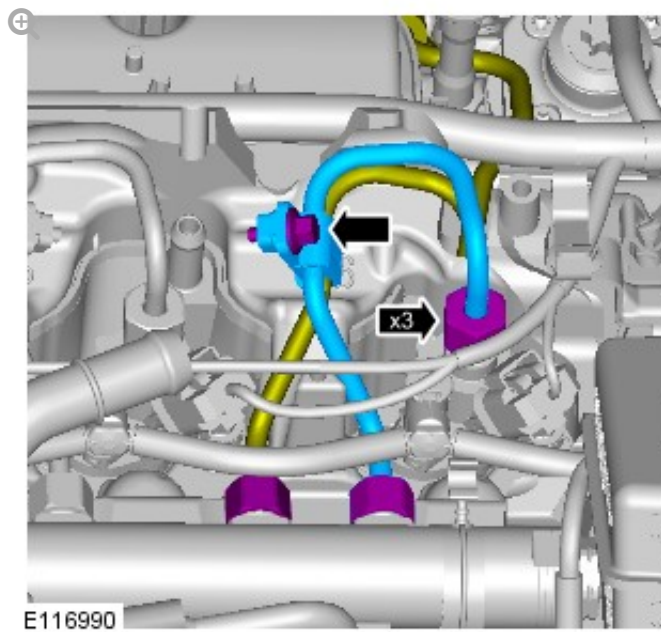


11.



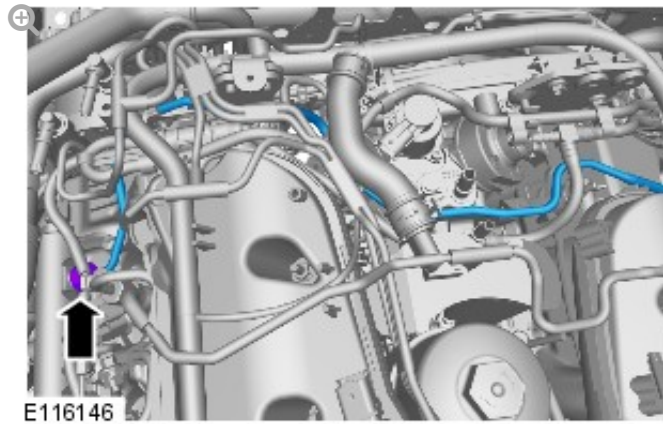
12.

- Be prepared to collect escaping fuel.
- Discard the component.



13.

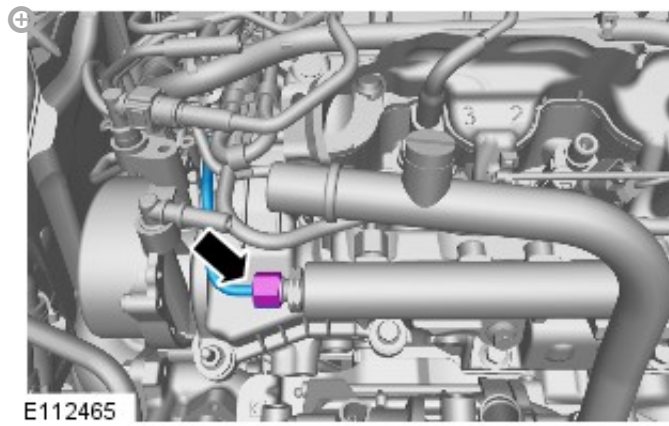
- Be prepared to collect escaping fuel.
- Discard the component.



14.

Be prepared to collect escaping fuel.

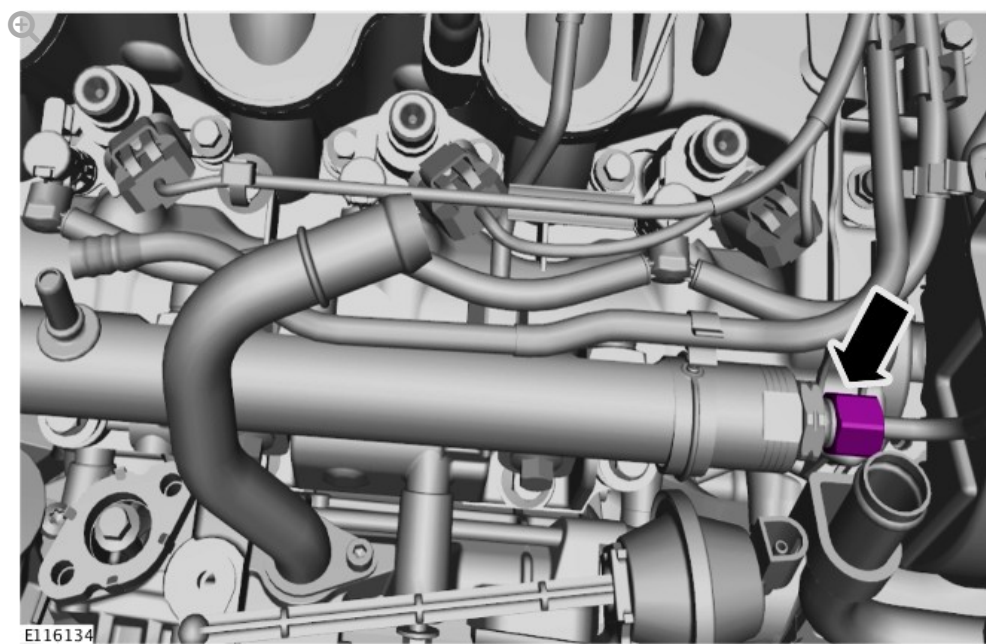
Some variation in the illustrations may occur, but the essential information is always correct.



15.

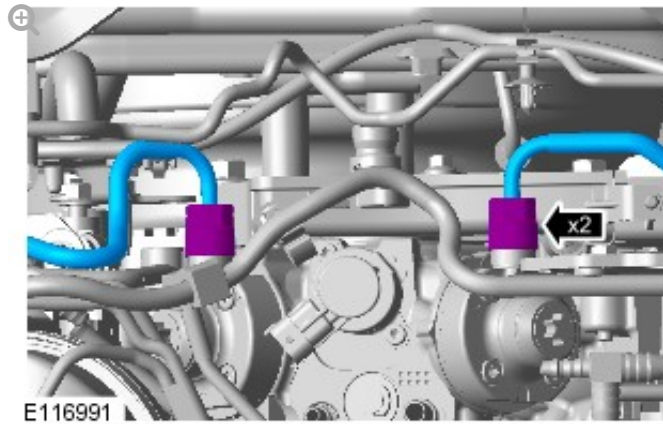
Be prepared to collect escaping fuel.

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

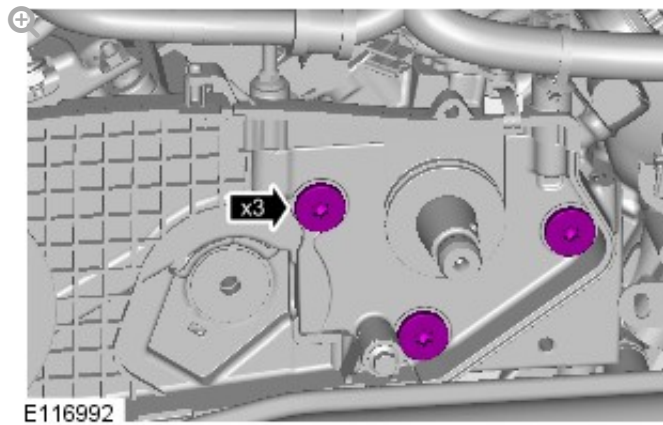


16.

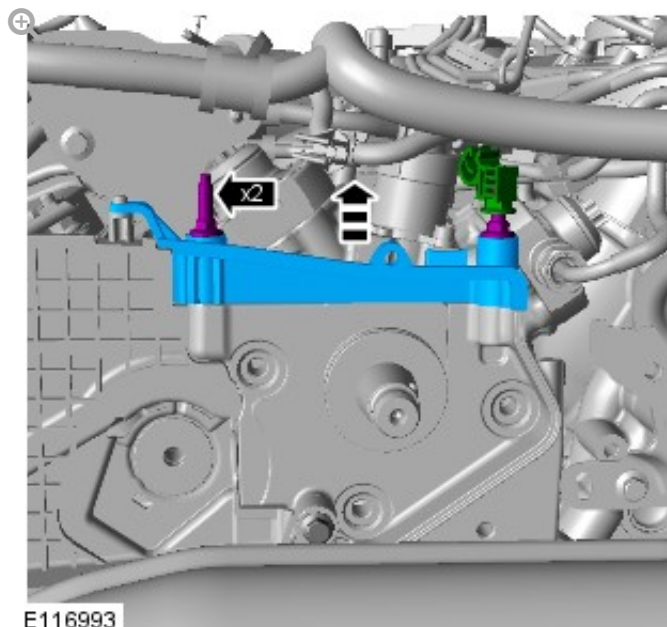
- Be prepared to collect escaping fuel.
- Discard the components.



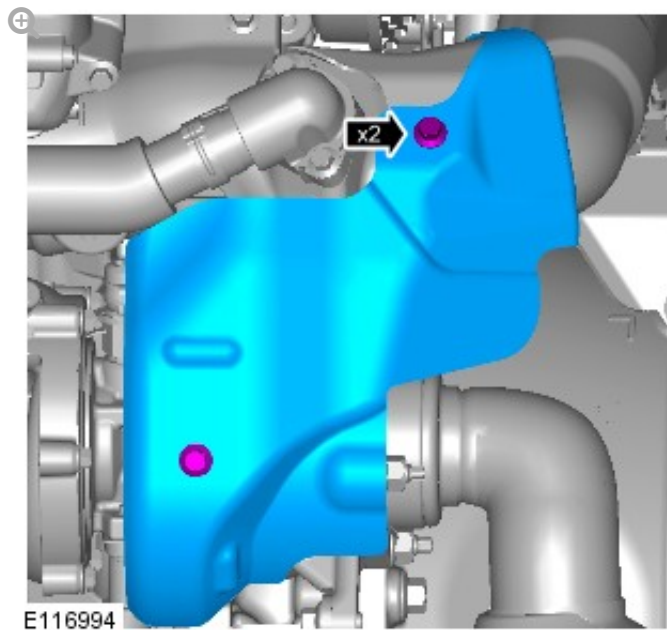
17.



18.

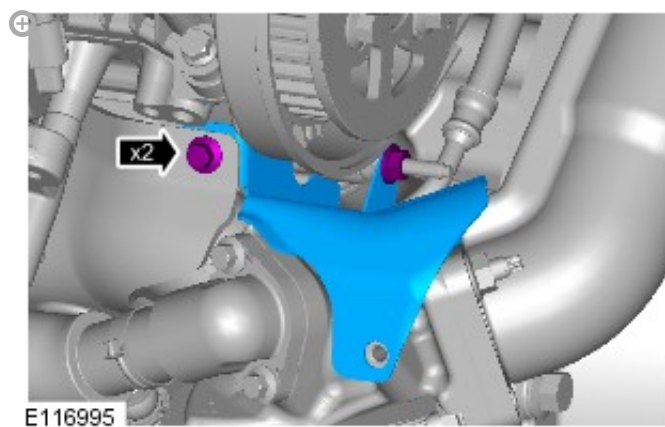


19.

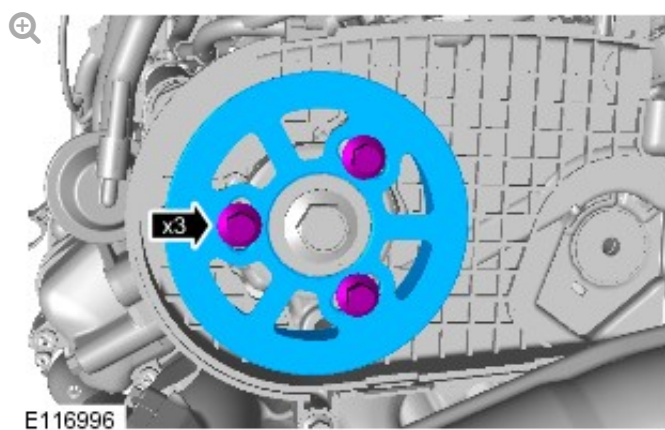




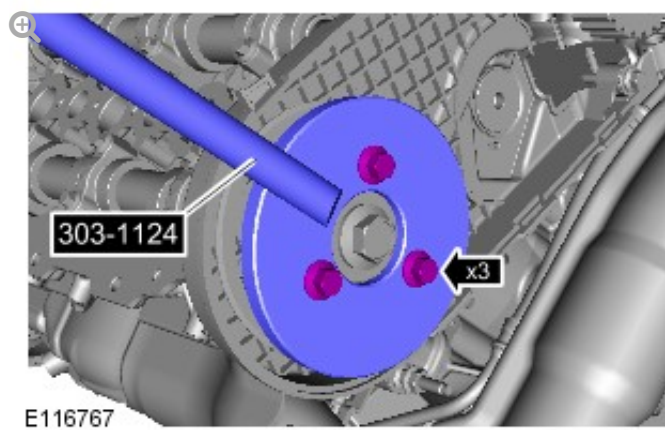
20.



21.

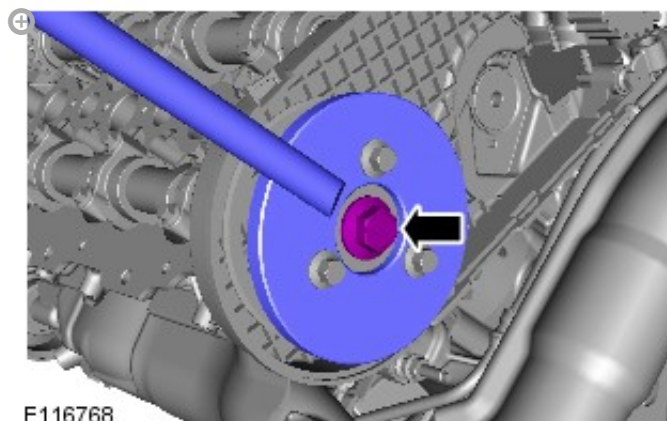


22.



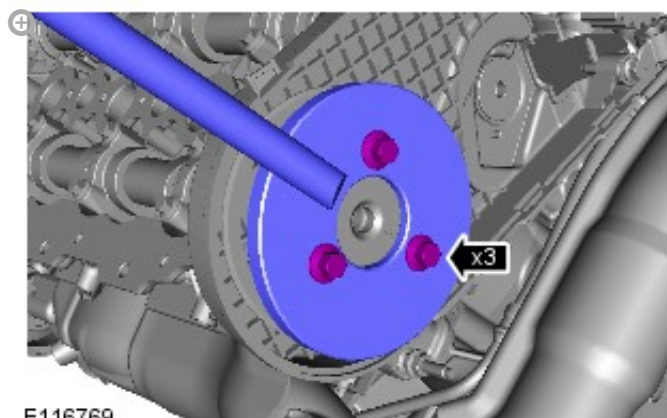
Special Tool(s): [303-1124](#)

23.



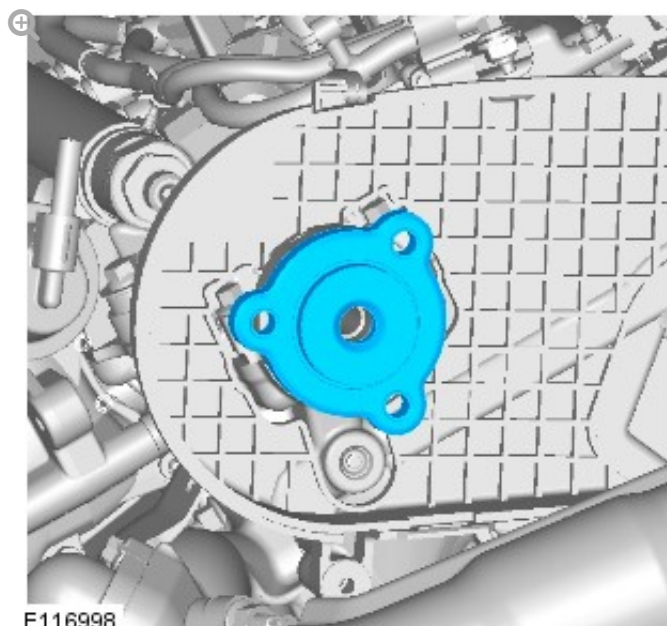
E116768

24.



E116769

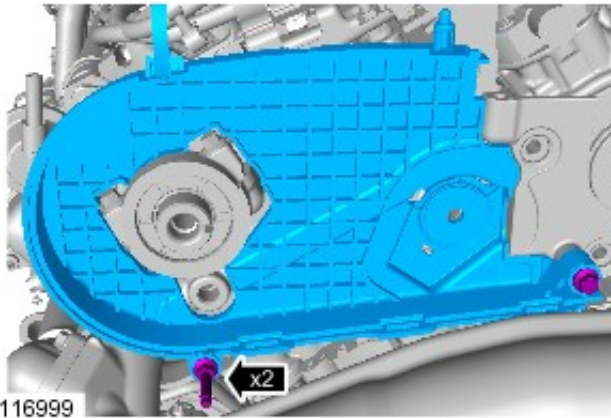
25.



E116998

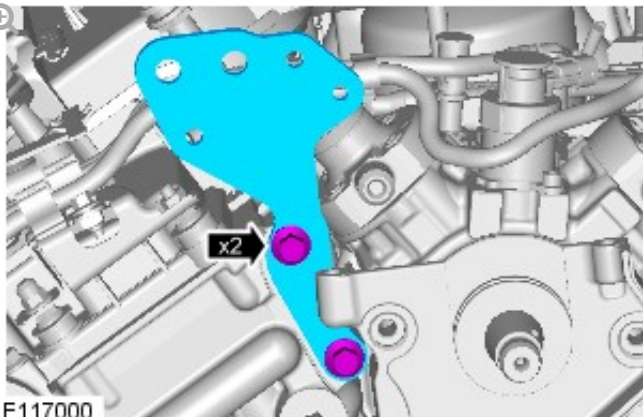


26.



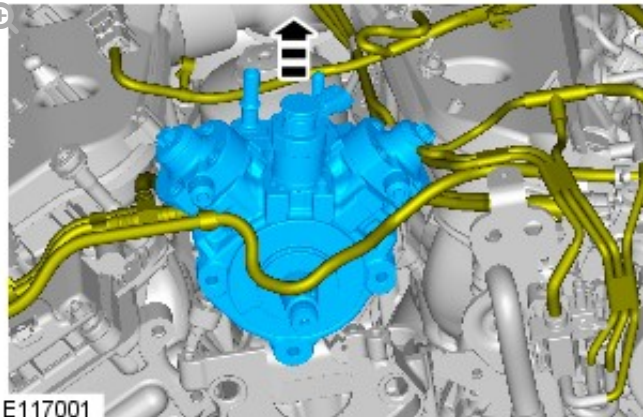
E116999

27.



E117000

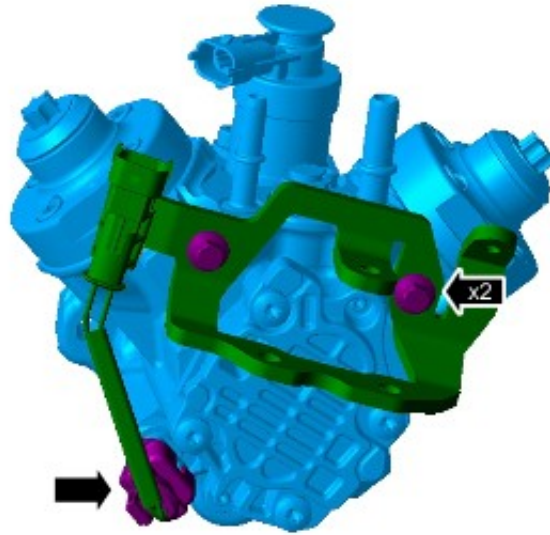
28.



E117001

29.

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

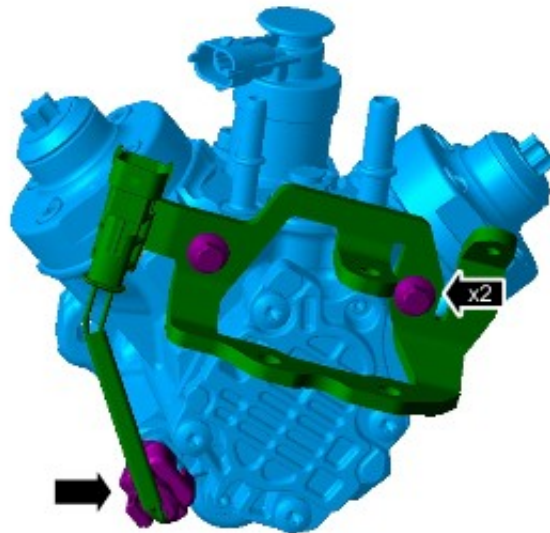


E117002

---

## INSTALLATION

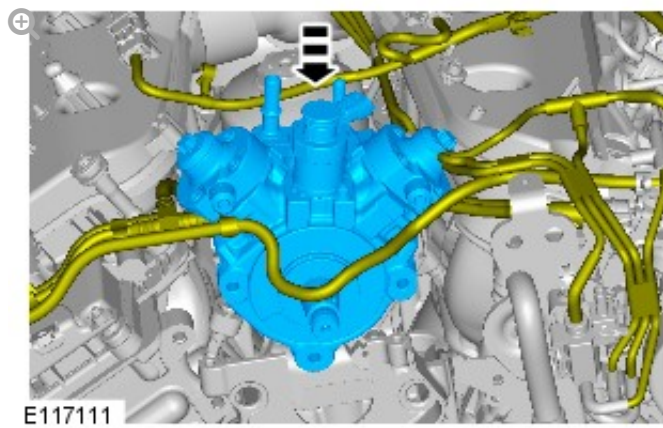
1.



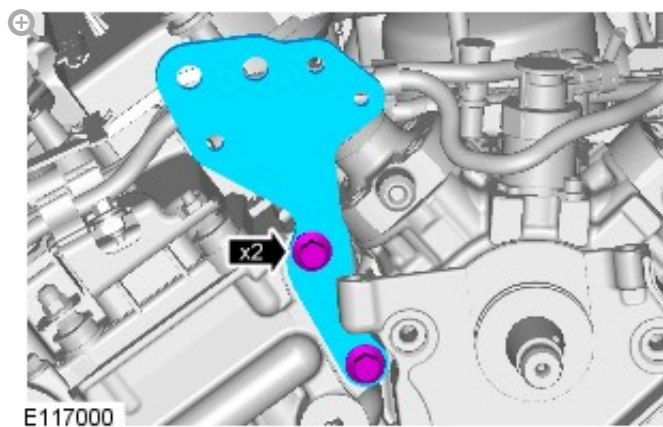
E117002

*Torque:* **3 Nm**

2.

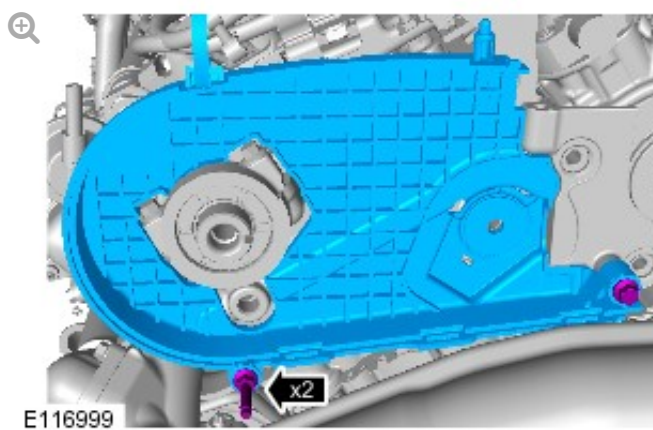


3.



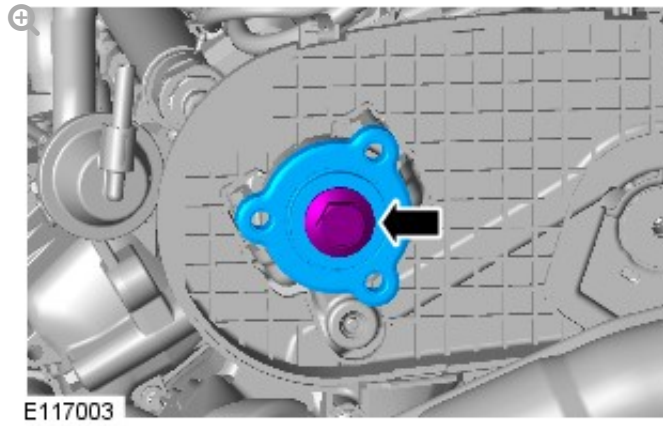
*Torque: 23 Nm*

4.

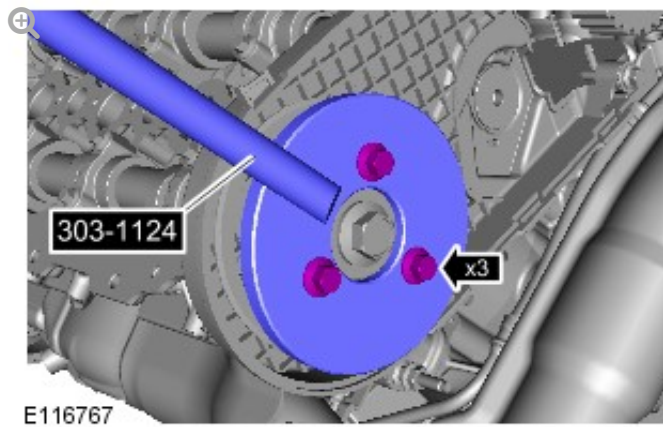


*Torque: 10 Nm*

5.

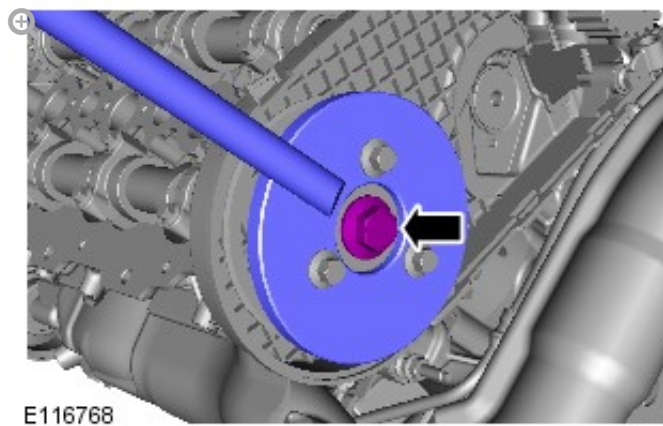


6.



*Special Tool(s):* 303-1124

7.



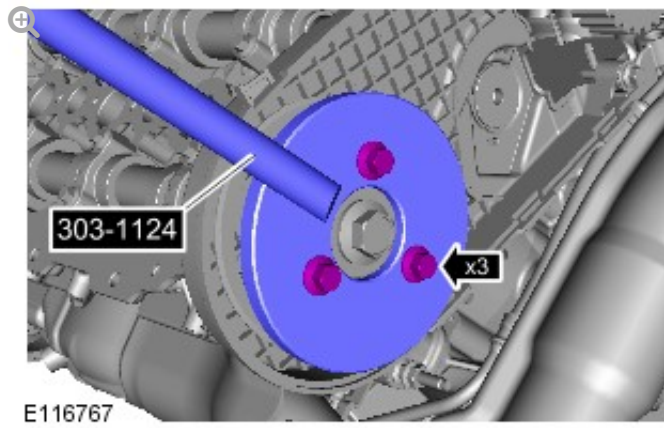
*Torque:*

Stage 1: **80 Nm**

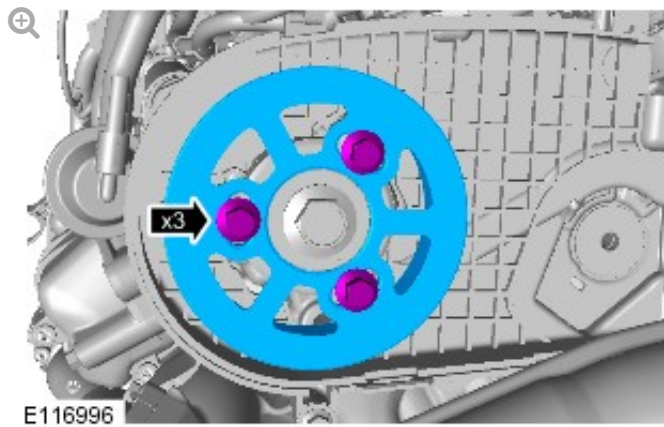
Stage 2: **80°**



8.

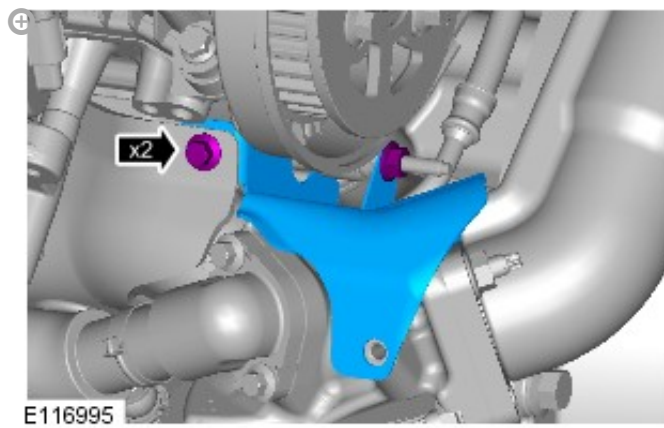


9.



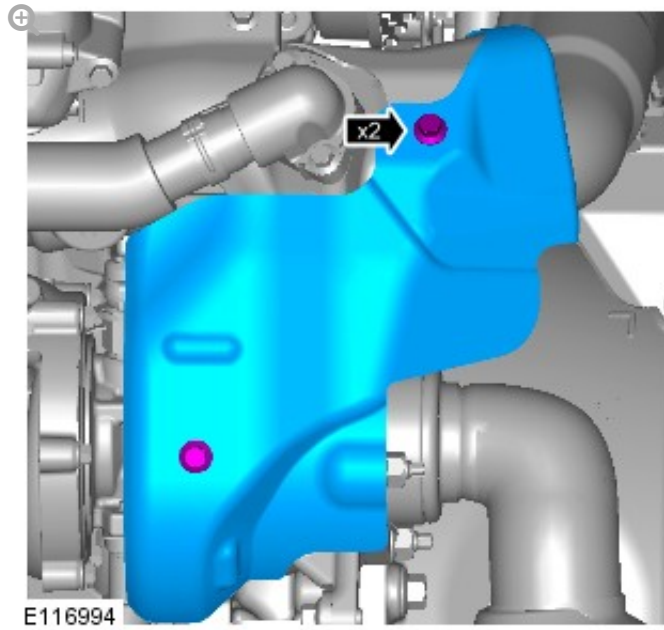
*Torque: 23 Nm*

10.



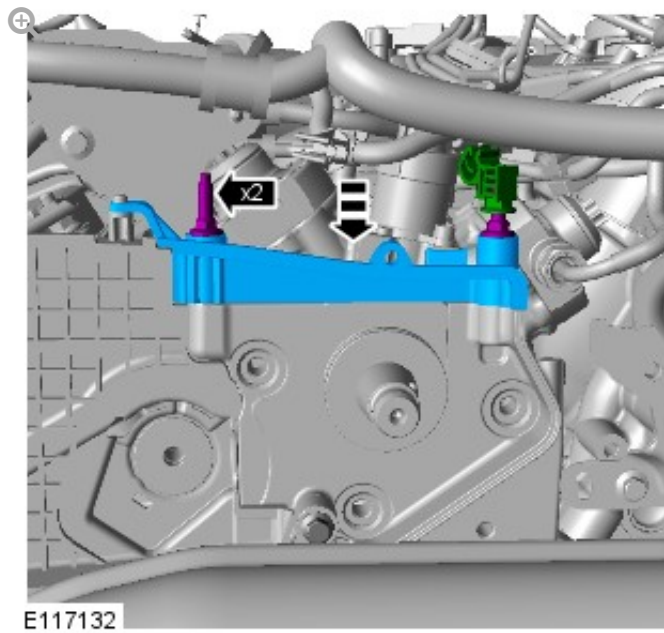
*Torque: 10 Nm*

11.



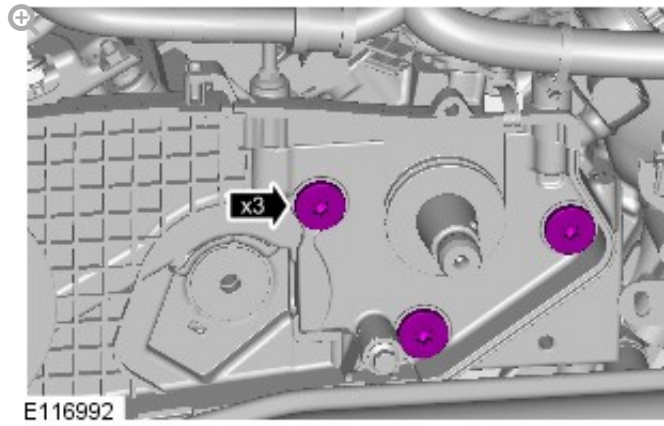
*Torque: 10 Nm*

12.



*Torque: 10 Nm*

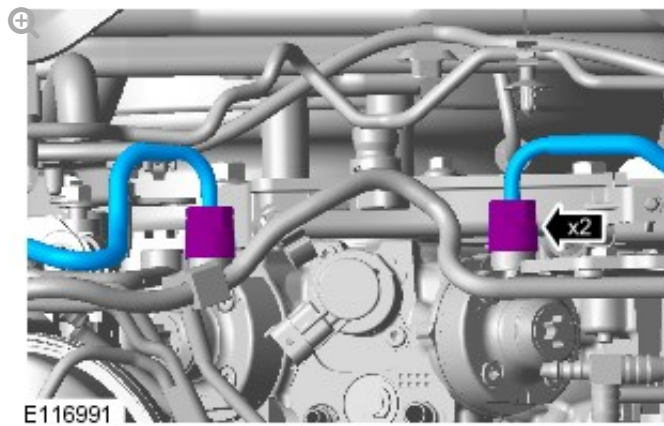
13.



*Torque:* **23 Nm**

14.

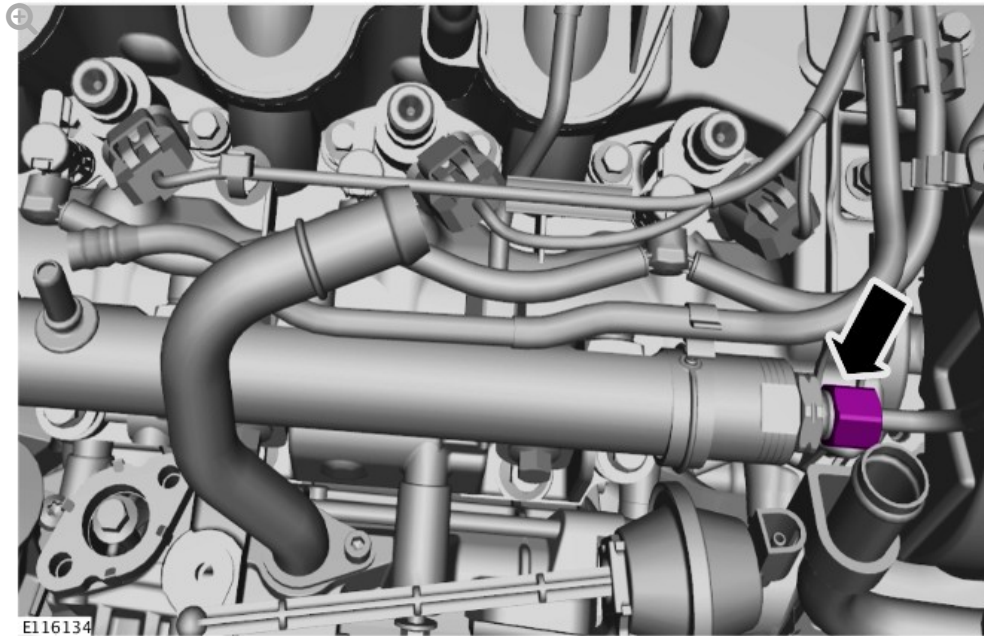
- Tighten the fuel supply line unions finger tight.
- Make sure that a new component is installed.



15.

- Make sure that a new component is installed.
- Tighten the fuel supply line unions finger tight.

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

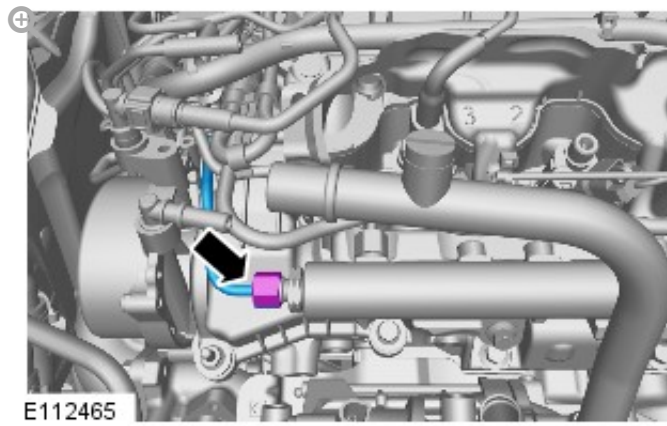


16.

- Make sure that a new component is installed.
- Tighten the fuel supply line unions finger tight.

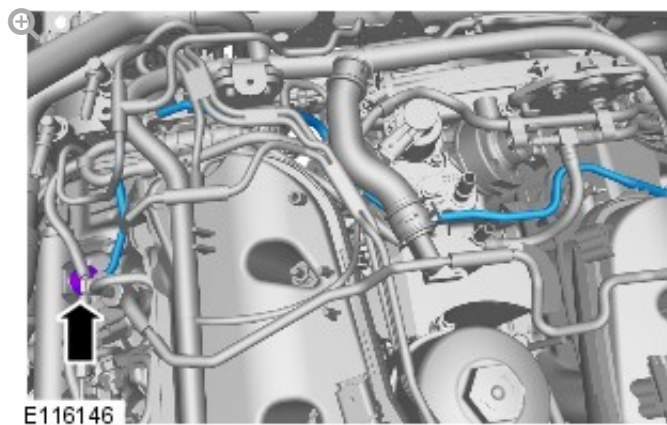
Some variation in the illustrations may occur, but the essential information is always correct.





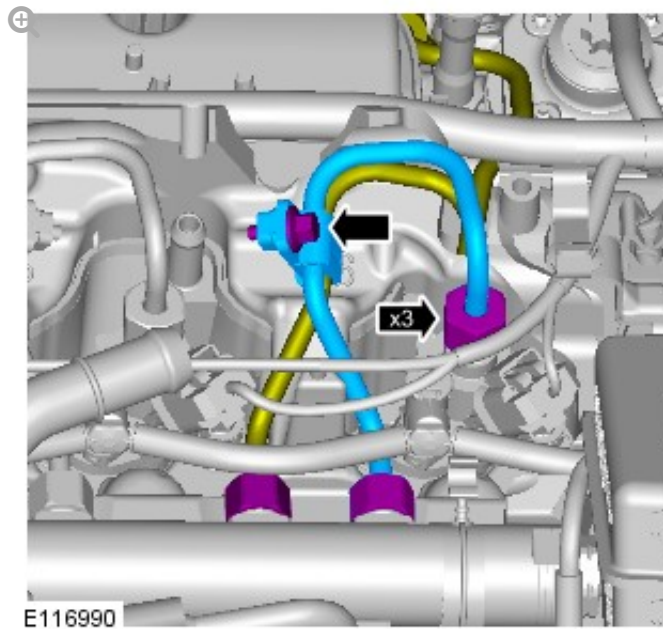
17.

- Make sure that a new component is installed.
- Tighten the fuel supply line unions finger tight.

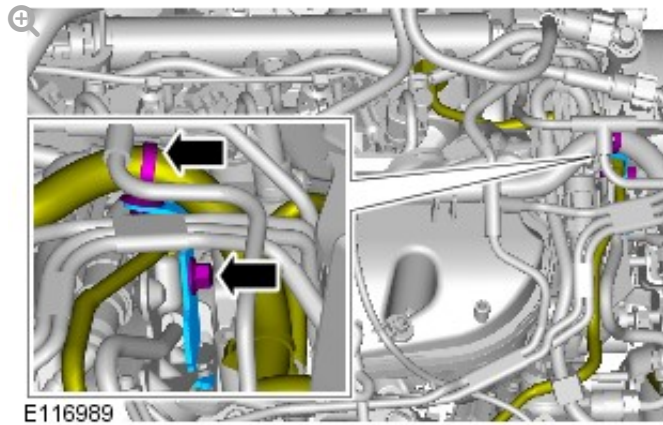


18.

- Tighten the fuel supply line unions finger tight.
- "Make sure that new components are installed. "



19.



*Torque: 10 Nm*

20.

- Make sure that a new component is installed.
- Tighten the fuel supply line unions finger tight.