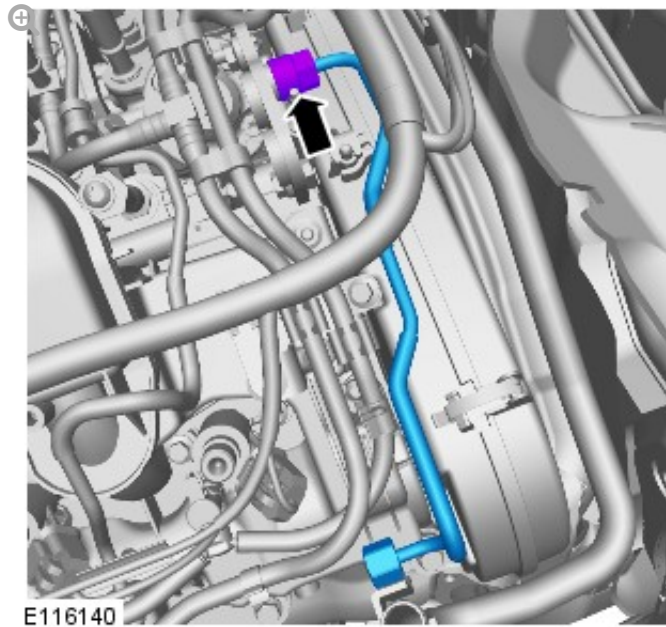
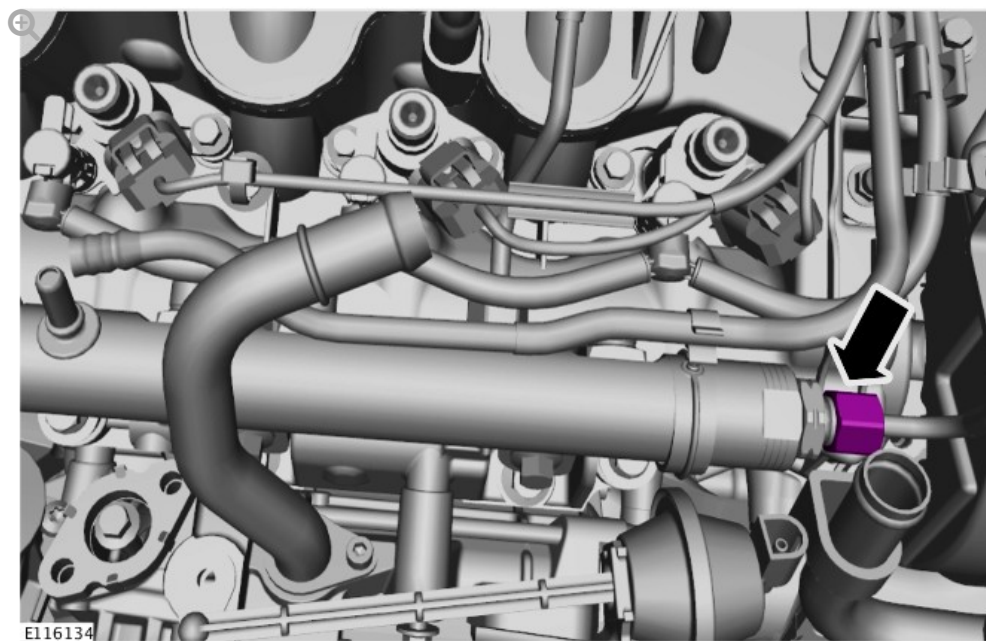


18.



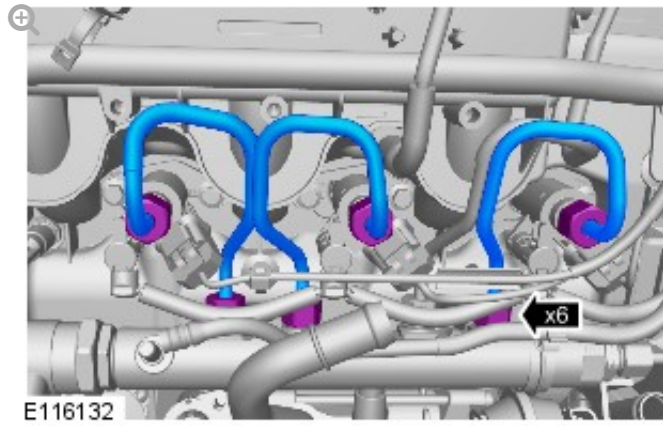
Tighten the high-pressure fuel lines union to 15Nm.

19.



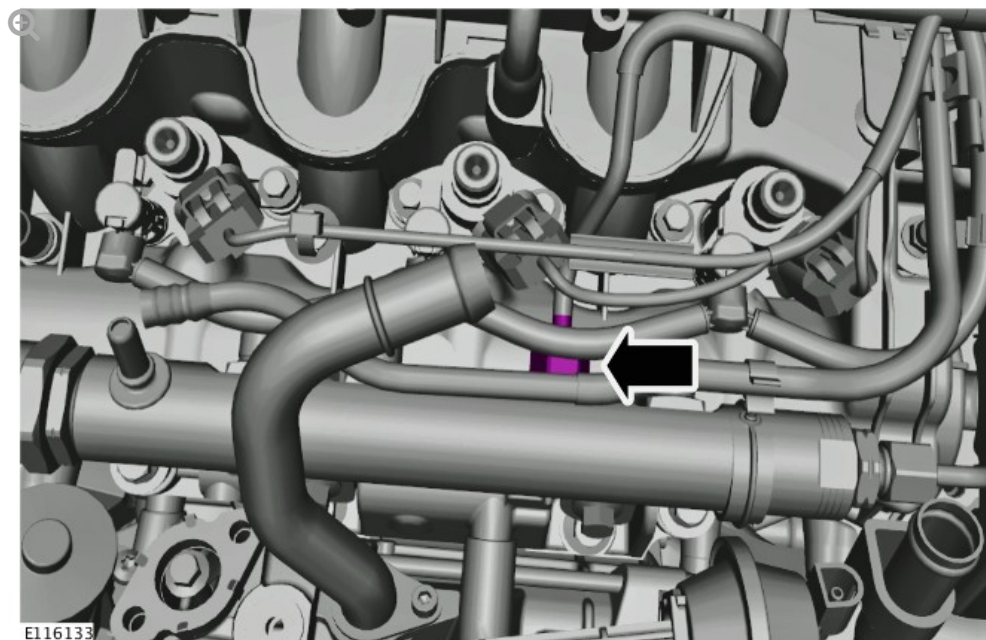
Tighten the high-pressure fuel lines union to 15Nm.

20.



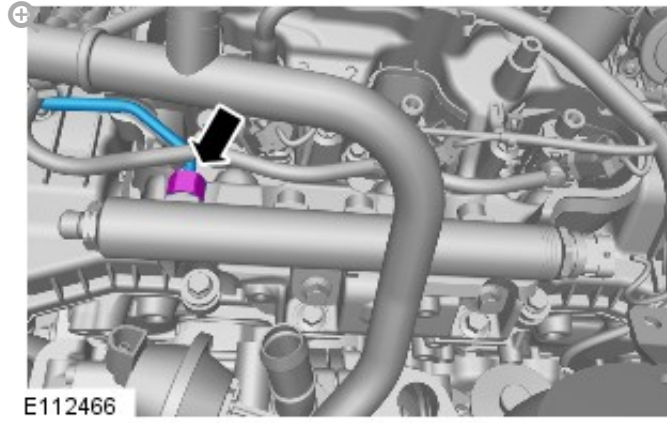
- Stage 1: Tighten the high-pressure fuel supply line unions at the fuel rail to 30Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 30Nm.

21.



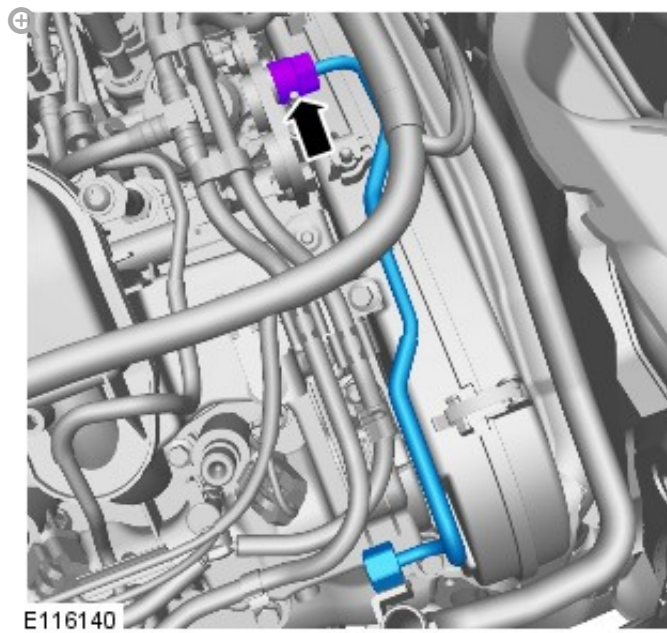
Tighten the high-pressure fuel line union to 30Nm.

22.



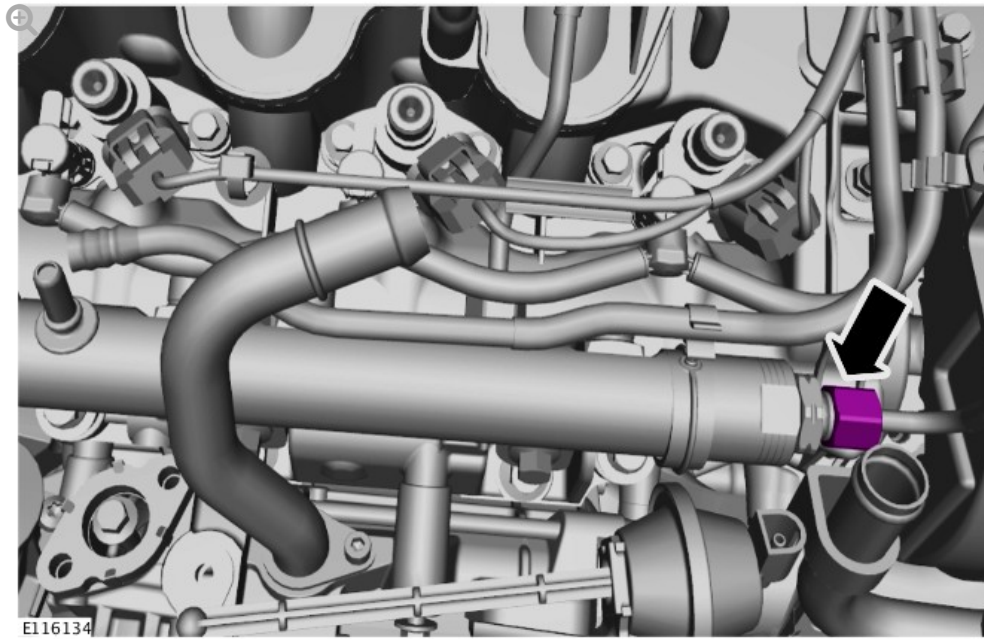
Tighten the high-pressure fuel line union to 30Nm.

23.



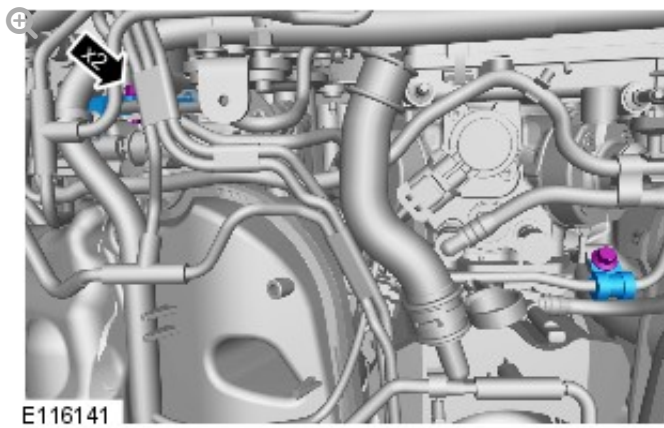
Tighten the high-pressure fuel line union to 30Nm.

24.



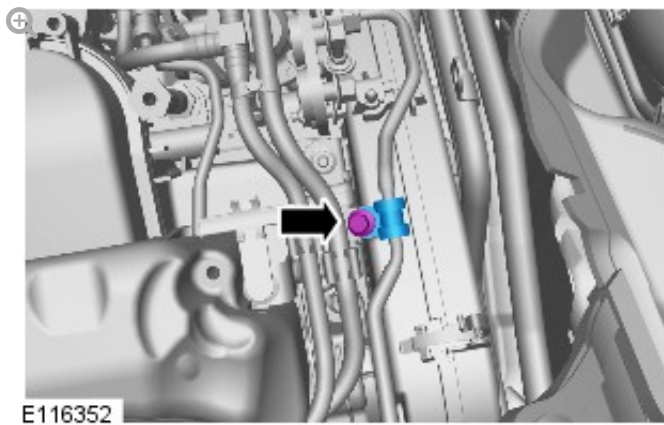
Tighten the high-pressure fuel line union to 30Nm.

25.



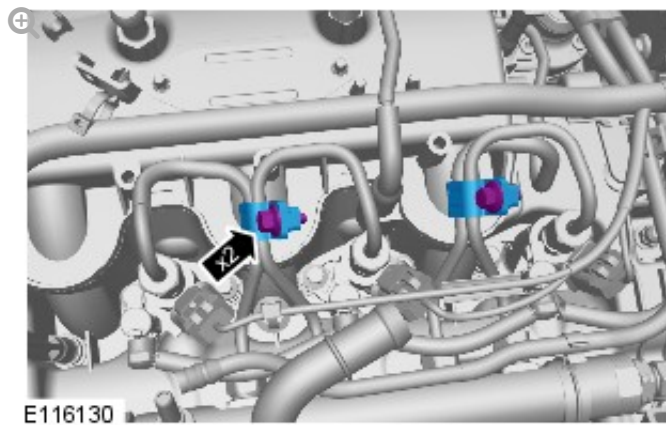
Torque: 10 Nm

26.



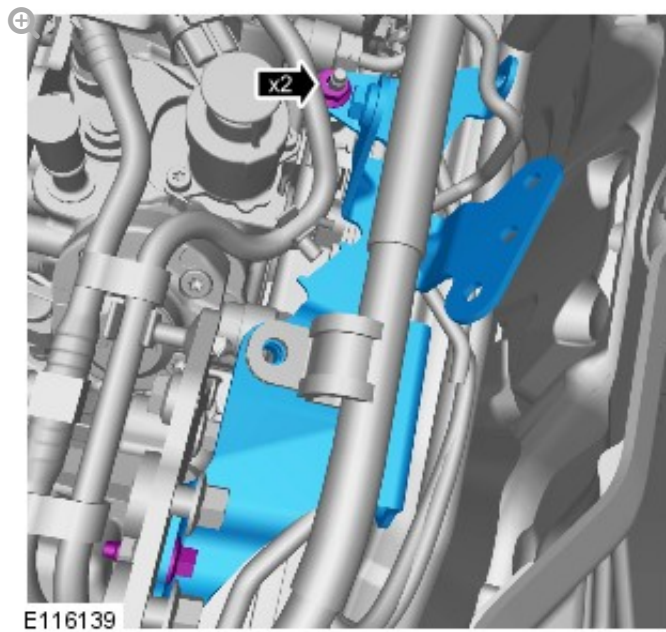
Torque: 10 Nm

27.



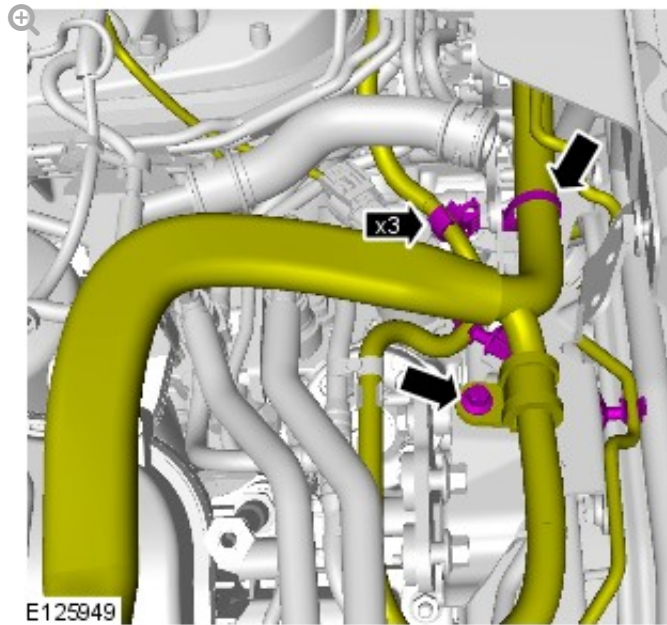
Torque: 10 Nm

28.



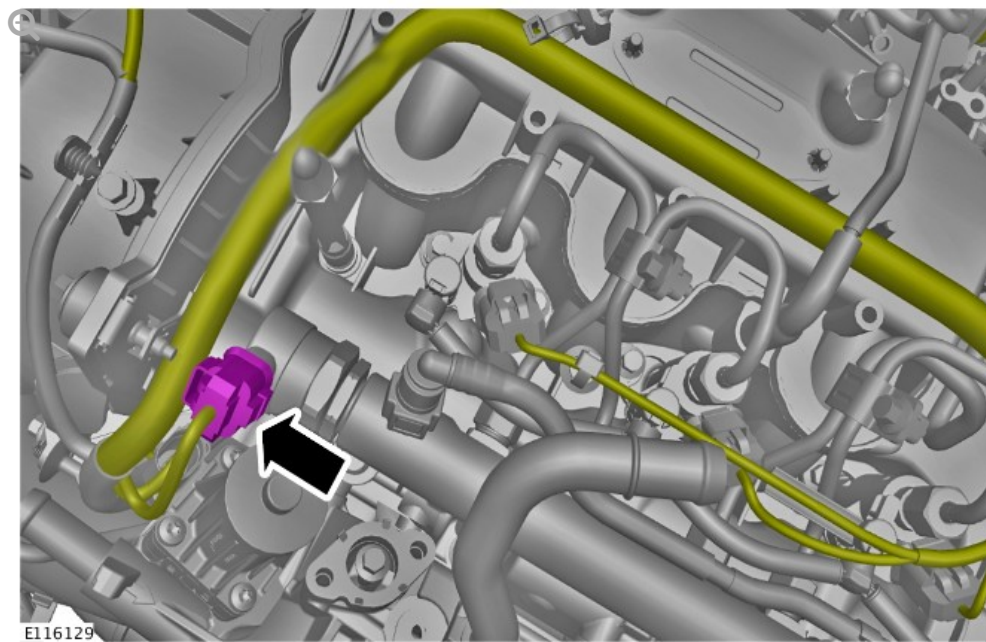
Torque: 10 Nm

29.



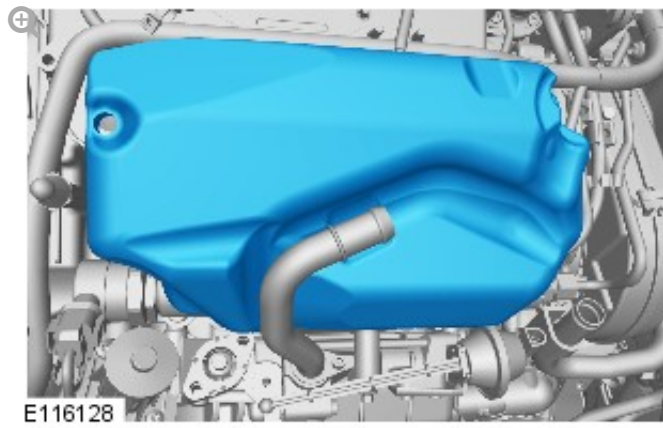
Torque: 10 Nm

30.



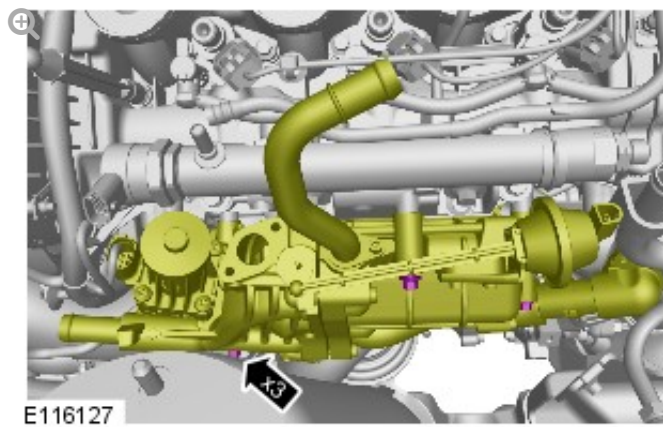
31.

Left-hand shown, right-hand similar.



32.

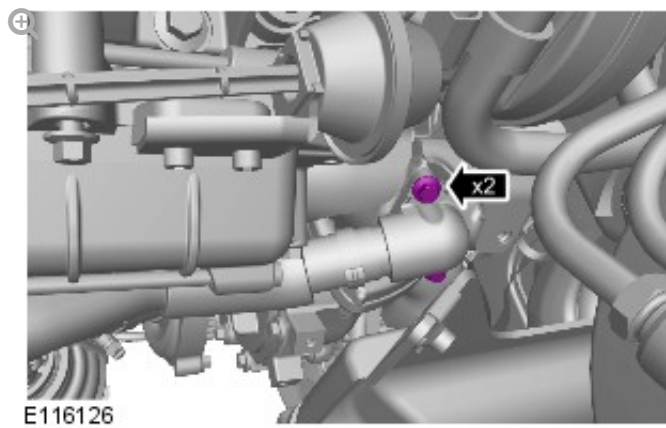
Only tighten the bolts finger tight at this stage.



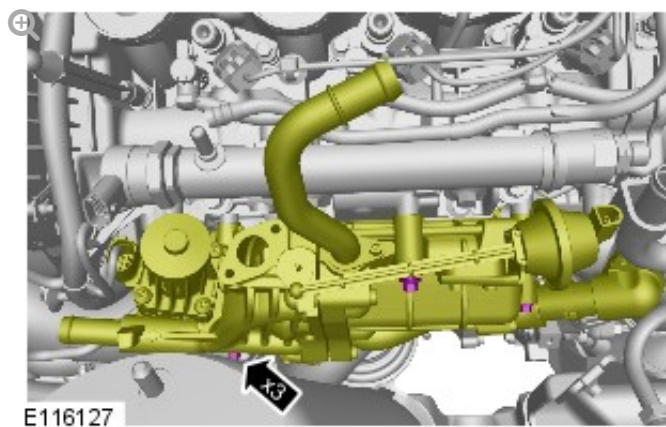
33.

Only tighten the bolts finger tight at this stage.

Install a new gasket.

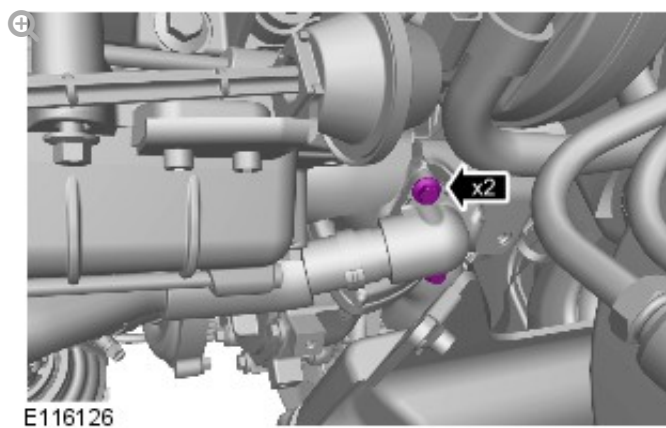


34.



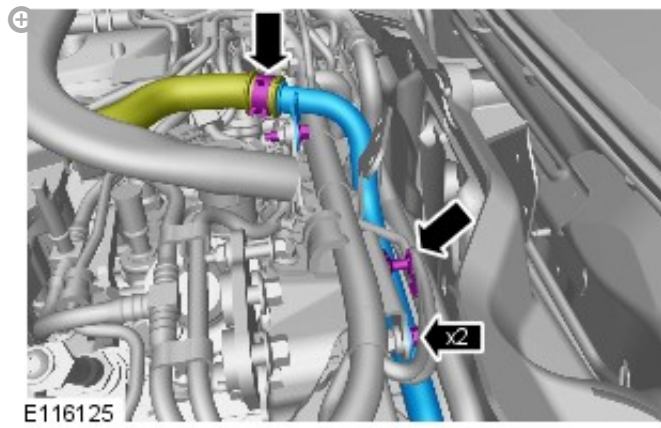
Torque: 10 Nm

35.



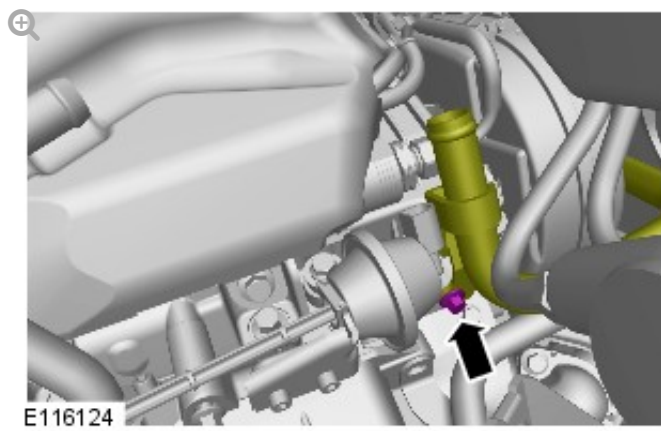
Torque: 10 Nm

36.



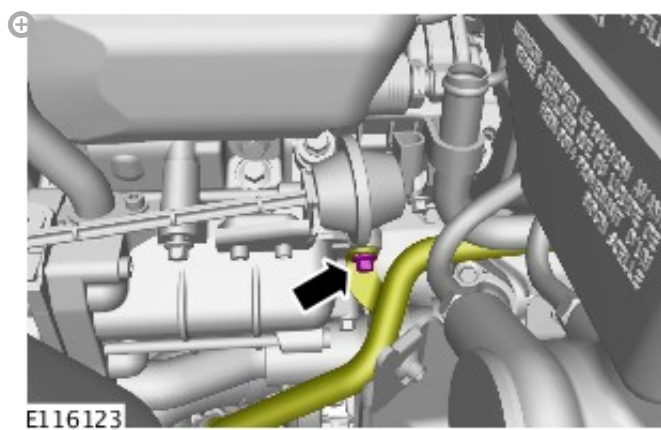
Torque: 10 Nm

37.



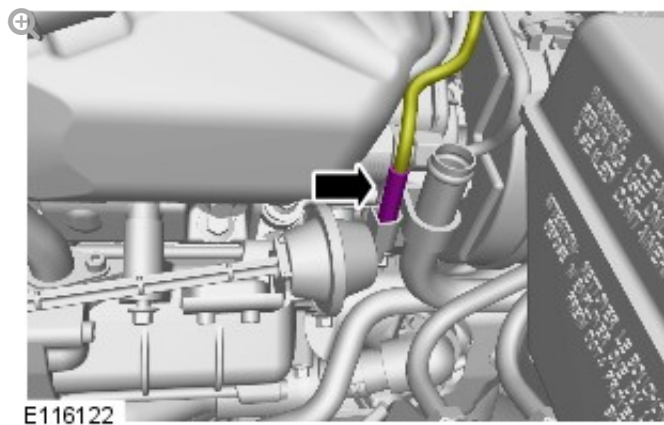
Torque: 10 Nm

38.

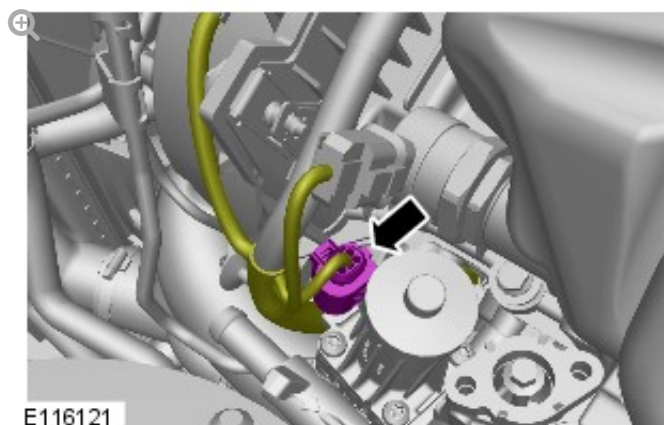


Torque: 10 Nm

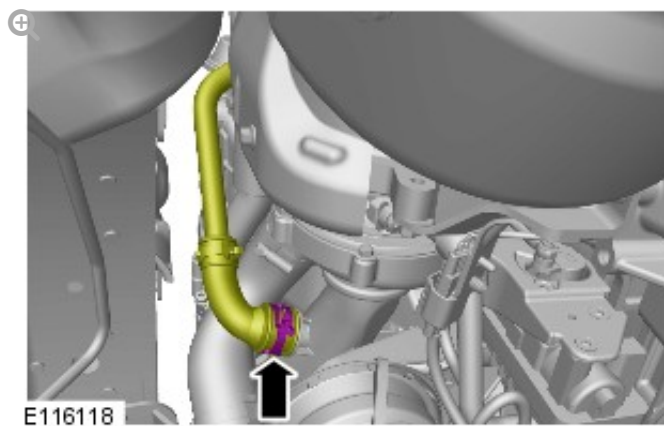
39.



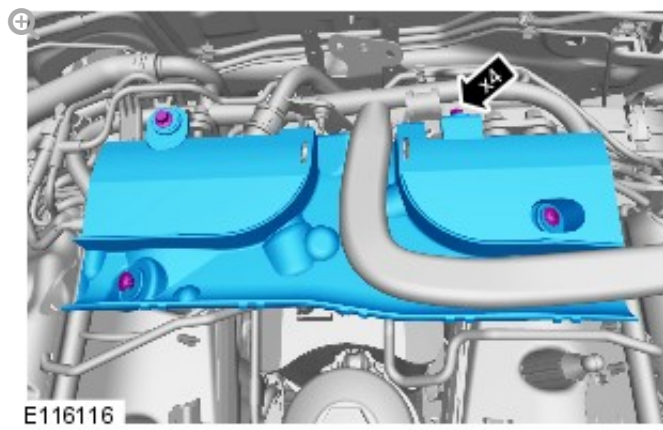
40.



41.

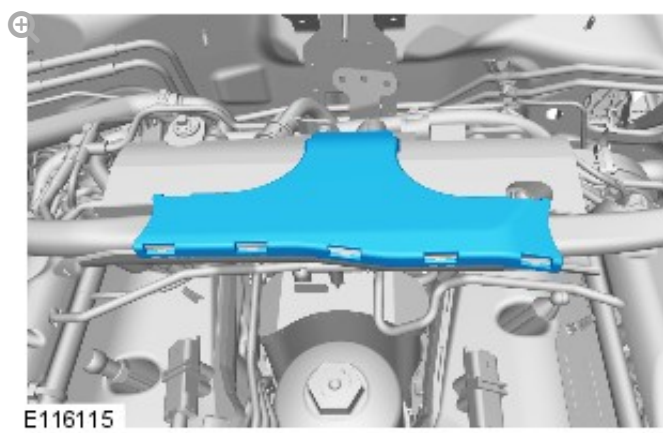


42.

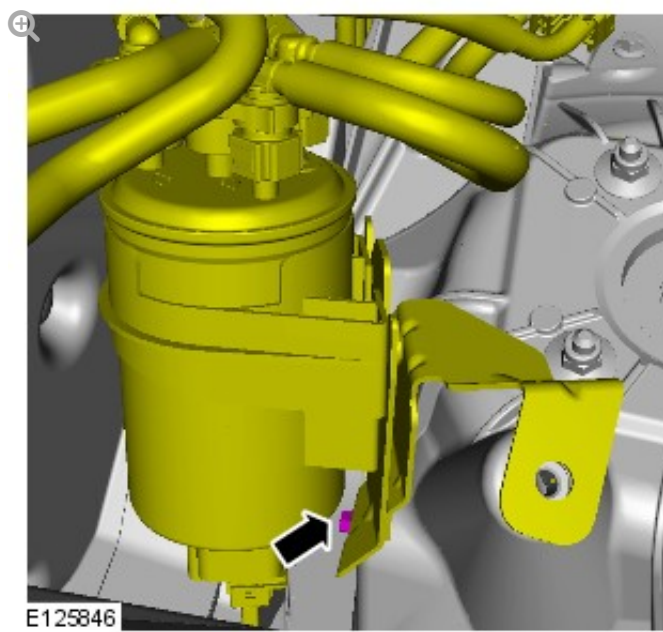


Torque: 10 Nm

43.



44.



Torque: 27 Nm

- 45. Refer to: [Left Exhaust Gas Recirculation Valve Outlet Tube](#) (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).
- 46. Refer to: [Secondary Bulkhead Left Panel](#) (501-02 Front End Body Panels, Removal and Installation).
- 47. Refer to: [Air Cleaner](#) (303-12A Intake Air Distribution and Filtering - TDV6 3.0L Diesel, Removal and Installation).
- 48. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
- 49. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

FUEL CHARGING AND CONTROLS - TDV6 3.0L DIESEL

FUEL CHARGING AND CONTROLS - OVERVIEW [G1245372]

OVERVIEW

The 3.0L V6 diesel engine is equipped with a High Pressure (HP) common rail fuel injection system. With this fuel injection process, a HP pump delivers a uniform level of pressure to the shared fuel lines (the common rails), which serve all 6 fuel injectors. Pressure is controlled to the optimum level for smooth operation.

The common rail system supports a pre and pilot injection depending on engine operating conditions, which reduces combustion noise levels, more commonly referred to as 'diesel knock'.

Fuel injection pressure is generated independently of engine speed and fuel injection events.

The fuel injection timing and volume are calculated by the ECM (engine control module), which then energizes the appropriate piezo actuated injector. The common rail fuel injection system has the following features:

- High fuel injection pressures of up to 2000 bar (29007 lbf/in²) for greater atomization of fuel (increasing performance and lowering emissions).
- Variable injection to optimize combustion in all engine operating conditions

- Low tolerances and high precision throughout the life of the system.

The fuel system is divided into two sub systems:

- Low Pressure (LP) system
- HP system.

The LP system features the following components:

- In-tank fuel pump
- Fuel pressure regulator (integral to the fuel delivery module)
- Fuel filter
- Return pipes
- Injector return pipes
- Fuel coolers (engine and vehicle).

The LP system is regulated to 0.5 bar (7.25 lbf/in²).

The HP system features the following components:

- HP pump
- Fuel rails and diverter rail
- HP fuel pipes
- Injectors.

FUEL CHARGING AND CONTROLS - TDV6 3.0L DIESEL

RIGHT FUEL RAIL [G1272060]



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.

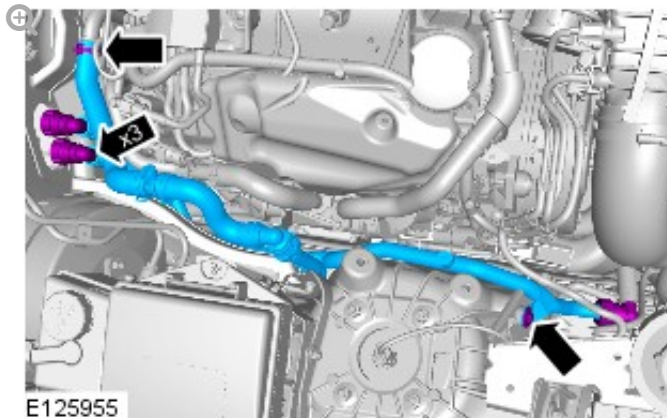
Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

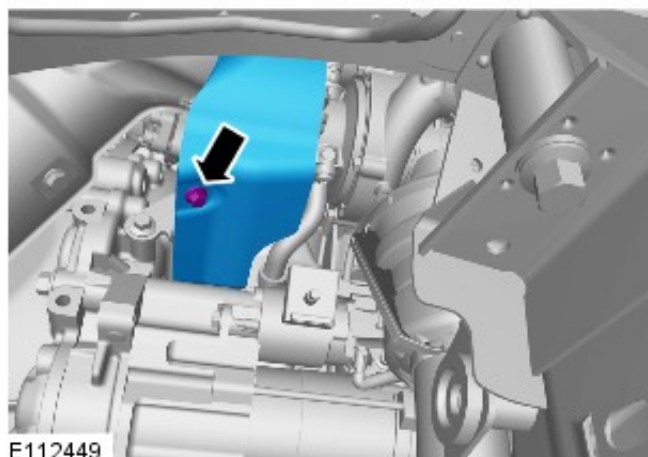
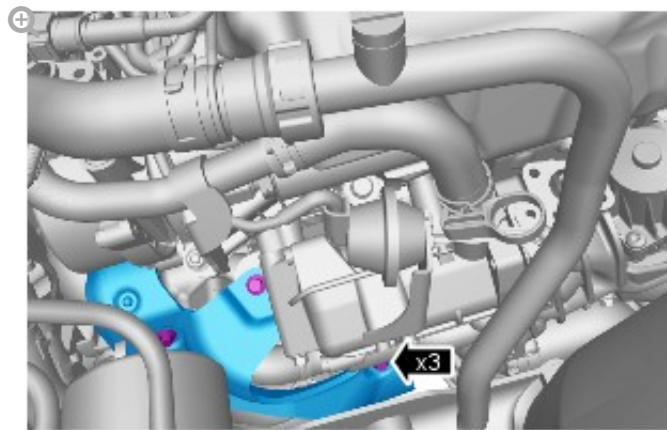
2. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
4. Refer to: [Secondary Bulkhead Right Panel](#) (501-02 Front End Body Panels, Removal and Installation).
5. Refer to: [Right Exhaust Gas Recirculation Valve Outlet Tube](#) (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).
- 6.

Be prepared to collect escaping coolant.

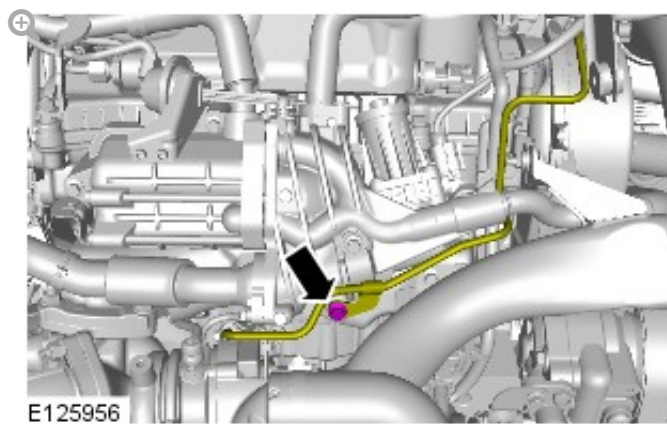


7.

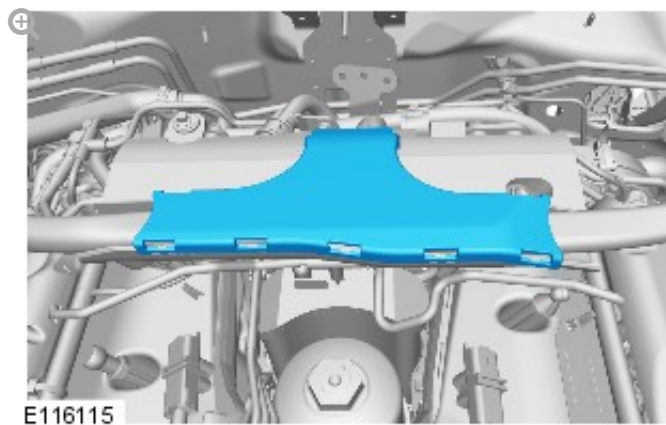


8.

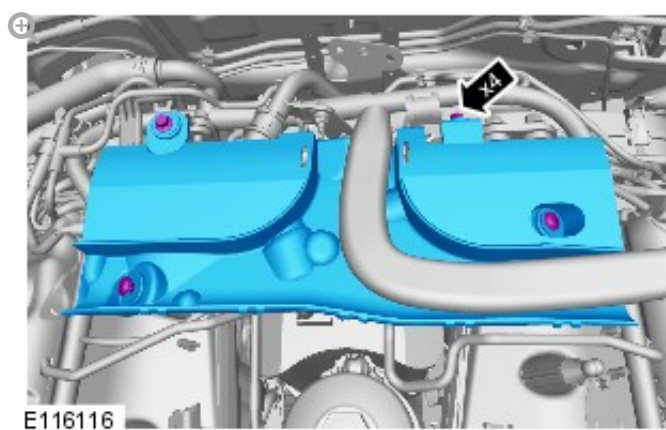
Engine shown removed for clarity.



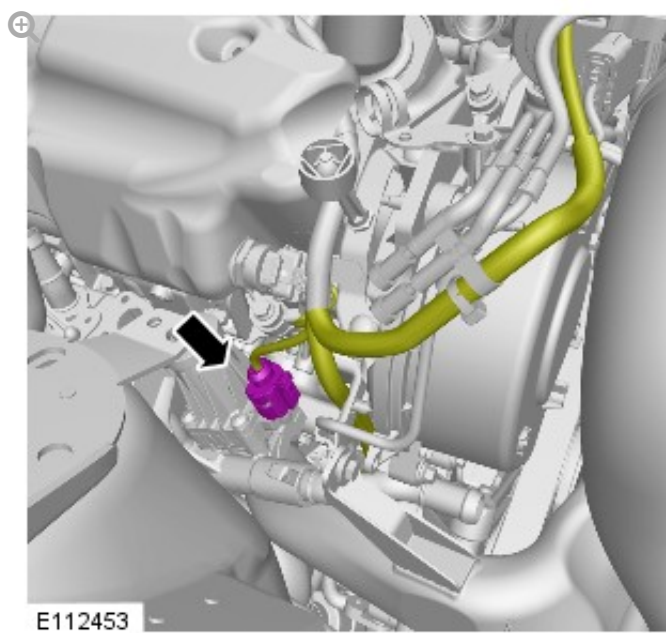
9.



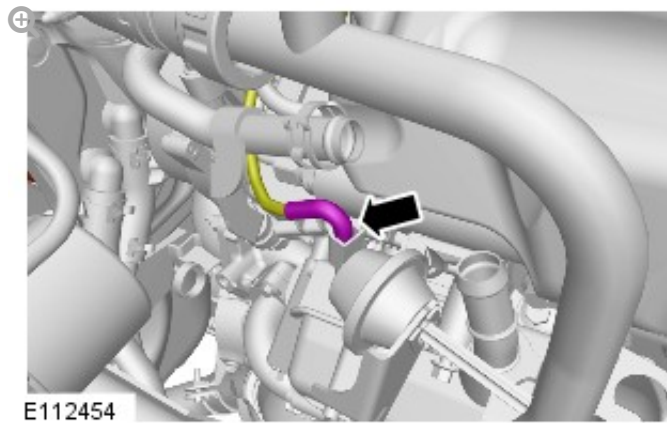
10.



11.



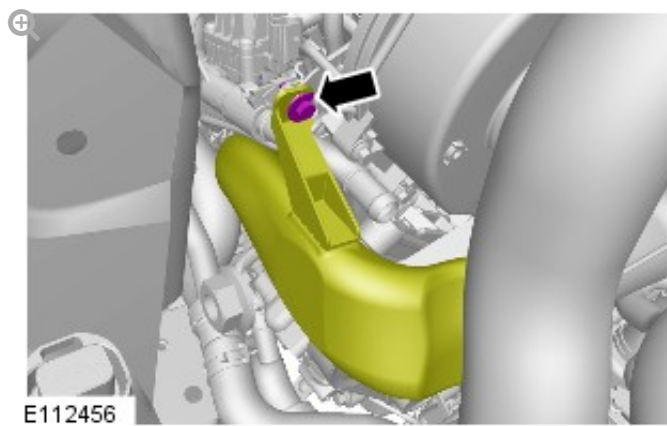
12.



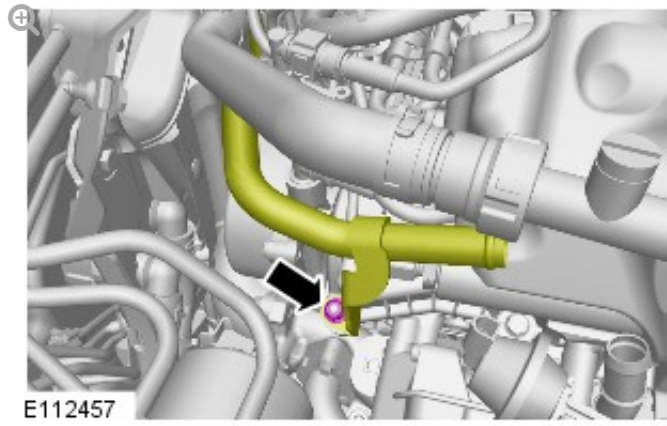
13.



14.

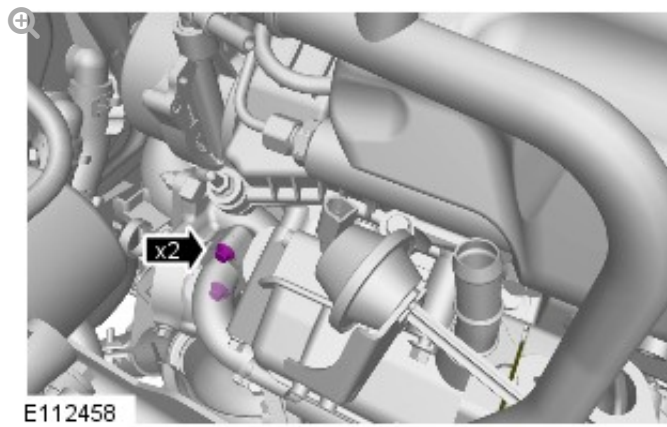


15.

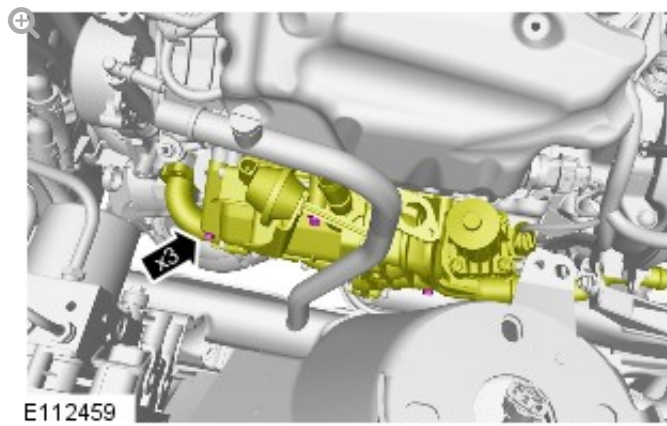


16.

Discard the gasket.

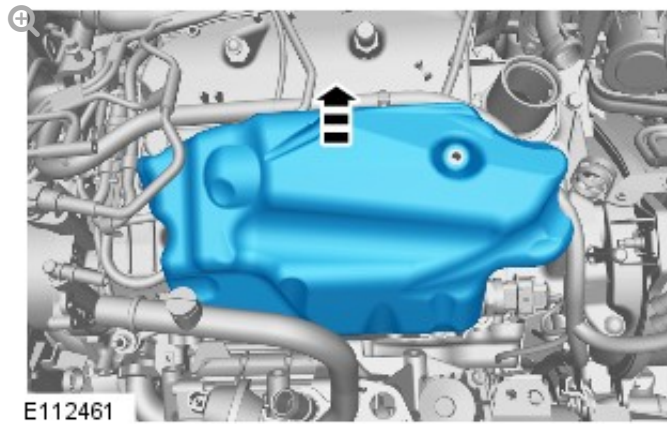


17.

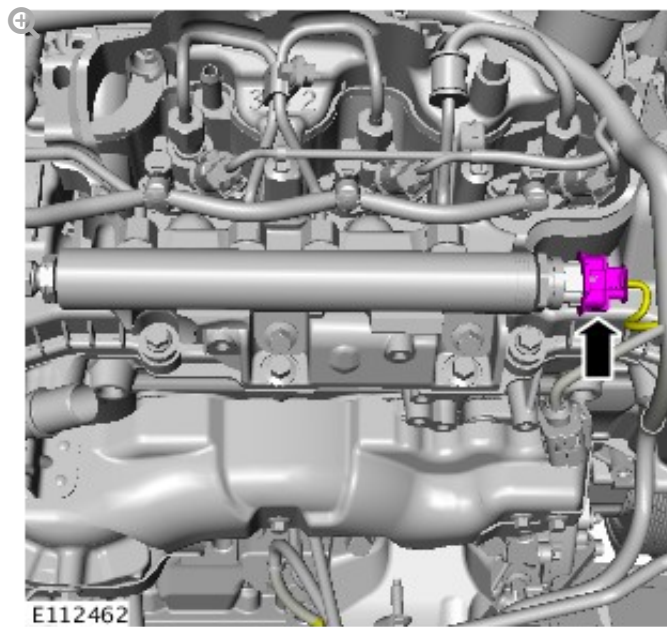


18.

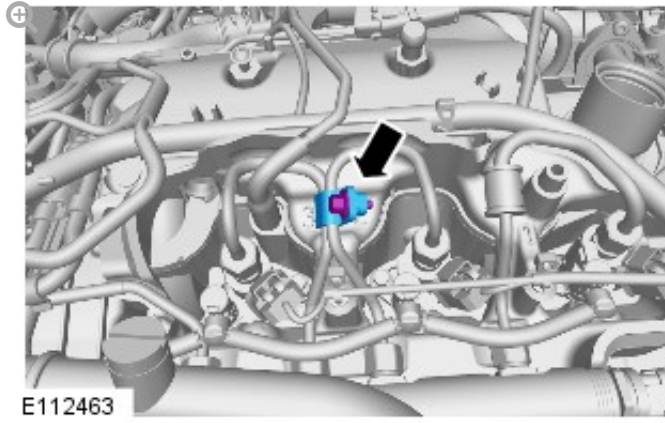
Right-hand shown, Left-hand similar.



19.



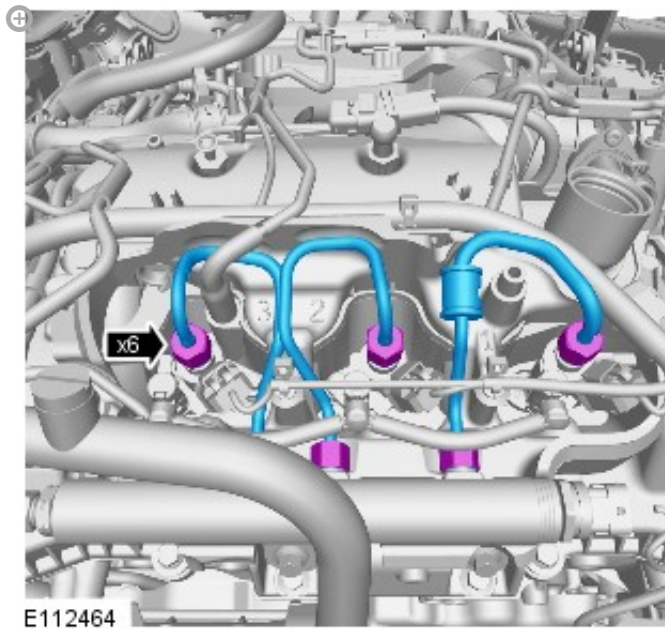
20.



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

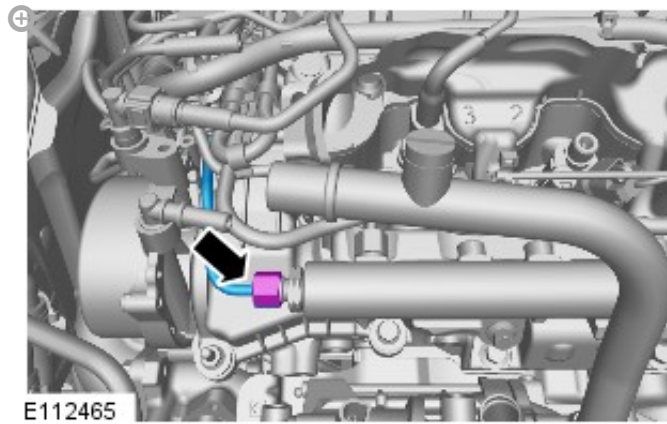
22.

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



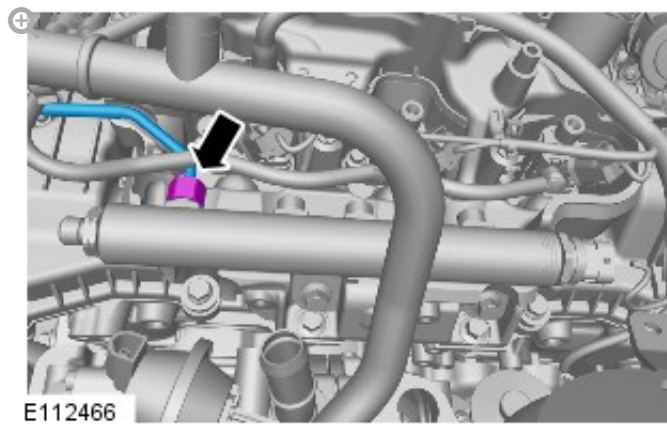
23.

Be prepared to collect escaping fuel.



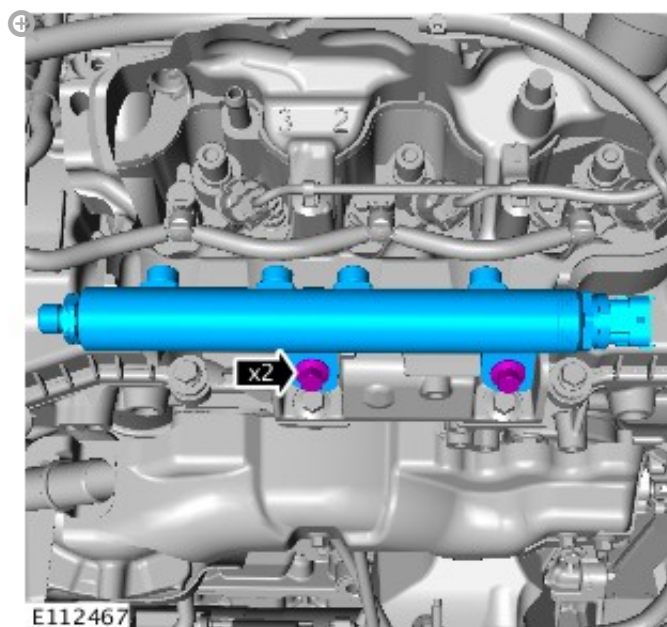
24.

Be prepared to collect escaping fuel.

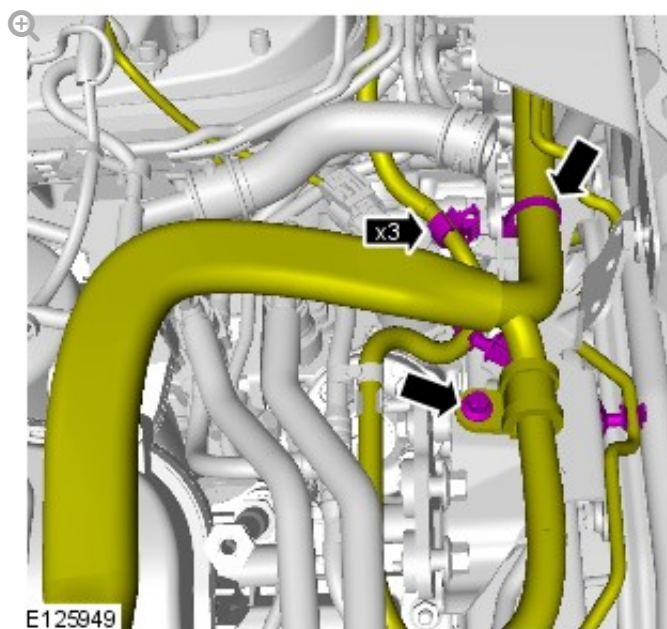


25.

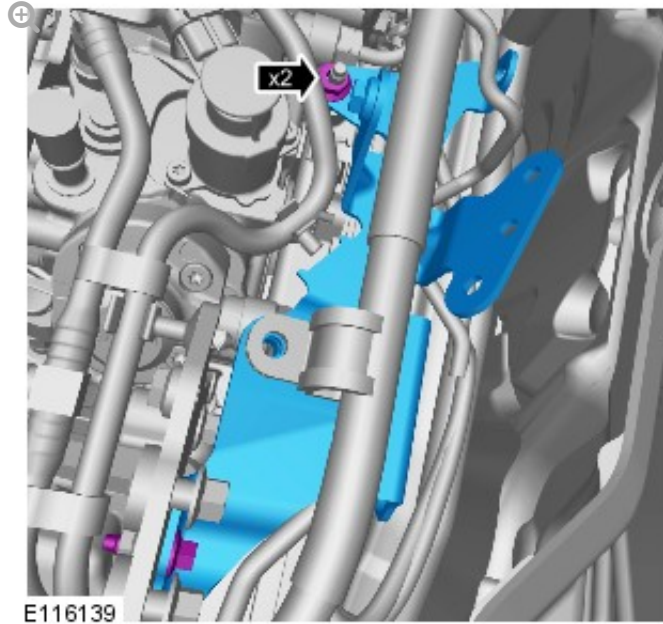
Be prepared to collect escaping fuel.



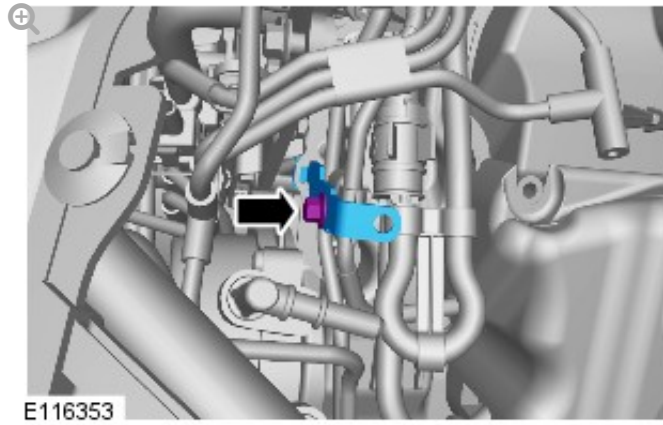
26.



27.

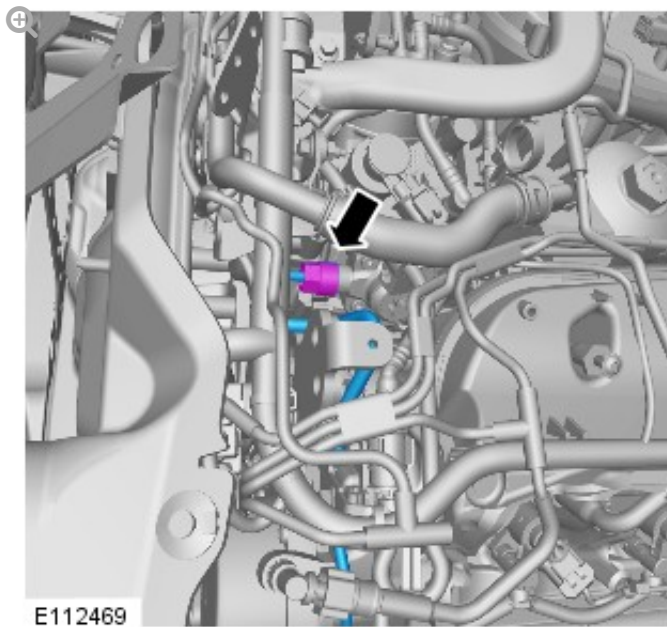


28.

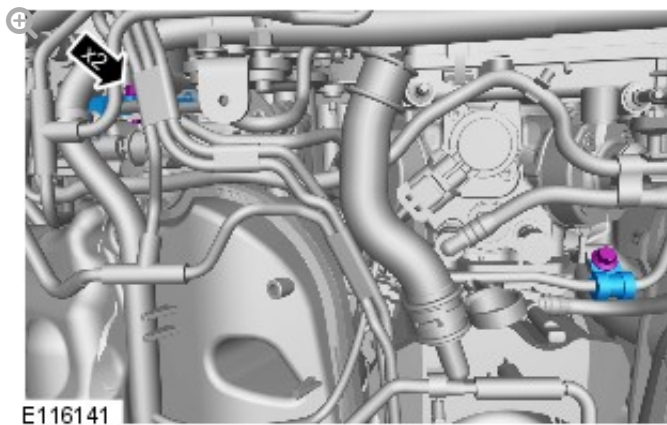


29.

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

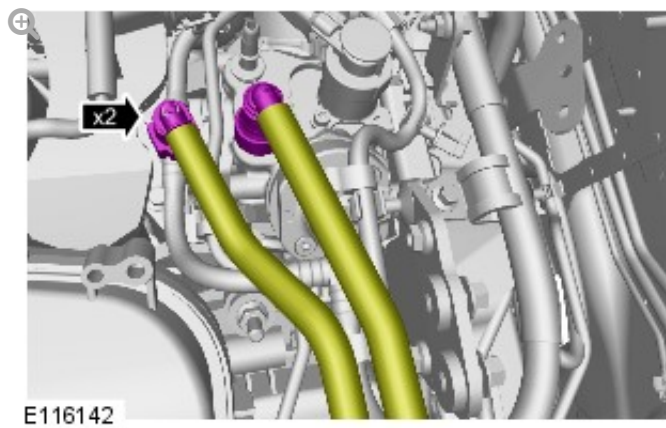


30.



31.

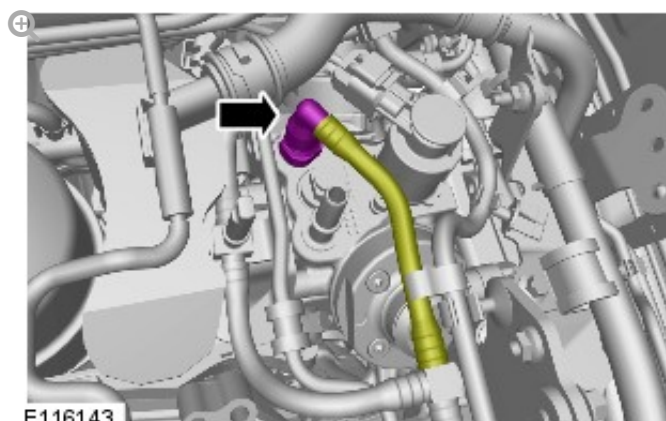
Be prepared to collect escaping fuel.



E116142

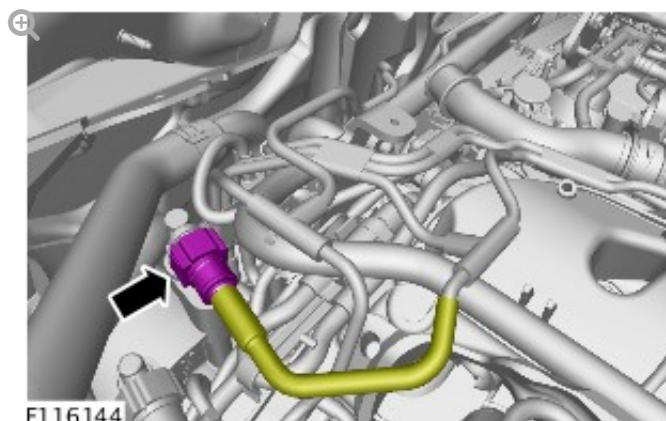
32.

Be prepared to collect escaping fuel.



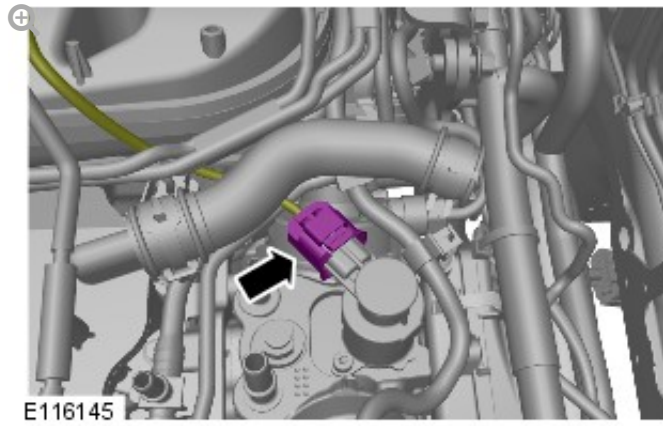
E116143

33.



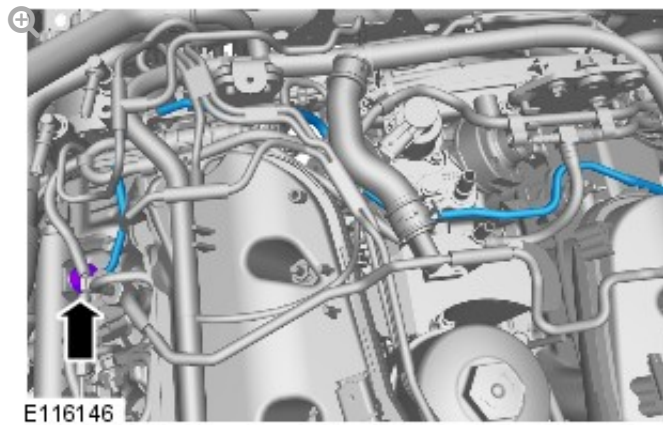
E116144

34.



35.

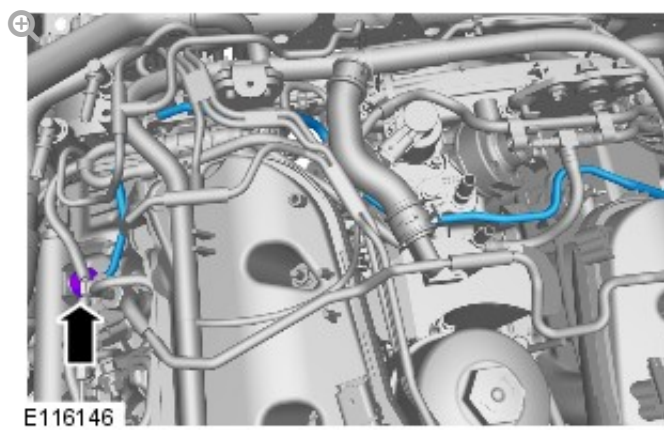
- Be prepared to collect escaping fuel.
- Discard the component.



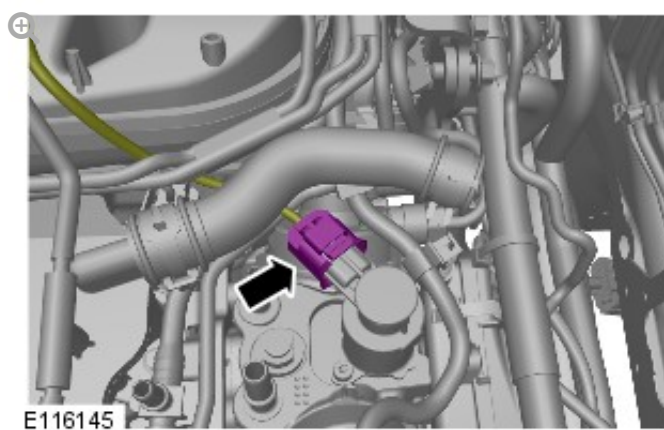
INSTALLATION

1.

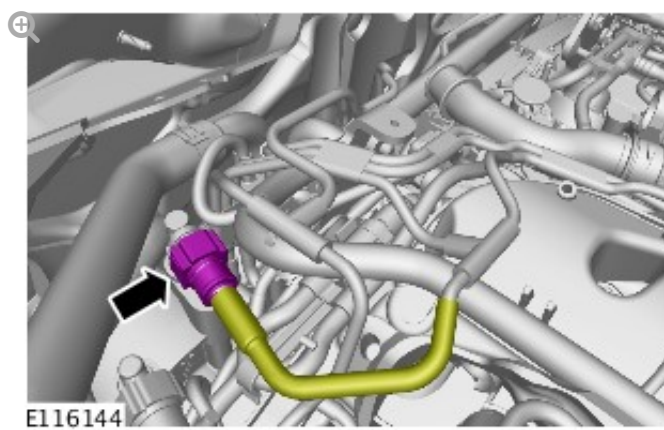
- Make sure that a new component is installed.
- Tighten the fuel supply line unions finger tight.



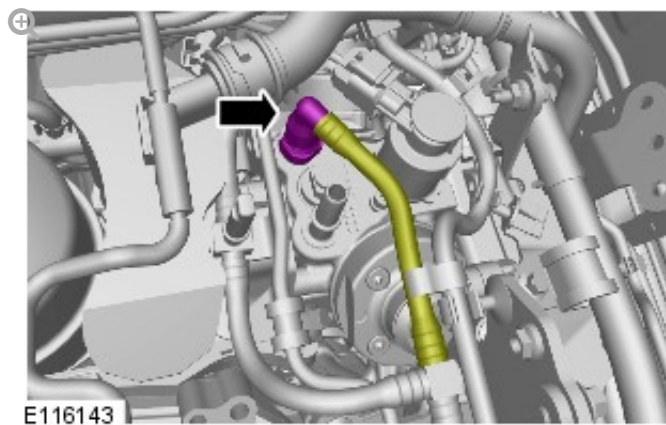
2.



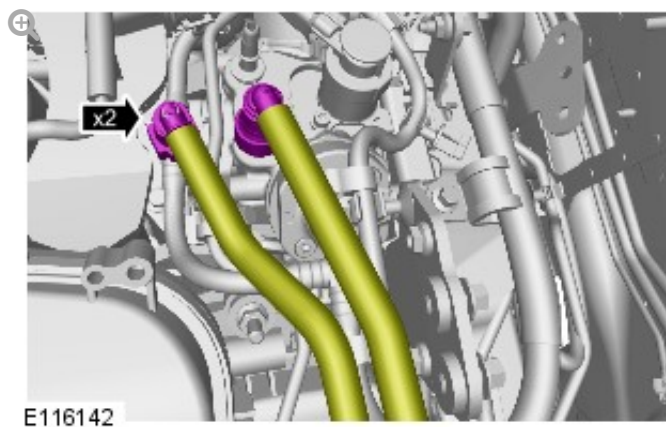
3.



4.

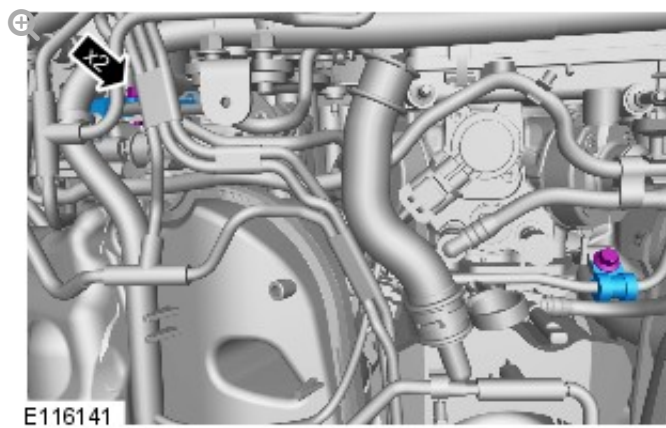


5.



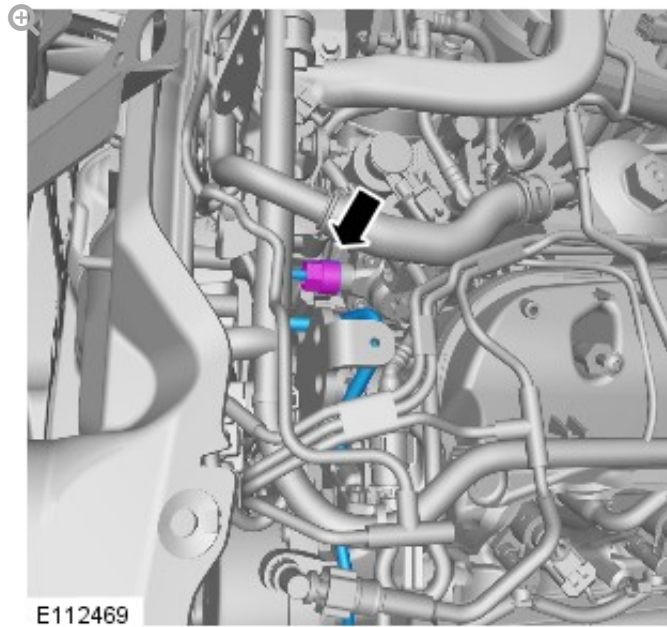
6.

Only tighten the bolt finger-tight at this stage.



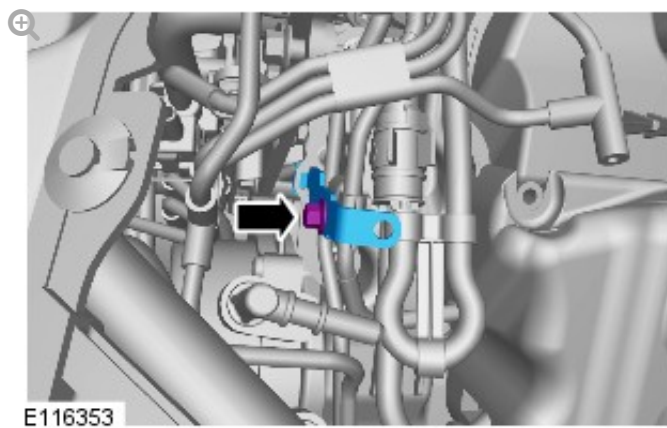
7.

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

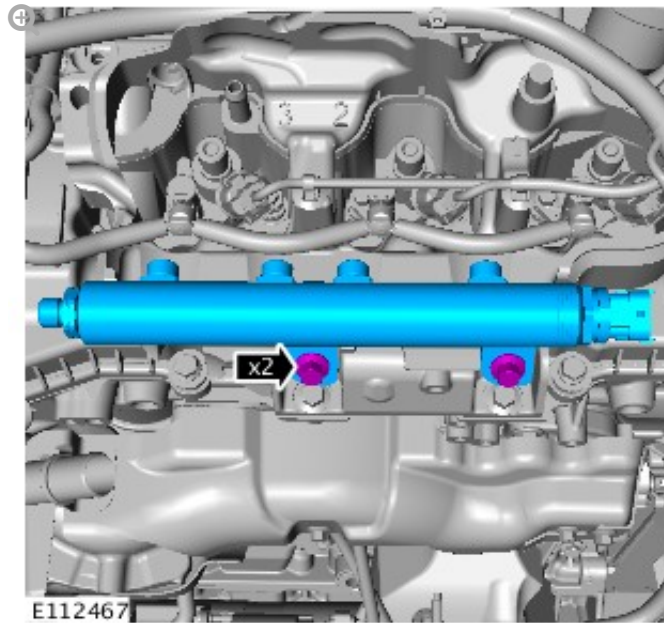


8.

Only tighten the bolt finger-tight at this stage.



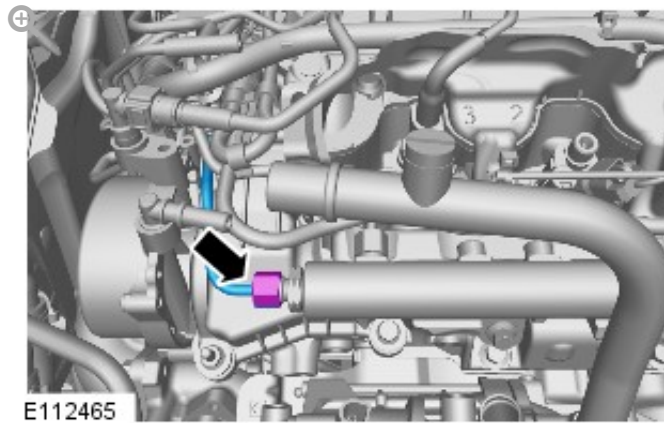
9.



Torque: **24 Nm**

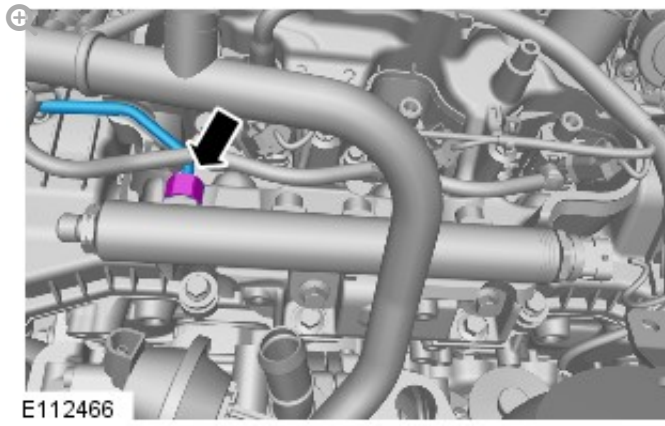
10.

Tighten the fuel supply line unions finger tight.



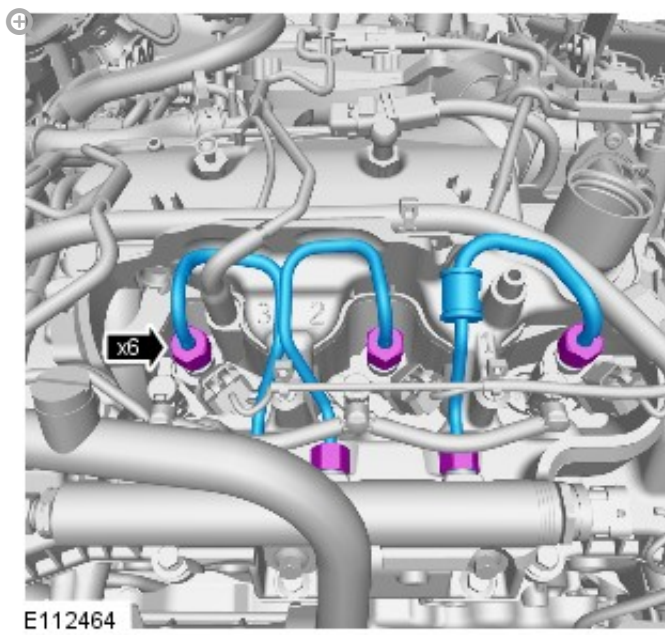
11.

Tighten the fuel supply line unions finger tight.



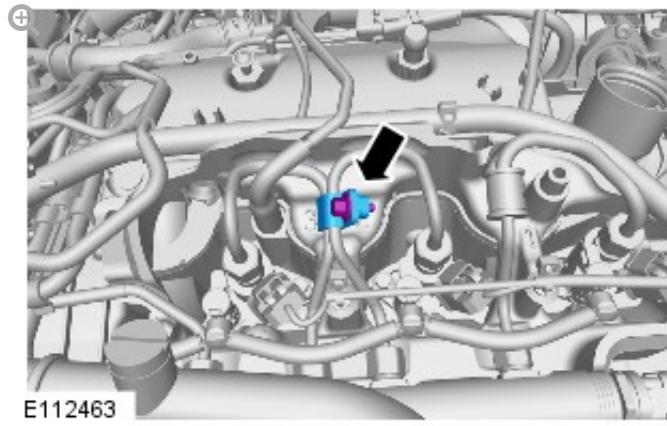
12.

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

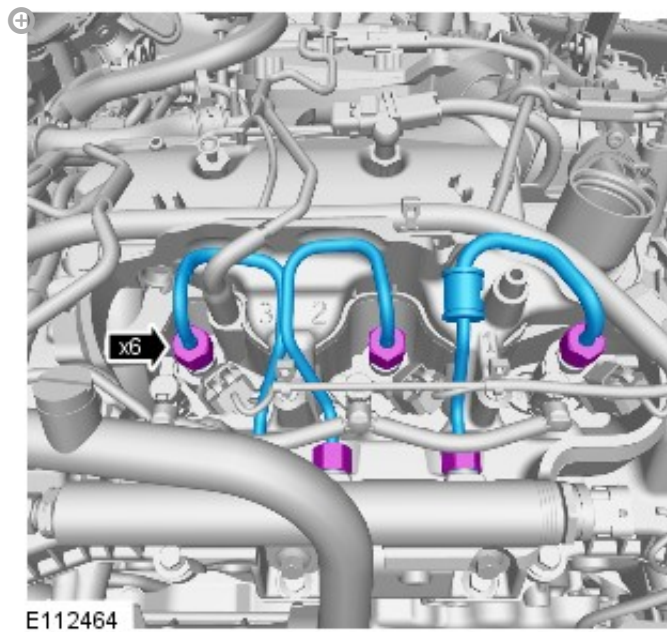


13.

Tighten the fuel supply line unions finger tight.

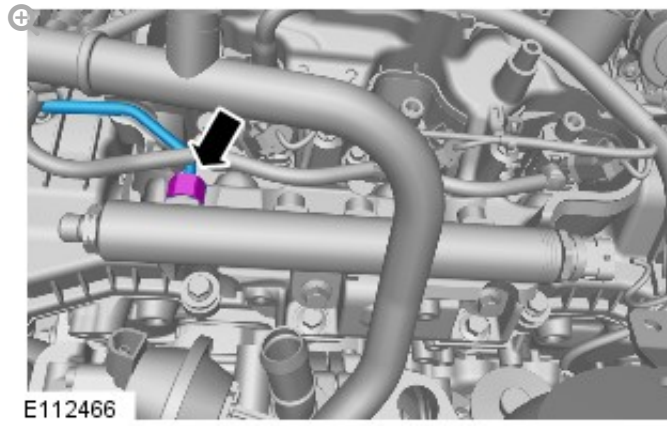


14.



- Stage 1: Tighten the high-pressure fuel supply line unions at the fuel rail to 15Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 15Nm.

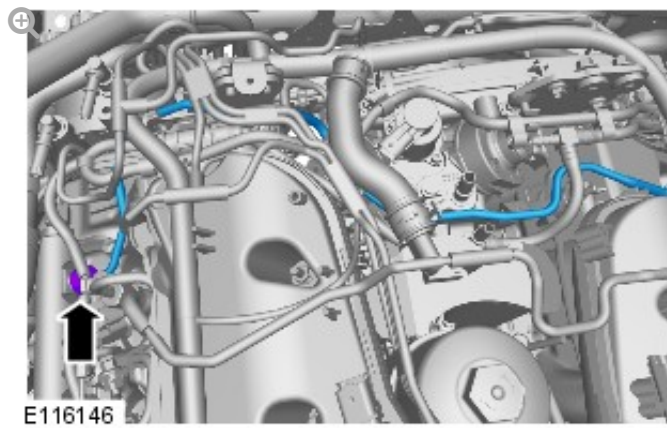
15.



Tighten the high-pressure fuel lines union to 15Nm.

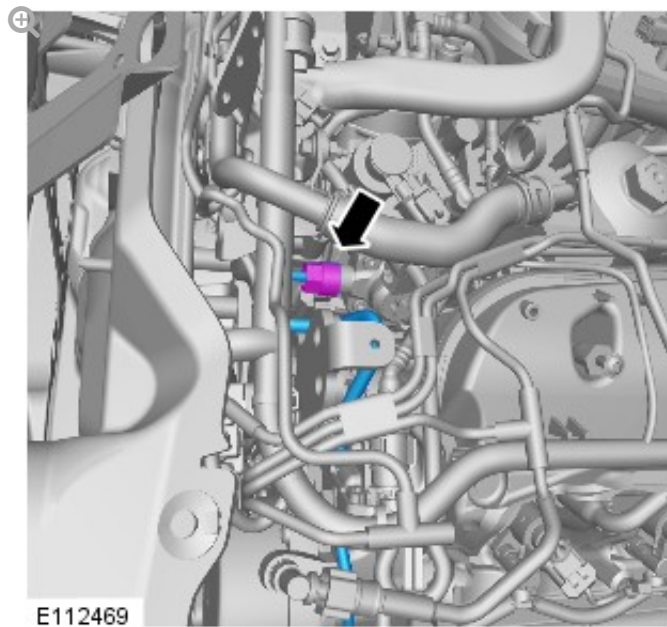
16.

Make sure that a new component is installed.



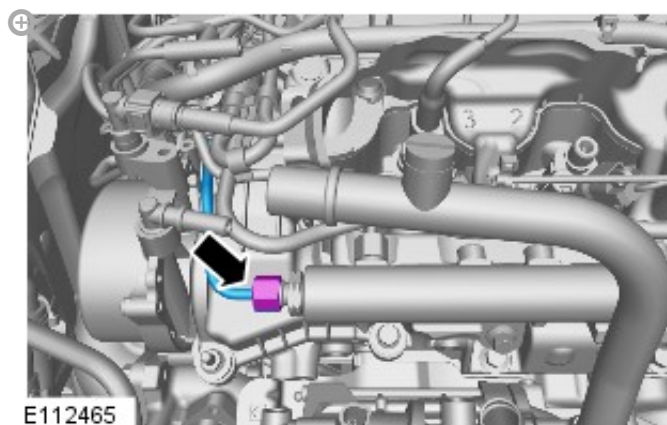
Tighten the high-pressure fuel lines union to 15Nm.

17.



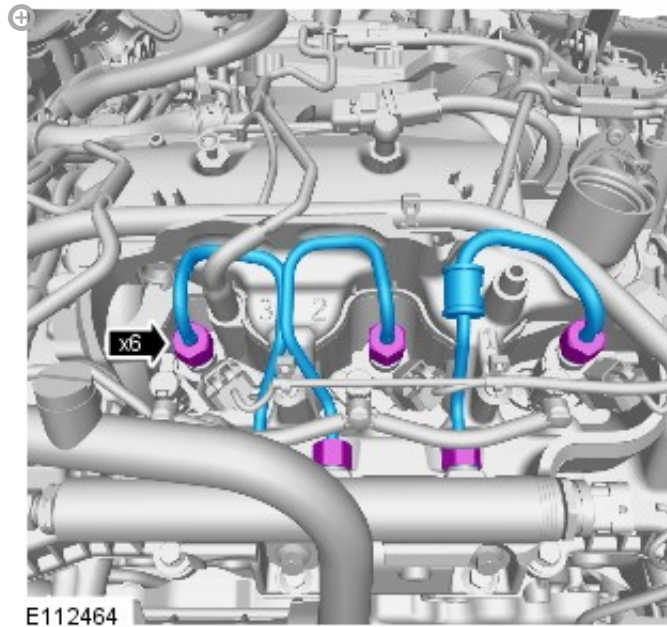
Tighten the high-pressure fuel lines union to 15Nm.

18.



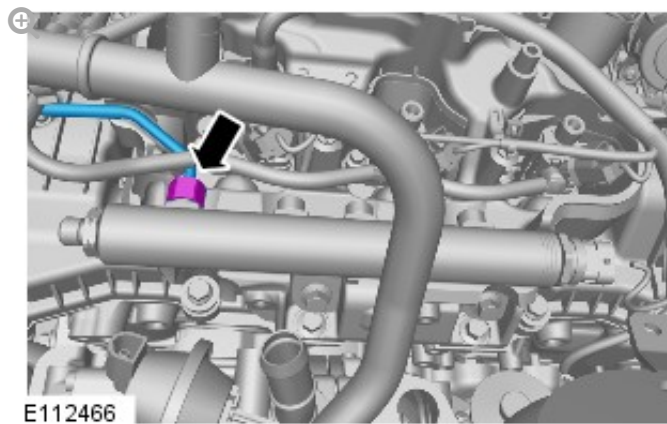
Tighten the high-pressure fuel lines union to 15Nm.

19.



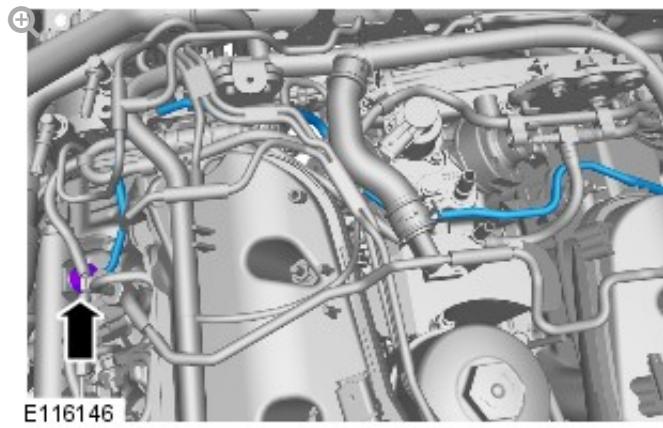
- Stage 1: Tighten the high-pressure fuel supply line unions at the fuel rail to 30Nm.
- Stage 2: Tighten the high-pressure fuel supply line unions at the injector to 30Nm.

20.



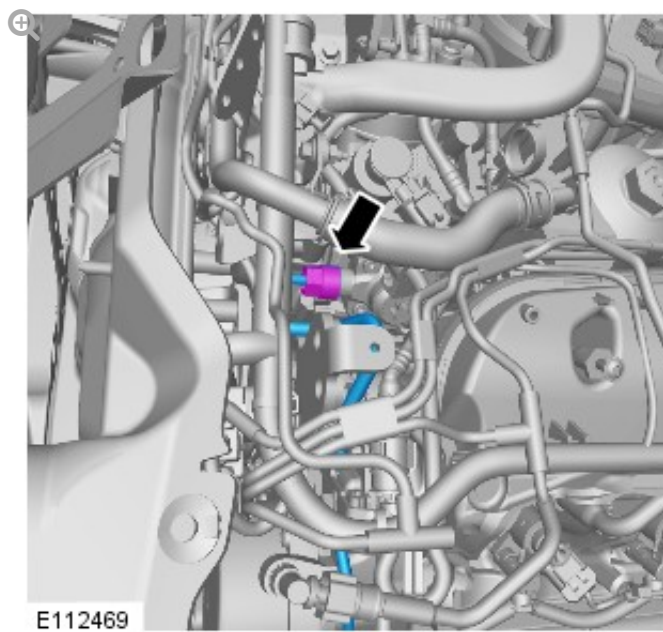
Tighten the high-pressure fuel line union to 30Nm.

21.



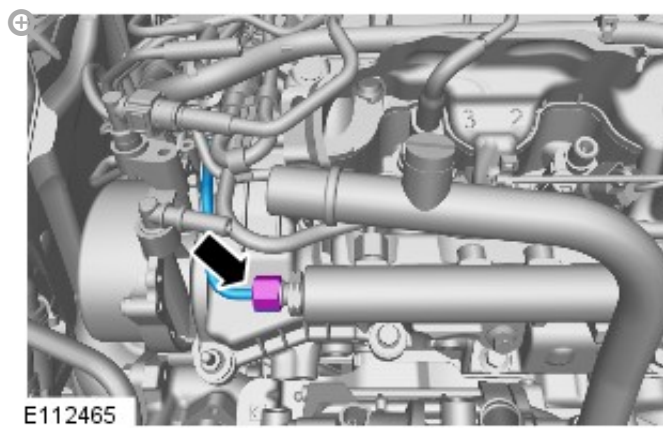
Tighten the high-pressure fuel line union to 30Nm.

22.



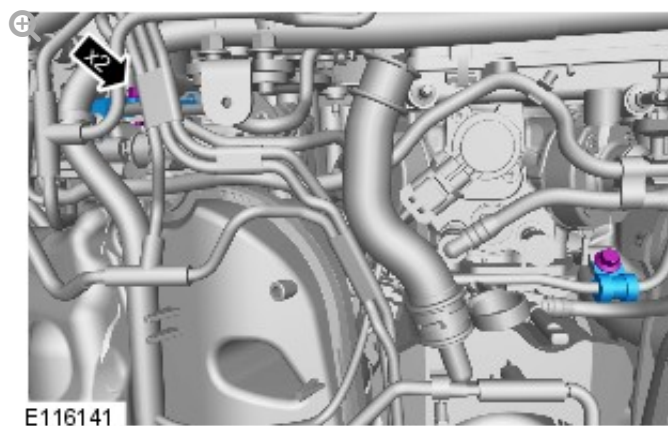
Tighten the high-pressure fuel line union to 30Nm.

23.



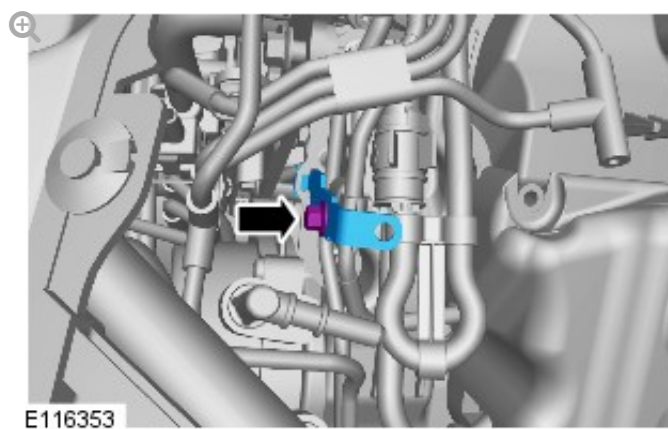
Tighten the high-pressure fuel line union to 30Nm.

24.



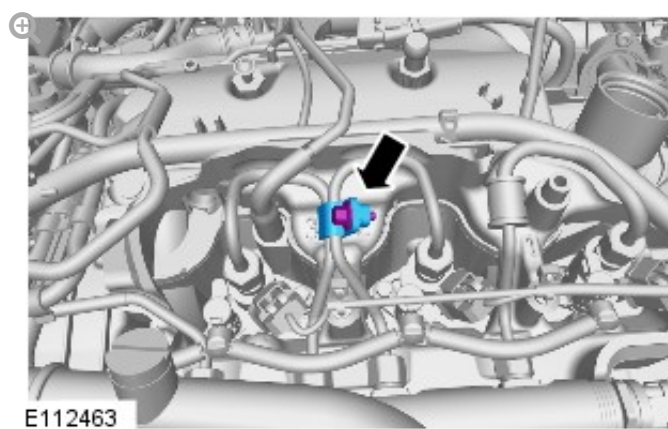
Torque: 10 Nm

25.



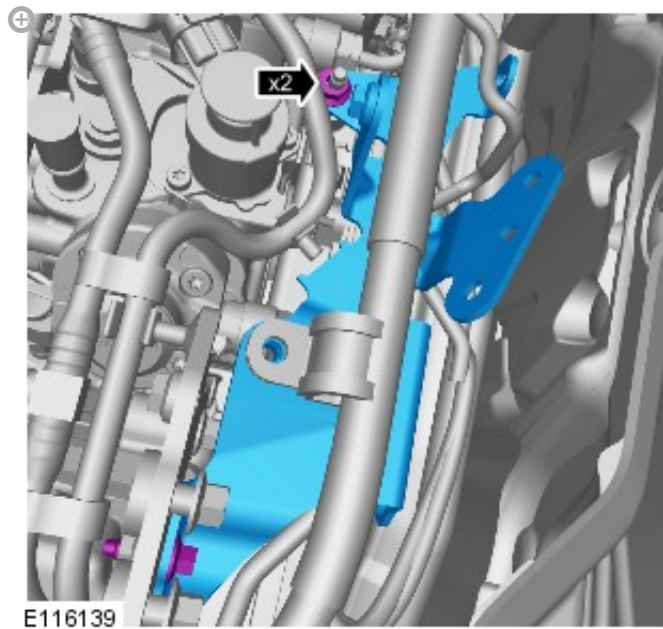
Torque: 10 Nm

26.



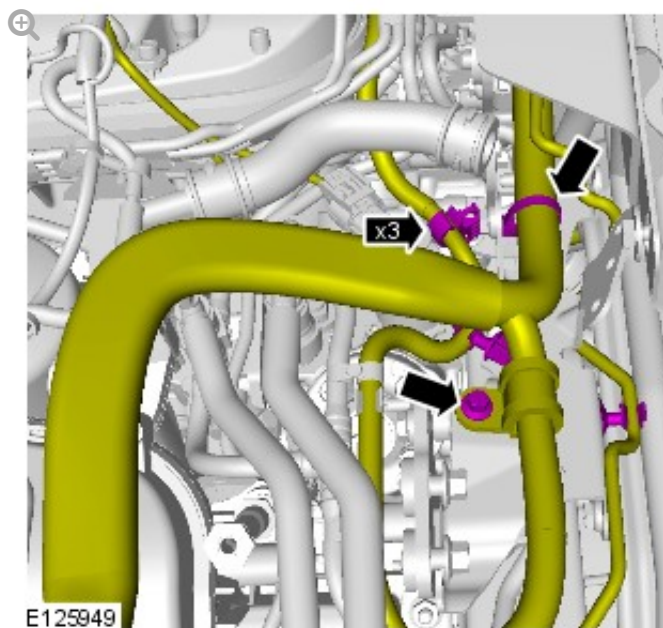
Torque: 10 Nm

27.



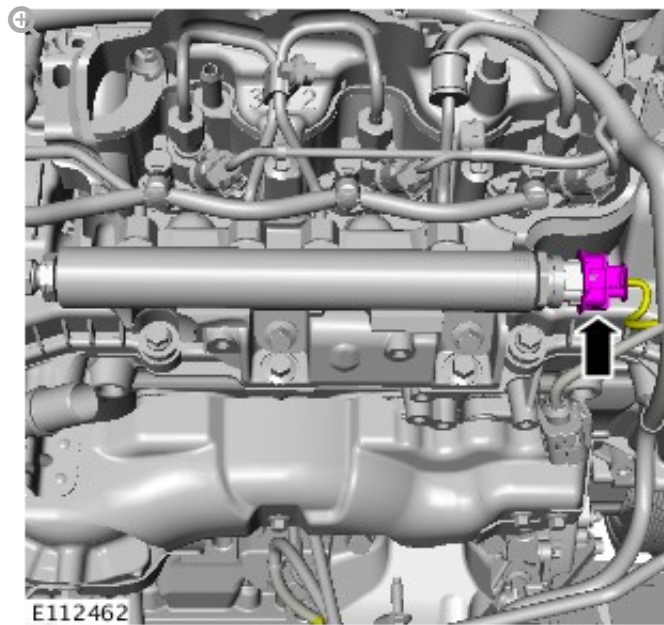
Torque: 10 Nm

28.



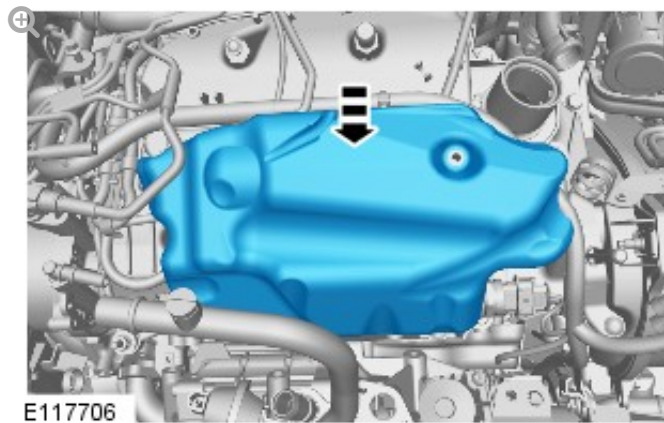
Torque: 10 Nm

29.



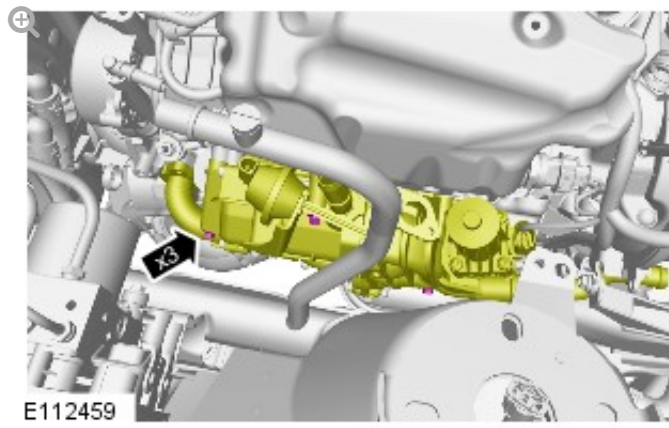
30.

Right-hand shown, Left-hand similar.



31.

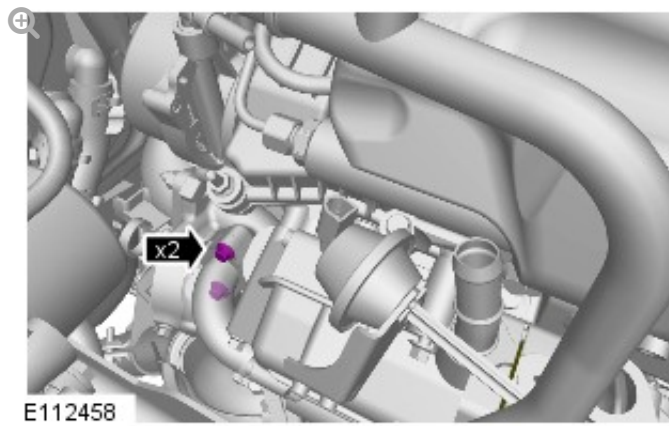
Only tighten the bolts finger-tight at this stage.



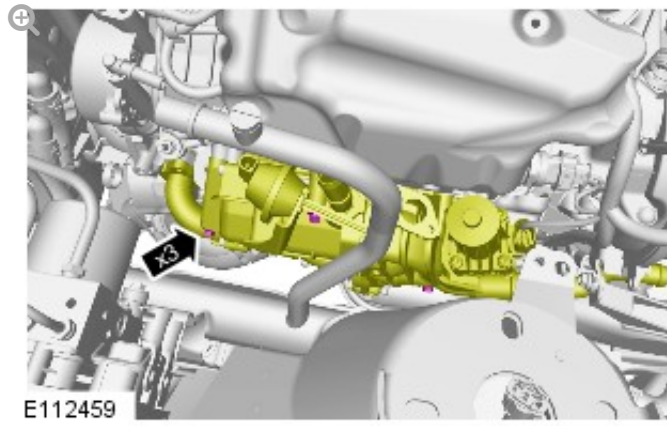
32.

Only tighten the bolts finger-tight at this stage.

Install a new gasket.

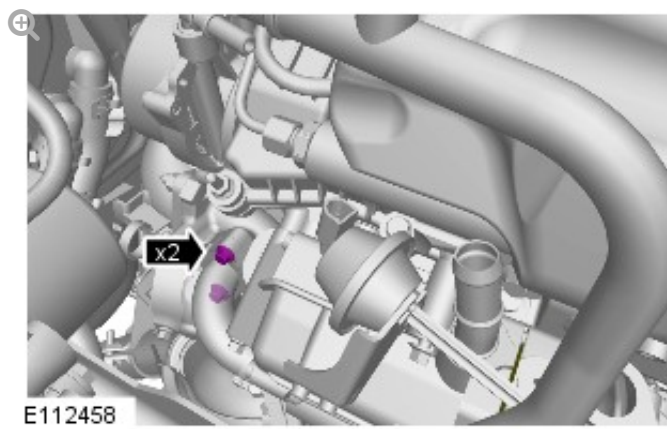


33.



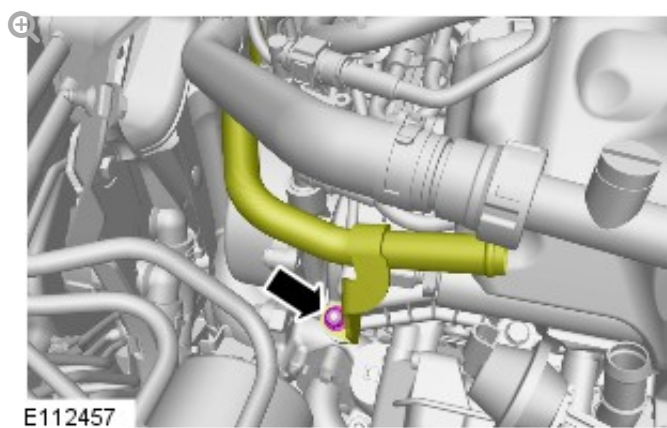
Torque: 10 Nm

34.



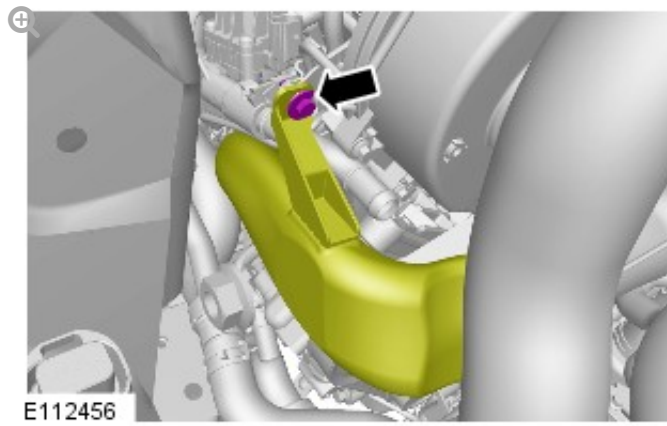
Torque: 10 Nm

35.



Torque: 10 Nm

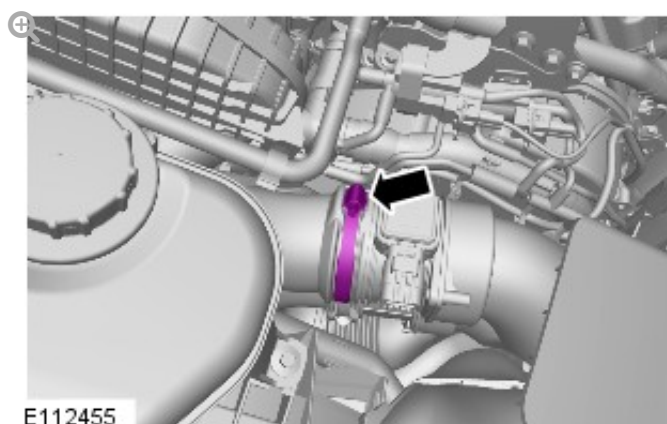
36.



E112456

Torque: 10 Nm

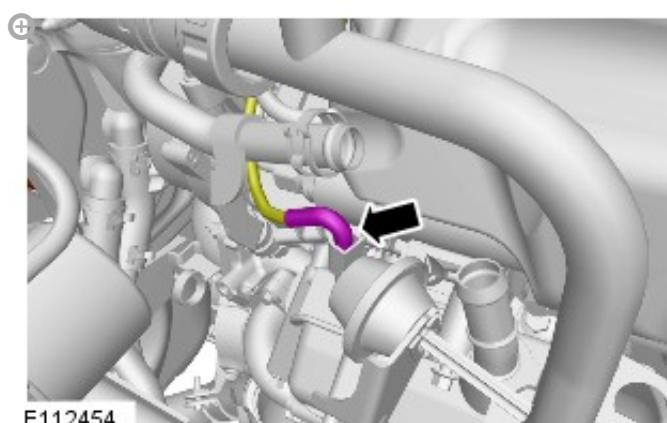
37.



E112455

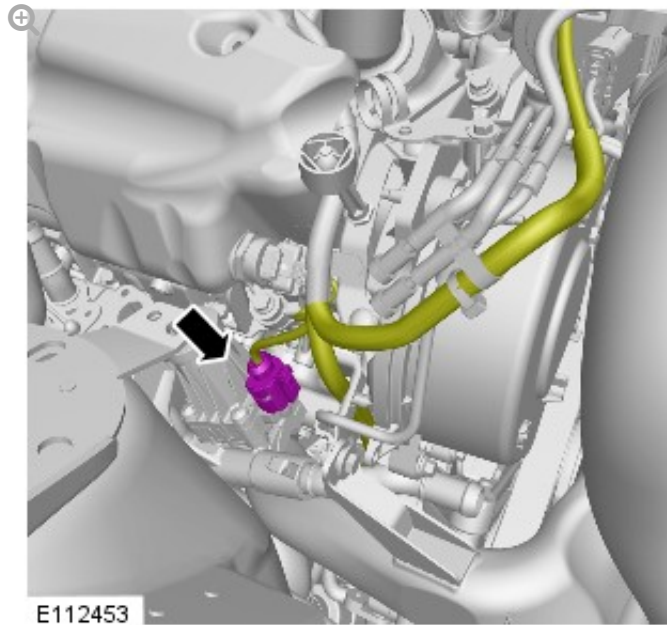
Torque: 7 Nm

38.



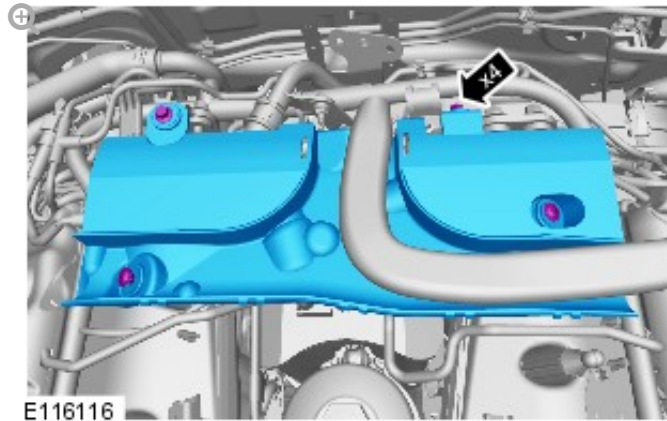
E112454

39.



E112453

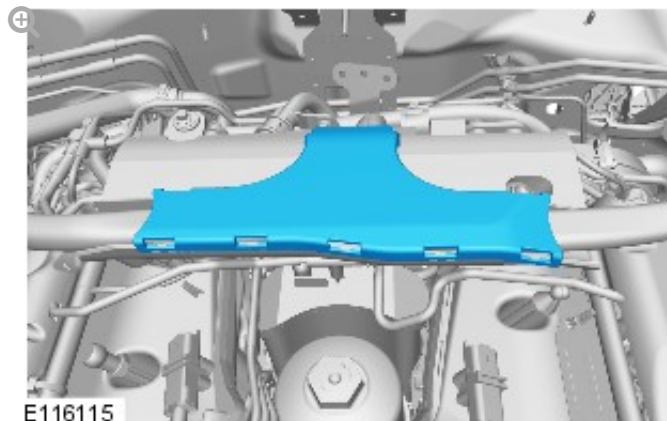
40.



E116116

Torque: 10 Nm

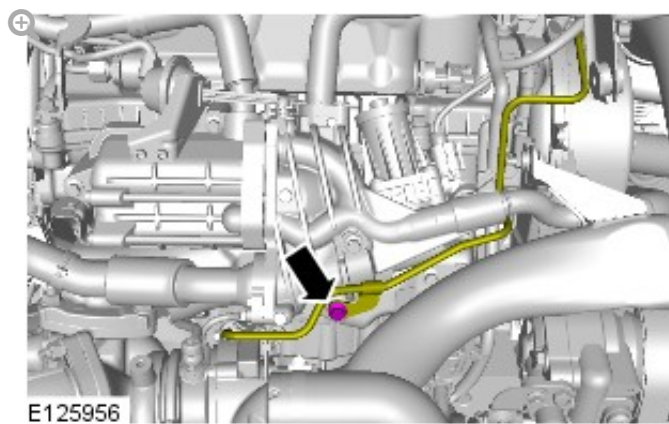
41.



E116115

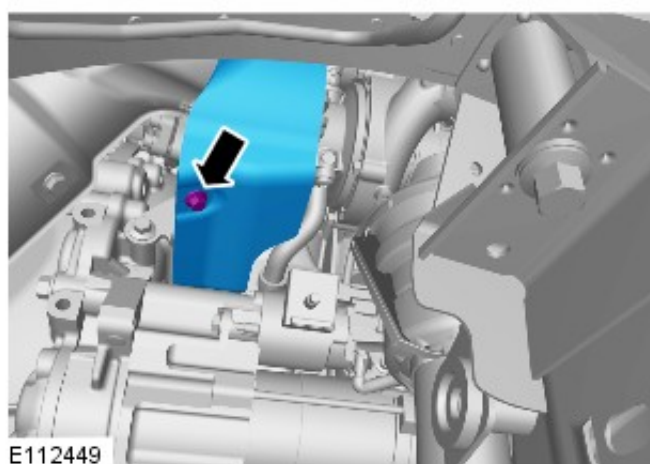
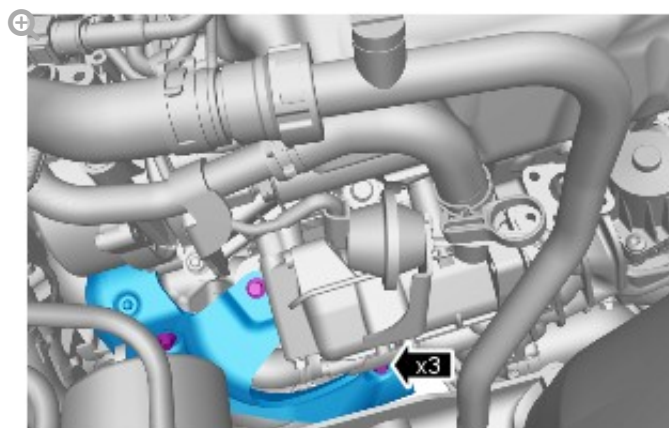
42.

Engine shown removed for clarity.



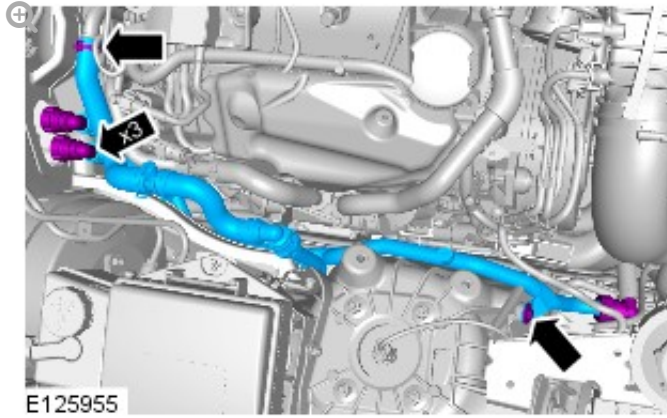
Torque: 10 Nm

43.



Torque: 10 Nm

44.



- 45. Refer to: [Right Exhaust Gas Recirculation Valve Outlet Tube](#) (303-08A Engine Emission Control - TDV6 3.0L Diesel, Removal and Installation).
- 46. Refer to: [Secondary Bulkhead Right Panel](#) (501-02 Front End Body Panels, Removal and Installation).
- 47. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
- 48. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

FUEL CHARGING AND CONTROLS - TDV6 3.0L DIESEL

FUEL CHARGING AND CONTROLS - SYSTEM OPERATION AND COMPONENT DESCRIPTION

[G1245373]

SYSTEM OPERATION

ENGINE STARTING

During starting, the fuel rail pressure must be at least 150 bar (2175 lbf/in²). Should the pressure be below this figure, the injectors will not operate, resulting in the vehicle not starting.

ENGINE STOPPING

To stop the engine the ECM (engine control module) stops energizing the actuators in the fuel injectors, therefore, no fuel is injected and the engine speed drops to zero.

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

HP FUEL PUMP

When the HP fuel pump is rotated, pressure is created when the volume control valve is open and the pressure control valve is closed. Both valves are electronically controlled by the ECM to allow variable fuel delivery and pressure control. When the ECM actuates the piezo actuators, the fuel rail pressure drop is off-set by additional fuel being delivered to the fuel rails by the pressure control valve. The fuel pressure in the system is reduced within a few seconds after the engine has stopped as the pressure control valve no longer has the holding current it requires, and therefore opens. No residual pressure remains in the system and the fuel is returned to the LP fuel return line to the fuel filter through the open pressure control valve.

COMPONENT DESCRIPTION

LOW PRESSURE [LP] SYSTEM

The electric fuel pump is located inside the fuel tank. Fuel is pumped from the tank via the in-tank fuel pump, to the HP pump via the fuel filter.

Refer to: [Fuel Tank and Lines](#) (310-01A Fuel Tank and Lines - TDV6 3.0L Diesel, Description and Operation).

The fuel filter is located on a bracket on the LH (left-hand) suspension turret in the engine compartment. Incorporated in the fuel filter housing is a bimetallic, temperature sensing, regulating valve which will start to close at 30 °C (86 °F) and will fully close at 50 °C (122 °F). This allows pre-heated diesel fuel, returning from the HP pump, to circulate inside the fuel filter to prevent waxing in cold operating conditions. When the valve is closed the fuel from the HP pump is passed through the fuel cooler before returning to filter to maintain the fuel at an optimum temperature.

The filter has an air bleed return to the fuel tank which returns excess air and fuel to the tank.

The fuel filter is also fitted with a water sensor to detect when moisture which has collected in the filter has reached an unacceptable level.

Refer to: [Fuel Tank and Lines](#) (310-01A Fuel Tank and Lines - TDV6 3.0L Diesel, Description and Operation).

An air blast fuel cooler is located under the LH side of the vehicle floor pan.

The fuel cooler has 2 connections; one is an inlet which allows heated fuel from the HP pump to be cooled, the second allows the cooled fuel to be fed from the cooler into the supply pipe from the LP fuel pump in the fuel tank, via a 'Y' connector back to the fuel filter.

When the regulating valve in the fuel filter is open, the heated fuel from the HP pump is routed direct to the fuel cooler before returning to the fuel filter.

HIGH PRESSURE (HP) SYSTEM