

- Pressure regulator solenoids
- Shift control solenoid
- Damper
- Hydraulic spool valves
- Selector valve
- Temperature sensor
- Turbine speed sensor
- Output shaft speed sensor.

### Speed Sensors

The turbine speed sensor and the output shaft speed sensor are Hall effect type sensors located in the Mechatronic valve block and are not serviceable items. The TCM monitors the signals from each sensor to determine the input (turbine) speed and the output shaft speed.

The turbine speed is monitored by the TCM to calculate the slip of the torque converter clutch and internal clutch slip. This signal allows the TCM to accurately control the slip timing during shifts and adjust clutch application or release pressure for overlap shift control.

The output shaft speed is monitored by the TCM and compared to engine speed signals received on the CAN bus from the ECM. Using a comparison of the two signals the TCM calculates the transmission slip ratio for plausibility and maintains adaptive pressure control.

### Temperature Sensor

The temperature sensor is also located in the Mechatronic valve block. The TCM uses the temperature sensor signals to determine the temperature of the transmission fluid. These signals are used by the TCM to control the transmission operation to promote faster warm-up in cold conditions or to

assist with fluid cooling by controlling the transmission operation when high fluid temperatures are experienced. If the sensor fails, the TCM will use a default value and a fault code will be stored in the TCM.

There is one damper located in the valve housing. The damper is used to regulate and dampen the regulated pressure supplied via EPRS. The damper is load dependent through modulation of the damper against return spring pressure.

The damper comprises a piston, a housing bore and a spring. The piston is subject to the pressure applied by the spring. The bore has a connecting port to the function to which it applies. Fluid pressure applied to the applicable component (i.e. a clutch) is also subjected to the full area of the piston, which moves against the opposing force applied by the spring. The movement of the piston creates an action similar to a shock absorber, momentarily delaying the build up of pressure in the circuit. This results in a more gradual application of clutches improving shift quality.

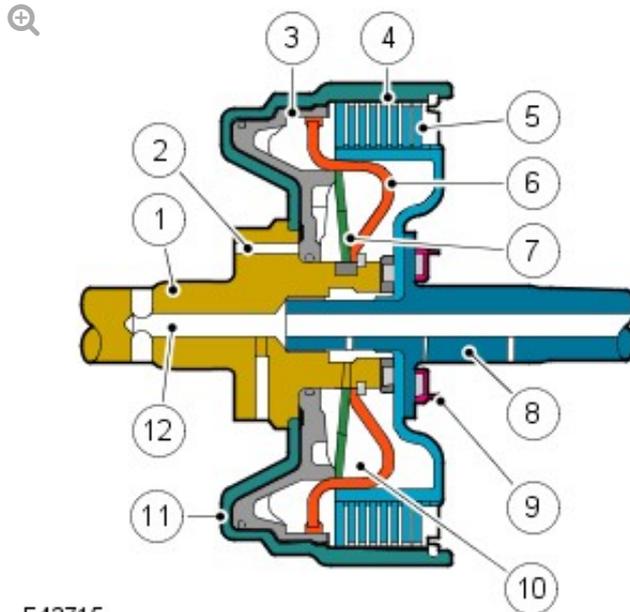
The valve block spool valves control various functions of the transmission. The spool valves are of conventional design and are operated by fluid pressure.

Each spool valve is located in its spool bore and held in a default (unpressurized) position by a spring. The spool bore has a number of ports which allow fluid to flow to other valves and clutches to enable transmission operation. Each spool has a piston which is waisted to allow fluid to be diverted into the applicable ports when the valve is operated.

When fluid pressure moves a spool, one or more ports in the spool bore are covered or uncovered. Fluid is prevented from flowing or is allowed to flow around the applicable waisted area of the spool and into another uncovered port. The fluid is either passed through galleries to actuate another spool, operate a clutch or is returned to the fluid pan.

---

## DRIVE CLUTCHES



E42715

|    |                                       |
|----|---------------------------------------|
| 1  | Input shaft                           |
| 2  | Main pressure supply port             |
| 3  | Piston                                |
| 4  | Cylinder – external plate carrier     |
| 5  | Clutch plate assembly                 |
| 6  | Baffle plate                          |
| 7  | Diaphragm spring                      |
| 8  | Output shaft                          |
| 9  | Bearing                               |
| 10 | Dynamic pressure equalization chamber |
| 11 | Piston chamber                        |
| 12 | Lubrication channel                   |

There are three drive clutches and two brake clutches used in the ZF 6HP28 transmission. Each clutch comprises one or more friction plates dependent on the output controlled. A typical clutch consists of a number of steel outer plates and inner plates with friction material bonded to each face.

On 5.0L SC (supercharger) and 3.0L diesel models, the updated transmission includes additional clutch plates to enable the transmission to manage the additional power output from these engines.

The clutch plates are held apart mechanically by a diaphragm spring and hydraulically by dynamic pressure. The pressure is derived from a lubrication channel which supplies fluid to the bearings etc. The fluid is passed via a drilling in the output shaft into the chamber between the baffle plate and the piston. To prevent inadvertent clutch application due to pressure build up produced by centrifugal force, the fluid in the dynamic pressure equalization chamber overcomes any pressure in the piston chamber and holds the piston off the clutch plate assembly.

When clutch application is required, main pressure from the fluid pump is applied to the piston chamber from the supply port. This main pressure overcomes the low pressure fluid present in the dynamic pressure equalization chamber. The piston moves, against the pressure applied by the diaphragm spring, and compresses the clutch plate assembly. When the main pressure falls, the diaphragm spring pushes the piston away from the clutch plate assembly, disengaging the clutch.

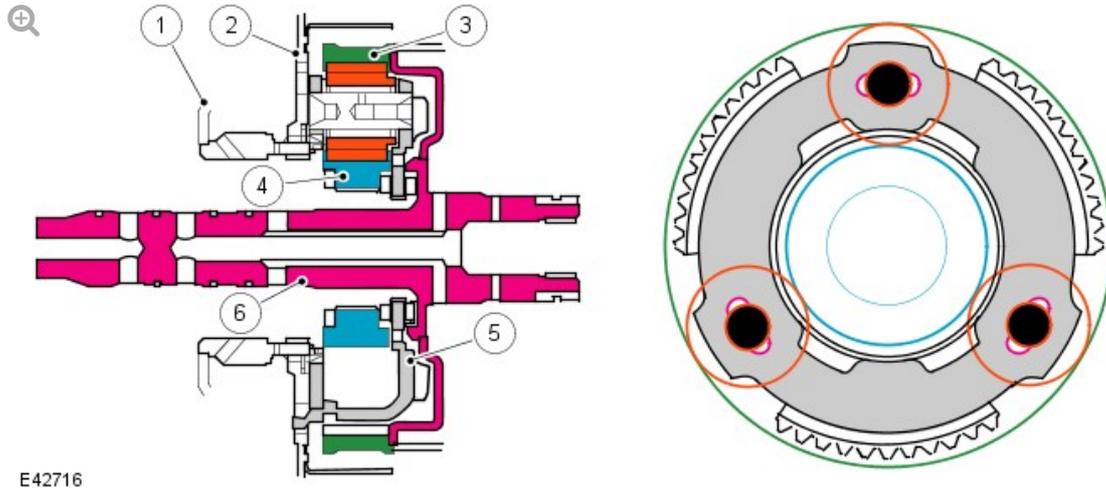
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## PLANETARY GEAR TRAINS

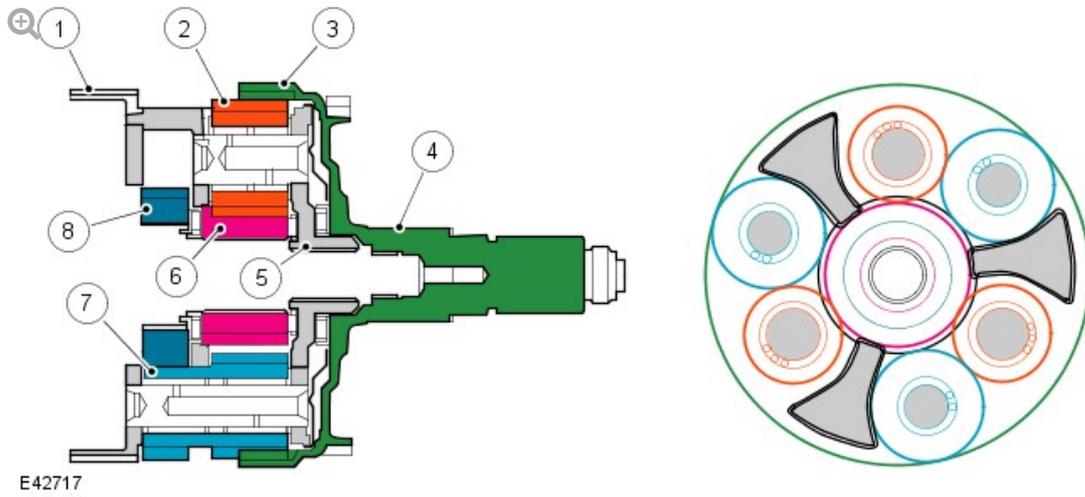
The planetary gear trains used on the ZF 6HP28 transmission comprise a single web planetary gear train and a double web planetary gear train. These gear trains are known as Lepelletier type gear trains and together produce the six forward gears and the one reverse gear.

The single web planetary gear train comprises:

- Sunwheel
- Three (naturally aspirated versions) or four (5.0L SC and 3.0L diesel versions) planetary gears
- Planetary gear carrier (spider)
- Ring gear or annulus.



|   |                              |
|---|------------------------------|
| 1 | Cylinder                     |
| 2 | Baffle plate                 |
| 3 | Ring gear                    |
| 4 | Sun gear                     |
| 5 | Planetary gear spider        |
| 6 | Torque converter input shaft |



E42717

|   |                               |
|---|-------------------------------|
| 1 | Planetary gear spider         |
| 2 | Planetary gears (short)       |
| 3 | Ring gear                     |
| 4 | Output shaft                  |
| 5 | Planetary gear carrier        |
| 6 | Sunwheel                      |
| 7 | Double planetary gears (long) |
| 8 | Sunwheel                      |

The double planetary gear train comprises:

- Two sunwheels
- Three short planetary gears
- Three long planetary gears
- Planetary gear carrier
- Ring gear or annulus

The park lock is electronically actuated by solenoid valve located in the valve block. The park lock is engaged by a mechanical spring system comprising a parking disc and a lock cylinder controlled by a solenoid valve.

The park lock is engaged when the TCM receives a park request from the JaguarDrive selector. When the park lock is released, a solenoid valve in the valve housing directs hydraulic pressure to the lock cylinder, which moves the piston within the cylinder and releases the park lock pawl at the rear of the transmission by means of a connecting rod. The solenoid on the lock cylinder is energized and locks the cylinder piston in the unlocked position. Additional locking of the piston is achieved with ball catches within the lock cylinder.

When park is selected, the solenoid on the lock cylinder is de-energized, the ball catches are released and the piston is free to move in the lock cylinder. The solenoid in the valve housing is also de-energized. The spring loaded parking disc pulls the cylinder piston in the park direction which allows the park disc to move on its mounting. This movement is transferred via the connecting rod to parking pawl, which is engaged in the park lock gear.

If an electrical failure occurs, the park lock can be manually released by means of an emergency park release lever located in the floor console. The lever is connected to the parking disc by a cable and allows the park lock to be released manually. Refer to: External Controls (307-05, Description and Operation).

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## TRANSMISSION CONTROL MODULE

The TCM is an integral part of the Mechatronic valve block which is located at the bottom of the transmission, within the fluid pan. The TCM is the main controlling component of the transmission.

The TCM processes signals from the transmission speed and temperature sensors, ECM and other vehicle systems. From the received signal inputs and pre-programmed data, the module calculates the correct gear, torque converter clutch setting and optimum pressure settings for gear shift and lock-

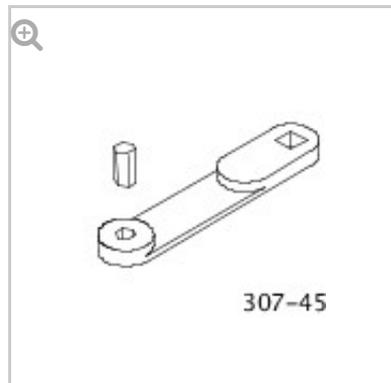
up clutch control.

**AUTOMATIC  
TRANSMISSION/TRANSAXLE**

**TRANSMISSION FLUID DRAIN  
AND REFILL** [G1268839]

---

**SPECIAL TOOL(S)**



**307-452**

Wrench,  
Transmission Filler  
Plug



- Observe due care when draining, as the fluid can be very hot.
- Observe due care when working near a hot exhaust system.

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

1. The following steps must be observed before starting the transmission drain and refill.  
Make sure that the electric park brake is applied.  
The vehicle must be on a horizontal ramp.  
Make sure the transmission control switch (TCS) is in the Park (P) position.  
Do not start the engine.
2. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).
3. Place a container under the transmission.

4.



Discard the transmission fluid drain plug.

Allow the fluid to drain into the container.

5.

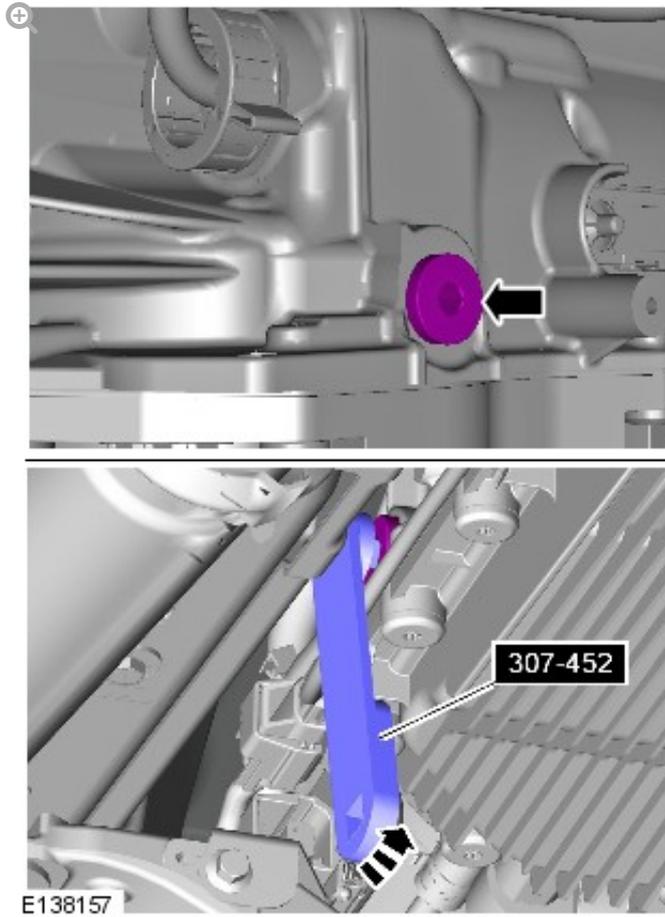
Install a new transmission drain plug.



*Torque:* **8 Nm**

6.

Remove the oil filler plug, do not discard.



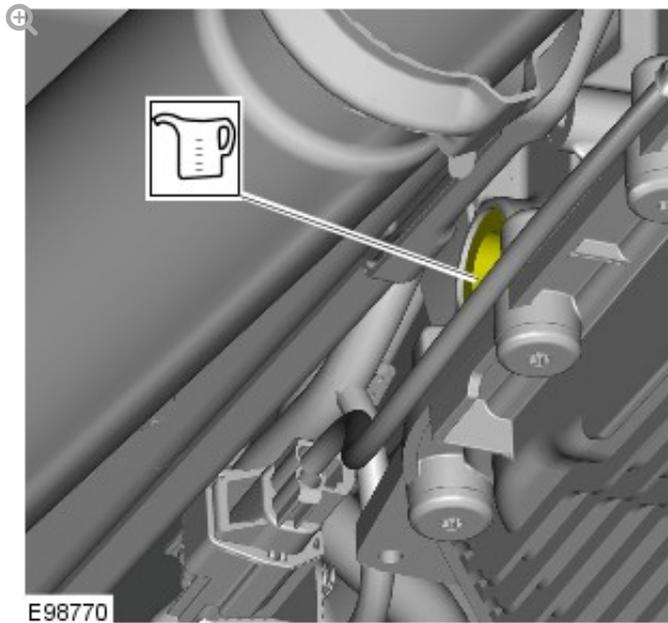
Clean the area around the transmission fluid level plug.

*Special Tool(s):* [307-452](#)

7.

Make sure the correct specification and quantity of oil is used.

Use transmission fluid meeting Jaguar specification.



- Fill the transmission with the correct specification of fluid. Fill oil through the overflow hole until the level inside is high enough that oil starts to trickle back out of the same hole.

Refer to: [Specifications](#) (307-01 Automatic Transmission/Transaxle, Specifications).

Install the fluid level plug, only finger tight at this stage.

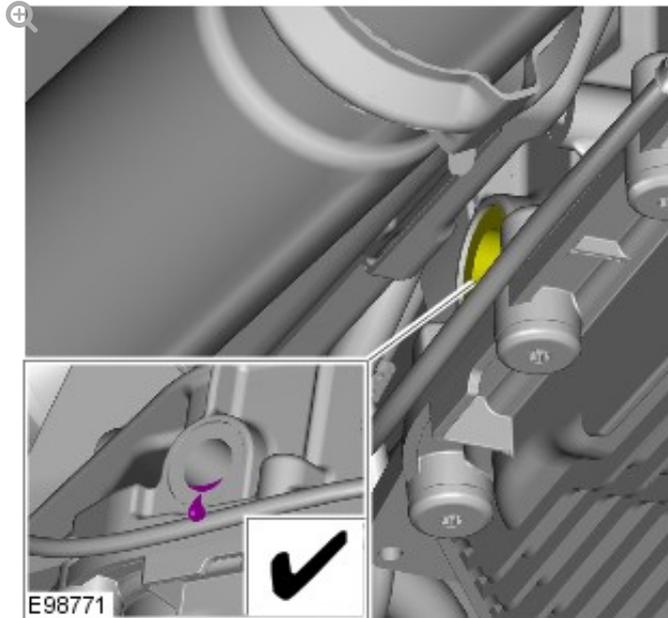
Remove the container from under the transmission to avoid damage.

8.

The following steps require the aid of another technician, due to controlling the engine speed while the visual check is carried out.

Lower the vehicle.

9.



Raise the vehicle.

Place the container under the transmission to catch the overflow oil.

Remove the fluid level plug.

Fill oil through the overflow hole until the level inside is high enough that oil starts to trickle back out of the same hole.

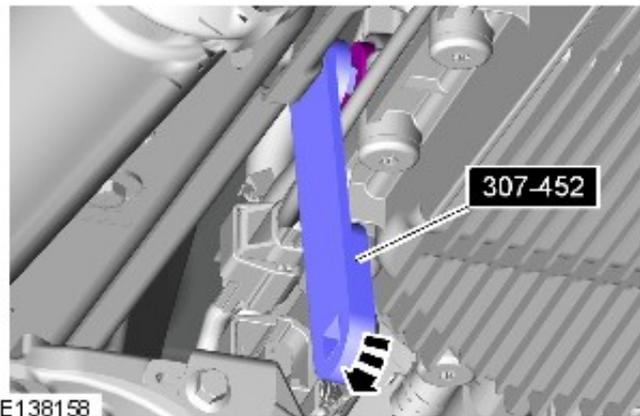
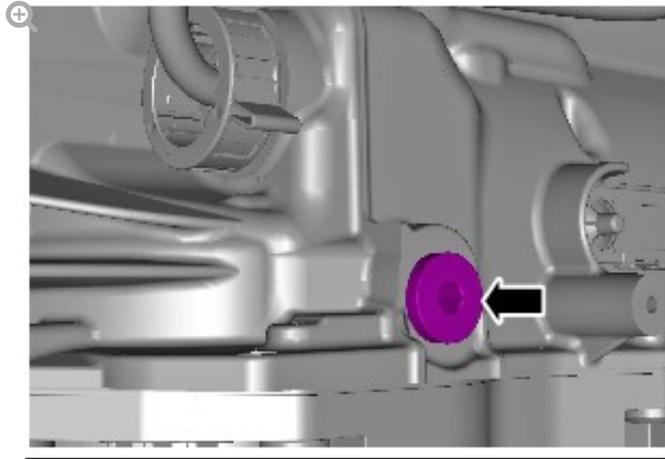
10. Start the engine, and allow to idle.

Increase the engine idle speed to 2000 rpm for 30 seconds, this is to fill the torque converter.

Allow the engine to return to idle speed.

11. Fill oil through the overflow hole until the level inside is high enough that oil starts to trickle back out of the same hole.

12.



Vehicle without thermostat.

**Install the filler plug finger-tight and proceed to the transmission fluid check.**

Vehicles with thermostat.

**Install the oil filler plug temporarily and follow step 13.**

*Special Tool(s):* [307-452](#)

*Torque:* **20 Nm**

13.

**Vehicles with thermostat.**

Carry out a road test to open the thermostat and allow transmission fluid to fill the circuit.

Use Jaguar approved diagnostic equipment, to ensure the transmission temperature does go above the level where the thermostat opens 69°C (156°F).

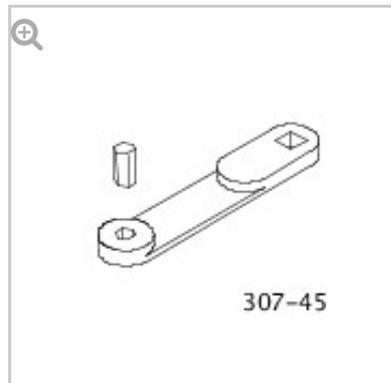
14. Refer to: [Transmission Fluid Level Check](#) (307-01 Automatic Transmission/Transaxle, General Procedures).

**AUTOMATIC  
TRANSMISSION/TRANSAXLE**

**TRANSMISSION FLUID LEVEL  
CHECK** [G1268838]

---

**SPECIAL TOOL(S)**



**307-452**

Wrench,  
Transmission Filler  
Plug

---

CHECK

- Observe due care when draining, as the fluid can be very hot.
- Observe due care when working near a hot exhaust system.

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

1.
  - The following steps must be observed before starting the transmission fluid level check.
  - The vehicle must be on a horizontal ramp.
  - Make sure that the electric park brake (EPB) is applied.
  - Make sure the transmission control switch (TCS) is in the Park (P) position.

2.

Using the Jaguar approved diagnostic equipment, make sure the transmission temperature is between 30°C (86°F) and 50°C (122°F) before starting the fluid level check.

- Connect the Jaguar approved diagnostic equipment to the vehicle.
  - Start the engine and allow to idle.
  - Switch off the air conditioning (A/C) system and other electrical components.
3.
    - Make sure that the transmission is not in the default mode, if this

is the case, stop and correct the cause first and then restart the fluid level check.

4.

Make sure the hydraulic control system is filled with oil.

- Apply and hold the brake pedal.
- Select reverse gear and wait for 10 seconds.
- Select drive, then manual 1st gear and wait for 10 seconds.
- Select 2nd gear and wait for 10 seconds.
- Select P on the TCS.

5.

Make sure the torque converter is completely filled with oil.

- Raise the engine speed to 2000 rpm and hold for 30 seconds. Then return to idle speed.

6.

After completing the preparation, proceed to the actual transmission fluid level check.

- If the transmission oil temperature is lower than 30°C (86°F). Allow the transmission to warm up above 30°C (86°F) with the engine idling in the P position, then proceed with the transmission fluid level check.
- If the transmission oil temperature is above 50°C (122°F), switch off the engine and allow the transmission to cool down, then

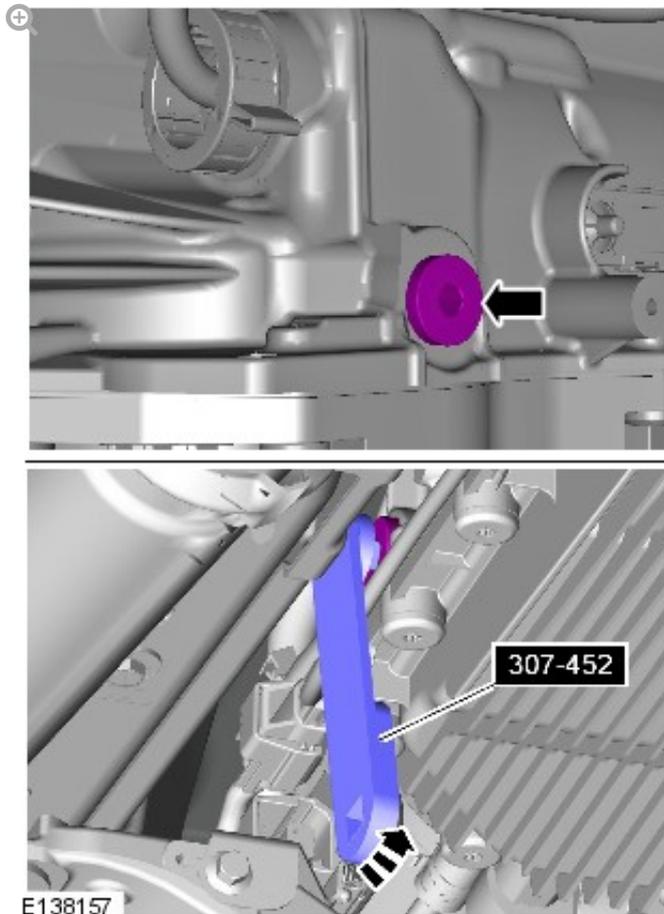
restart the fluid level check.

7.

Only continue with the fluid level check if the transmission temperature is between 30°C (86°C) 50°C (122°).

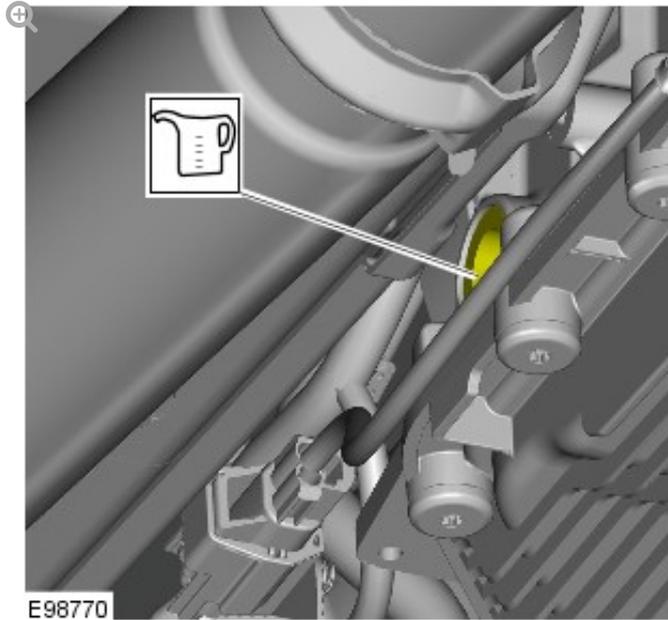
- Maintain the engine idle speed.
8. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

9.



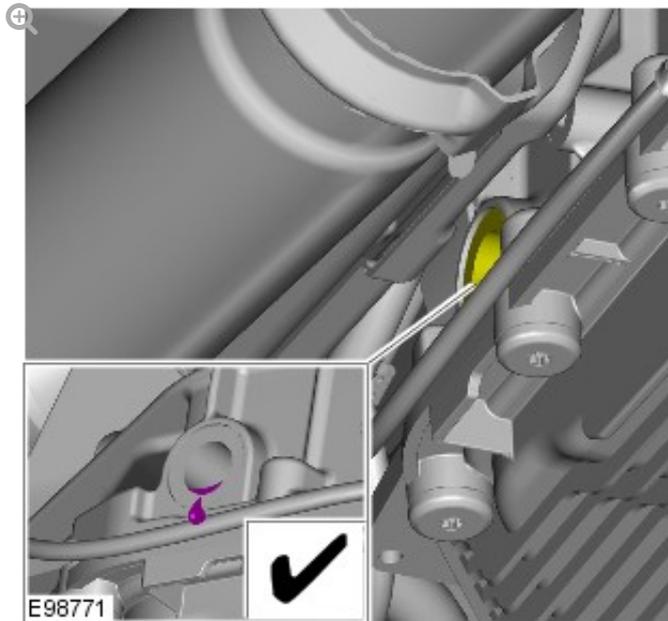
- Remove the oil filler plug, do not discard.
- If fluid flows out, proceed to Step 11.
- If fluid does not flow out, proceed to Step 10.
- *Special Tool(s):* [307-452](#)

10.



- Fill oil through the overflow hole until the level inside is high enough that oil starts to trickle back out of the same hole. Refer to: [Specifications](#) (307-01 Automatic Transmission/Transaxle, Specifications).

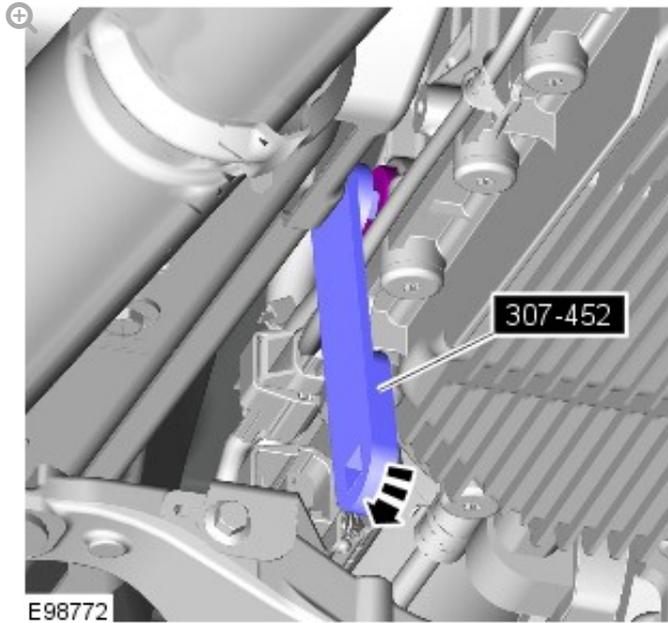
11.



- Allow the transmission fluid to drain from the oil filler hole until the flow almost stops to a trickle.

12.

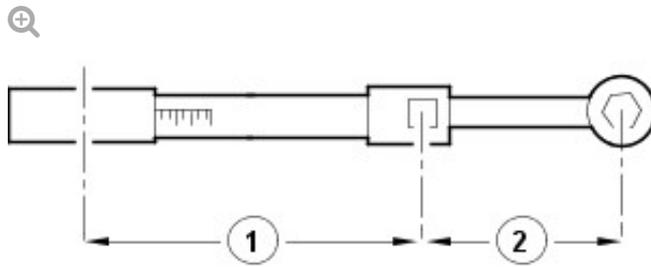
Install the original oil filler plug.



- Using the special tool, install the original oil filler plug.
- *Special Tool(s):* [307-452](#)

13.

Make sure the transmission fluid fill plug is tightened to the correct specification. Failure to follow this instruction may result in damage to the transmission.



E37107

- To make sure the transmission fill plug is tightened to the correct specification. Using the special tool and torque wrench the following calculation steps must be followed.
  - Step 1. Multiply 35 Nm by the effective length of the torque wrench (1).
  - Step 2. Add the effective length of the special tool (2) to the effective length of the torque wrench (1).
  - Step 3. Divide the total of step 1 by the total of step 2.
  - Step 4. Set the torque wrench to the figure arrived at in step 3.
  - Tighten the transmission fluid fill plug to the torque given by the calculation.
14.   ▪ Remove the special tool.
- *Special Tool(s):* [307-452](#)

15.

Clean the area around the filler plug, wipe away any excess fluid.

Remove the container.

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

17. Lower the vehicle.

18. Disconnect the Jaguar approved diagnostic equipment.

# AUTOMATIC TRANSMISSION/TRANSAXLE TRANSMISSION FLUID PAN, GASKET AND FILTER [G1271944]

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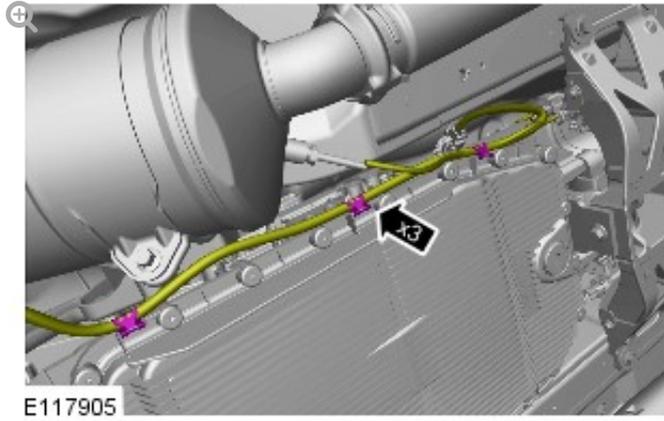
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## REMOVAL

Removal steps in this procedure may contain installation details.

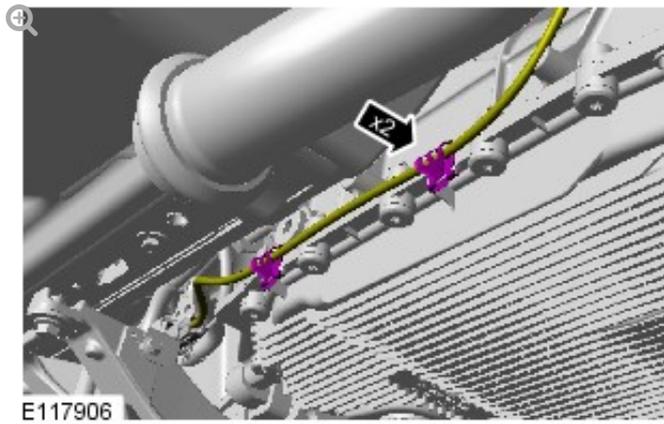
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
2. Raise and support the vehicle.
3. Refer to: [Transmission Fluid Drain and Refill](#) (307-01 Automatic Transmission/Transaxle, General Procedures).

4.



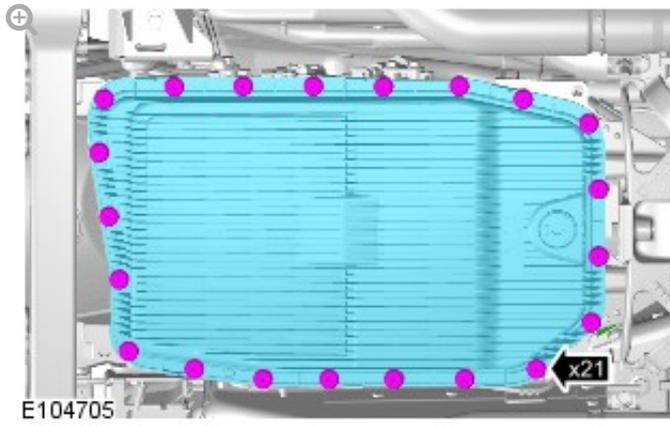
5.

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



6.

- Make sure that the area around the component is clean and free of foreign material.
- Be prepared to collect escaping fluids.



*Torque:* **8 Nm**

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## INSTALLATION

1. To install, reverse the removal procedure.

**AUTOMATIC  
TRANSMISSION/TRANSAXLE**

**TRANSMISSION SUPPORT  
INSULATOR - TDV6 3.0L  
DIESEL** [G1271946]

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**REMOVAL**

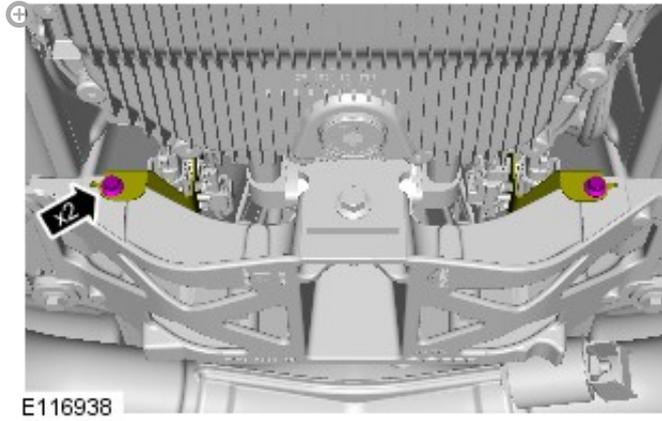
- Removal steps in this procedure may contain installation details.
- Some variation in the illustrations may occur, but the essential information is always correct.

1.

Make sure to support the vehicle with axle stands.

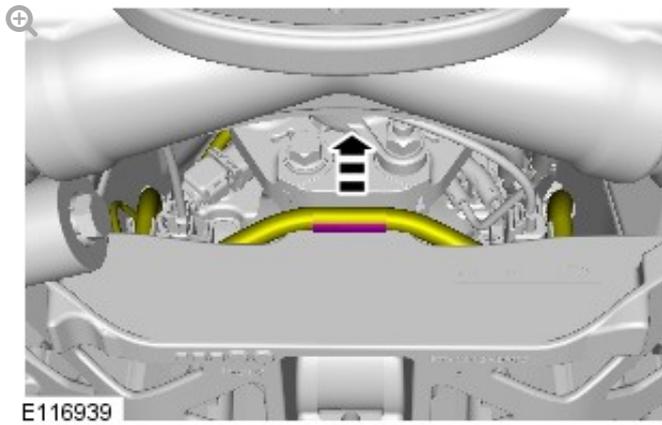
Raise and support the vehicle.

2.



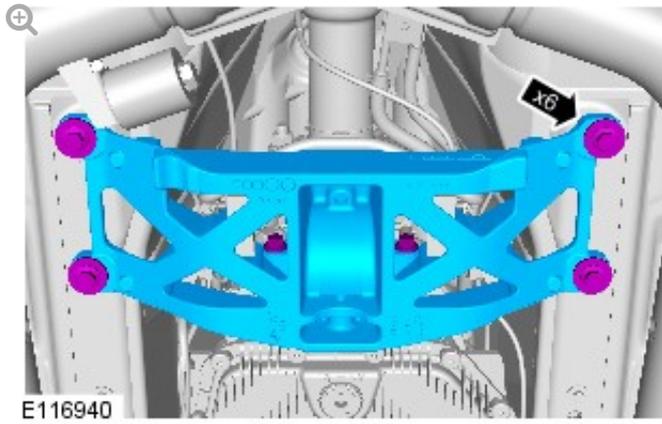
*Torque: 10 Nm*

3.



4.

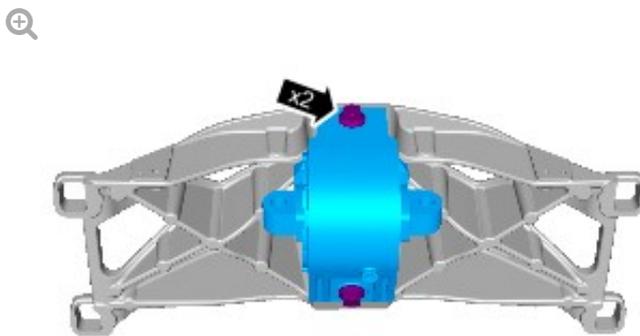
During this procedure the transmission crossmember is removed, make sure the transmission is correctly supported to avoid damaging associated components.



*Torque: 48 Nm*

5.

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



*Torque: 70 Nm*

---

## INSTALLATION

1. To install, reverse the removal procedure.



**AUTOMATIC  
TRANSMISSION/TRANSAXLE**

**TRANSMISSION - TDV6 3.0L  
DIESEL** [G1271947]

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REMOVAL

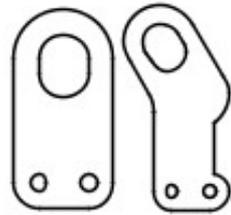
**SPECIAL TOOL(S)**



303-021

## **303-021**

Engine support  
bracket



E54554

## **303-1129**

Engine Lifting  
Brackets



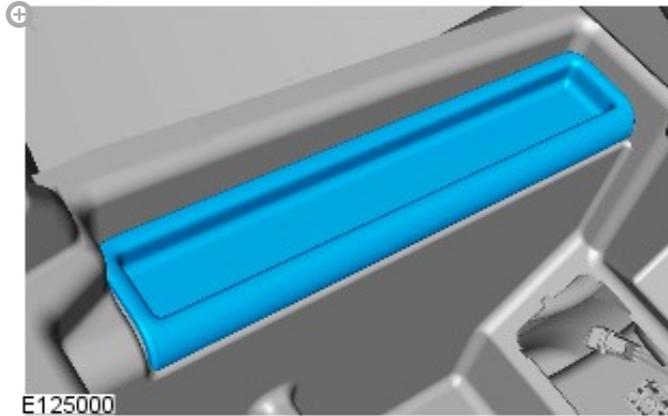
E116925

## **303-1497**

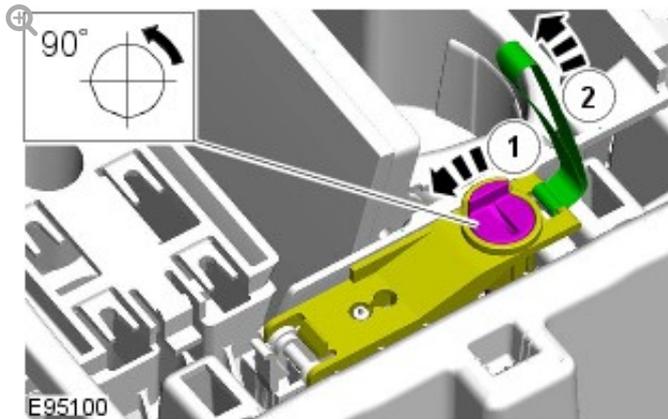
Left-Hand Rear  
Engine Lifting  
Bracket

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

1.

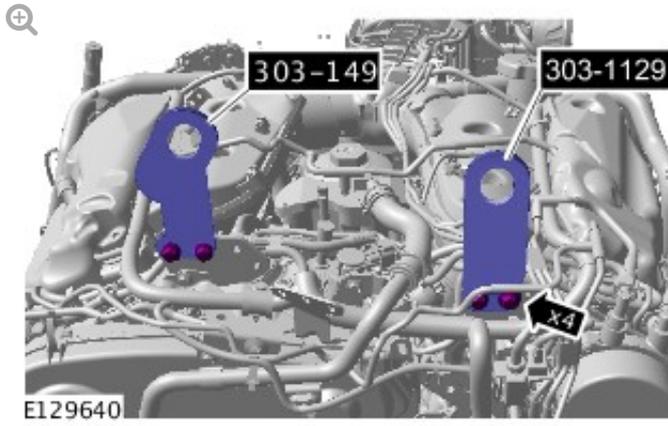


2.



3. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
4. Refer to: [Engine Cover - TDV6 3.0L Diesel](#) (501-05 Interior Trim and Ornamentation, Removal and Installation).

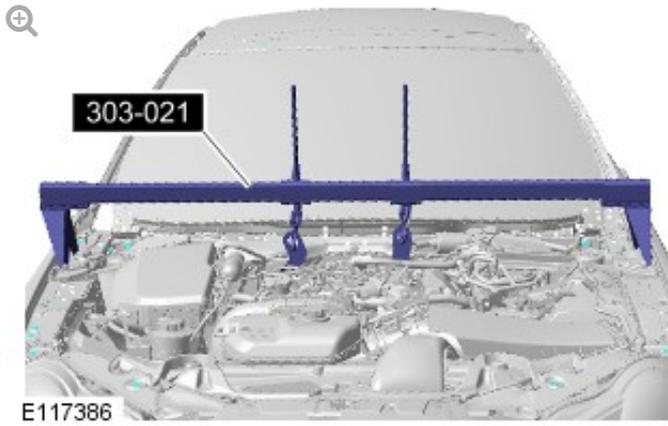
5.



*Special Tool(s):* 303-1129, 303-1497

*Torque:* **22 Nm**

6.



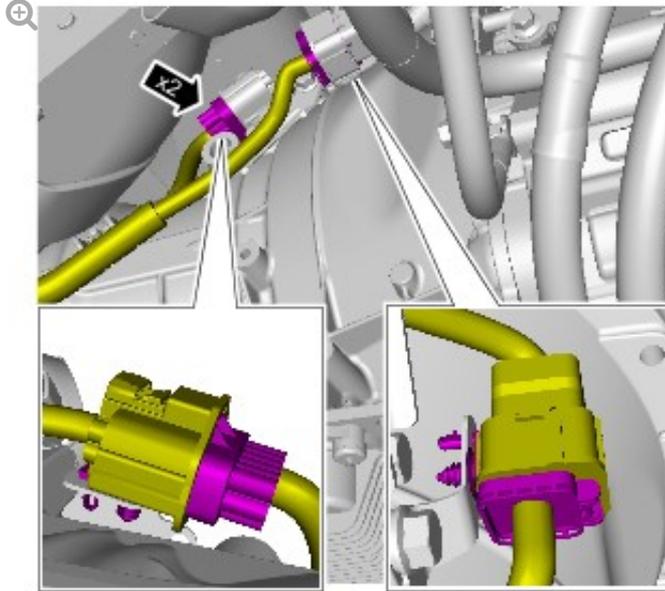
*Special Tool(s):* 303-021

7.

Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

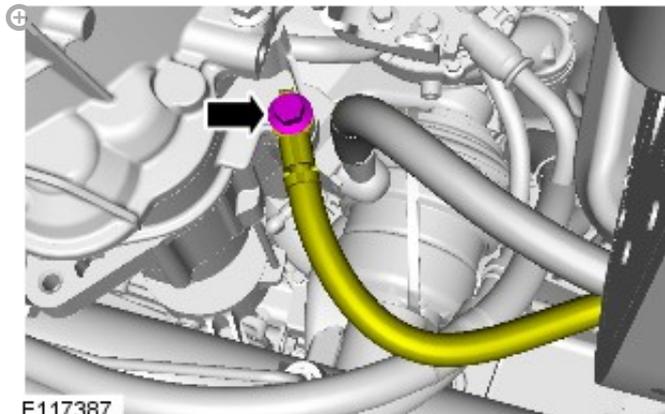
8.



E117393

- 9. Refer to: [Intake Air Shutoff Throttle](#) (303-04A Fuel Charging and Controls - TDV6 3.0L Diesel, Removal and Installation).  
Refer to: [Exhaust Manifold Cross-over Pipe](#) (303-01A Engine - TDV6 3.0L Diesel, Removal and Installation).

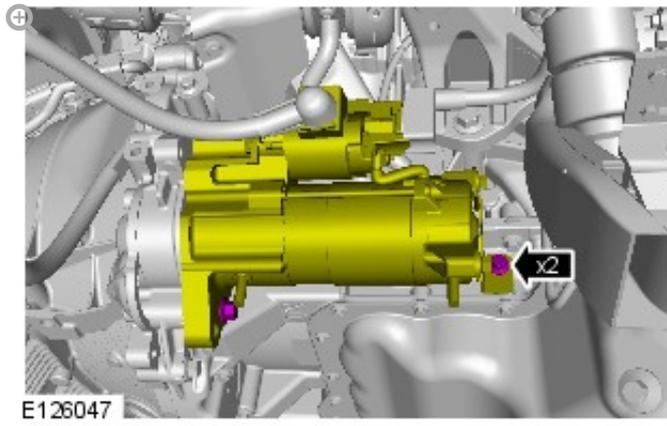
10.



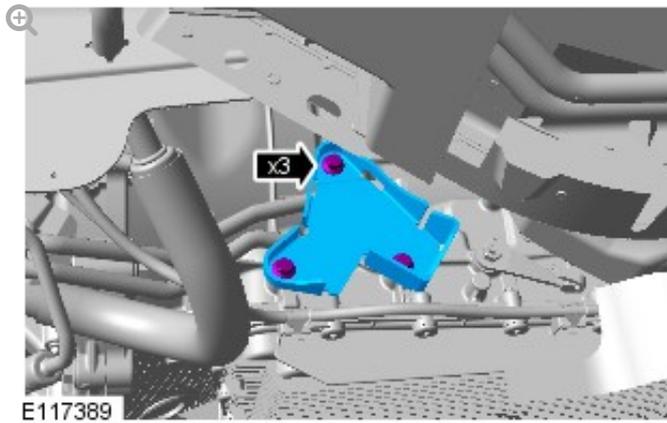
E117387

11.

Secure with cable ties.

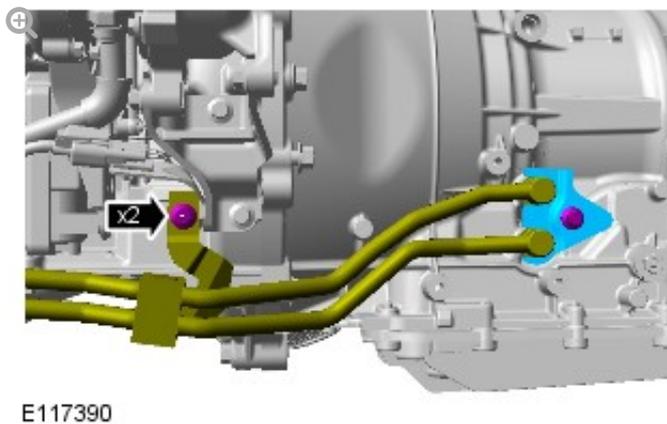


12.



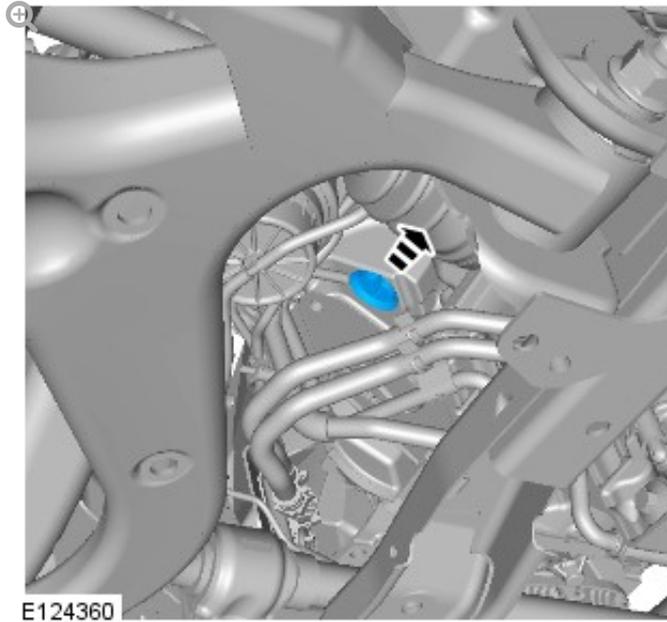
13.

Remove and discard the O-ring seals.



- Install blanking caps to the exposed ports.

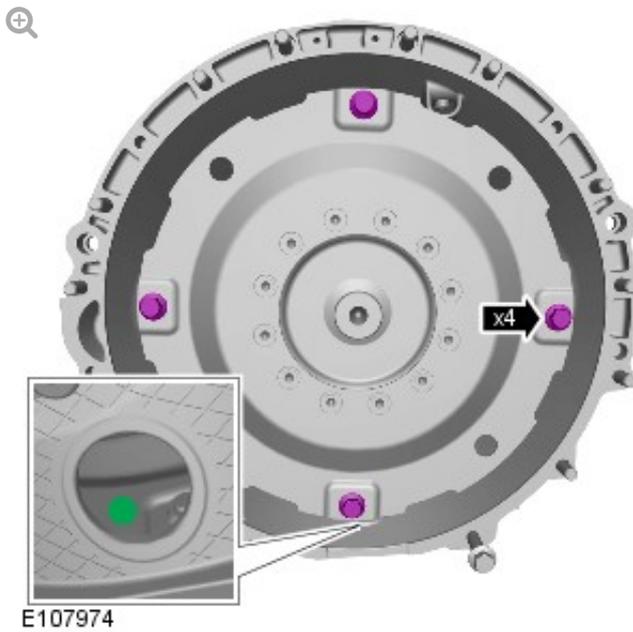
14.



Remove the rubber access cover.

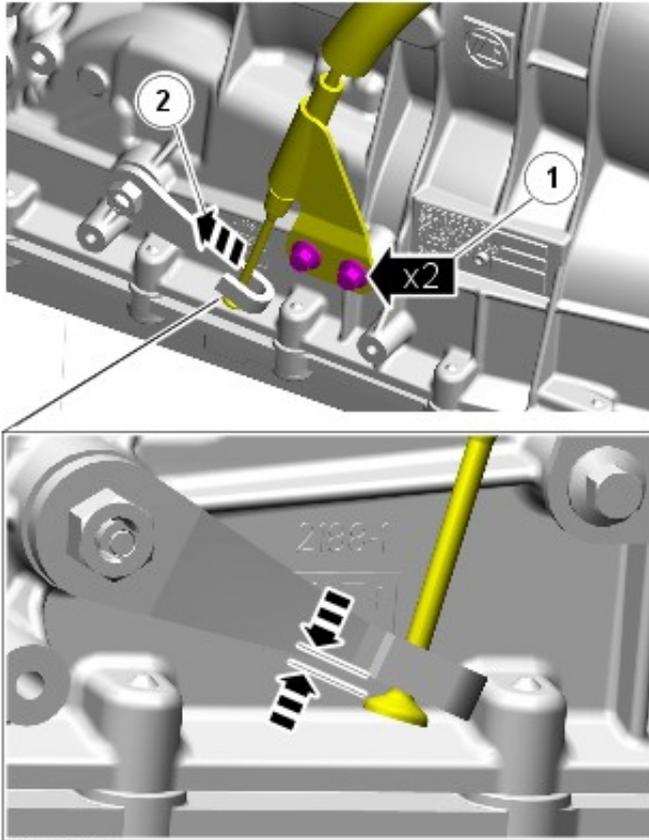
15.

Only rotate the crankshaft clockwise.



- Make sure that the alignment mark is visible through the inspection hole on removal of the last torque converter bolt.

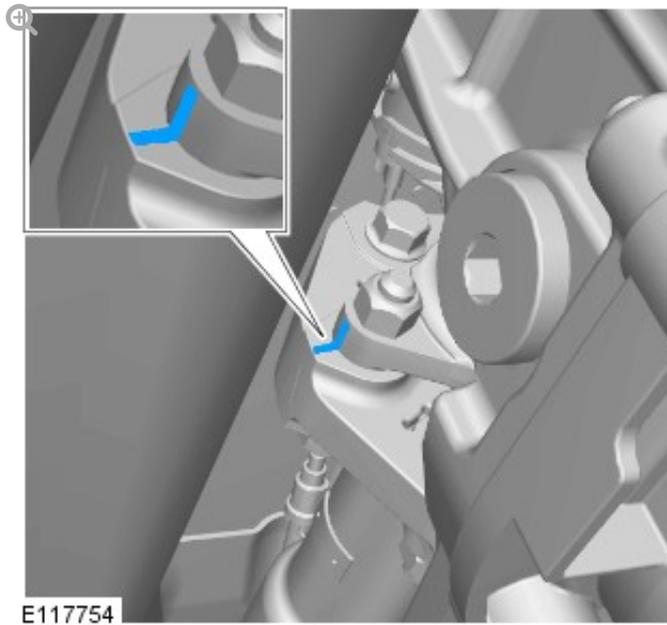
16.



E100350

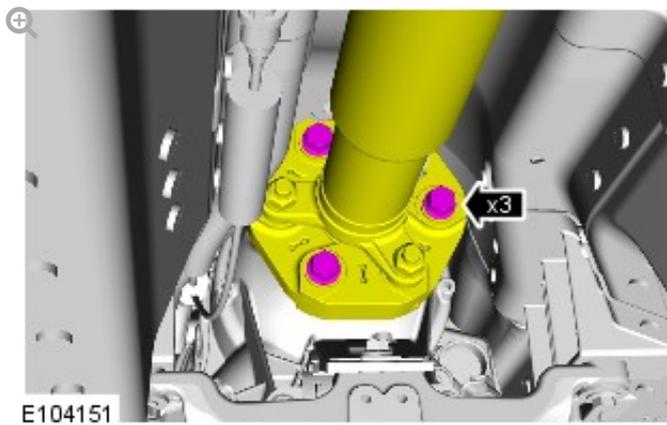
17.

Mark the position of the driveshaft on the transmission flange.



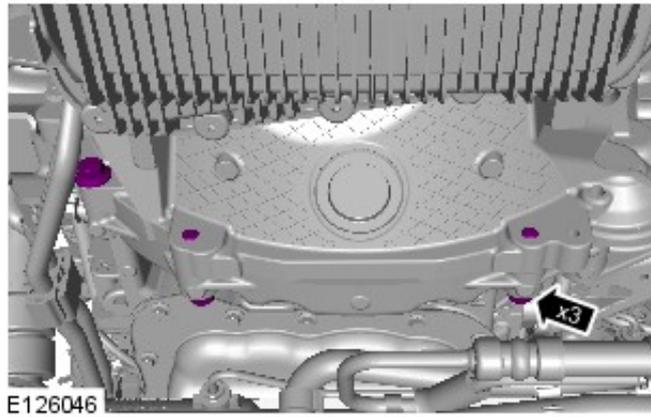
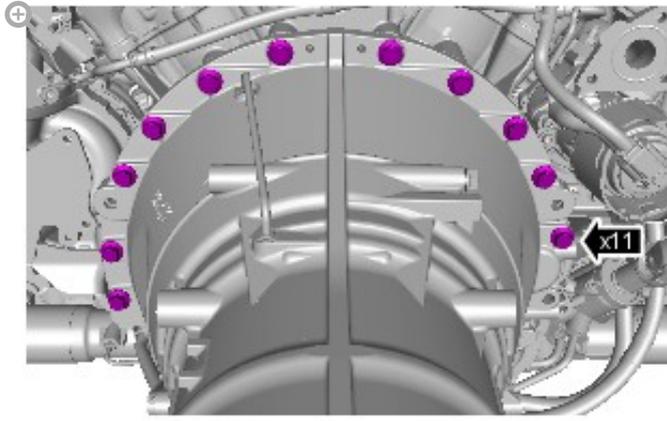
18.

Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.



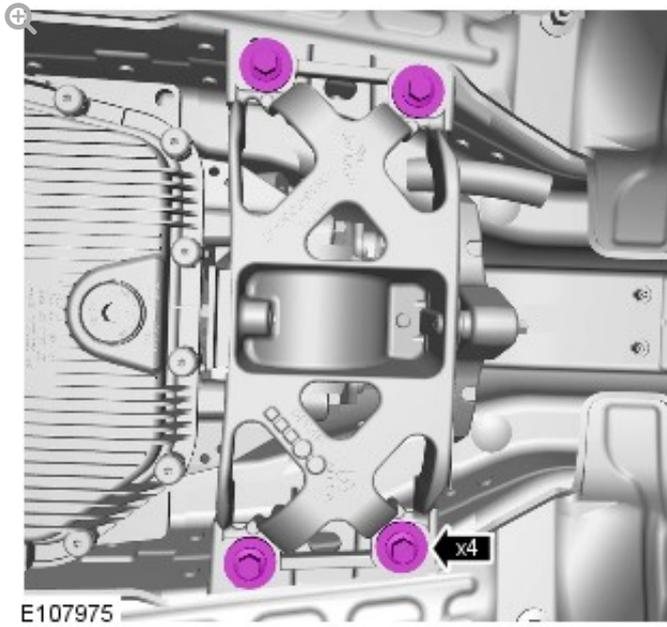
19.

Make sure that the transmission is secured with suitable retaining straps.



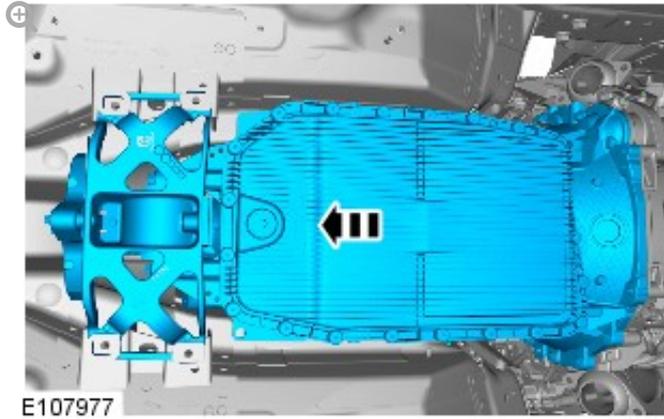
Align the powertrain assembly jack to the transmission.

20.



21.

Make sure that the torque converter remains in the transmission.



Lower the transmission jack.

**AUTOMATIC  
TRANSMISSION/TRANSAXLE**

**TRANSMISSION - TDV6 3.0L  
DIESEL** [G1271949]

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INSTALLATION

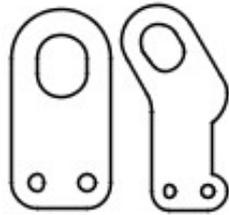
**SPECIAL TOOL(S)**



303-021

## **303-021**

Engine support bracket



E54554

## **303-1129**

Engine Lifting Brackets



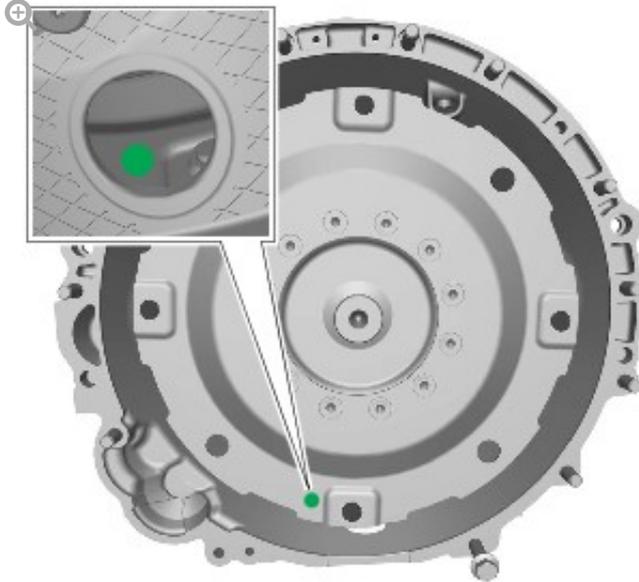
E116925

## **303-1497**

Left-Hand Rear Engine Lifting Bracket

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

1.

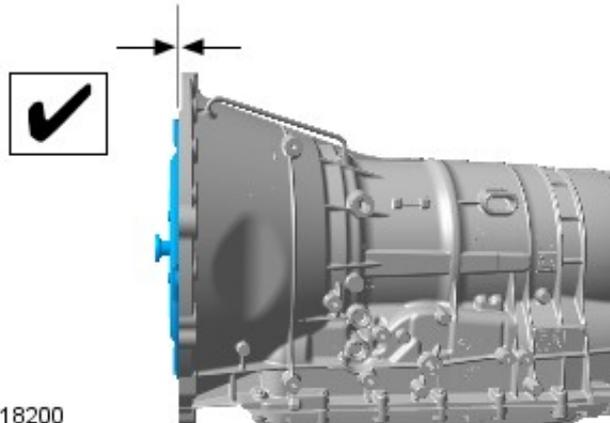
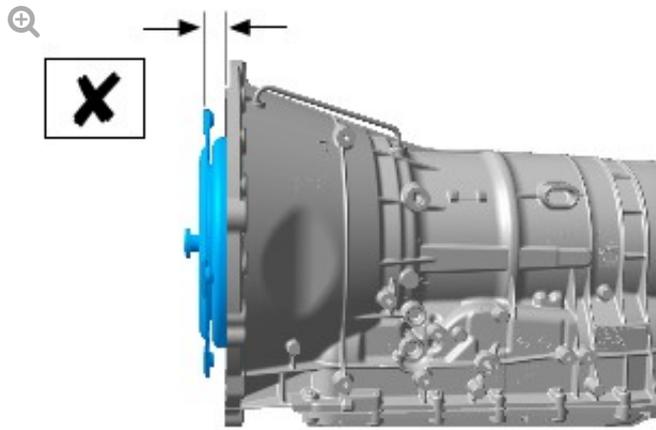


E117455

Make sure that the alignment mark is visible through the inspection hole on installation of the first torque converter bolt.

2.

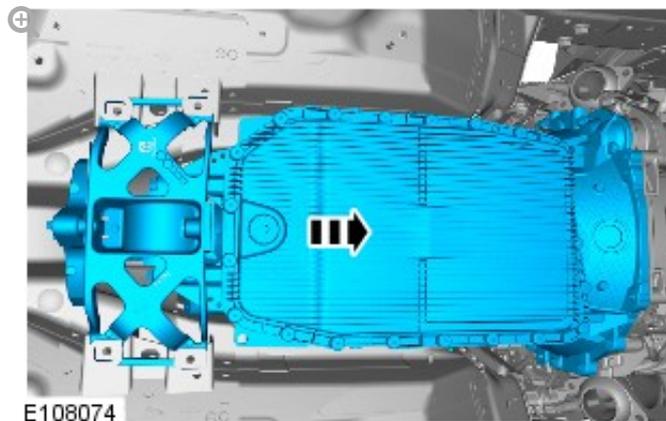
Make sure the torque converter is fully located into the oil pump drive.



E118200

3.

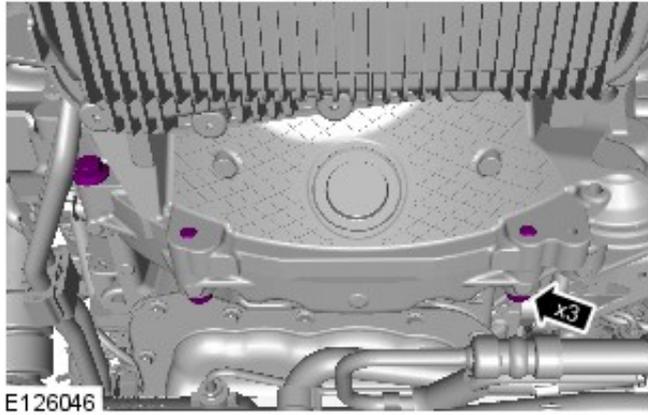
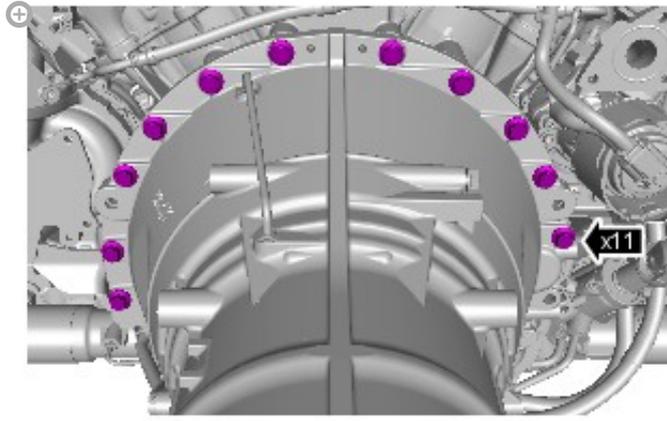
Make sure that the torque converter remains in the transmission.



E108074

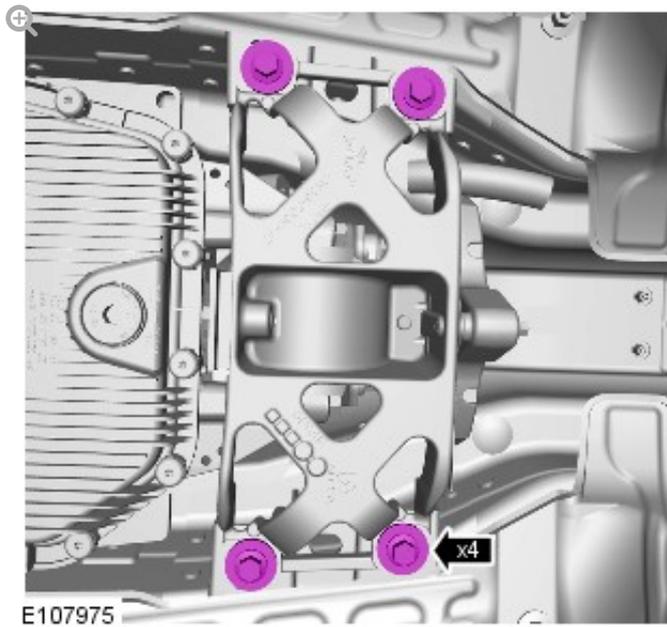
Raise the powertrain assembly jack and transmission assembly.

4.



*Torque: 48 Nm*

5.

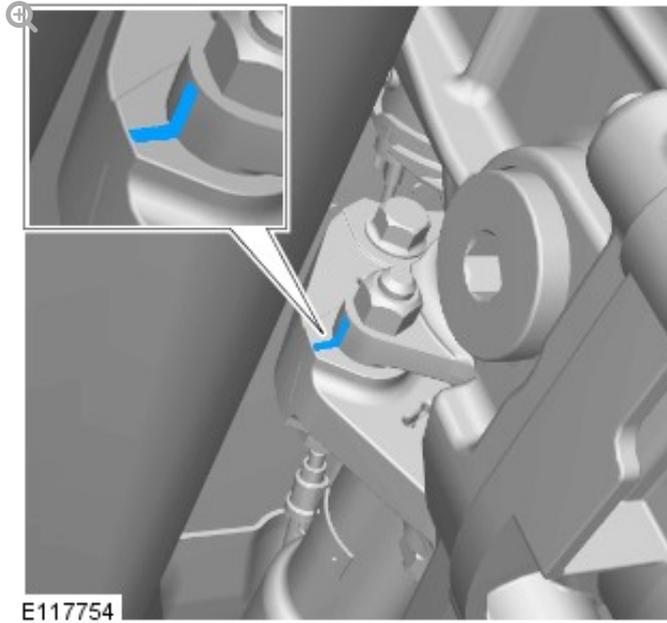


*Torque: 48 Nm*

6. Remove the transmission jack.

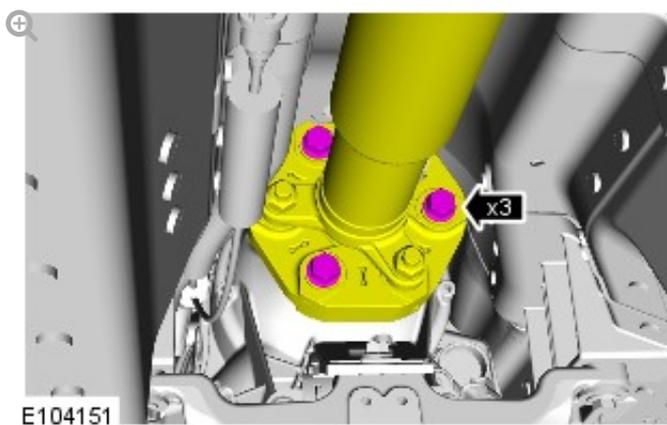
7.

Make sure that you re-align the driveshaft to the transmission flange using the alignment mark.



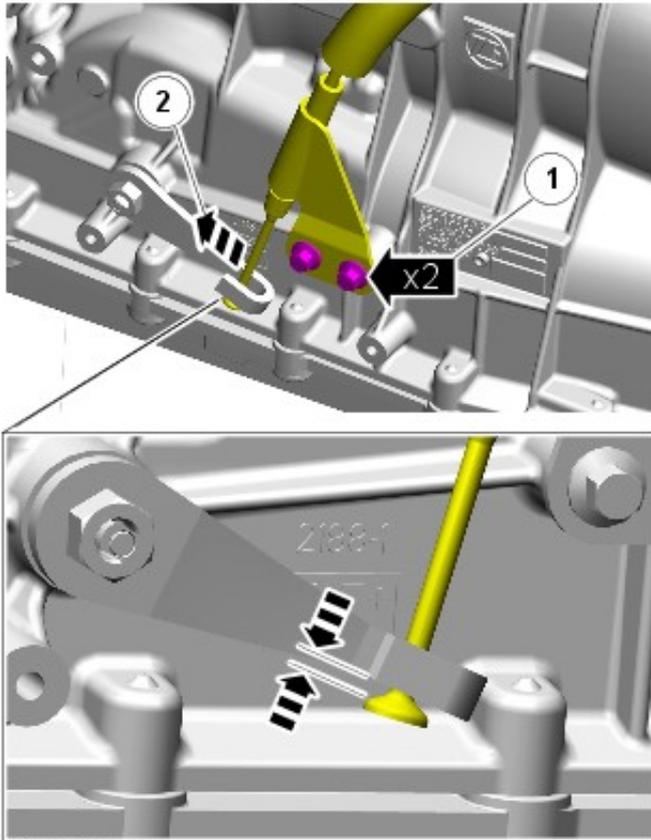
8.

Under no circumstances must the flexible coupling (or it's fixings) be loosened or removed from the driveshaft.



*Torque: 127 Nm*

9.

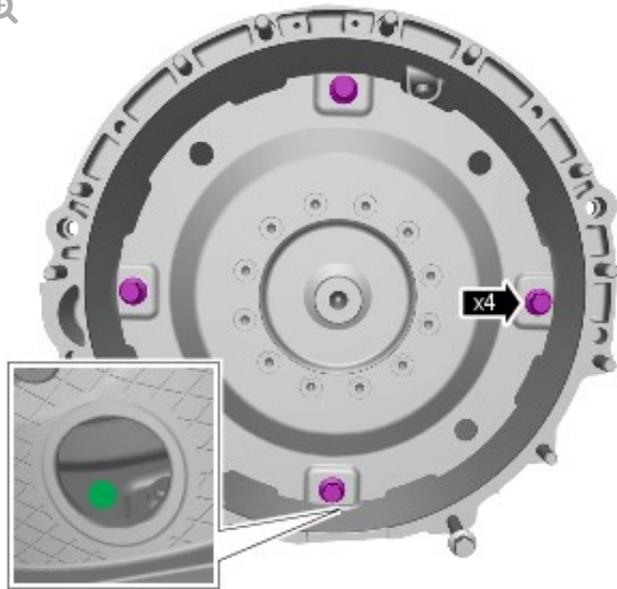


E100350

*Torque: 10 Nm*

10.

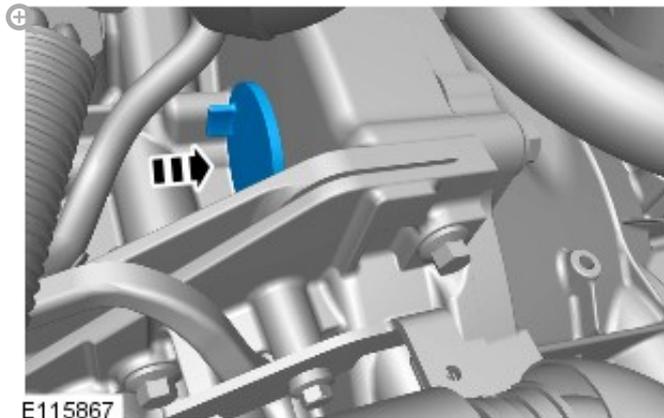
Only rotate the crankshaft clockwise.



E107974

*Torque: 63 Nm*

11.



E115867

12.

Install new o-ring seals