Published: 26-Sep-2011

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD -

Maintenance

CAUTION: Use only Shell L12108 (ZF Lifeguard 8) Automatic transmission fluid. Use of any other fluids may result in a transmission malfunction or failure.

Description	Intervals
Normal maintenance	Filled for life.
Severe duty maintenance	Change the fluid at 48,000 km (30,000 miles) intervals.

Capacities

	Liters
Transmission	8.5

Lubricants, Fluids, Sealers and Adhesives

Description	Specification
Transmission fluid	Shell L12108 (ZF Lifeguard 8)
Sealant	WSS-M4G323-A6
Metal surface cleaner	WSW-M5B392-A
High temperature grease	Molecote FB180

Torque Specifications

NOTE: * = refer to the procedure for correct torque sequence

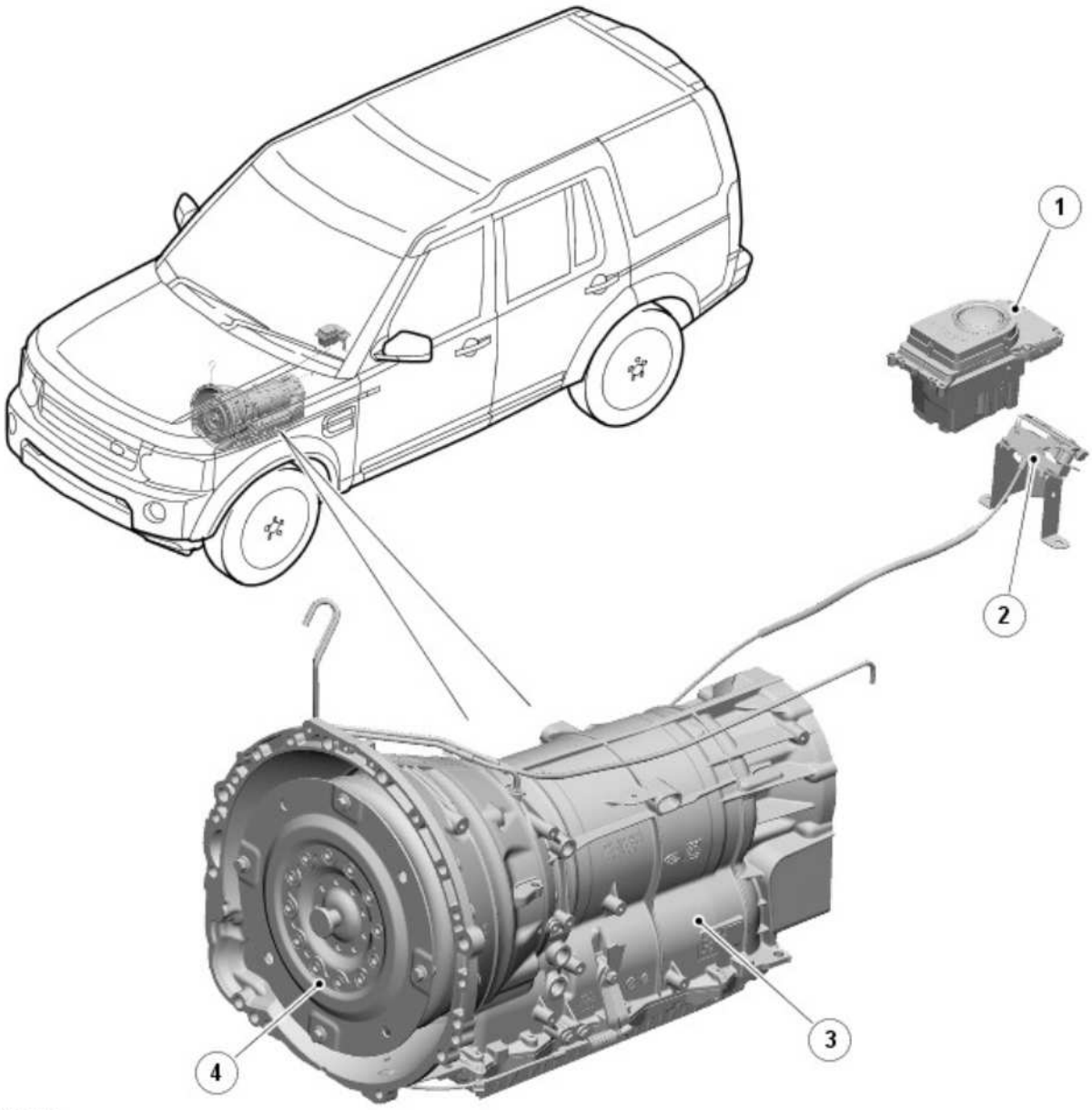
Description	Nm	lb-ft	lb-in
Transmission retaining bolts	40	30	-
Transmission mount retaining bolts	60	44	-
* Transmission fluid fill plug	35	26	-
* Transmission control module (TCM) and main control valve body retaining bolts	8	6	-
Torque converter retaining bolts	63	46	-
Transmission fluid cooler tube retaining bolt	12	9	-
Transmission fluid drain plug	8	6	-
* Transmission fluid pan, gasket and filter retaining bolts	10	7	-

Published: 06-Jun-2013

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Description

Description and Operation

COMPONENT LOCATION



E137695

Item	Part Number	Description
1	-	Electronic Transmission Selector (ETS)
2	-	Emergency park release lever
3	-	Automatic transmission
4	-	Torque converter

INTRODUCTION

The ZF 8HP70 transmission is an electronically controlled, hydraulically operated, eight-speed automatic unit. The hydraulic and electronic control elements of the transmission, including the TCM (transmission control module), are incorporated in a single unit located inside the transmission and is known as 'Mechatronic'.

The ZF 8HP70 transmission has the following features:

- Designed to be maintenance free
- Transmission fluid is 'fill for life'
- The torque converter features a controlled slip feature with electronically regulated control of lock-up, creating a smooth transition to the fully locked condition
- Shift programs controlled by the TCM

ASIS (adaptive shift strategy), to provide continuous adaptation of shift changes to suit the driving style of the driver, which can vary from sporting to economical
- Connected to the ECM (engine control module) via the high-speed CAN (controller area network) bus for communications
- Default mode if major faults occur
- Diagnostics available from the TCM via the high speed CAN bus.

The higher fuel efficiency of the ZF 8HP70 automatic transmission is mainly due to the following modifications:

- a wider ratio spread and more gears for better adaptation to ideal engine operating points
- significantly reduced drag torque in the shift elements (only two open shift elements per gear)
- use of a more efficient ATF (automatic transmission fluid) pump (double-stroke vane pump)
- decoupling of the transmission when the vehicle is at standstill
- improved torsion damping in the converter.

The transmission selections are made using the Electronic Transmission Selector (ETS) in the floor console.
For additional information, refer to: External Controls (307-05 Automatic Transmission/Transaxle External Controls - TDV6 3.0L Diesel, Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Description and Operation).

TRANSMISSION

The transmission comprises the main casing which houses all of the transmission components. The main casing also incorporates an integral torque converter housing.

A fluid pan is attached to the lower face of the main casing and is secured with bolts. The fluid pan is sealed to the main casing with a gasket. Removal of the fluid pan allows access to the Mechatronic valve block. The fluid pan has magnets located at the rear which collects any ferrous metallic particles present in the transmission fluid.

A fluid filter is located inside the fluid pan. If the transmission fluid becomes contaminated or after any service work, the fluid pan with integral filter must be replaced.

The transmission does not have a Bowden cable for park lock operation. This is initiated electronically when the ETS is moved to the 'P' park position. An emergency park interlock release mechanism is provided to release the park interlock if a failure occurs.

A new feature of the 8 speed transmission is decoupling of the transmission when the vehicle is at a standstill. Normally the transmission remains in gear with the torque converter slipping and the vehicle is prevented from moving by applying the brake. The new system disengages one of the transmission clutches and only a minimum rotating load remains. This has the effect of further reducing fuel consumption.

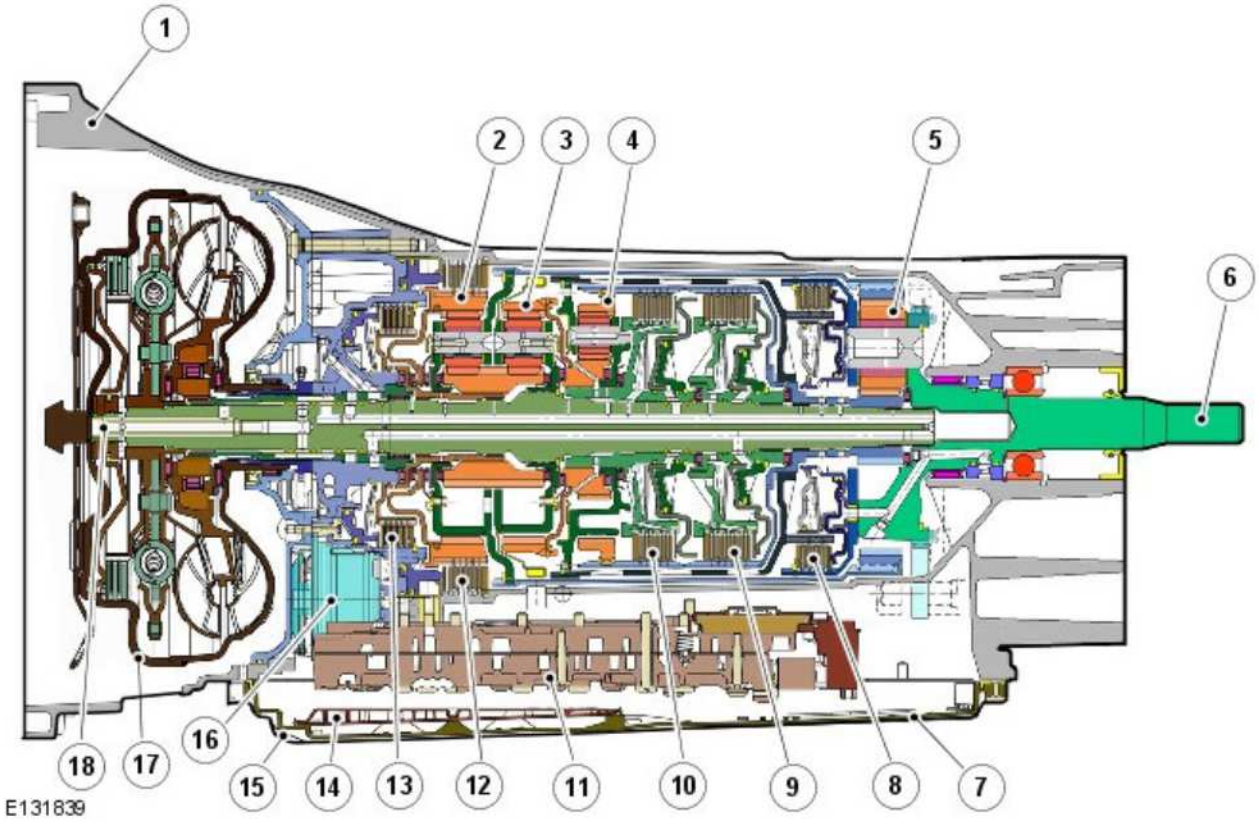
The internal oil pump is driven by a simplex chain and two drive gears from the input shaft. The oil pump is a double stroke vane cell pump which delivers 50 cm^2 of transmission fluid per revolution.

The integral torque converter housing provides protection for the torque converter assembly and also provides the attachment for the gearbox to the engine. The torque converter is a non-serviceable assembly which also contains the lock-up clutch mechanism.

The main casing contains the following major components:

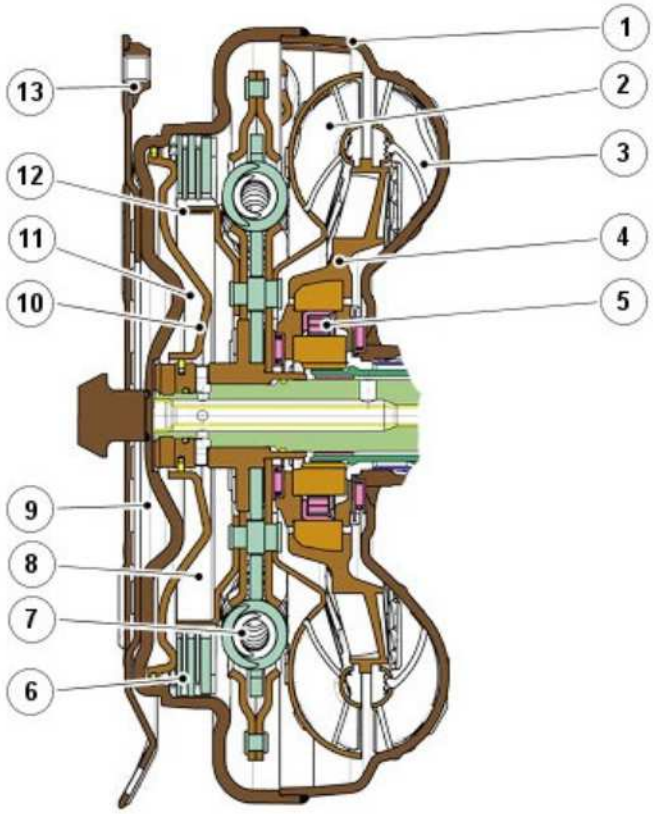
- Input shaft
- Output shaft
- Mechatronic valve block which contains the solenoids, speed sensors and the TCM
- Three rotating multiplate drive clutches
- Two fixed multiplate brake clutches
- Four planetary gear trains.

Transmission Sectional View



Item	Part Number	Description
1	-	Transmission casing
2	-	Gear set 1
3	-	Gear set 2
4	-	Gear set 3
5	-	Gear set 4
6	-	Output shaft
7	-	Drain plug
8	-	Clutch D
9	-	Clutch C
10	-	Clutch E
11	-	Mechatronic valve block
12	-	Brake B
13	-	Brake A
14	-	Fluid filter
15	-	Fluid pan
16	-	Fluid pump
17	-	Torque converter
18	-	Input shaft

TORQUE CONVERTER



E131838

Item	Part Number	Description
1	-	Converter cover
2	-	Turbine
3	-	Impeller
4	-	Stator
5	-	Stator freewheel
6	-	Lined plate of lock-up clutch
7	-	Torsional vibration damper
8	-	Pipe 1 and 2
9	-	Pipe 3
10	-	Lock-up clutch piston
11	-	Space behind lock-up clutch
12	-	Disc carrier
13	-	Drive plate/disc carrier

The torque converter is the coupling element between the engine and the transmission and is located in the torque converter housing, on the engine side of the transmission. The driven power from the engine crankshaft is transmitted hydraulically and mechanically through the torque converter to the transmission. The torque converter is connected to the engine by a flex plate attached to the rear of the crankshaft.

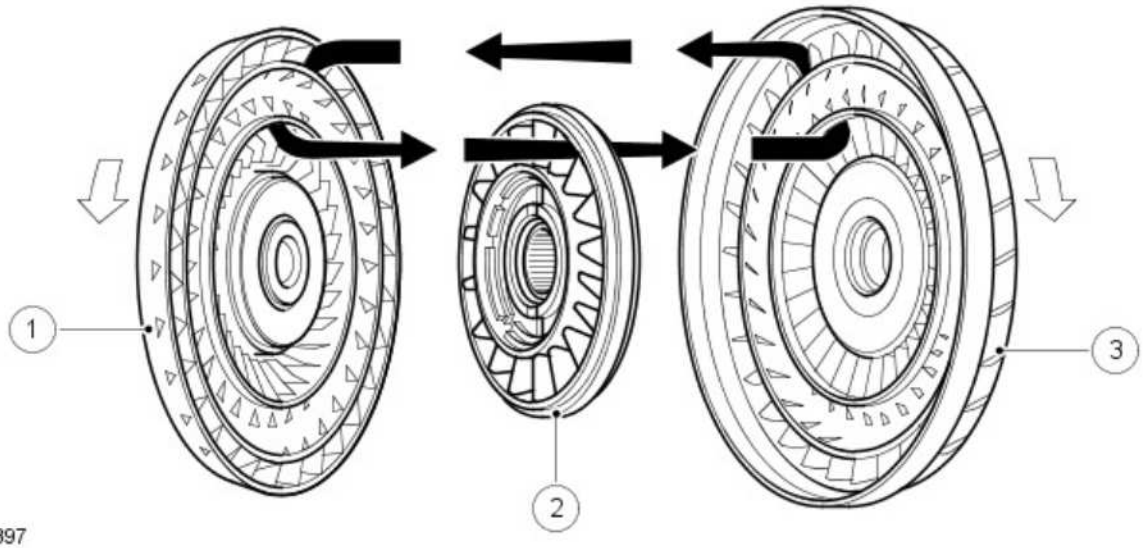
The torque converter comprises an impeller, a stator and a turbine. The torque converter is a sealed unit with all components located between the converter housing cover and the impeller. The two components are welded together to form a sealed, fluid filled housing. With the impeller brazed to the converter housing cover, the impeller is therefore driven at engine crankshaft speed.

The converter housing drive plate has four threaded bosses, which provide for attachment of the engine flex plate. The threaded bosses also provide for location of special tools which are required to remove the torque converter from the torque converter housing.

Impeller

Fluid Flow

NOTE: The following illustration shows a typical turbine, stator and impeller.



E42397

Item	Part Number	Description
1	-	Turbine
2	-	Stator
3	-	Impeller

When the engine is running the rotating impeller acts as a centrifugal pump, picking up fluid at its center and discharging it at high velocity through the blades on its outer rim. The design and shape of the blades and the curve of the impeller body cause the fluid to rotate in a clockwise direction as it leaves the impeller. This rotation improves the efficiency of the fluid as it contacts the outer row of blades on the turbine.

The centrifugal force of the fluid leaving the blades of the impeller is passed to the curved inner surface of the turbine via the tip of the blades. The velocity and clockwise rotation of the fluid causes the turbine to rotate.

Turbine

The turbine is similar in design to the impeller with a continuous row of blades. Fluid from the impeller enters the turbine through the tip of the blades and is directed around the curved body of the turbine to the root of the blades. The curved surface redirects the fluid back in the opposite direction to which it entered the turbine, applying a turning force to the turbine from the impeller.

The fluid leaving the inner row of the turbine blades is rotated in a counter-clockwise direction due to the curve of the turbine and the shape of the blades. The fluid is now flowing in the opposite direction to the engine rotation and therefore the impeller. If the fluid was allowed to hit the impeller in this condition, it would have the effect of applying a brake to the impeller. To prevent this, the stator is located between the impeller and the turbine.

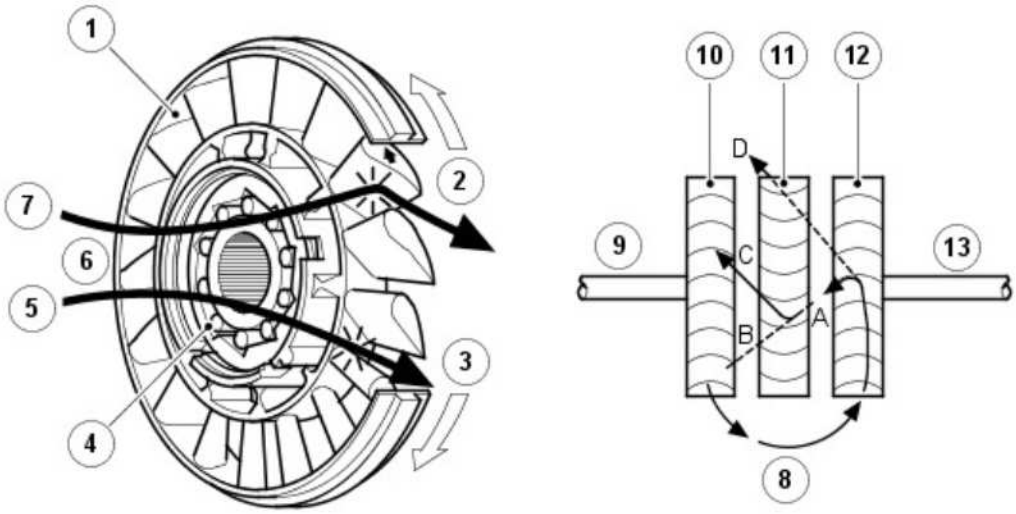
Stator

The stator is located on the splined transmission stator shaft via a freewheel clutch. The stator comprises a number of blades which are aligned in an opposite direction to those of the impeller and turbine. The main function of the stator is to redirect the returning fluid from the turbine, changing its direction to that of the impeller.

The redirected fluid from the stator is directed at the inner row of blades of the impeller, assisting the engine in turning the impeller. This sequence increases the force of the fluid emitted from the impeller and thereby produces the torque multiplication effect of the torque converter.

Stator Functions

NOTE: The following illustration shows a typical stator



E 42398

Item	Part Number	Description
1	-	Blades
2	-	Stator held – fluid flow redirected
3	-	Stator rotates freely
4	-	Roller freewheel
5	-	Converter at coupling speed
6	-	Fluid flow from turbine
7	-	Converter multiplying
8	-	Fluid flow from impeller
9	-	Drive from engine
10	-	Impeller
11	-	Stator
12	-	Turbine
13	-	Output to transmission

Fluid emitted from the impeller acts on the turbine. If the turbine is rotating at a slower speed than the fluid from the impeller, the fluid will be deflected by the turbine blades in the path **'A'**. The fluid is directed at and deflected by the stator blades from path **'B'** to path **'C'**. This ensures that the fluid is directed back to the pump in the optimum direction. In this condition the roller clutch is engaged and the force of the fluid on the stator blades assists the engine in rotating the impeller.

As the rotational speed of the transmission and therefore the turbine increases, the direction of the fluid leaving the turbine changes to path **'D'**. The fluid is now directed from the turbine to the opposite side of the stator blades, rotating the stator in the opposite direction. To prevent the stator from resisting the smooth flow of the fluid from the turbine, the freewheel clutch releases, allowing the stator to rotate freely on its shaft.

When the stator becomes inactive, the torque converter no longer multiplies the engine torque. When the torque converter reaches this operational condition it ceases to multiply the engine torque and acts solely as a fluid coupling, with the impeller and the turbine rotating at approximately the same speed.

One Way Free Wheel Clutch

The free wheel clutch can perform two functions; hold the stator stationary and free wheel allowing the stator to rotate without a drive output. The free wheel clutch used is of the roller type and comprises an inner and outer race and a roller and cage assembly. The inner and outer races are pressed into their related components with which they rotate. The roller and cage assembly is located between the inner and outer races.

The rollers are located in a cage which is a spring which holds the rollers in the 'wedge' direction and maintains them in contact with the inner and outer races. The outer race has a series of ramps which allow the rollers to lock the inner and outer races together.

When the outer race is rotated in a clockwise direction, the rollers are 'wedged' between the inner and outer races. The rollers then prevent the rotation of the outer race by holding it to the inner race, which is held stationary.

Lock-Up Clutch Mechanism

The TCC (torque converter clutch) is hydraulically controlled by an Electronic Pressure Regulating Solenoid (EPRS) , which is controlled by the TCM. This allows the torque converter to have three states of operation as follows:

- Fully engaged
- Controlled slip variable engagement
- Fully disengaged.

The torque converter pressure valve reduces system pressure and guarantees the pressure needed for the torque converter. It also limits the maximum torque converter pressure, to prevent the torque converter from expanding.

The solenoid valve is operated by PWM (pulse width modulation) signals from the TCM to give full, partial or no lock-up

of the torque converter.

The lock-up clutch is a hydro-mechanical device which eliminates torque converter slip, improving fuel consumption. The engagement and disengagement is controlled by the TCM to allow a certain amount of controlled 'slip'. This allows a small difference in the rotational speeds of the impeller and the turbine which results in improved shift quality. The lock-up clutch comprises a piston and a clutch friction plate.

In the unlocked condition, the oil pressure supplied to the piston chamber is reduced and the pressure in the turbine chamber is allowed to push the piston back. In this condition the clutch plate are released and torque converter slip is permitted.

In the locked condition, the TCC spool valves are actuated by the EPRS. Pressurized fluid is directed into the lock-up clutch piston. The piston moves with the pressure and pushes the clutch plates together. As the pressure increases, the friction between the clutch plates increases, finally resulting in full lock-up of the clutch plates. In this condition there is direct mechanical drive from the engine crankshaft to the transmission planetary gear train.

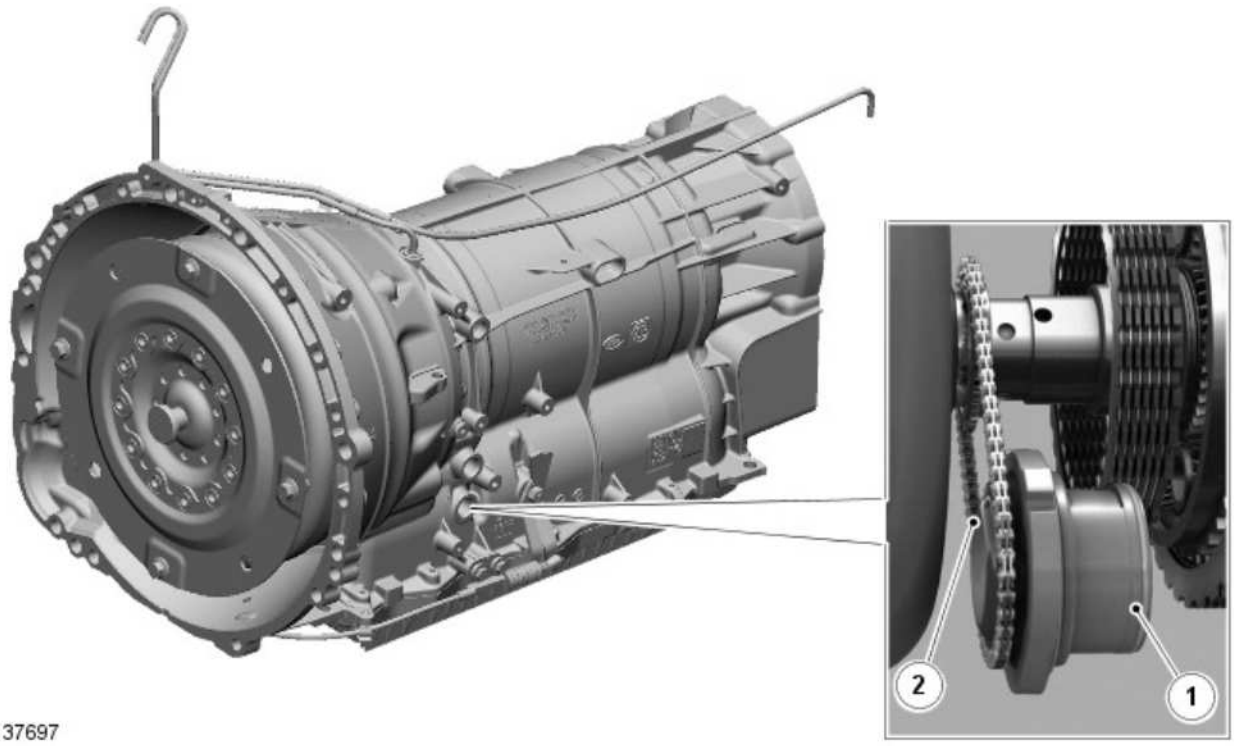
The standstill decoupling feature is new for the 8 speed transmission. When the vehicle comes to a standstill (with the brakes applied), the converter is disconnected from the driveline so that only a slight residual load remains. This further reduces fuel consumption. Decoupling is by actuating clutch B in the transmission, and is dependent on load and output speed.

FLUID PUMP

The fluid pump is an integral part of the transmission. The fluid pump is used to supply hydraulic pressure for the operation of the control valves and clutches, to pass the fluid through the transmission cooler and to lubricate the gears and shafts.

The ZF 8HP70 fluid pump is a double stroke, vane type pump and is located below the transmission input shaft. The pump is driven by a chain drive from a sprocket located on the input shaft. The pump has a delivery rate of 50 cm^3 per revolution. The drive sprocket is driven at engine speed through a splined connection in the torque converter shell.

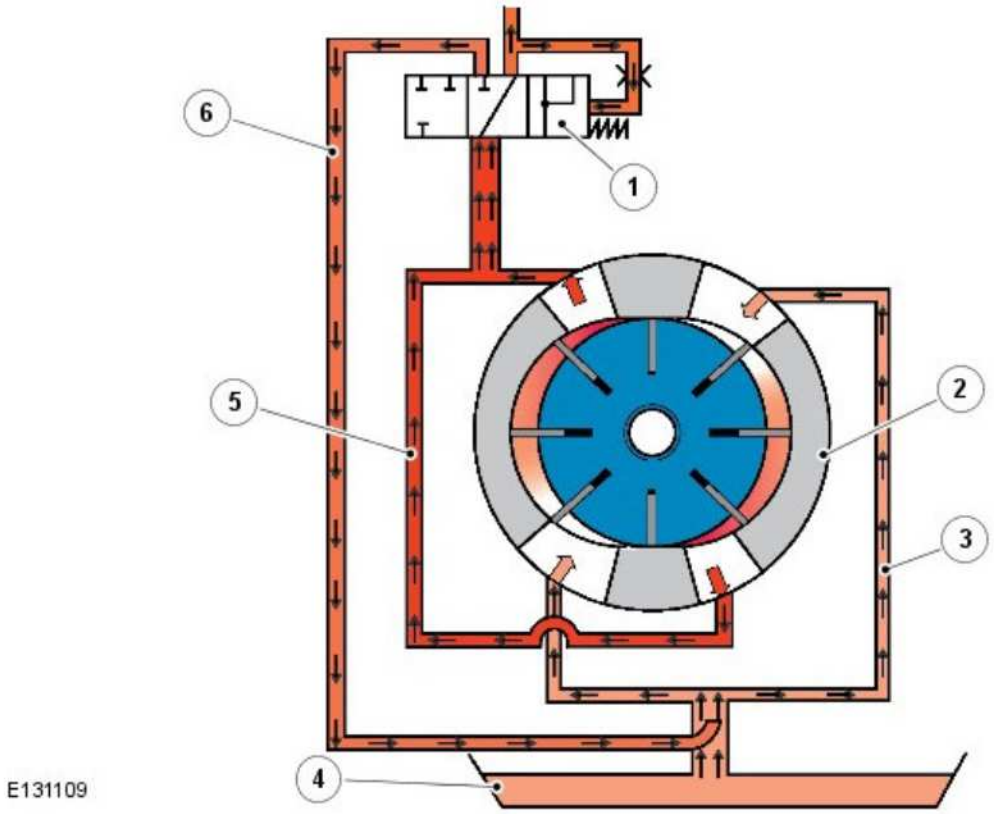
Double Vane Fluid Pump Location



E137697

Item	Part Number	Description
1	-	Vane pump
2	-	Chain drive from torque converter cover

Double Vane Fluid Pump Schematic Diagram



Item	Part Number	Description
1	-	System pressure valve
2	-	Vane pump
3	-	Intake pipe
4	-	Oil pan
5	-	Pressure pipe
6	-	Recycling of redundant fluid

The pump comprises a sprocket, a rear cover with bearing, a front cover with bearing, a cylinder, a rotor shaft and a rotor with vanes. A pressure relief valve is fitted in the pressure outlet gallery from the pump but is not an integral part of the pump itself.

A sprocket is located around the transmission input shaft. Splines on the torque converter nose and the sprocket ensure a positive drive. A simplex chain transmits the rotation of the torque converter cover into rotation of the pump rotor shaft via a second sprocket fitted to the rotor shaft. The gearing of the two sprockets rotates the pump rotor shaft at a speed slightly higher than the Revolutions Per minute (RPM) of the torque converter cover which is directly connected to the engine crank.

The pump contains 7 vanes which are attached to the rotor and rotate within the cam shaped cylinder. As the vanes rotate, the eccentricity of the central hole in the cylinder causes the space between the vanes to increase. This causes a depression between the vanes and fluid is drawn into the space between the vanes via a suction port connected to the fluid pan. The fluid passes through the fluid pan filter before it is drawn into the pump.

As the rotor shaft rotates further, the inlet port is closed by the vanes which have drawn in fluid, trapping the fluid in the space between the vanes. The eccentric hole in the cylinder causes the space between the vanes to decrease and consequentially compresses and pressurizes the fluid trapped between them.

Further rotation of the rotor shaft moves the vanes towards the outlet port. As the vanes pass the outlet port the pressurized fluid passes from the space between the vanes into the pressure gallery to the pressure relief valve.

As the pump is a double stroke vane pump, this sequence is repeated twice per revolution of the rotor shaft.

The pressure relief valve controls the pressure and flow of fluid delivered to the transmission valve block, torque converter and other components. Pressure is controlled by a relief valve which limits the maximum system pressure to 32 bar (464 lbf/in²). The pressure control maintains a constant pressure of fluid irrespective of torque converter input shaft rotational speed. A metering orifice is subject to the pump output pressure. If the pressure in the orifice reaches a predetermined level, a spring loaded ball in the flow control valve is lifted from its seat and pressurized fluid is allowed to recirculate through the pump.

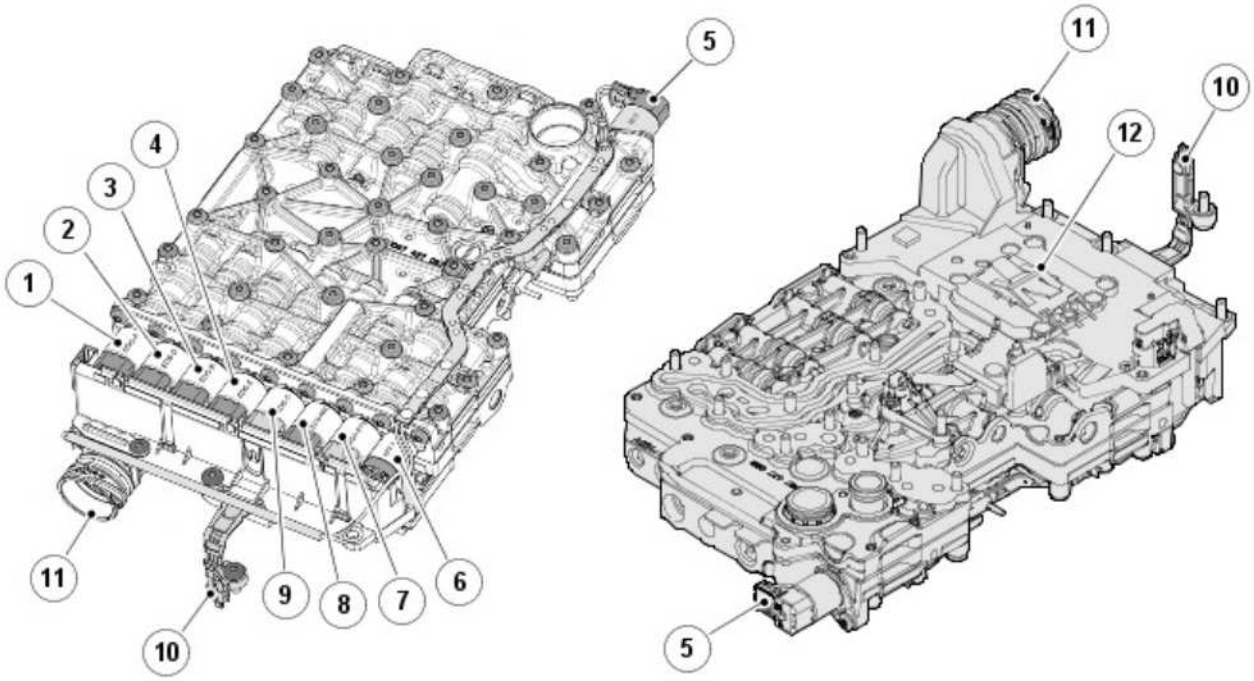
MECHATRONIC VALVE BLOCK

The Mechatronic valve block is located in the bottom of the transmission and is covered by the fluid pan. The valve block houses the TCM, electrical actuators, speed sensors and control valves which provide all electro-hydraulic control for all transmission functions. The Mechatronic valve block comprises the following components:

- TCM
- Seven pressure regulator solenoids
- Two park lock solenoids

- Twenty one hydraulic spool valves
- Temperature sensor
- Turbine speed sensor
- Output shaft speed sensor.

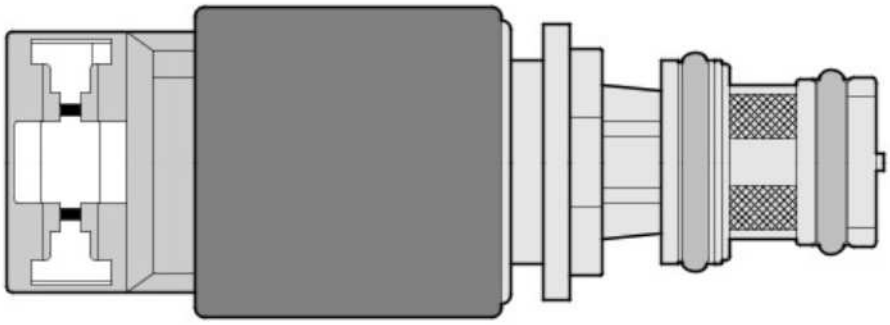
Mechatronic Valve Block



E131253

Item	Part Number	Description
1	-	EPRS A - A brake valve
2	-	EPRS D - D clutch valve
3	-	EPRS B - B brake valve
4	-	EPRS E - E clutch valve
5	-	MV 2 - magnet-valve 2 for electrical park interlock (hold out of park)
6	-	MV 1 - pressure reducing valve
7	-	EPRS SYS - system pressure valve
8	-	EPRS WK - Torque converter lock-up clutch valve
9	-	EPRS C - C clutch valve
10	-	Transmission input shaft speed sensor
11	-	Electrical connector
12	-	Transmission Control Module (TCM) - hidden

Electronic Pressure Regulator Solenoids (EPRS)



E42713

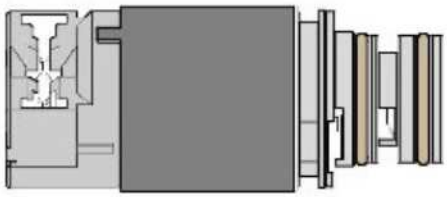
Seven EPRS are located in the valve block. The solenoids are controlled by PWM signals from the TCM. The solenoids convert the electrical signals into hydraulic control pressure proportional to the signal to actuate the spool valves for precise transmission operation.

Solenoids EPRS A, B, D, E and WK supply a higher control pressure as the signal amperage increases and can be identified by an orange connector cap. The TCM operates the solenoids using PWM signals. The TCM monitors engine load and clutch slip and varies the solenoid duty cycle accordingly. The solenoids have a 12 V operating voltage and a pressure range of 0 - 4.7 bar (0 - 68 $lbf.in^2$).

Solenoids EPRS C and SYS supply a lower control pressure as the signal amperage increases and can be identified by a gray connector cap. The TCM monitors engine load and clutch slip and varies the solenoid duty cycle accordingly. The solenoids have a 12 V operating voltage and a pressure range of 4.7 - 0 bar (68 - 0 $lbf.in^2$).

The resistance of the solenoid coil winding for EPRS solenoids is 5.05 Ohms at 20 °C (68 °F).

Control Solenoid (MV 1)



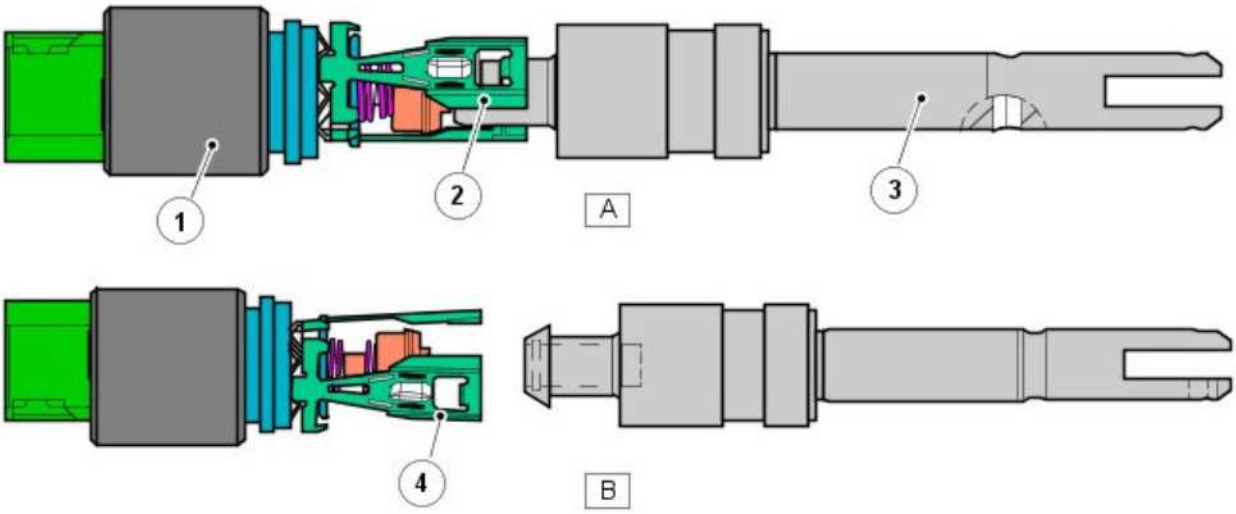
E42714

A shift control solenoid MV1 (Magnetic Valve 1) is located in the valve block. The solenoid is controlled by the TCM and converts electrical signals into hydraulic control signals to control clutch application.

The shift control solenoid is an open/closed, on/off solenoid which is controlled by the TCM switching the solenoid to earth. The TCM also supplies power to the solenoid. The TCM energizes the solenoid in a programmed sequence for clutch application for gear ratio changes and shift control.

The resistance of the solenoid coil winding for solenoid is between 10 to 11 Ohms at 20 °C (68 °F).

Control Solenoid (MV 2)



E131254

Item	Part Number	Description
A	-	Solenoid in locked (energized) condition - park lock released
B	-	Solenoid in unlocked (deenergized) condition - park lock engaged
1	-	Solenoid
2	-	Claw - locked
3	-	Piston
4	-	Claw - unlocked

A control solenoid MV 2 (Magnetic Valve 2) is located in the valve block. The solenoid is controlled by the TCM and converts electrical signals into hydraulic control signals to control the electronic park lock function

The control solenoid is an on/off solenoid which is controlled by the TCM by switching the solenoid to earth.

When the park position is deselected, control solenoid MV2 resets the parking lock valve in the Mechatronic valve block. This is achieved by the TCM providing the ground for the solenoid which is energized, releasing the claws from retaining the park lock piston. Main fluid pressure acting on the parking lock piston, pushes the piston back to release the lock.

When the park position is selected, control solenoid MV2 is deenergized. The fluid pressure at the parking lock cylinder piston is vented and the mechanical interlock of the piston is opened. A pre-tensioned torsion spring at the park lock disc pulls the piston into the "park" position where the piston engages with the control solenoid claws and is locked in the park position. An emergency release wire cable can be used to release the parking lock manually if an electrical failure occurs.

The resistance of the solenoid coil winding for solenoid is 25 Ohms at 20 °C (68 °F).

When the neutral "N" position is selected and the engine is turned off, the fluid pressure at the park lock cylinder piston is released. The current supply to the control solenoid MV2 remains. The park lock cylinder piston is still held in the unlocked position by the spring force acting on the park lock disc, preventing the park lock plate from engaging the parking lock. This allows the vehicle to be moved when the engine is not running for a short time. Should the battery voltage fall below the level required to maintain the solenoid in the energized condition, the park lock will be engaged.

Sensors

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 theTCM 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.

Spool Valves

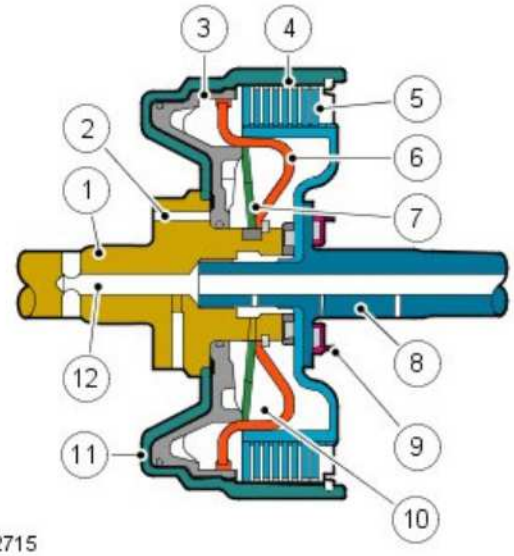
The valve block contains spool valves which control various functions of the transmission. The spool valves are of conventional design and are operated by fluid pressure.

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, 1 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

Multiplate Clutch or Brake – Typical



E42715

Item	Part Number	Description
1	-	Input shaft
2	-	Main pressure supply port
3	-	Piston
4	-	Cylinder – external plate carrier
5	-	Clutch plate assembly
6	-	Baffle plate (for clutch, not brake)
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 brakes used in the transmission. Each clutch comprises a number of friction plates dependent on the output controlled. A typical clutch consists of a number of alternating steel plates and plates with friction material bonded to each face.

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 and clutch cooling. The fluid is passed via a drilling in the input 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 centrifugal 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.

PLANETARY GEAR TRAINS

The 8 forward gears and the reverse gear are produced by a combination of four simple planetary gear sets, 3 clutches

and 2 brakes. The front two gear sets share a common sun gear. Power is output always through the planetary carrier of the fourth gearset.

Five shift elements comprising 3 clutches and 2 brakes, are responsible for all 8 forward and reverse gears. High efficiency is achieved by the use of only 2 shift elements disengaged in each gear which reduces drag and so increases the efficiency.

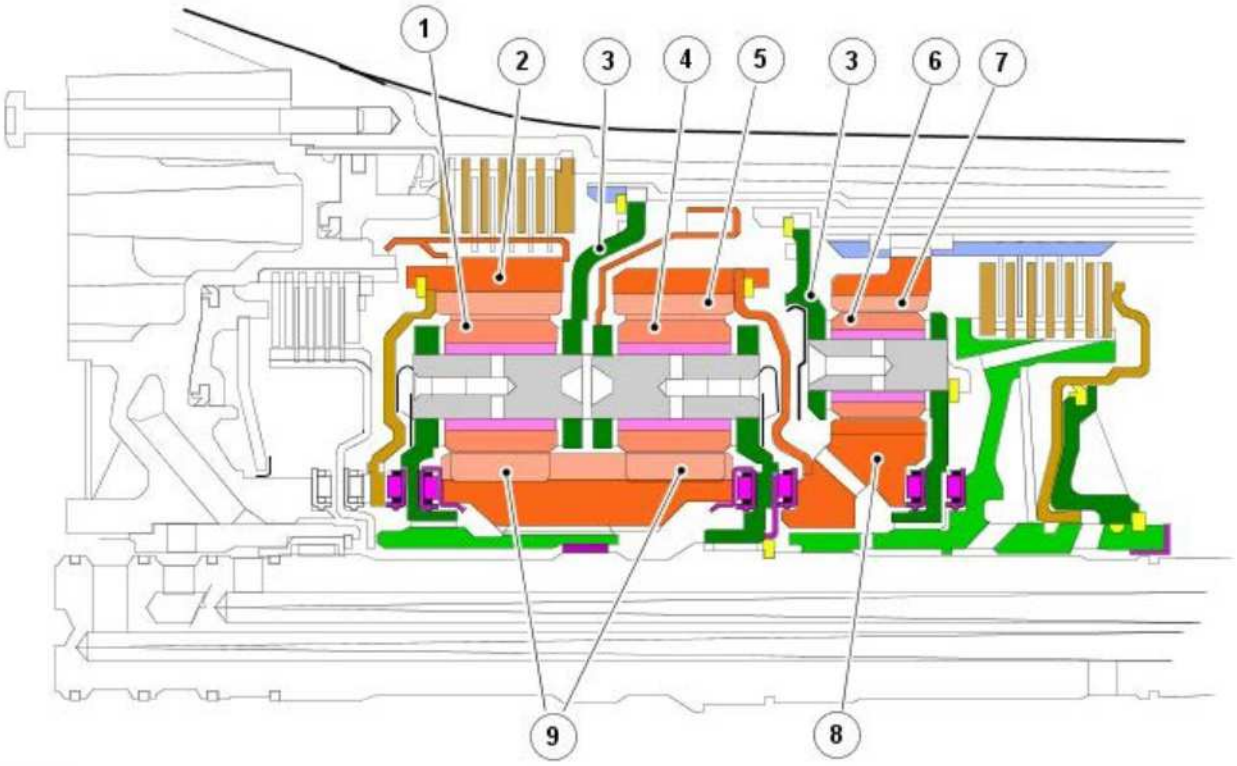
Planetary Gear Sets 1, 2 and 3

The planetary gear sets 1 and 2 comprise:

- Sunwheel - shared by both gear sets
- 4 planetary gears per gear set
- Planetary gear carrier (spider) per gear set
- Ring gear per gear set.

The planetary gear set 3 comprises:

- Sunwheel
- 3 planetary gears
- Planetary gear carrier (spider)
- Ring gear.



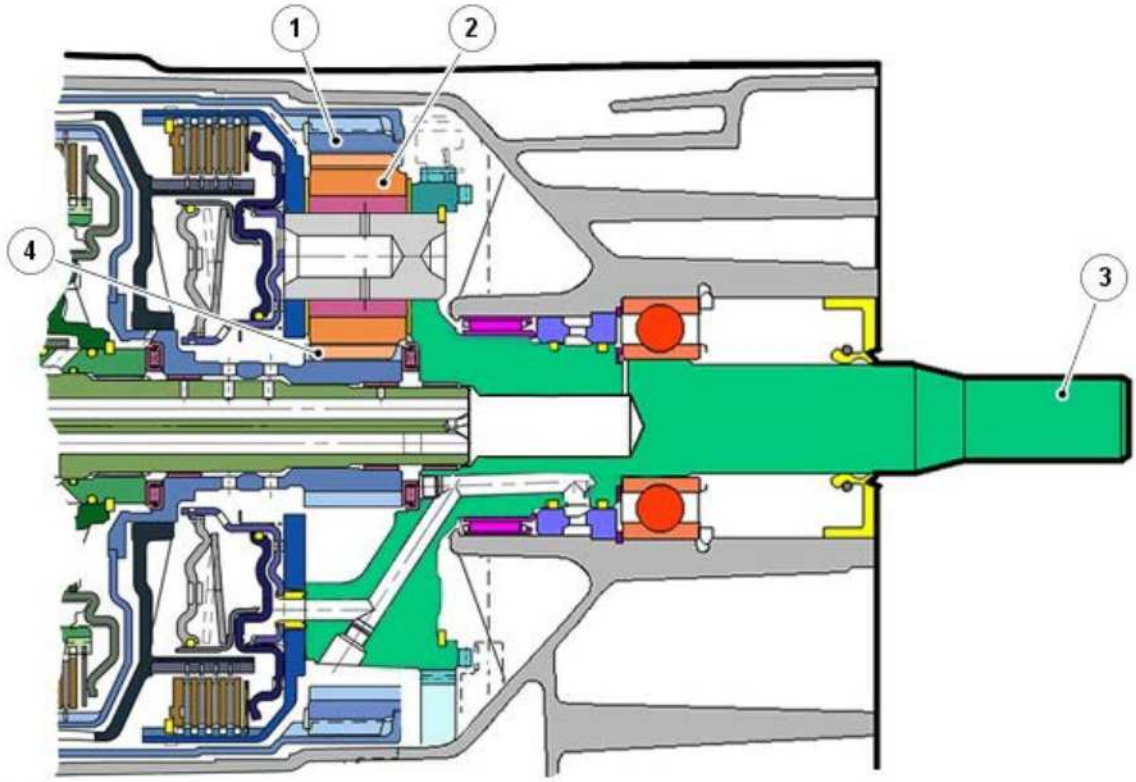
E131255

Item	Part Number	Description
1	-	Planetary gears - gear set 1
2	-	Ring gear - gear set 1
3	-	Planetary gear carrier (spider)
4	-	Planetary gears - gear set 2
5	-	Ring gear - gear set 2
6	-	Planetary gears - gear set 3
7	-	Ring gear - gear set 3
8	-	Sun wheel - gear set 3
9	-	Sun wheel - joint gear sets 1 and 2

Planetary Gear Set 4

The planetary gear set 4 comprises:

- Sunwheel
- 4 planetary gears
- Planetary gear carrier (spider) - output shaft
- Ring gear.



E131256

Item	Part Number	Description
1	-	Ring gear
2	-	Planetary gears
3	-	Output shaft / gear carrier
4	-	Sun wheel

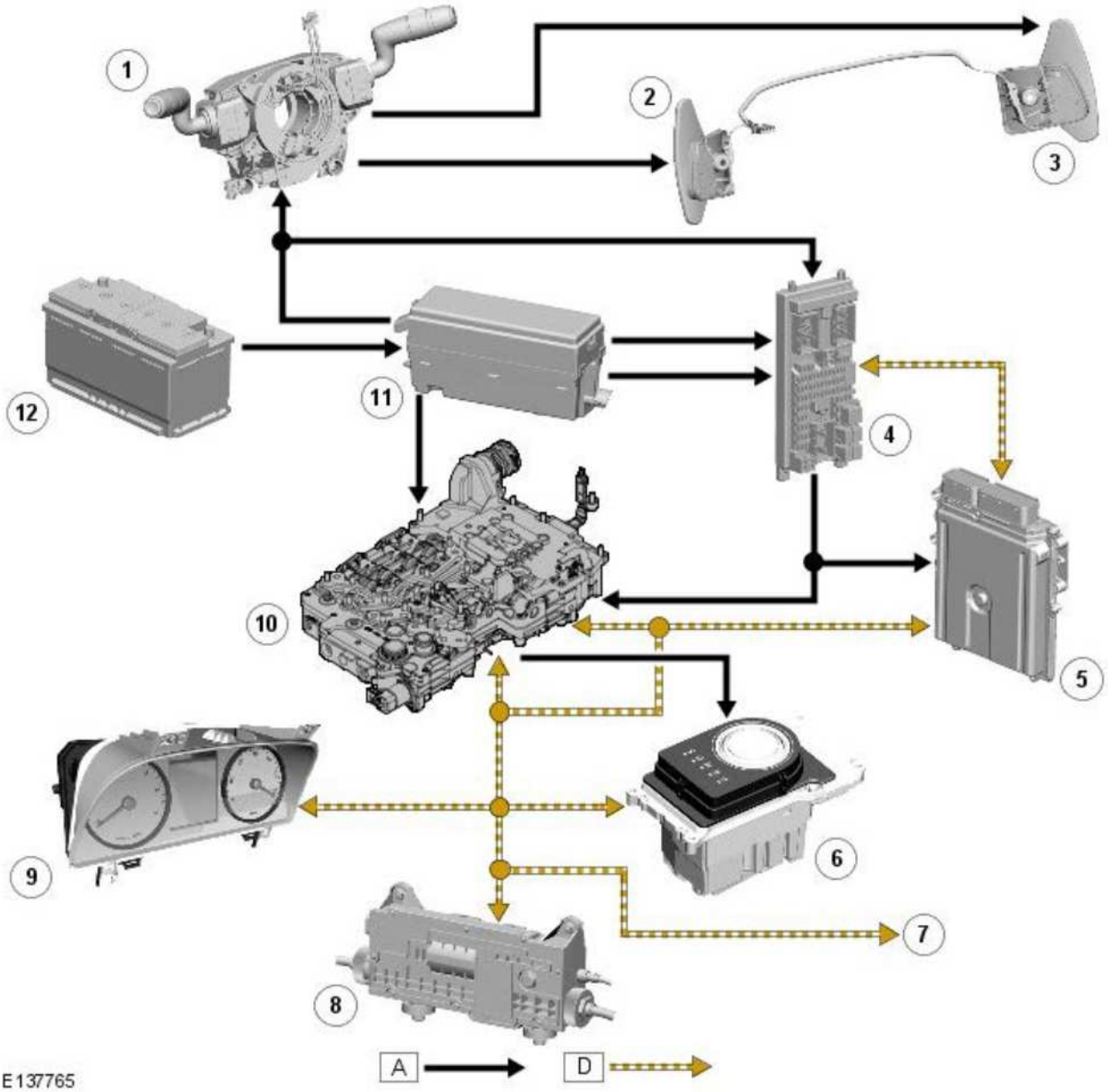
TRANSMISSION CONTROL MODULE

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.

CONTROL DIAGRAM

NOTE: **A** = Hardwired; **D** = High speed CAN bus.



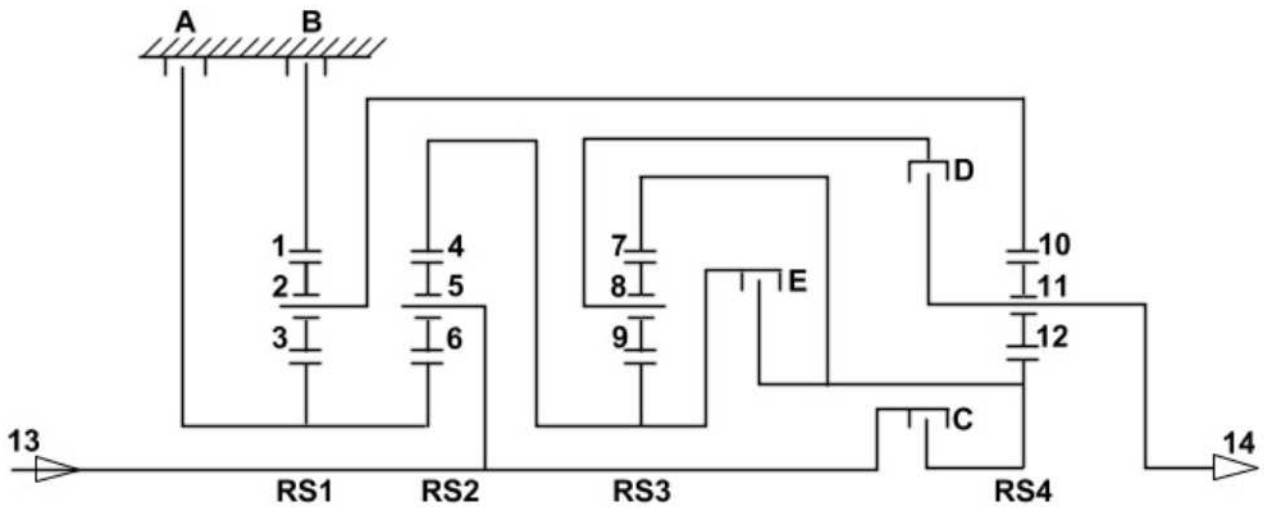
Item	Part Number	Description
1	-	Clockspring / Steering wheel module
2	-	Downshift paddle switch
3	-	Upshift paddle switch
4	-	CJB (central junction box)
5	-	ECM (engine control module)
6	-	ETS (electronic transmission selector)
7	-	High-speed Controller Area Network (CAN) to other systems and components
8	-	Parking brake module
9	-	Instrument cluster
10	-	TCM (Transmission Control Module)
11	-	BJB (Battery Junction Box)
12	-	Battery

OPERATION

Power Flows

Operation of the transmission is controlled by the TCM, which electrically activates various solenoids to control the transmission gear selection. The sequence of solenoid activation is based on programmed information in the TCM memory and physical transmission operating conditions such as vehicle speed, throttle position, engine load and selector lever position.

All gear shifts from 1st to 8th and 8th to 1st are known as 'overlap' shifts. Overlap shifts are during a gear shift one clutch must remain capable of transmitting torque at a reduced main pressure until the other clutch is ready to accept the torque.



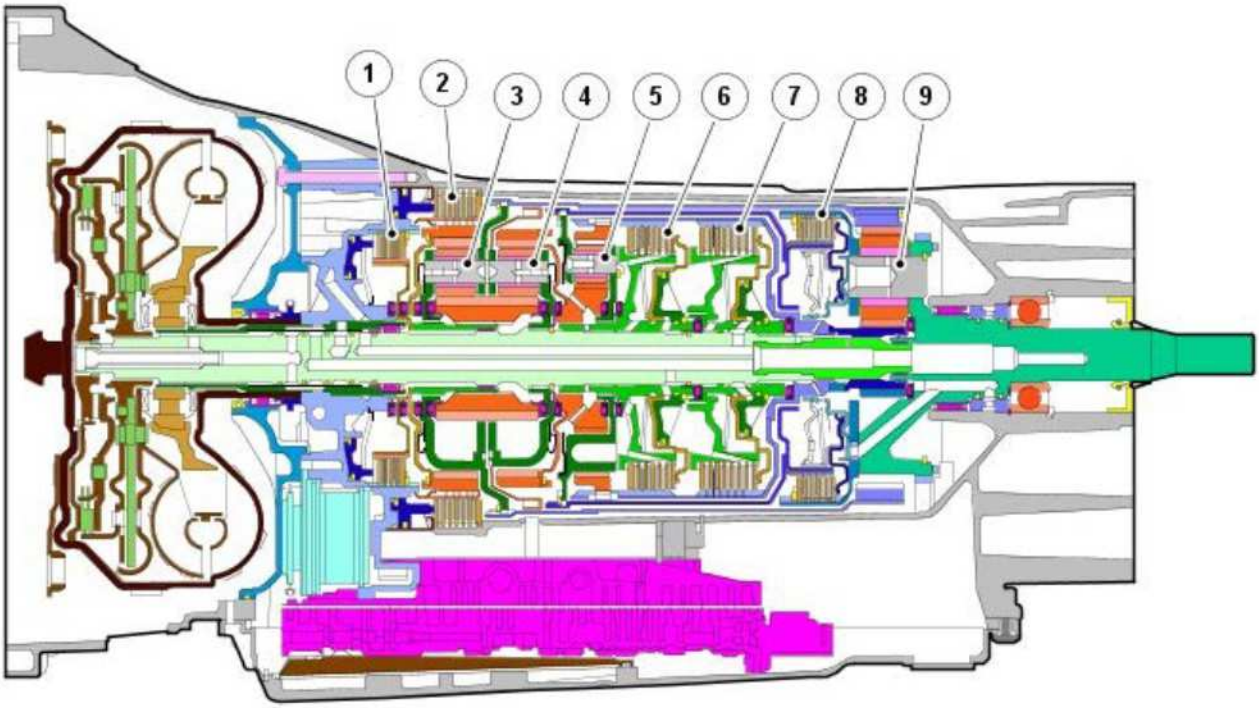
E131258

Item	Part Number	Description
A	-	Multiplate brake
B	-	Multiplate brake
C	-	Multiplate clutch
D	-	Multiplate clutch
E	-	Multiplate clutch
1	-	Ring gear of planetary gear set 1
2	-	Planetary gears of planetary gear set 1
3	-	Sun gear of planetary gear set 1
4	-	Ring gear of planetary gear set 2
5	-	Planetary gears of planetary gear set 2
6	-	Sun gear of planetary gear set 2
7	-	Ring gear of planetary gear set 3
8	-	Planetary gears of planetary gear set 3
9	-	Sun gear of planetary gear set 3
10	-	Ring gear of planetary gear set 4
11	-	Planetary gears of planetary gear set 4
12	-	Sun gear of planetary gear set 4
13	-	Power input from torque converter
14	-	Power output to output shaft

Engine torque is transferred, via operation of single or combinations of clutches to the 4 planetary gear trains. All gear trains are controlled by reactionary inputs from brake clutches to produce the 8 forward gears and 1 reverse gear. The ratios are as follows:

Gear	1st	2nd	3rd	4th	5th	6th	7th	8th	Reverse
Ratio	4.714	3.143	2.106	1.667	1.285	1.000	0.839	0.667	3.317

Shift Elements



E131259

Item	Part Number	Description
1	-	Brake A
2	-	Brake B
3	-	Gear set 1
4	-	Gear set 2
5	-	Gear set 3
6	-	Clutch E
7	-	Clutch C
8	-	Clutch D
9	-	Gear set 4

The shift elements, clutches and brakes are actuated hydraulically. Fluid pressure is applied to the required clutch and/or brake, pressing the plates together and allowing drive to be transmitted through the plates. The purpose of the shift elements is to perform power-on shifts with no interruption to traction and smooth transition between gear ratios.

Instrument Cluster

E137706

Item	Part Number	Description
1	-	MIL (malfunction indicator lamp)
2	-	Message center
3	-	Transmission status display

The instrument cluster is connected to the TCM via the high speed CAN bus. Transmission status is transmitted by the TCM and displayed to the driver in one of two displays in the instrument cluster.
For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

Malfunction Indicator Lamp

Transmission related faults which may affect the vehicle emissions will illuminate the MIL (malfunction indicator lamp).

The MIL is illuminated by the ECM on receipt of a relevant fault message from the TCM on the high speed CAN. The nature of the fault can be diagnosed using Land Rover approved diagnostic equipment which reads the fault codes stored in the TCM memory.

Transmission Status Display

The transmission status display is located in the tachometer of the instrument cluster. The display shows the selector lever position or the selected gear when in manual and sport modes.

The following table shows the displays and their descriptions.

Symbol	Description
P	Park selected
R	Reverse selected
N	Neutral selected
D*	Drive and temporary manual mode selected (* = current gear)
S*	Sport mode selected (* = current gear)
1	1st gear selected (manual CommandShift mode)
2	2nd gear selected (manual CommandShift mode)
3	3rd gear selected (manual CommandShift mode)
4	4th gear selected (manual CommandShift mode)
5	5th gear selected (manual CommandShift mode)
6	6th gear selected (manual CommandShift mode)
7	7th gear selected (manual CommandShift mode)
8	8th gear selected (manual CommandShift mode)

Message Center

The message center relays vehicle status and operating information to the driver and display's messages relating to a number of vehicle systems. If a transmission fault occurs, the message GEARBOX FAULT is displayed in the message center.
For additional information, refer to: Information and Message Center (413-08 Information and Message Center, Description and Operation).

Transmission Control Module

The TCM outputs signals to control the shift control solenoid valves and the EPRS's to control the hydraulic operation of the transmission.

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

The ECM supplies the engine management data over the high speed CAN bus. The TCM requires engine data to efficiently control the transmission operation, for example; flywheel torque, engine speed, accelerator pedal angle, engine temperature. The steering angle sensor and the ABS (anti-lock brake system) module also supply data to the TCM on the high speed CAN bus. The TCM uses data from these systems to suspend gear changes when the vehicle is cornering and/or the ABS module is controlling braking or traction control.

The CJB (central junction box) supplies steering wheel paddle data over the high speed CAN bus. The TCM uses this to schedule driver requested upshifts and downshifts.

Using the signal inputs and the memorized data, the TCM control program computes the correct gear and torque converter lock-up clutch setting and the optimum pressure settings for gear shift and lock-up clutch control. Special output-side modules (power output stages, current regulator circuits), allow the TCM to control the solenoid valves and pressure regulators and consequently precisely control the hydraulics of the automatic transmission. In addition, the amount and duration of engine interventions are supplied to the engine management by way of the CAN bus.

The TCM determines the position of the selector lever using signals from the electronic transmission selector on the high speed CAN bus and Local LIN (local interconnect network) bus

The TCM transmits the position of the electronic transmission selector and any manual gear selected on the high speed CAN bus. This information is shown in the gear selector display in the instrument cluster.

Engine Stall

If the vehicle stalls it will coast down in gear, with the transmission providing drive to the engine. A restart can be attempted at this point and the engine may start and the driver can continue.

If the coast down speed reduces such that the speed of the engine is less than 400 rev/min, the transmission will go to neutral, 'D' illumination will flash in the instrument cluster. The driver needs to select neutral or park and then press the brake pedal to restart the engine.

If the start/stop button is pressed when driving, the message ENGINE STOP BUTTON PRESSED is displayed in the message center but there will be no change to the ignition state. If the driver requires to switch off the engine, the start/stop button must be pressed for a second time. The engine will be stopped and will be back driven by the transmission as the vehicle coasts down.

Published: 04-Nov-2011

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Diagnostics TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD

Diagnosis and Testing

Principle of Operation

For a detailed description of the automatic transmission/transaxle system and operation, refer to the relevant Description and Operation sections in the workshop manual. REFER to: Transmission Description (307-01B, Description and Operation).

Fluid Level and Condition Check

CAUTION: The vehicle should not be driven if the fluid level is low as internal failure can result

NOTE: The transmission fluid temperature must not be allowed to exceed 50°C (122°F) whilst checking level. Should the temperature rise above this figure, abort the check and allow the transmission fluid to cool to below 30°C (86°F)

This vehicle is not equipped with a fluid level indicator. An incorrect level may affect the transmission operation and could result in transmission damage. To correctly check and add fluid to the transmission
REFER to: Transmission Fluid Level Check (307-01B, General Procedures).

High Fluid Level

A fluid level that is too high may cause the fluid to become aerated due to the churning action of the rotating internal parts. This will cause erratic control pressure, foaming, loss of fluid from the vent tube and possible transmission damage. If an overfill condition is identified, with the engine at idle ensure the fluid temperature is within the specified range and allow the excess fluid to drain until a small thread of fluid runs from the filler/level plug hole

Low Fluid Level

A low fluid level could result in poor transmission engagement, slipping, or damage. This could also indicate a leak in one of the transmission seals or gaskets
REFER to: Transmission Fluid Level Check (307-01B, General Procedures).

Adding Fluid

CAUTION: The use of any other type of transmission fluid other than that specified can result in transmission damage

If fluid needs to be added, add fluid in 0.50 liter increments through the fill hole opening. Do not overfill the fluid. For fluid type, refer to the general specification chart in this section
REFER to: Specifications (307-01B, Specifications).

Fluid Condition Check

1. Check the fluid level
2. Observe the color and the odor of the fluid. The color under normal circumstances should be like honey, not dark brown or black
3. Allow the fluid to drip onto a facial tissue and examine the stain
4. If evidence of solid material is found, the transmission fluid pan should be removed for further inspection

NOTE: In the event of a transmission unit replacement for internal failure, the oil cooler and pipes must also be replaced

Inspection and Verification

CAUTION: Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault, and may also cause additional faults in the vehicle being tested and/or the donor vehicle

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

Mechanical	Electrical	Hydraulic

Damaged/stuck shift mechanism • Damaged automatic transmission casing	Blown fuse(s) • Damaged, loose or corroded connectors • Wiring harness	Fluid level too high/low • Poor condition of fluid • Fluid leak

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident check for diagnostic trouble codes (DTCs) and refer to the DTC Index

DTC Index

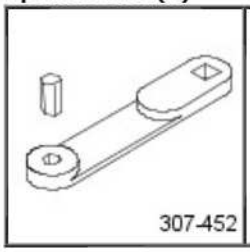
For a list of DTCs that could be logged on this vehicle, please refer to Section 100-00.
REFER to: Diagnostic Trouble Code (DTC) Index - DTC: Transmission Control Module (TCM) - Bosch (100-00, Description and Operation).

Published: 27-Sep-2011

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Level Check

General Procedures

Special Tool(s)

	307-452 Wrench, Transmission Filler Plug

Check

WARNINGS:

Observe due care when draining, as the fluid can be very hot.

Observe due care when working near a hot exhaust system.

NOTE: 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.
   - The parking brake must be applied.
   - Place the transmission control switch (TCS) knob in the N position.

2.
   - Start the engine.
   - Apply, and hold, the footbrake.
   - Move the TCS to the 'R' position and wait for 5 seconds.
   - Move the TCS to the 'D' position and wait for 5 seconds.
   - Engage second gear and wait for 5 seconds.
   - Move the TCS back to the 'N' position.

3. Make sure that the torque converter is full of oil by holding the engine speed at 2,000 rpm for a minimum of 30 seconds. Move the TCS to the park position and allow the engine to idle between 600rpm and 750 rpm.

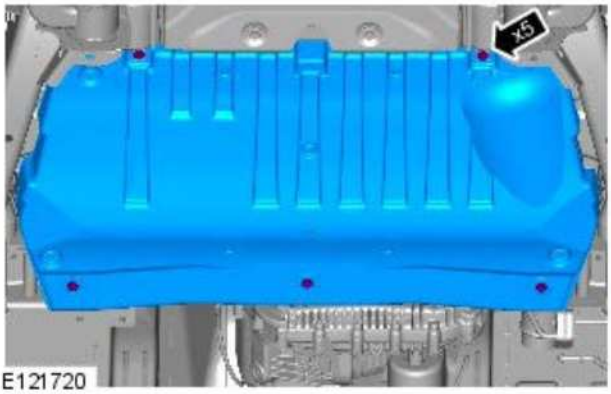
4. Connect the diagnostic tool to the vehicle.

5. Make sure that the transmission oil has exceeded a temperature of 69 degrees celsius so that the thermostat has fully opened allowing full circulation of the transmission fluid. Allow the temperature to drop below 30 degrees celsius before checking the transmission oil level.

6. WARNING: Make sure to support the vehicle with axle stands.

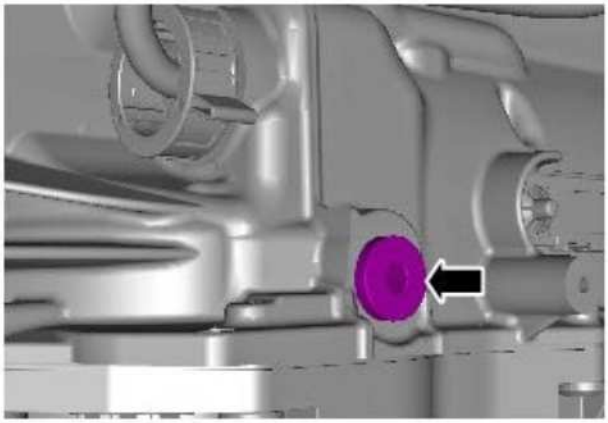
   Raise and support the vehicle.

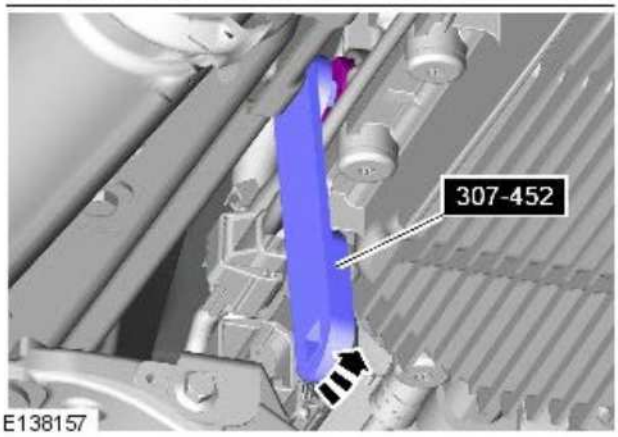
7.



8. CAUTION: Make sure that the transmission fluid temperature is below 30 degrees before starting the fluid level check.

   Place a suitable container under the transmission fluid fill plug.





9. CAUTIONS:

   The transmission fluid level must only be checked when the temperature of the fluid is between 30 degrees and 50 degrees. The fluid level obtained will be incorrect if the reading is outside this temperature range.

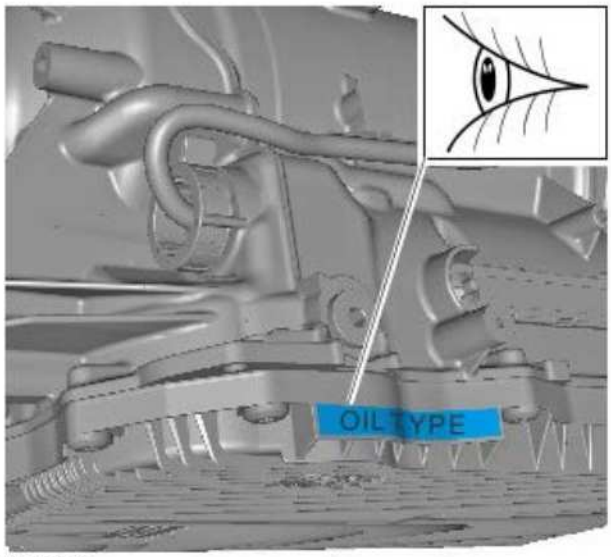
   Discard the component.

   - *Special Tool(s):* 307-452
   - Clean the area around the transmission fluid level plug.

Adjustment

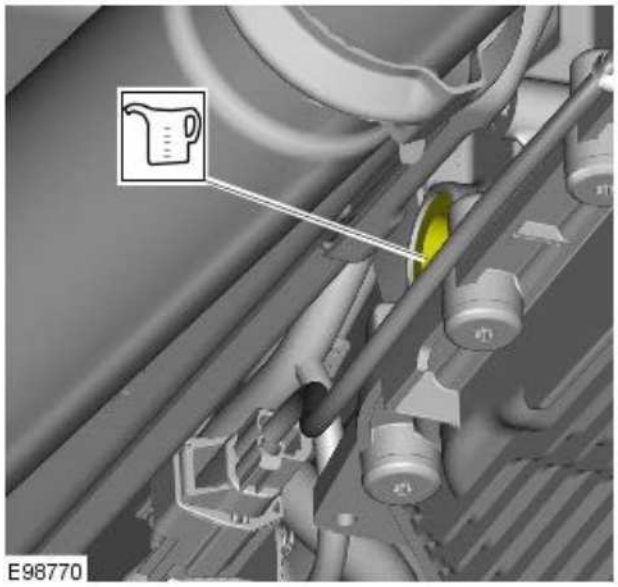
1. CAUTION: Make sure the correct specification of oil is used.

   Refer to: Specifications (307-01B, Specifications).

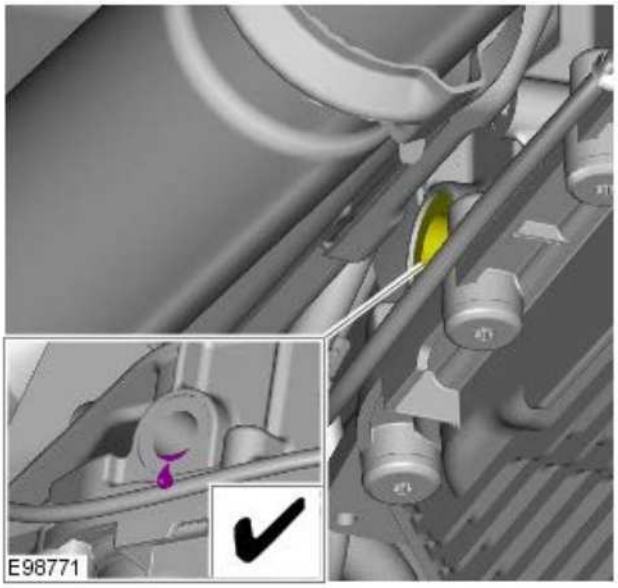


E138154

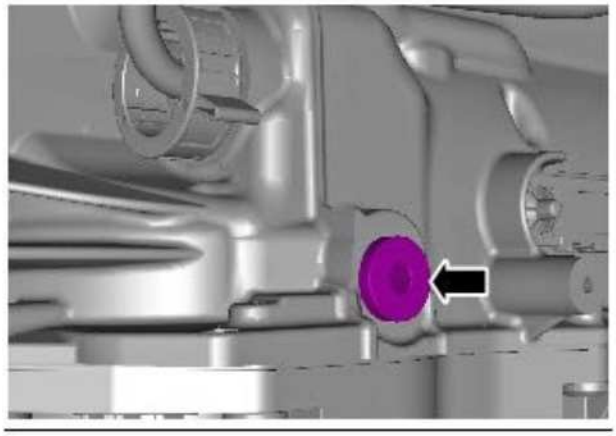
2. If the transmission fluid does not come out of the transmission fluid fill plug hole the transmission fluid level is insufficient. If this is the case add the transmission fluid in 0.5 liter units into the transmission fluid fill plug hole until fluid comes out.


E98770

3. Allow the transmission fluid to drain from the transmission fluid filler plug hole until the flow almost stops.

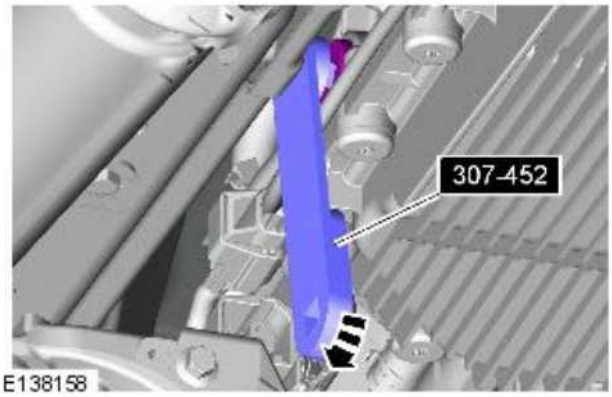

E98771

4. WARNING: Make sure to support the vehicle with axle stands.

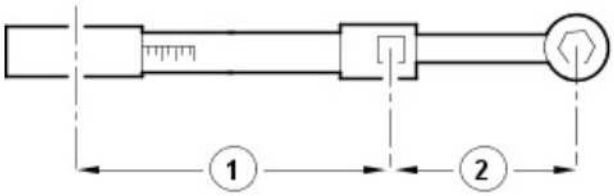


NOTE: Install a new fluid level filler plug.

- Using the special tool, install the new transmission fluid fill plug.
- Lower the vehicle on the lift.
- Switch off the engine.
- Raise and support the vehicle.

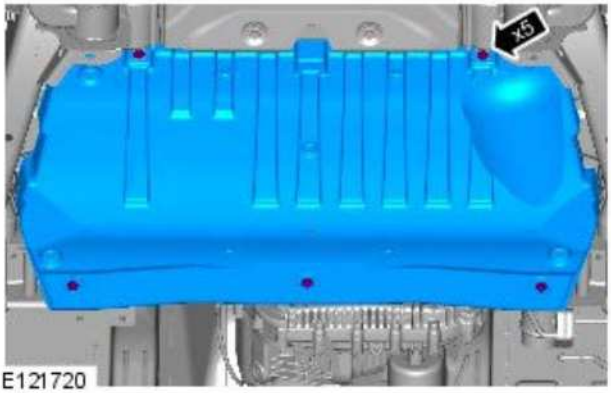


E138158



E37107

5. CAUTION: Make sure the transmission fluid fill plug is tightened to the correct specification. Failure to follow this instruction may result in damage to the vehicle.
   - To make sure the transmission fill plug is torqued 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.
6. Remove the special tool.
7. Remove the container.
8. *Torque:* 10 Nm



E121720

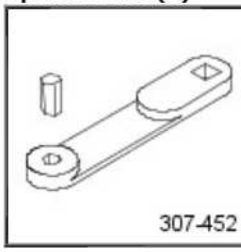
9. Lower the vehicle.
10. Disconnect the diagnostic tool.

Published: 27-Sep-2011

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Drain and Refill

General Procedures

Special Tool(s)

	307-452 Wrench, Transmission Filler Plug

WARNINGS:

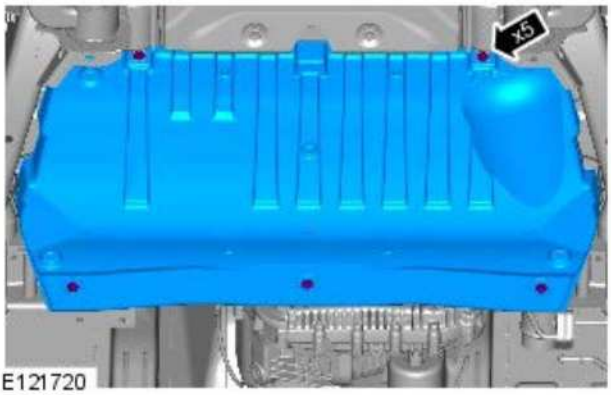
Observe due care when draining, as the fluid can be very hot.

Observe due care when working near a hot exhaust system.

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

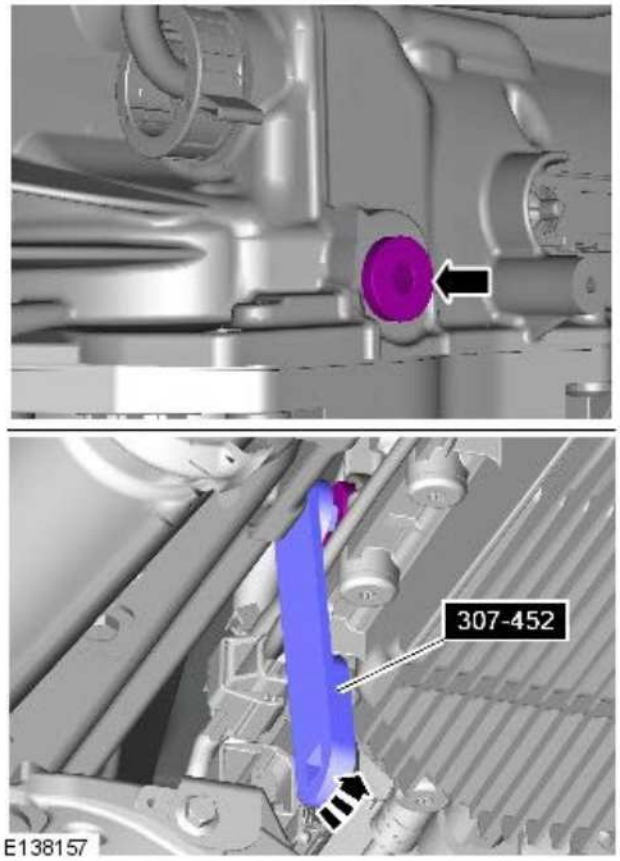
1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. 

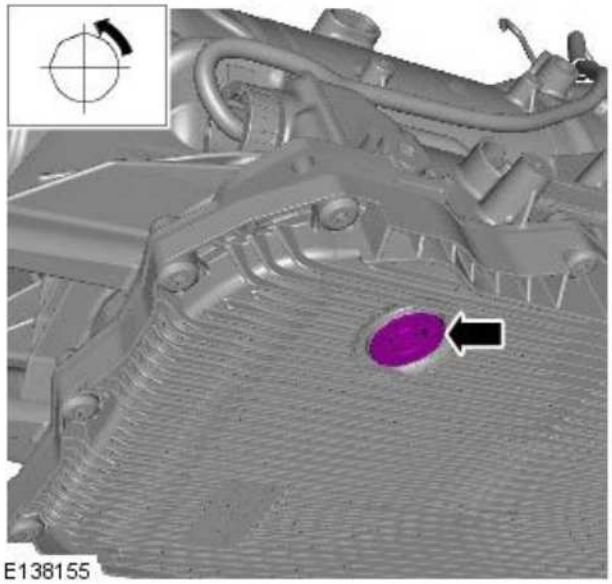
3. Place a container under the transmission.

4. - *Special Tool(s):* 307-452
   - Discard the component.



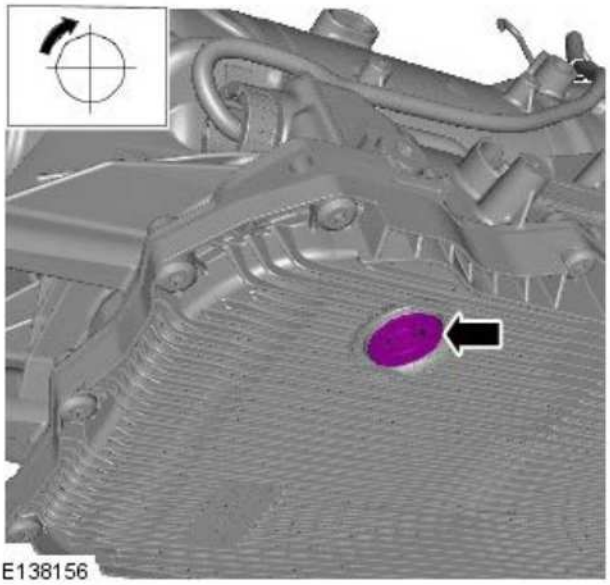
5.

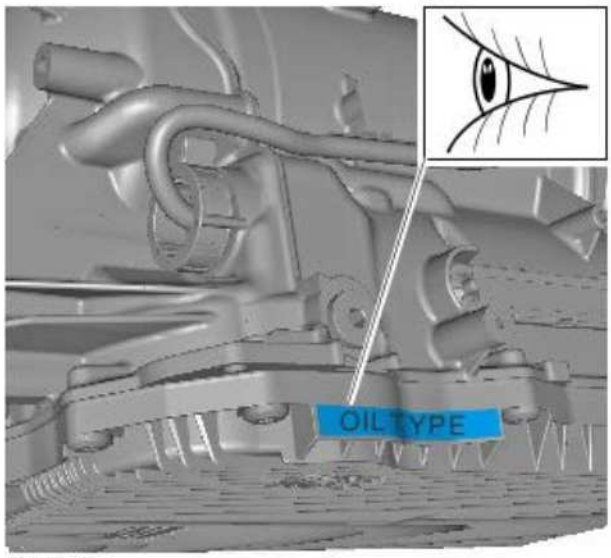
- Allow the fluid to drain.
- Discard the component.



6.

- Install a new component.
- *Torque:* 8 Nm

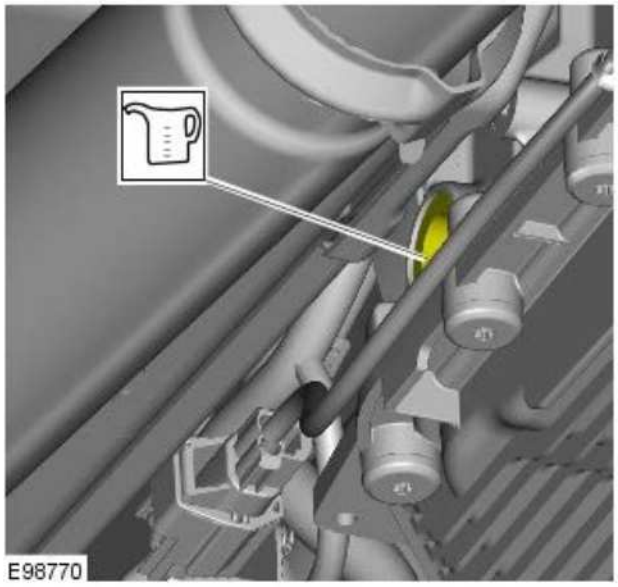

E138156



E138154

7. CAUTION: Make sure the correct specification of oil is used.

   Refer to: Specifications (307-01B, Specifications).


E98770

8.
   - Refill the transmission with fluid.
   - For fluid quantity, refer to the specification's section.

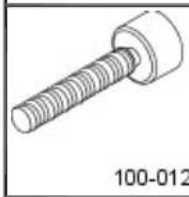
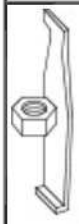
9. Refer to: Transmission Fluid Level Check (307-01, General Procedures).

Published: 27-Sep-2011

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Input Shaft Seal

Removal and Installation

Special Tool(s)

	100-012 Slide Hammer
	100-012-01 Slide Hammer Adapter
	307-613 Holding Pins, Torque Converter
	308-375 Remover, Input and Output Seal
	JLR-308-845 Installer, Input Shaft Seal

Removal

NOTES:

Removal steps in this procedure may contain installation details.

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

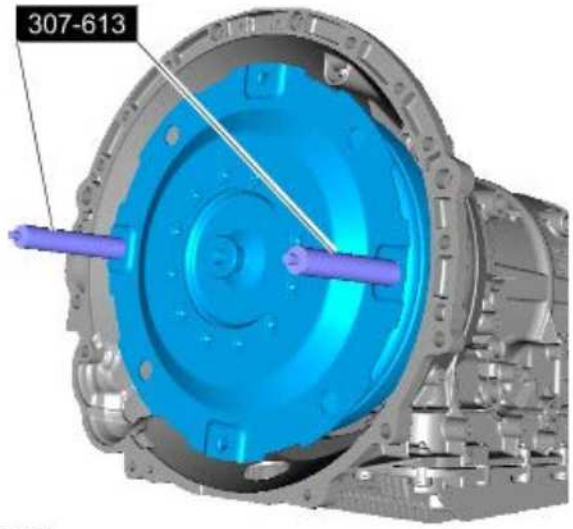
1. Disconnect the battery ground cable.

   Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

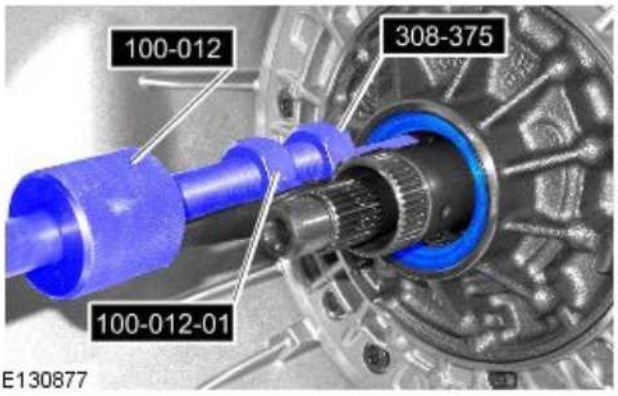
3. Refer to: Transmission - V6 S/C 3.0L Petrol (307-01 Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Removal).



E112115

4. CAUTION: Be prepared to collect escaping fluids.

   Special Tool(s): 307-613



E130877

5. CAUTIONS:

   Discard the seal.

   Care must be taken to avoid damage to the seal register and running surface.

   Special Tool(s): 100-012, 100-012-01, 308-375

Installation

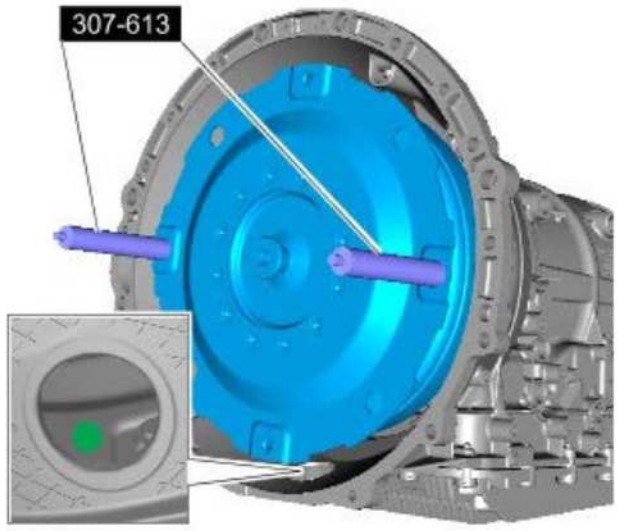
E130980

1. CAUTION: Install a new seal.

   Special Tool(s): JLR-308-845

2. CAUTION: Be prepared to collect escaping fluids.

   NOTE: Make sure that the painted mark is at the lowest possible point when the first retaining bolt is installed, as illustrated.



E112118

3. NOTE: Make sure that the torque converter is fully engaged to the transmission.

E138283

4. Refer to: Transmission - V6 S/C 3.0L Petrol (307-01 Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Installation).

5. Connect the battery ground cable.

   Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

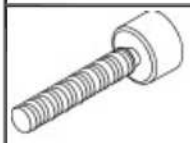
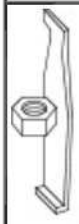
6. Refer to: Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

Published: 05-Nov-2013

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Extension Housing Seal

Removal and Installation

Special Tool(s)

 E54135	100-012 Slide Hammer
 100-012-01	100-012-01 Slide Hammer Adapter
 E52536	307-520 Installer, Output Shaft Seal
 308-375	308-375 Remover, Input and Output Seal
 E130934	JLR-307-520-01 Adapter, Output Shaft Seal

Removal

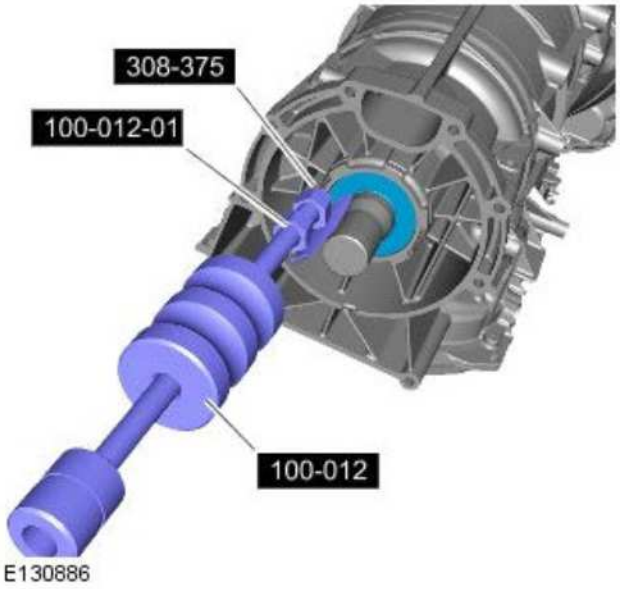
WARNING: Be prepared to collect escaping fluids.

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

1. Refer to: Transfer Case - V6 S/C 3.0L Petrol (308-07B Transfer Case - Vehicles With: Single Speed Transfer Case, Removal).
   Refer to: Transfer Case - V6 S/C 3.0L Petrol (308-07C Transfer Case - Vehicles With: Twin Speed Transfer Case, Removal).

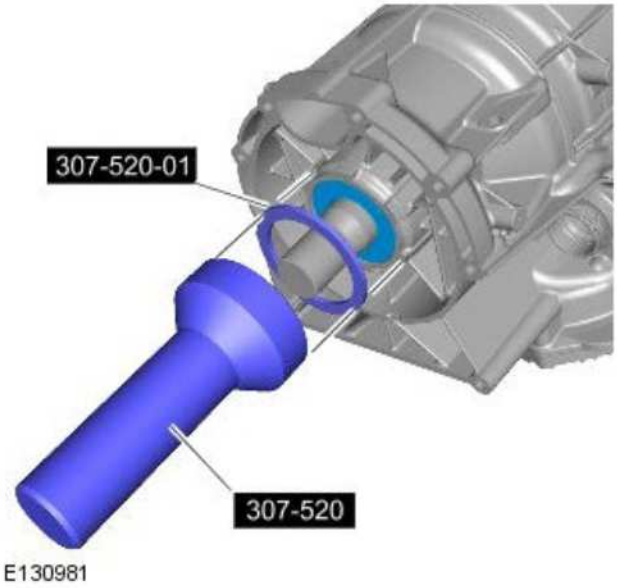
2. CAUTION: Care must be taken to avoid damage to the seal register and running surface.

   Special Tool(s): 100-012, 100-012-01, 308-



375

Installation



1. CAUTIONS:

   Oil seals must be installed dry.

   Make sure that the mating faces are clean and free of foreign material.

   Special Tool(s): 307-520, JLR-307-520-01

2. Refer to: Transfer Case - V6 S/C 3.0L Petrol (308-07B Transfer Case - Vehicles With: Single Speed Transfer Case, Installation).
   Refer to: Transfer Case - V6 S/C 3.0L Petrol (308-07C Transfer Case - Vehicles With: Twin Speed Transfer Case, Installation).

3. **Carry out a transmission fluid level check**.

   Refer to: Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

Published: 05-Nov-2013

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Control Module (TCM) and Main Control Valve Body

Removal and Installation

Special Tool(s)

 E130935	JLR-308-844 Remover/Installer, Transmission Control Module Electrical Connector

Removal

WARNING: Be prepared to collect escaping fluids.

CAUTION: Make sure all suitable safety precautions are taken to protect the TCM and main control valve body electrical connector pins against electrostatic discharge.

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

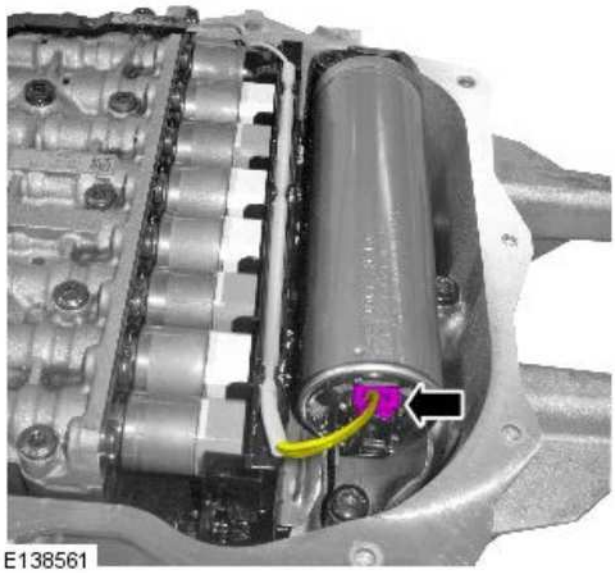
All vehicles

1. Refer to: Transmission Support Crossmember - V6 S/C 3.0L Petrol (502-02 Full Frame and Body Mounting, Removal and Installation).

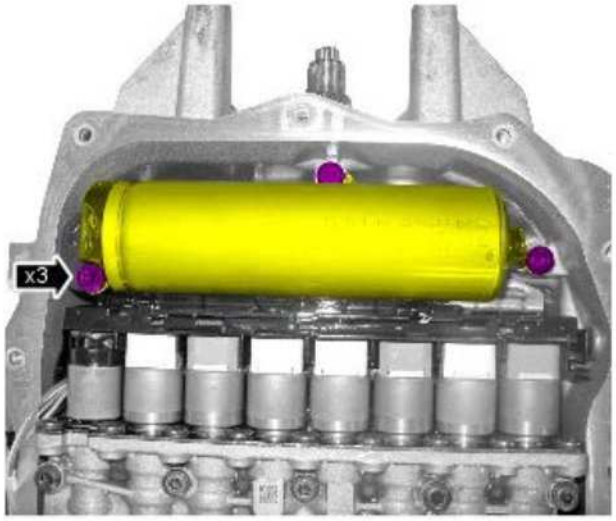
2. Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Removal and Installation).

Vehicles with Stop/Start

3. CAUTION: Take precautions to avoid any electrostatic charging, which could damage this component.


E138561

4.

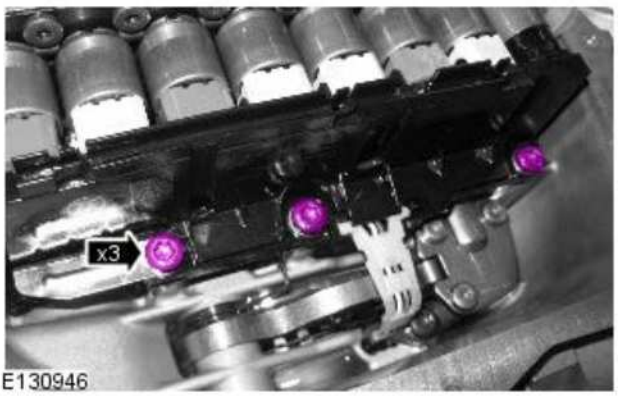


E138562

E138563

5. CAUTION: Remove and discard the O-ring seals.

All vehicles



E130946

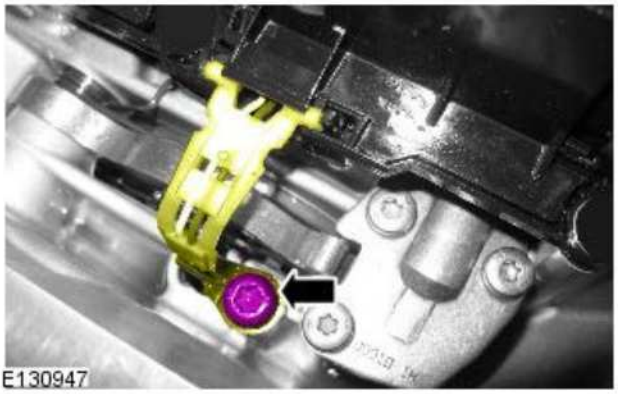
6. CAUTIONS:

Make sure all suitable safety precautions are taken to protect the TCM and main control valve body electrical connector pins against electrostatic discharge.

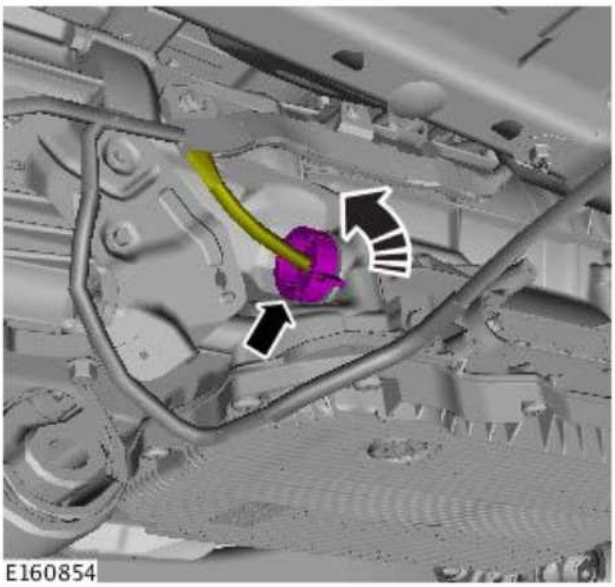
Discard the bolts.

Take precautions to avoid any electrostatic charging, which could damage this component.

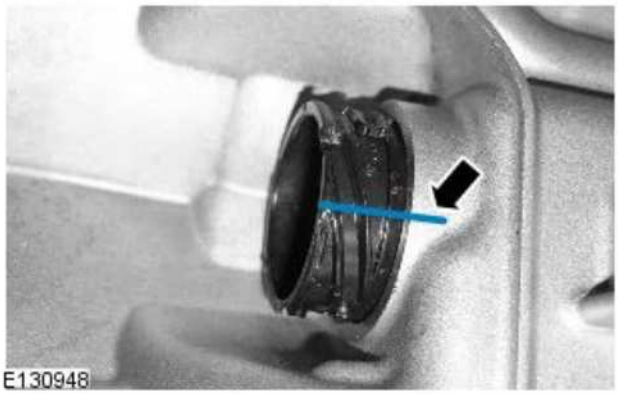
7. CAUTION: Discard the bolt.



8.

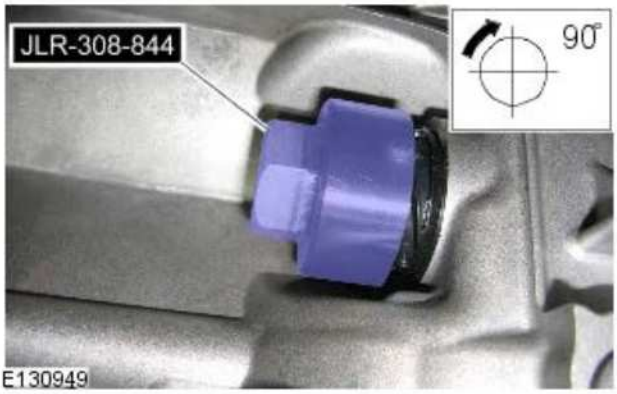


9. NOTE: Note the orientation of the component prior to removal.

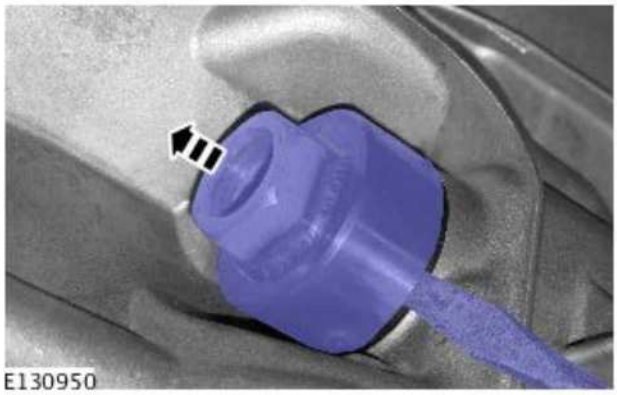


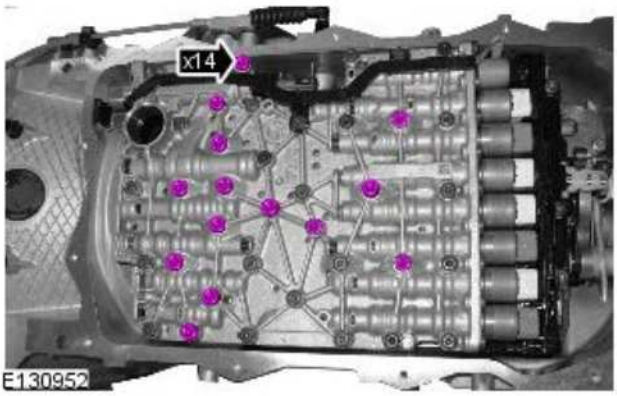
10.

11. *Special Tool(s):* JLR-308-844



12.

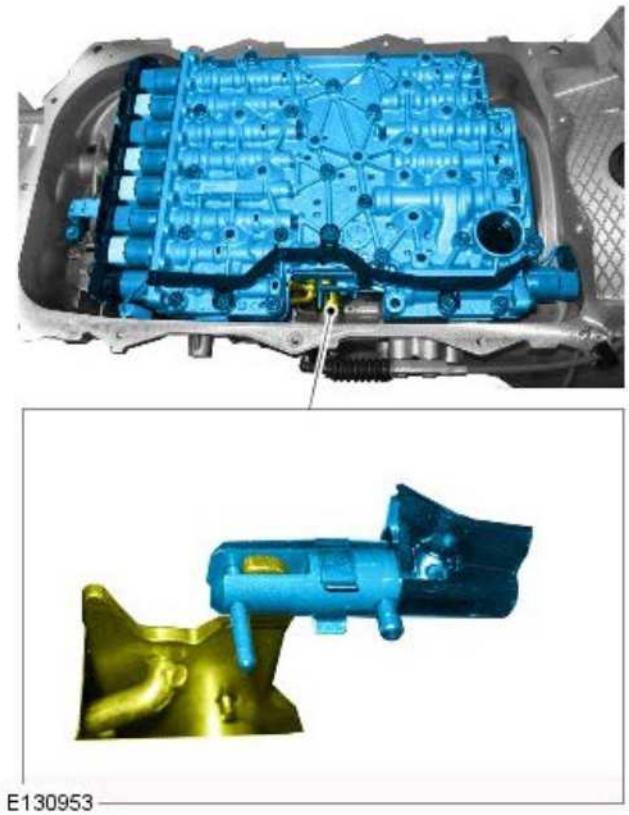




13. CAUTION: Discard the bolts.

Torque: 8 Nm

14. NOTE: Note the position of the manual park brake release.



E130953

Installation

All vehicles

1.

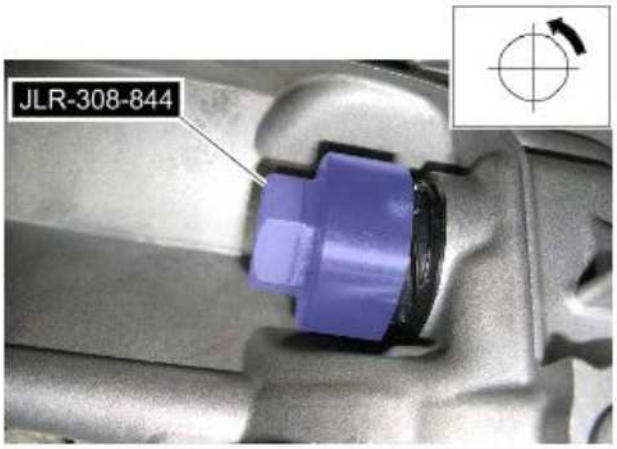
E150701

2. NOTE: Make sure that the component is installed to the noted removal position.

E130953

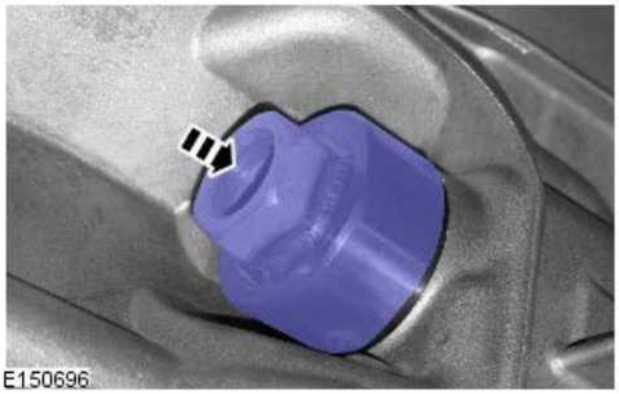
3.

- *Special Tool(s):* JLR-308-844



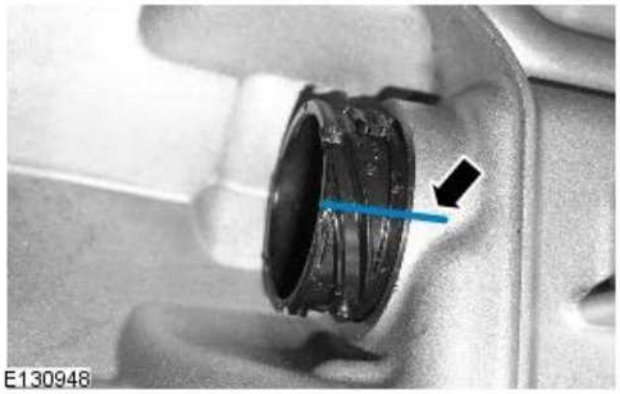
E150812

4.



E150696

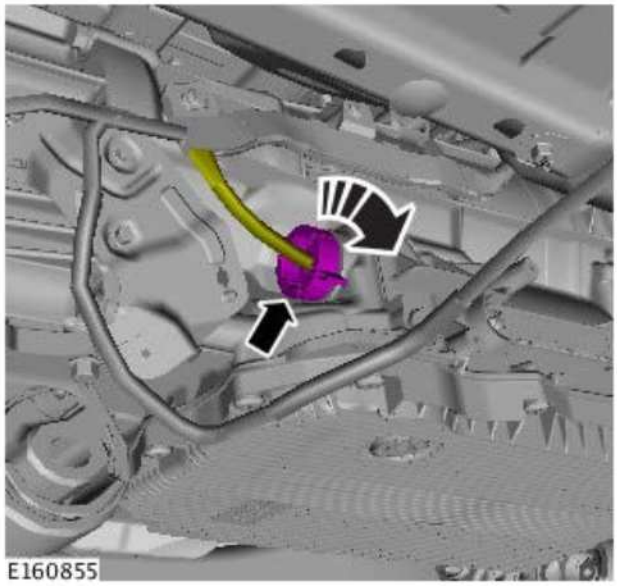
5. CAUTION: Make sure that the electrical



connector is installed in the correct orientation as noted in the removal step.

6.

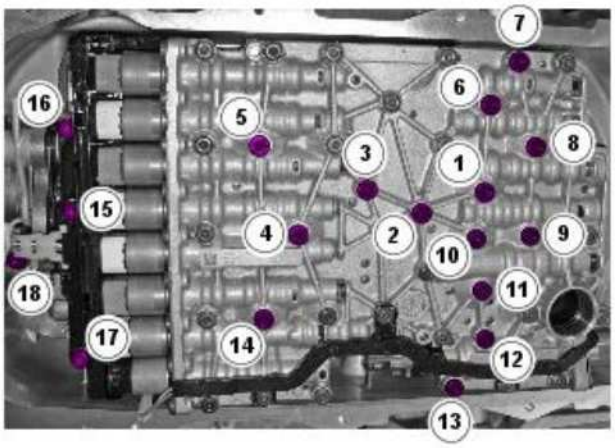
7. *Torque:* 10 Nm



8. CAUTION: Make sure that new bolts are installed.

NOTE: Tighten the retaining bolts evenly and progressively.

Torque: 8 Nm



E130933

Vehicles with Stop/Start

E138563

9. CAUTION: A new O-ring seal is to be installed.

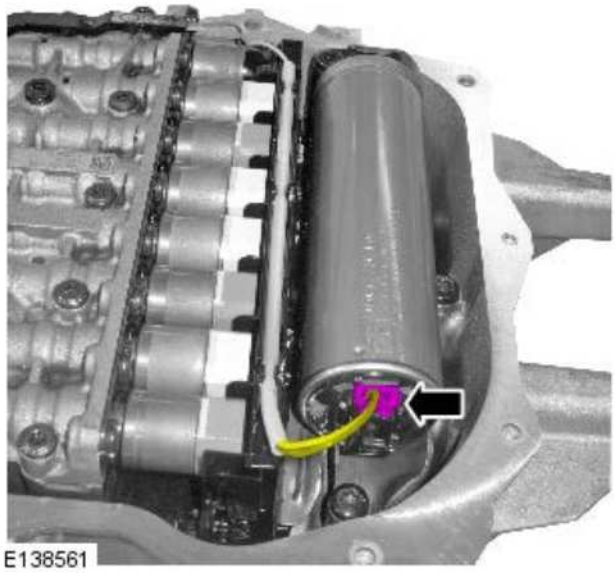
E138566

10. CAUTION: Make sure that new bolts are installed.

NOTE: Tighten the retaining bolts evenly and progressively.

Torque: 8 Nm

11.


E138561

All vehicles

12. Refer to: Transmission Fluid Pan, Gasket and Filter (307-01 Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, Removal and Installation).

13. Refer to: Transmission Support Crossmember - V6 S/C 3.0L Petrol (502-02 Full Frame and Body Mounting, Removal and Installation).

14. Using the diagnostic tool, calibrate the main control valve body and the transmission control module (TCM).

Published: 06-Aug-2013

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Fluid Pan, Gasket and Filter

Removal and Installation

General Equipment
Transmission jack

Removal

NOTES:

Removal steps in this procedure may contain installation details.

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

1. Disconnect the battery ground cable.

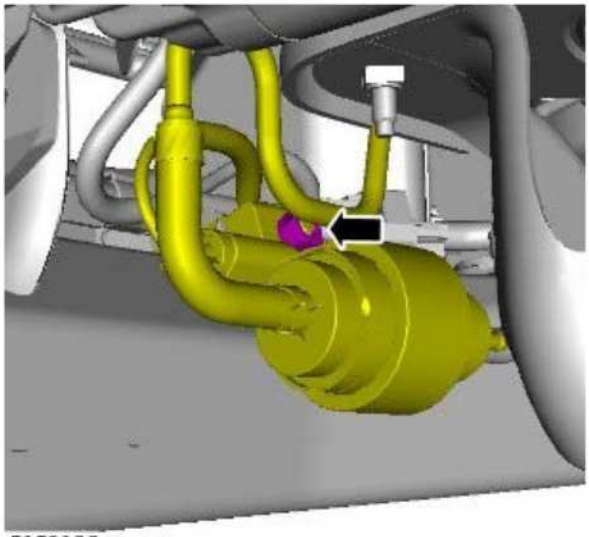
   Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

2. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

3. Refer to: Transmission Fluid Drain and Refill (307-01 Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

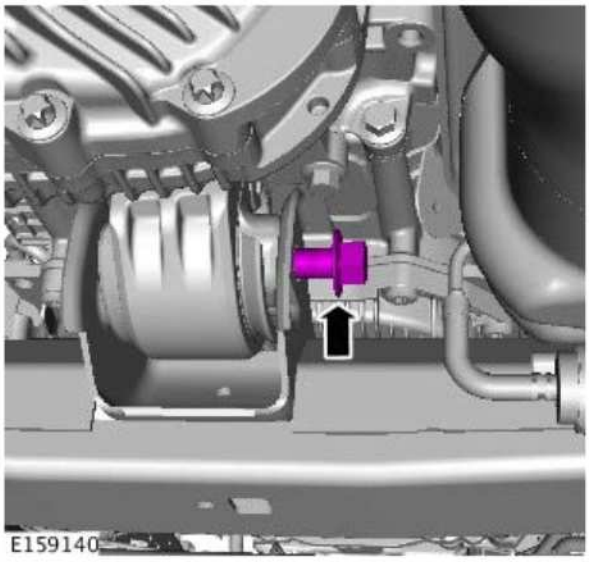
4. *Torque:* 10 Nm


E159139

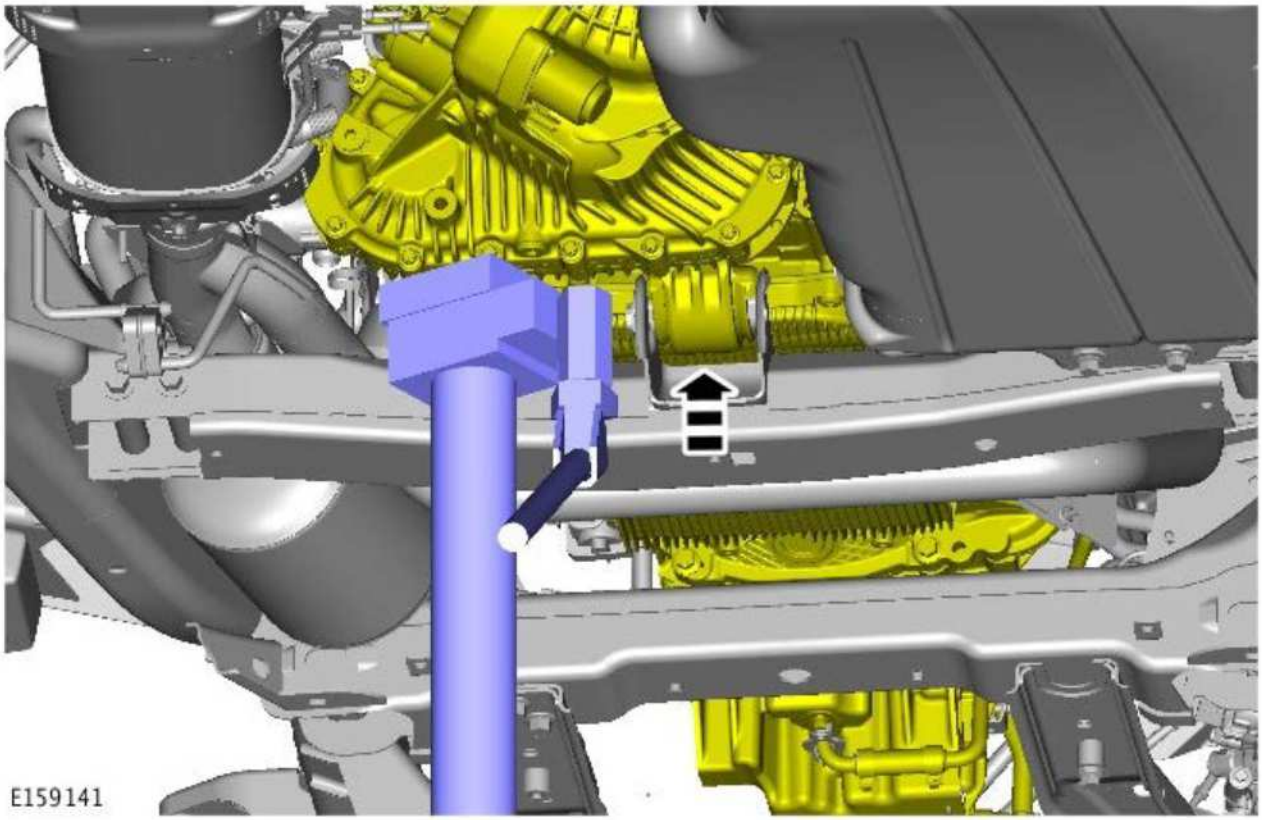
5. Using the transmission jack, support the transmission.

   General Equipment: Transmission jack

6. *Torque:* 175 Nm



7.



8. CAUTIONS:

Take extra care when removing the component, prevent damage to the mating faces.

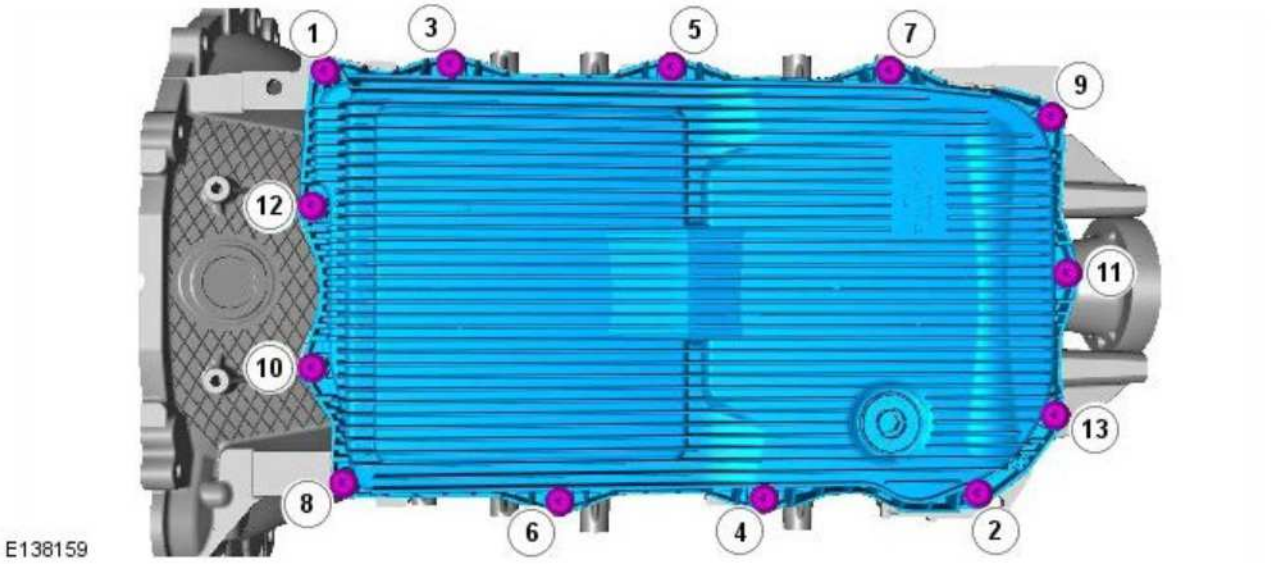
Make sure that the area around the component is clean and free of foreign material.

Be prepared to collect escaping fluids.

Discard all components including pan and bolts.

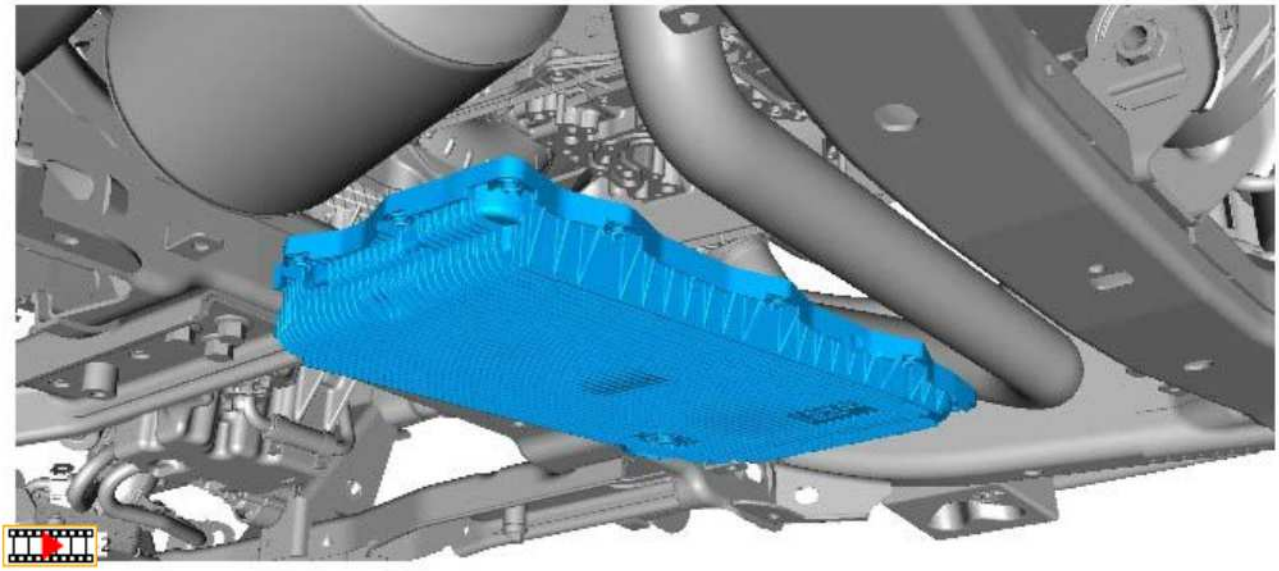
Remove and install pan bolts in order sequence 1 to 13.

Torque: 10 Nm

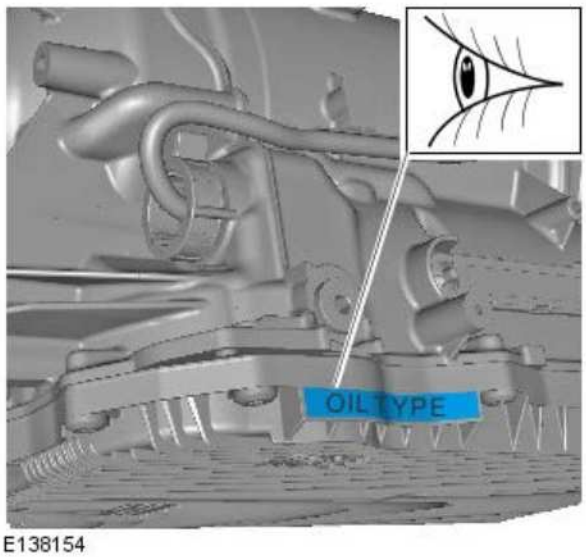


E138159

9. NOTE: Turn pan through 90 degrees to allow removal.



Installation



E138154

1. CAUTIONS:

   Make sure the correct specification of oil is used.

   Make sure that new components are installed.

   Make sure that the mating faces are clean and free of foreign material.

   To install, reverse the removal procedure.

Published: 11-May-2011

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission Support Insulator

Removal and Installation

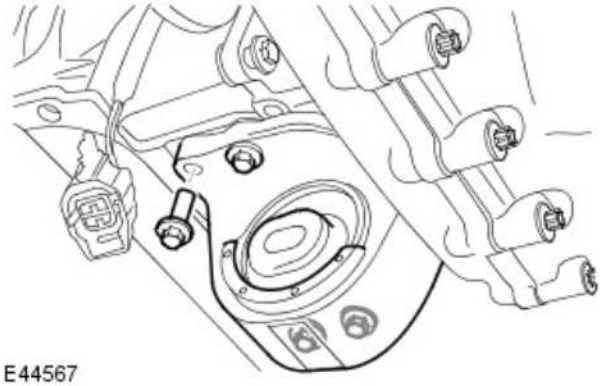
Removal

1. WARNING: Make sure to support the vehicle with axle stands.

   Raise and support the vehicle.

2. Remove the transmission crossmember.
   For additional information, refer to: Transmission Support Crossmember - 5.0L (502-02, Removal and Installation) / Transmission Support Crossmember - 3.0L Diesel (502-02, Removal and Installation).

3. Remove the transmission support insulator.
   - Remove the 4 bolts.



E44567

Installation

1. To install, reverse the removal procedure.
   - Clean the component mating faces.
   - Tighten the bolts to 60 Nm (44 lb.ft).

Published: 17-Jan-2014

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Selector Shaft Seal

Removal and Installation

Special Tool(s)

307-509-1  E50766	Seal extractor 307-509-1(LRT-44-033/1)
307-509-2  E50767	Seal extractor 307-509-2(LRT-44-033/2)
307-509-3  E50768	Seal installer 307-509-3(LRT-44-033/3)

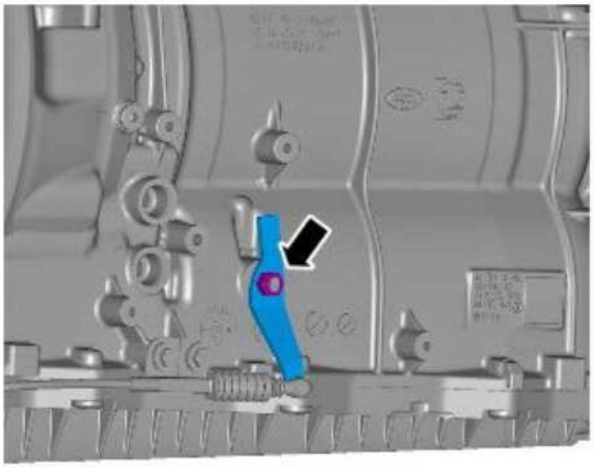
Removal

NOTES:

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

Some illustrations may show the transmission removed for clarity.

1. For additional information, refer to: Catalytic Converter LH (309-00B Exhaust System - V6 S/C 3.0L Petrol, Removal and Installation).
2. For additional information, refer to: Front Driveshaft - V6 S/C 3.0L Petrol (205-01 Driveshaft, Removal and Installation).
3.

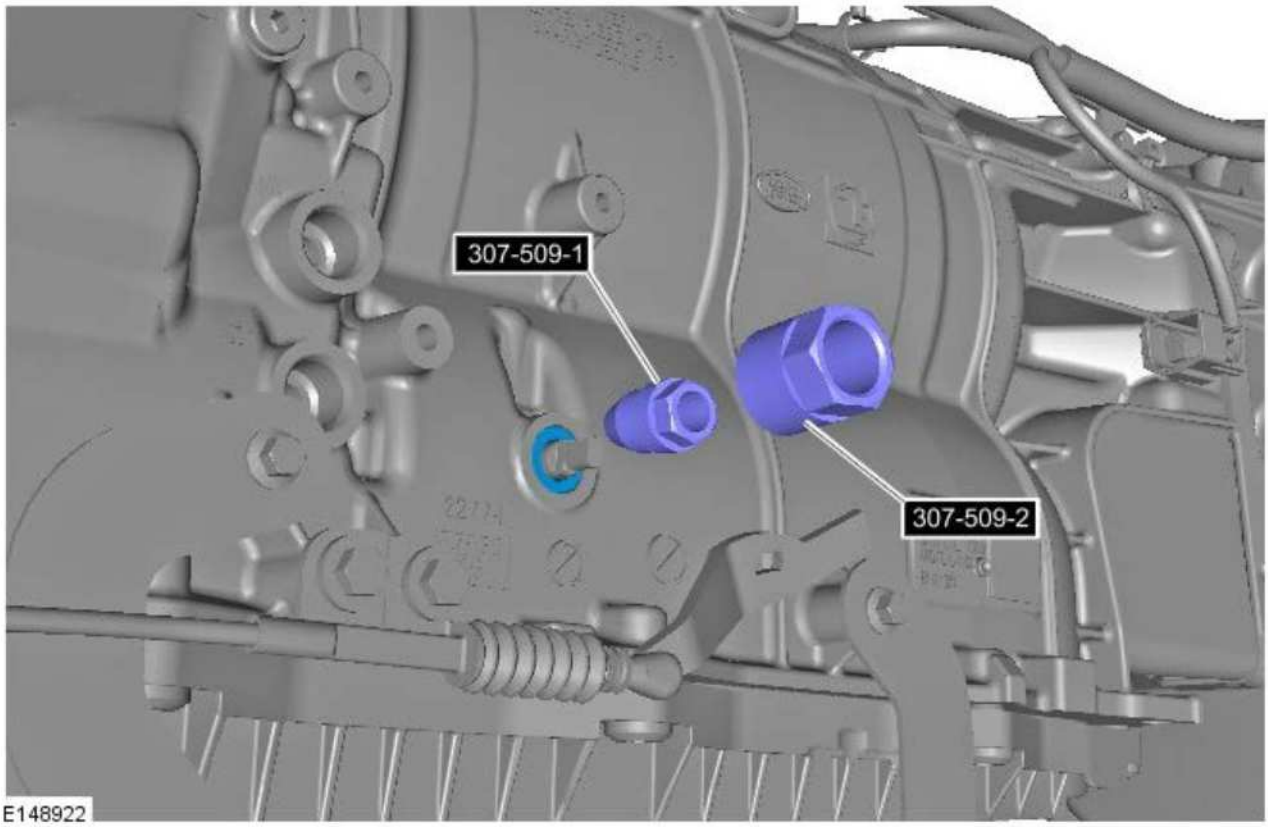


E149590

4. WARNING: Fluid loss is unavoidable, use absorbent cloth or a container to collect the fluid.

   CAUTION: Discard the seal.

   Install 307-509-2 to 307-509-1 and extract the seal.

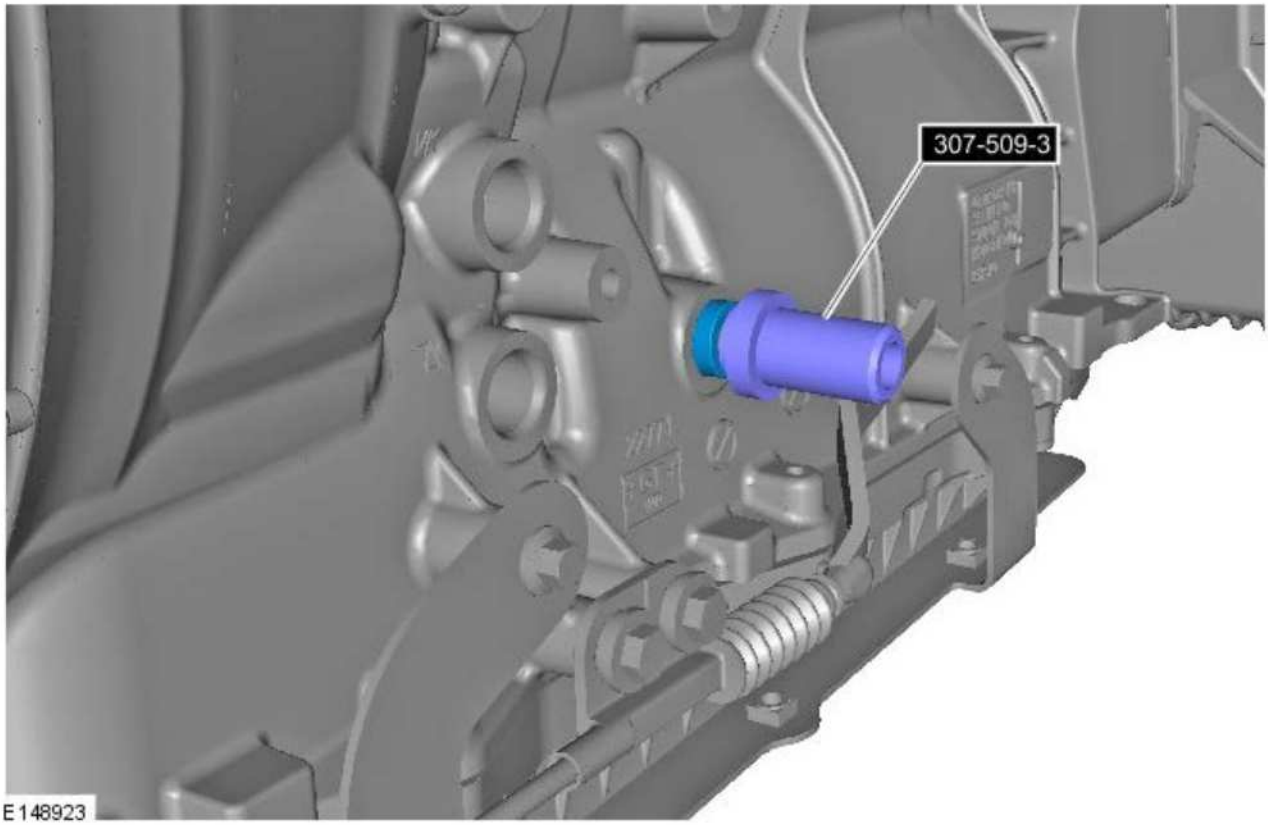


E148922

Installation

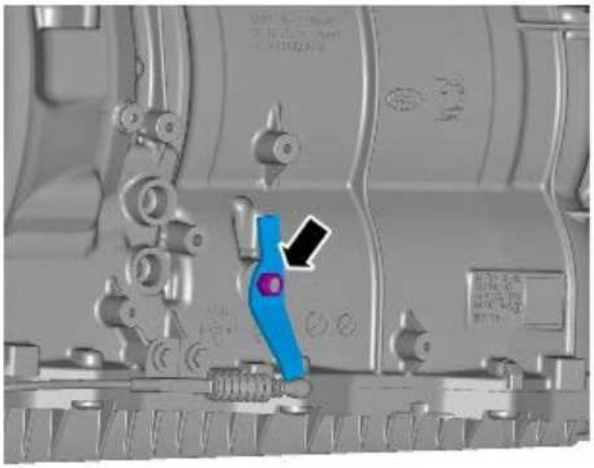
1. CAUTION: Make sure that the seal is correctly located.

   Using 307-509-3, install the selector shaft seal.



E148923

2. TORQUE: 12 Nm


E149590

3. For additional information, refer to: Front Driveshaft - V6 S/C 3.0L Petrol (205-01 Driveshaft, Removal and Installation).

4. For additional information, refer to: Catalytic Converter LH (309-00B Exhaust System - V6 S/C 3.0L Petrol, Removal and Installation).

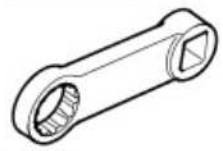
5. For additional information, refer to: Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

Published: 02-May-2013

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission TDV6 3.0L Diesel

Removal

Special Tool(s)

303-1069  E53727	303-1069 Adapter, Wrench

General Equipment
Transmission jack

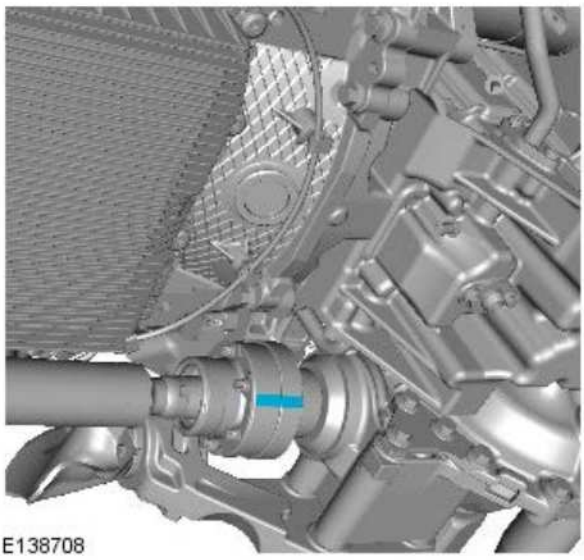
NOTES:

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

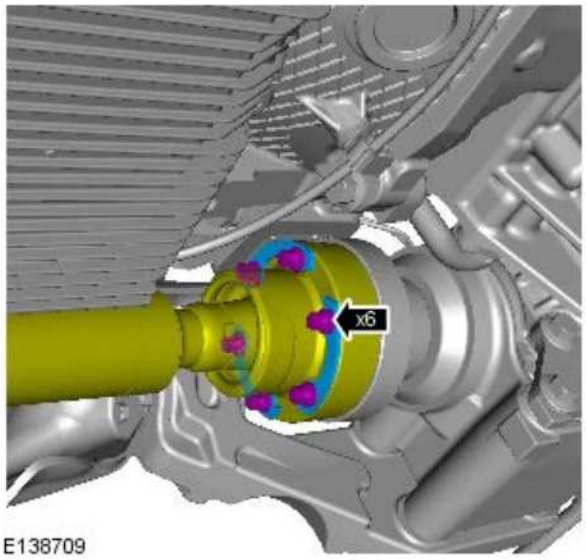
Some illustrations may show the transmission removed for clarity.

Some illustrations may show the engine removed for clarity.

1. Disconnect the battery ground cable.
2. WARNING: Make sure to support the vehicle with axle stands.

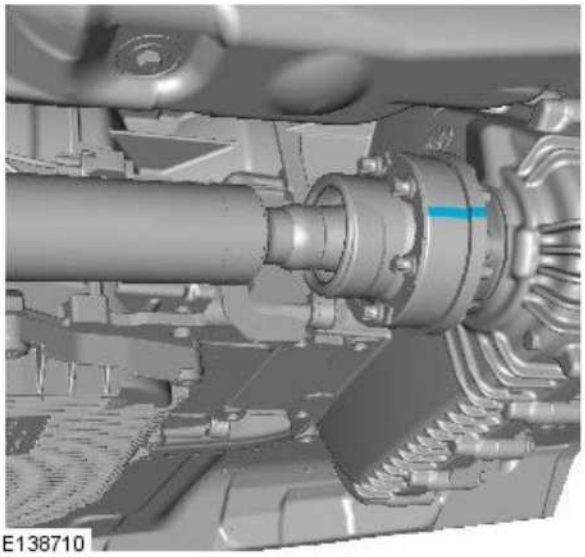
   Raise and support the vehicle.
3. Refer to: Exhaust System (309-00A, Removal and Installation).
4. Refer to: Rear Driveshaft (205-01 Driveshaft, Removal and Installation).
5. 
   E138708
6. CAUTION: Discard the bolts.

   Using a suitable tie strap, secure the driveshaft.

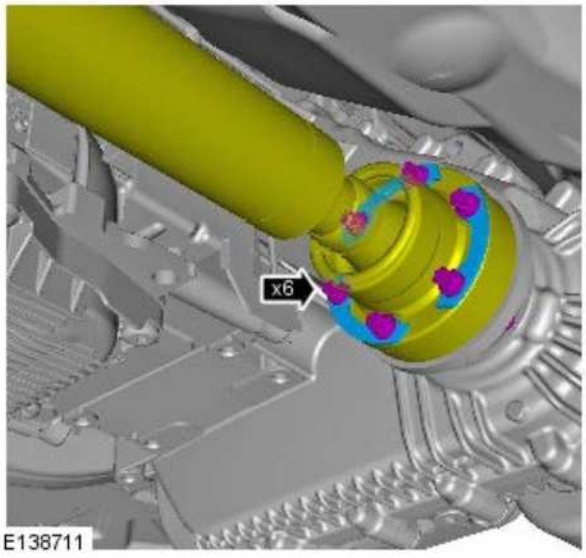


E138709

7.

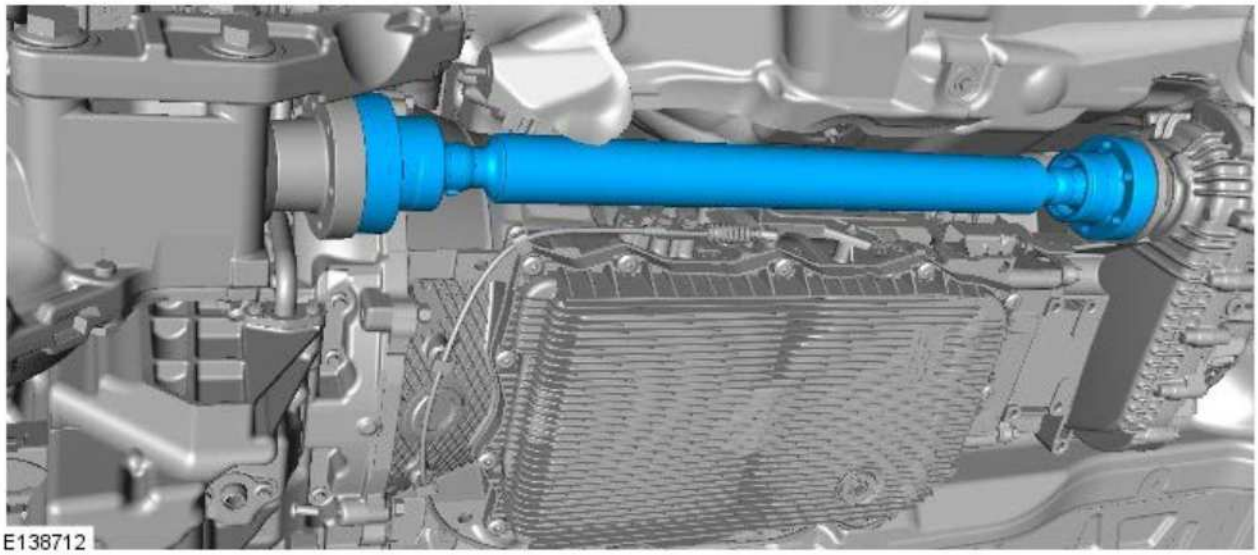

E138710

8. CAUTION: Discard the bolts.



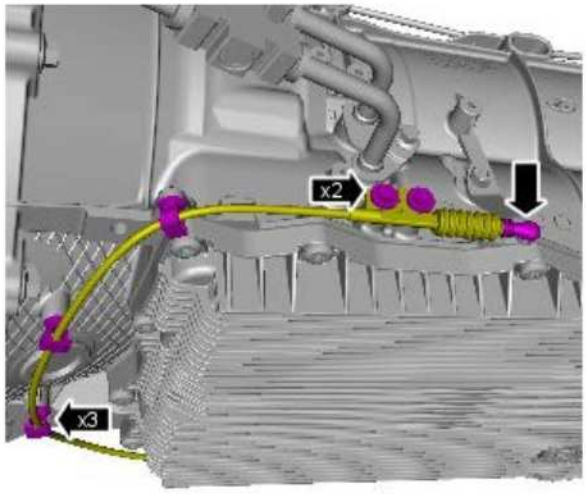
E138711

9.



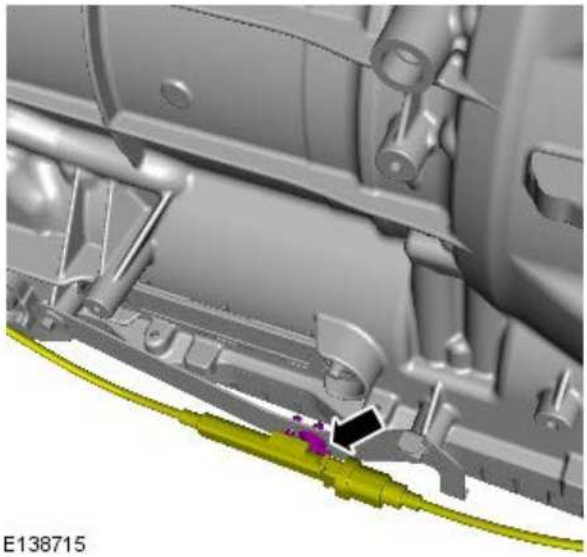
E138712

10.



E138714

11. NOTE: Discard the retaining clip.

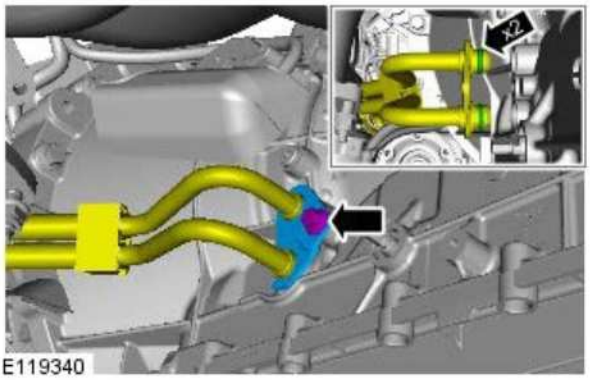


E138715

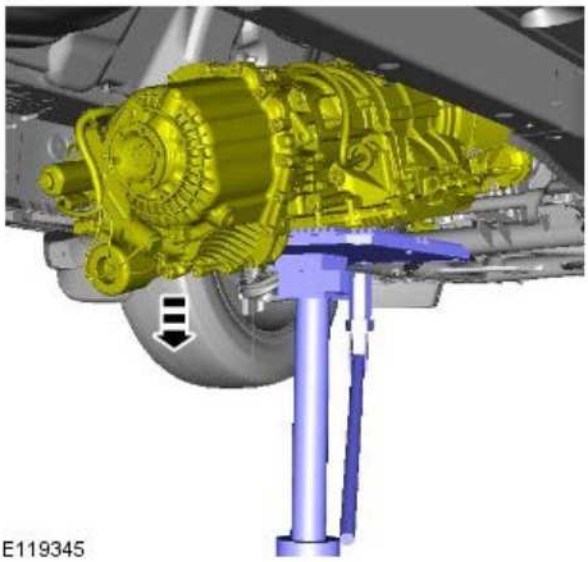
12. WARNING: Be prepared to collect escaping fluids.

NOTE: Make sure that all openings are sealed. Use new blanking caps.

Remove and discard the 2 O-ring seals.

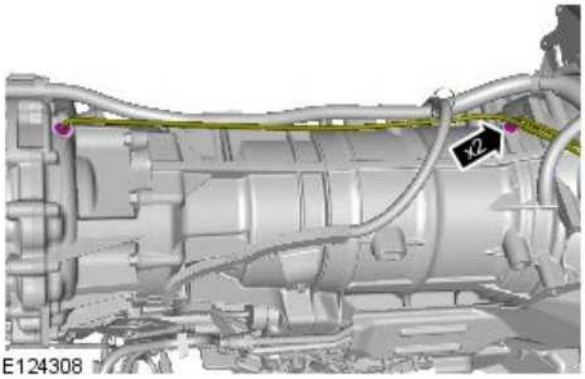


E119340


E119345

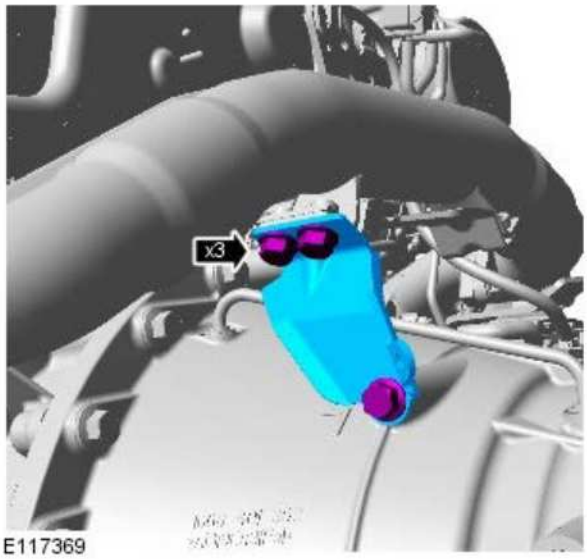
13. WARNING: Make sure that the transmission is secured with suitable retaining straps.
    - *General Equipment:* Transmission jack
    - Lower the rear of the transmission for access.

14.

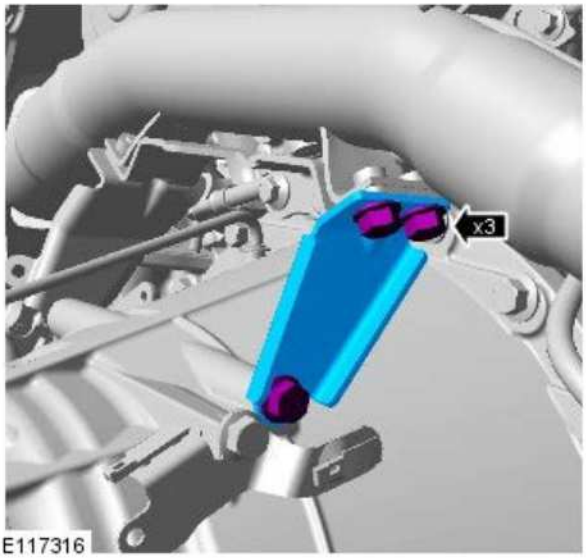


E124308

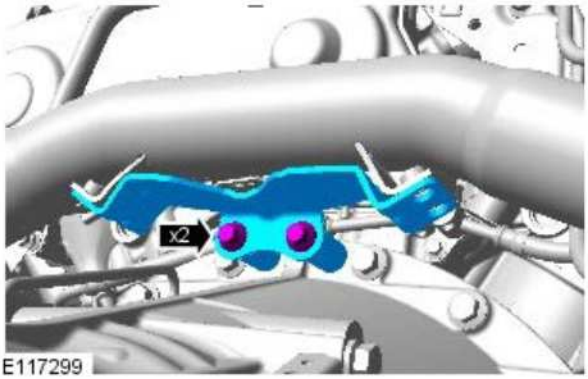
15.



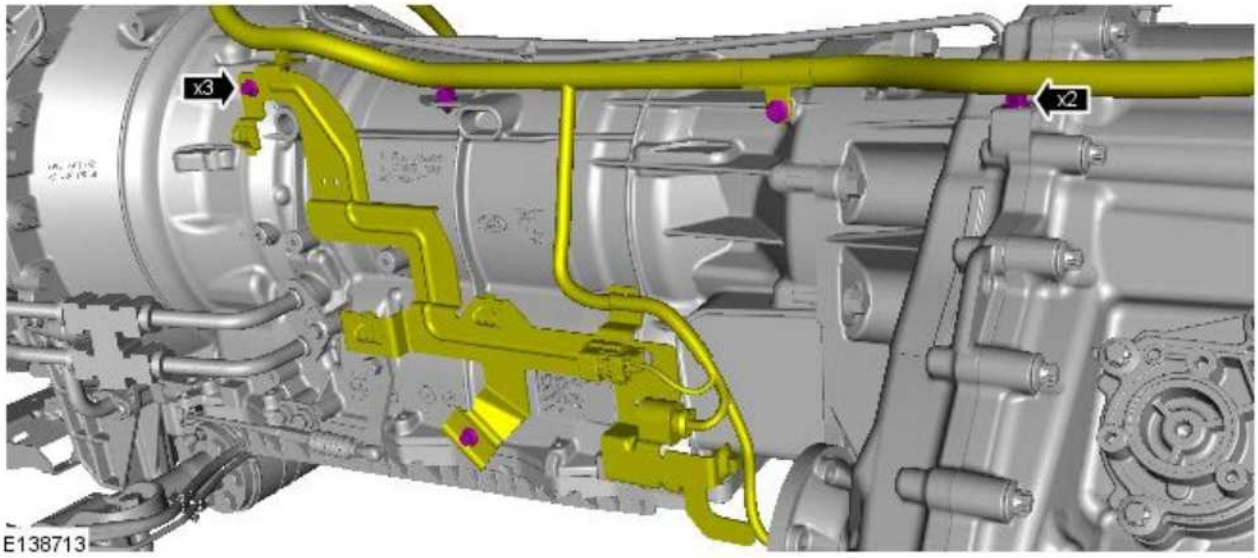
16.



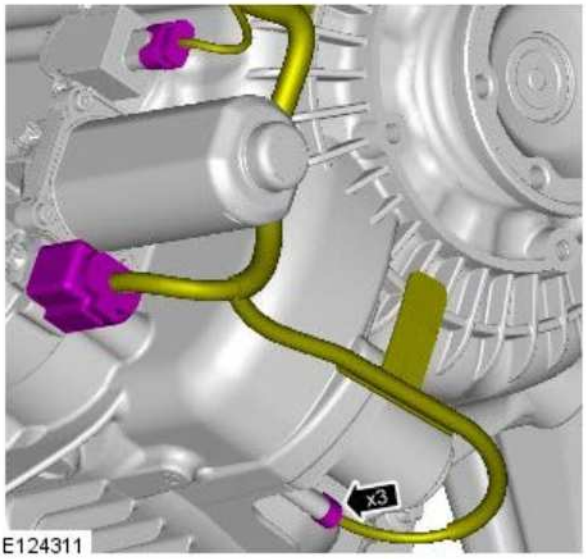
17.



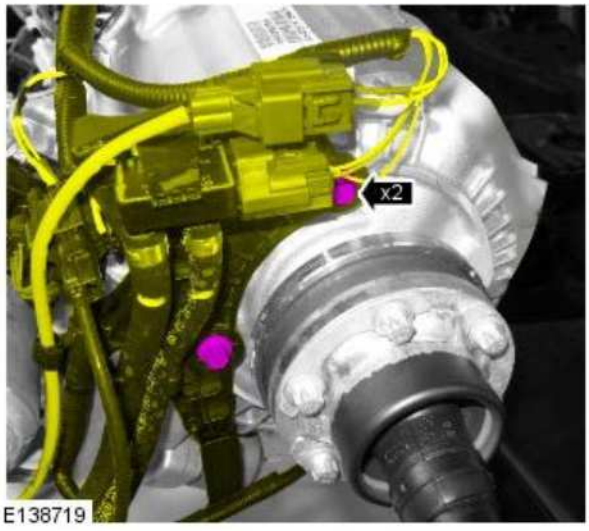
18.



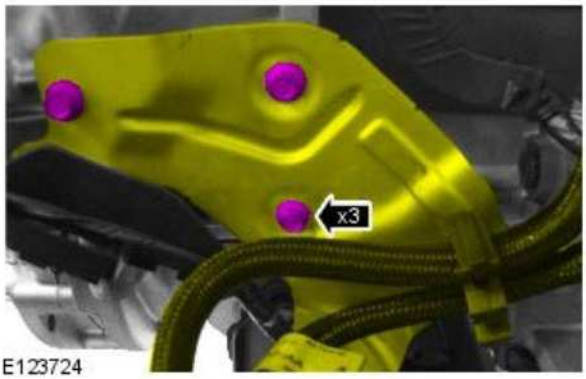
19.



20.

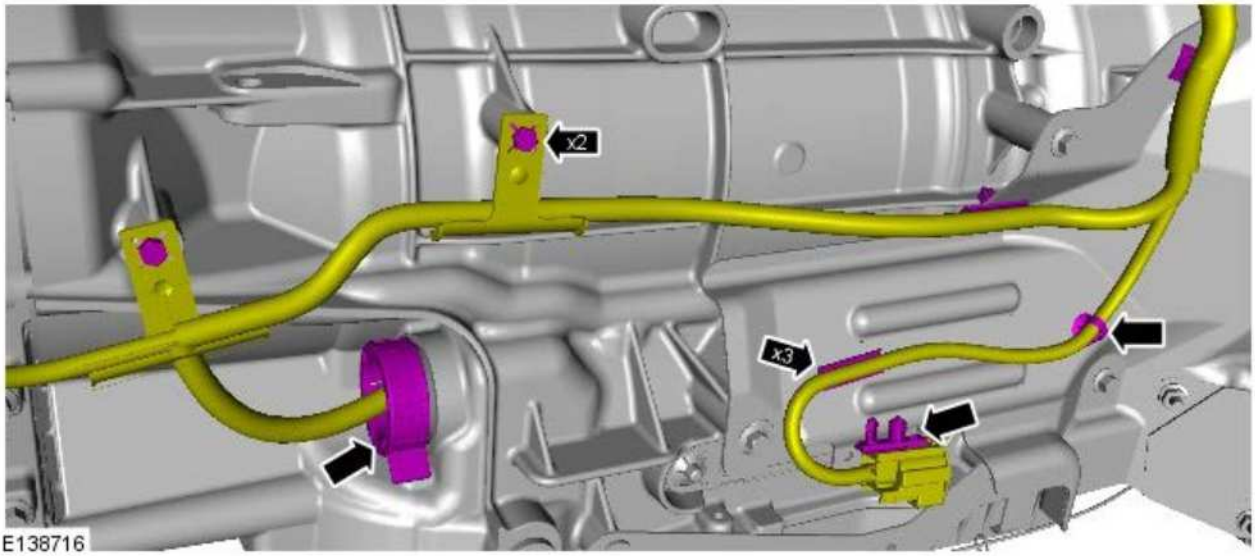


21.



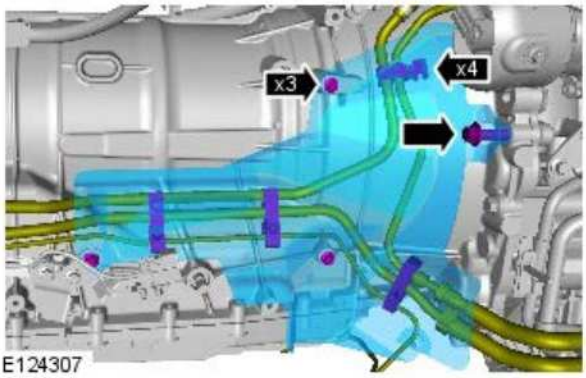
E123724

22.



E138716

23.

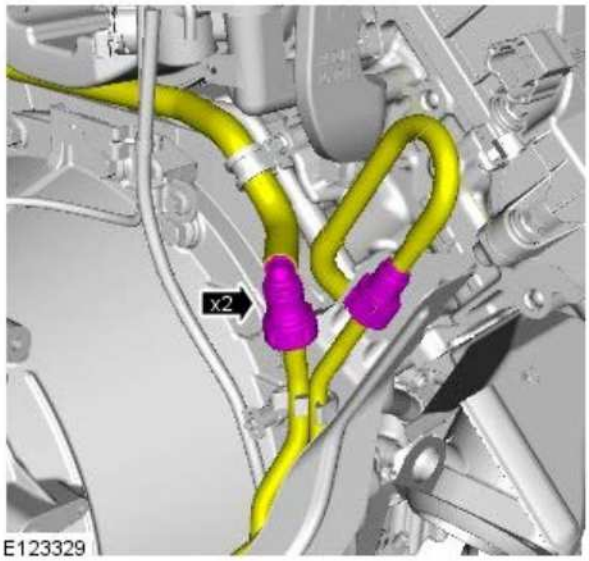


E124307

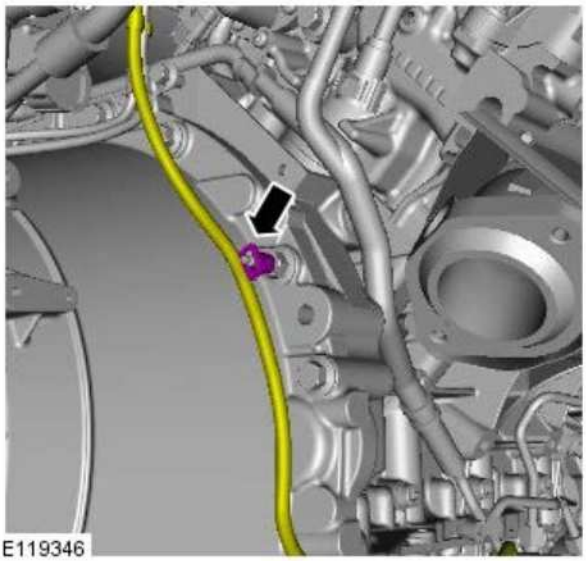
24. WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

CAUTION: Be prepared to collect escaping fluids.

NOTE: Make sure that all openings are sealed. Use new blanking caps.

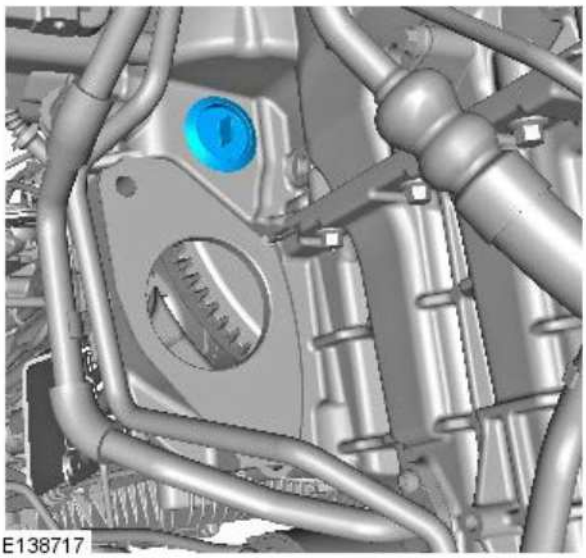


25.

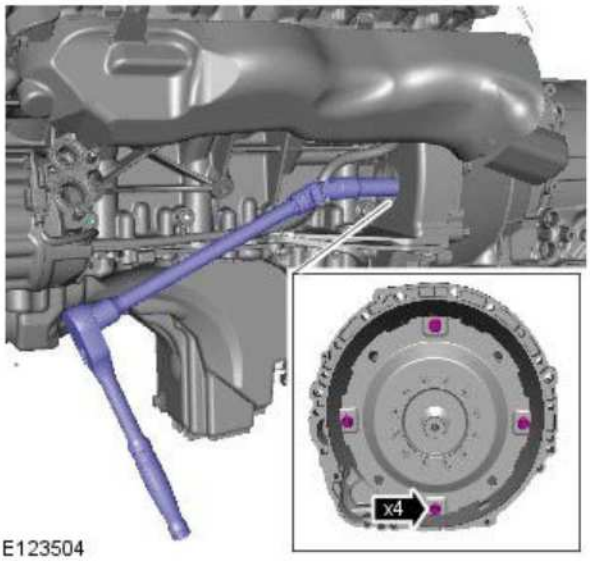


26. Refer to: Starter Motor (303-06 Starting System - TDV6 3.0L Diesel, Removal and Installation).

27.

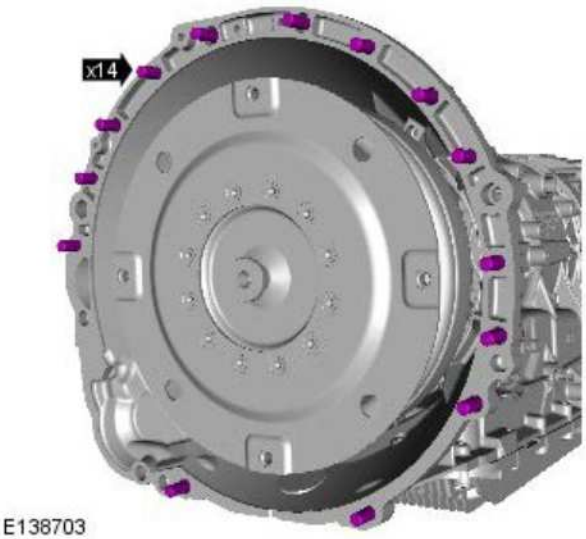


28.



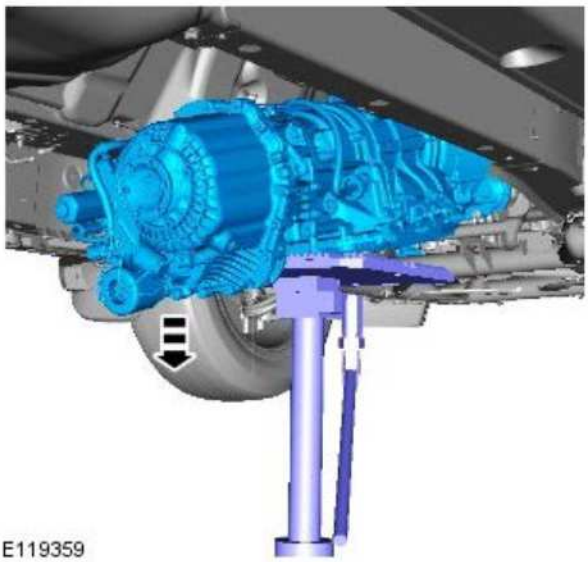
E123504

29.

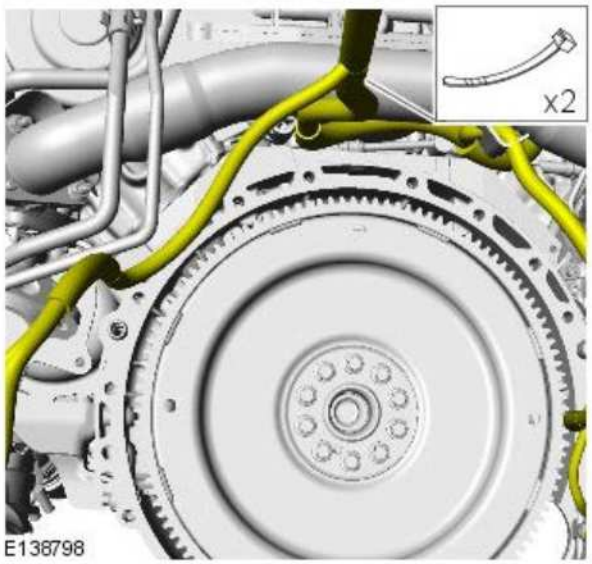


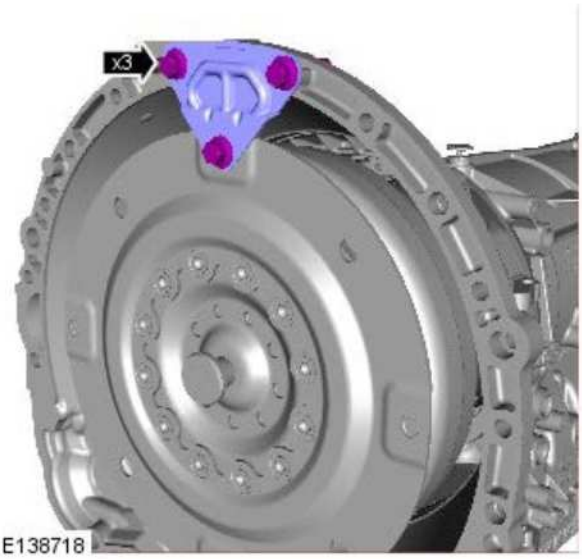
E138703

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

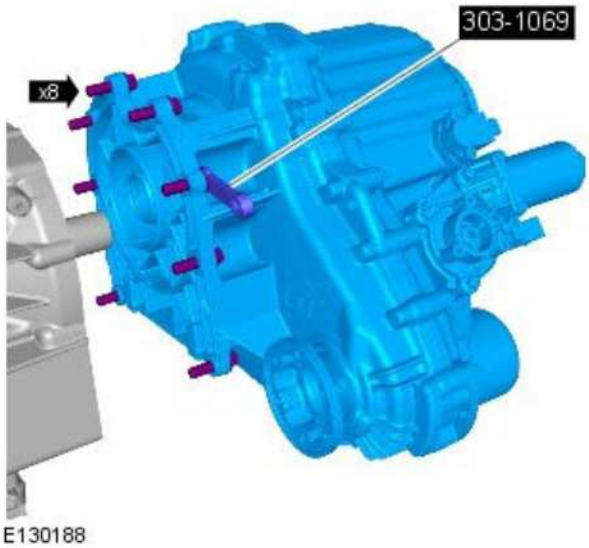

E119359

31. Carefully tie the harness aside.





32. CAUTION: Make sure that the torque converter remains in the transmission.

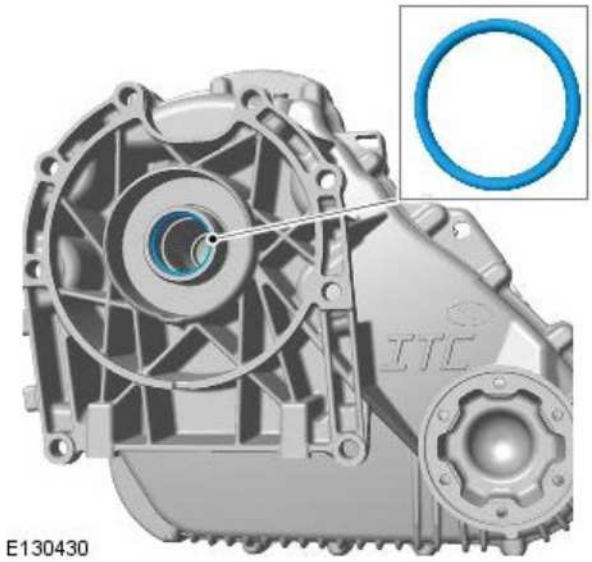


33. NOTE: Do not disassemble further if the component is removed for access only.

Special Tool(s): 303-1069

34. CAUTION: Inspect the seal, replace if damaged

NOTE: Remove and discard the O-ring seal.



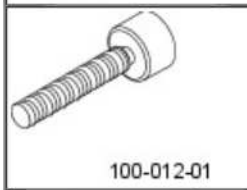
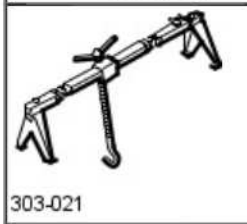
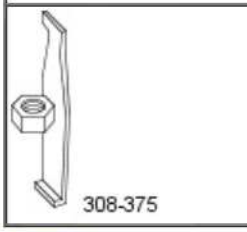
E130430

Published: 05-Nov-2013

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission V6 S/C 3.0L Petrol

Removal

Special Tool(s)

	100-012 Slide Hammer
	100-012-01 Slide Hammer Adapter
	303-021 Engine support bracket
	303-1069 Adapter, Wrench
	303-1435 Engine Lifting Brackets Rear
	308-375 Remover, Input and Output Seal

NOTES:

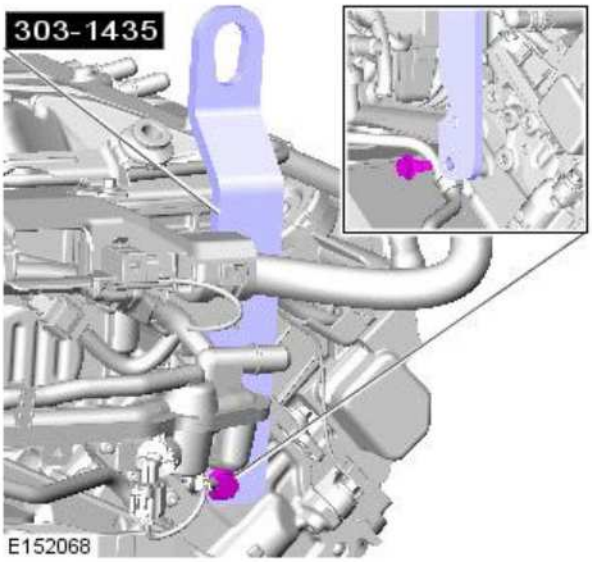
Some variation in the illustrations may occur, but the essential information is always correct.

Some illustrations may show the transmission removed for clarity.

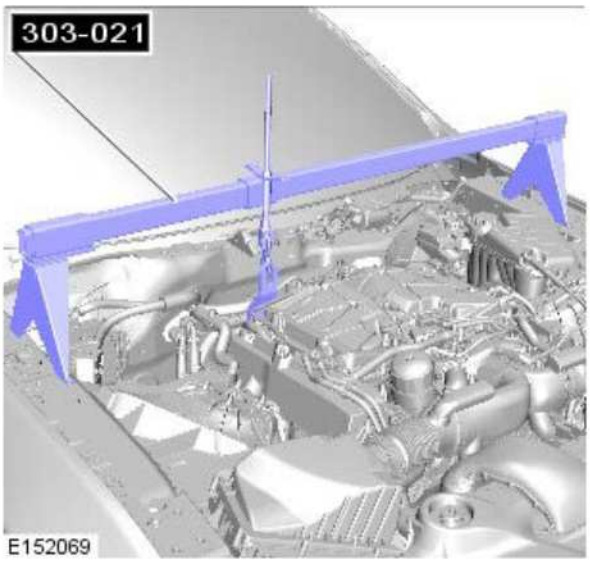
1. Disconnect the battery ground cable.

   Refer to: Specifications (414-01 Battery, Mounting and Cables, Specifications).

2. Refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).



3. *Special Tool(s):* 303-1435
   Torque: 40 Nm



4. *Special Tool(s):* 303-021

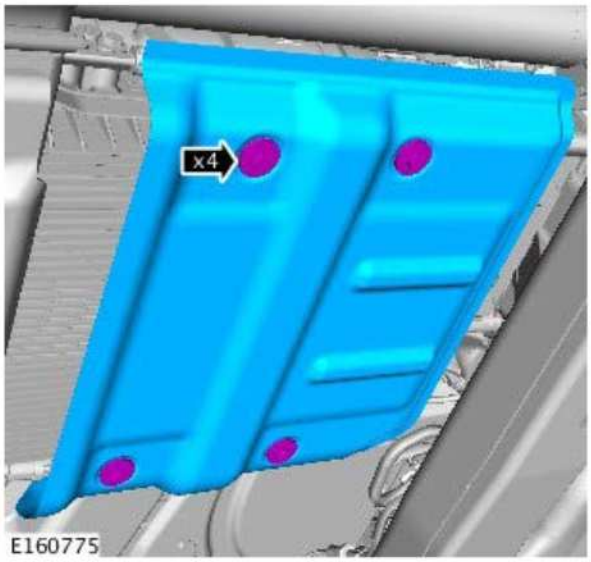
5. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03B Engine Cooling - V6 S/C 3.0L Petrol, General Procedures).

6. Refer to: Exhaust System (309-00B Exhaust System - V6 S/C 3.0L Petrol, Removal and Installation).

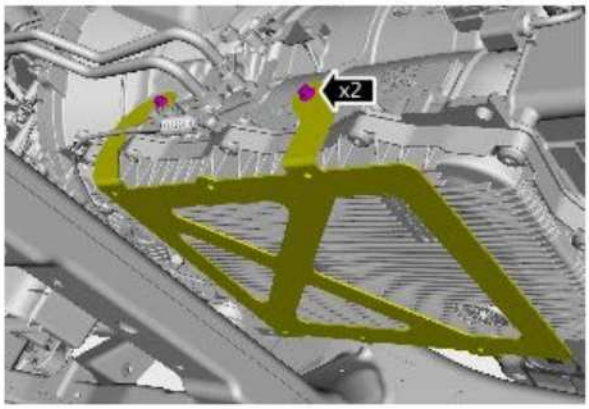
7. Refer to: Front Driveshaft - V6 S/C 3.0L Petrol (205-01, Removal and Installation).

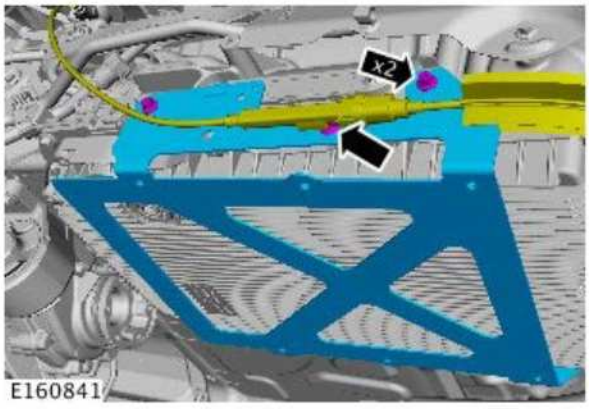
8. Refer to: Rear Driveshaft (205-01 Driveshaft, Removal and Installation).

9.

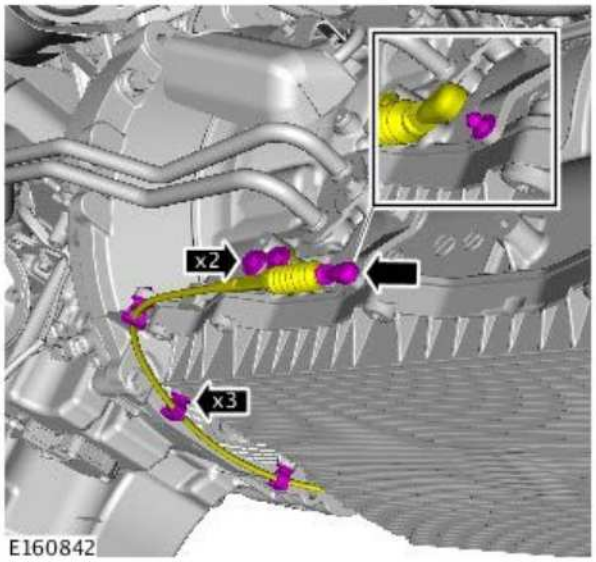


10.

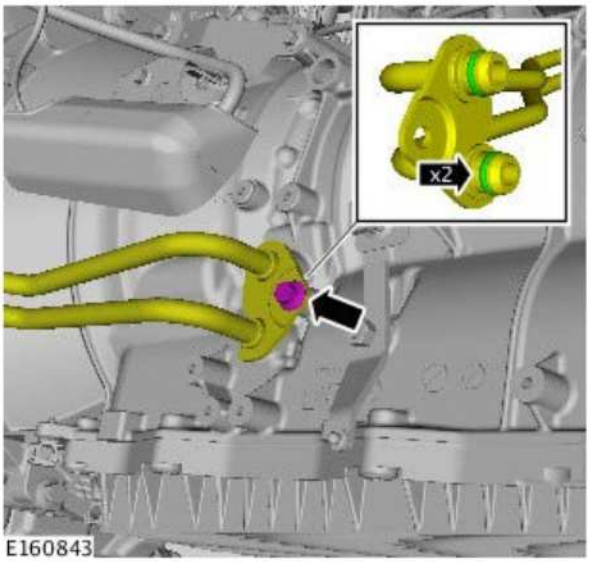




11.



E160842



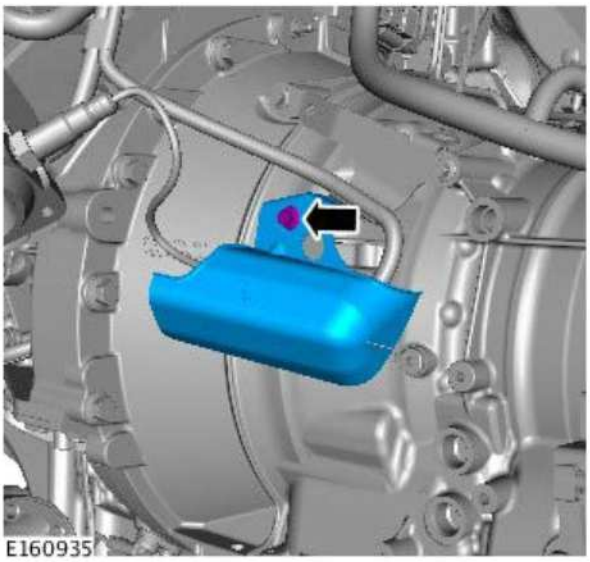
E160843

12. CAUTIONS:

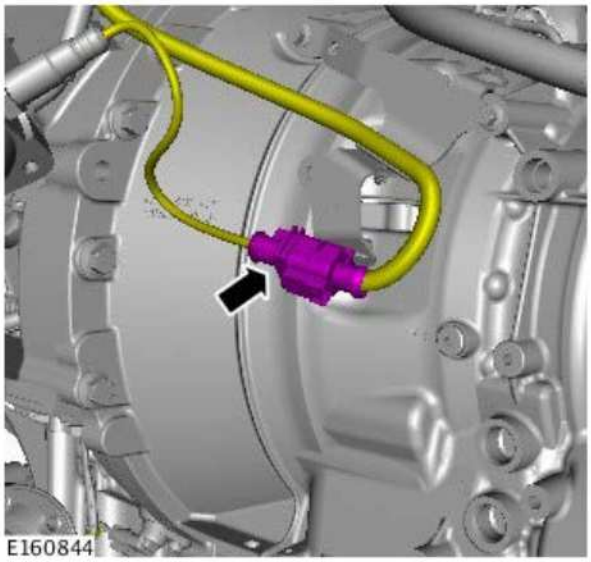
⚠ Be prepared to collect escaping fluid.

⚠ Remove and discard the seals.

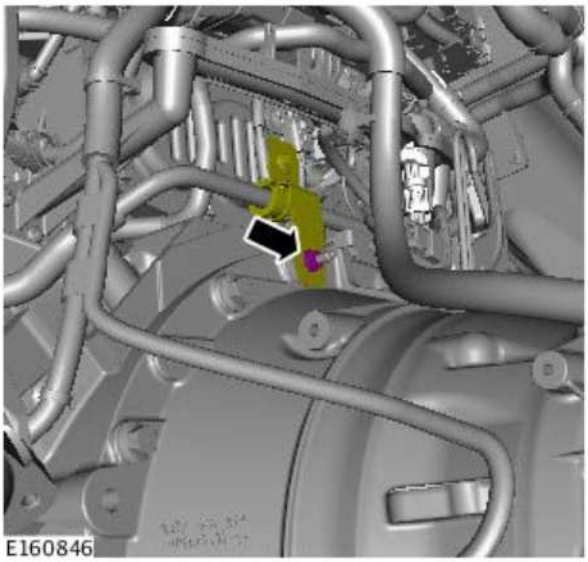
13.


E160935

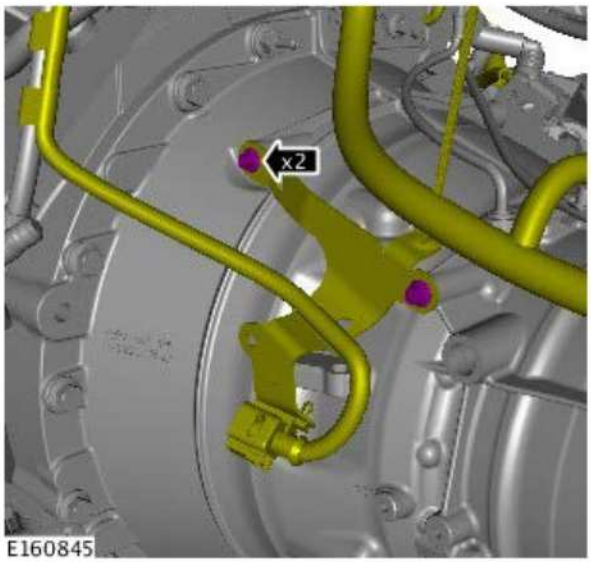
14.



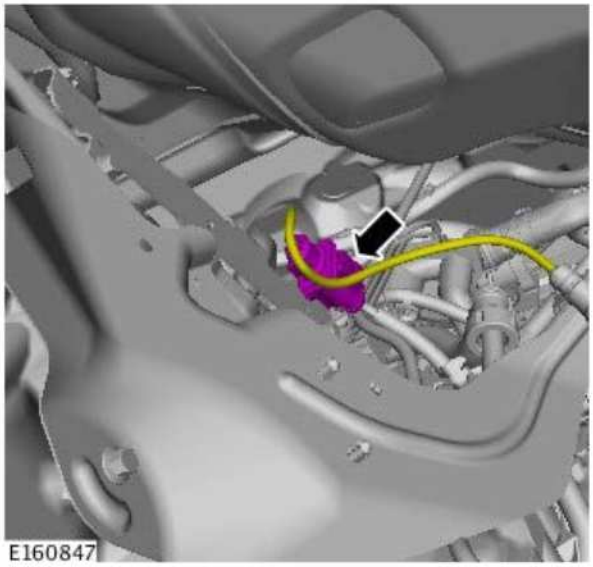
15.

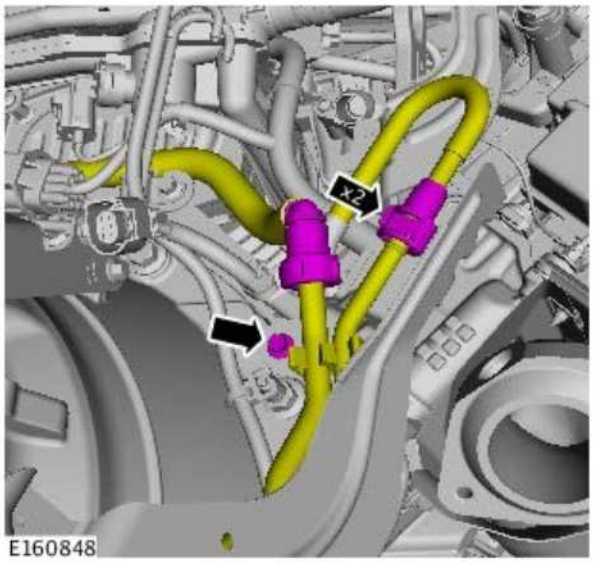


16.



17.

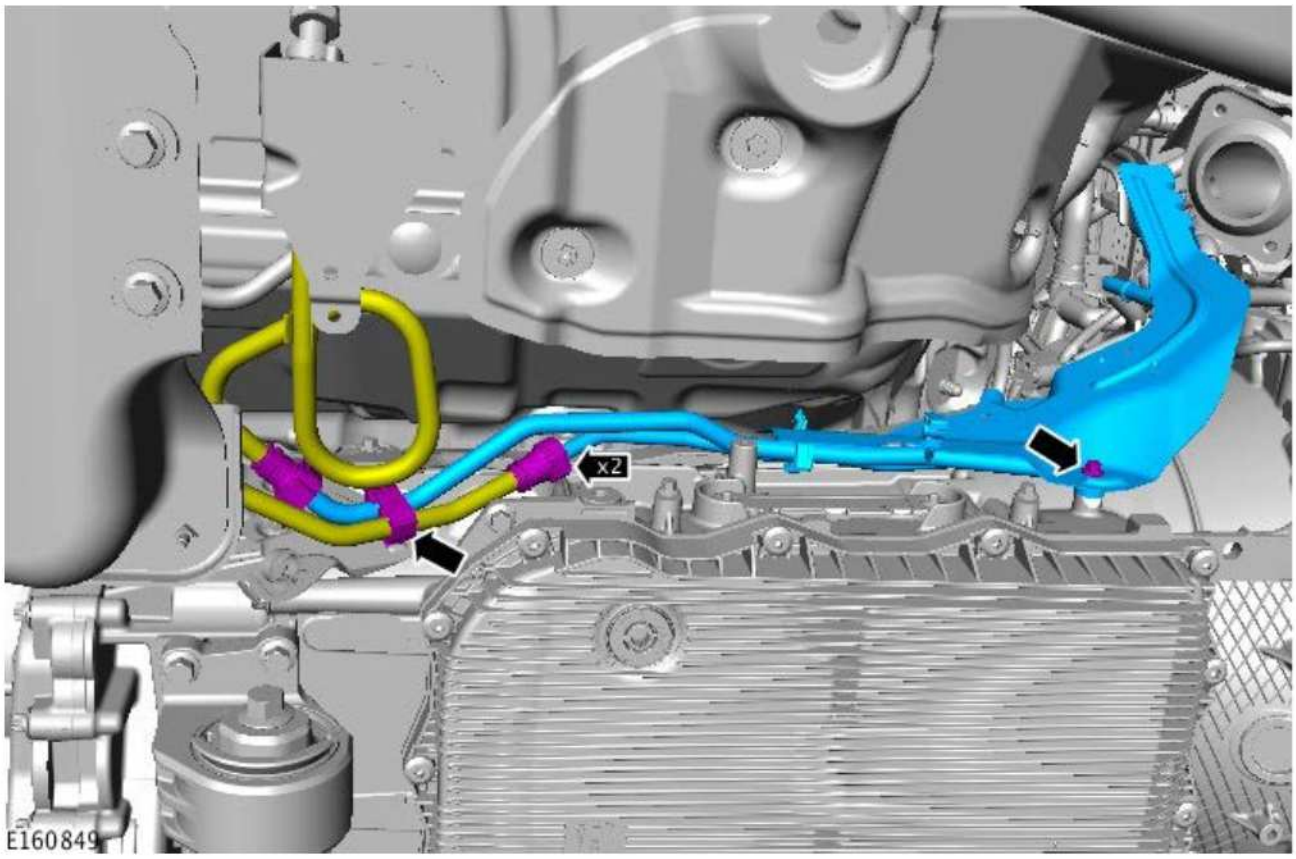

E160847



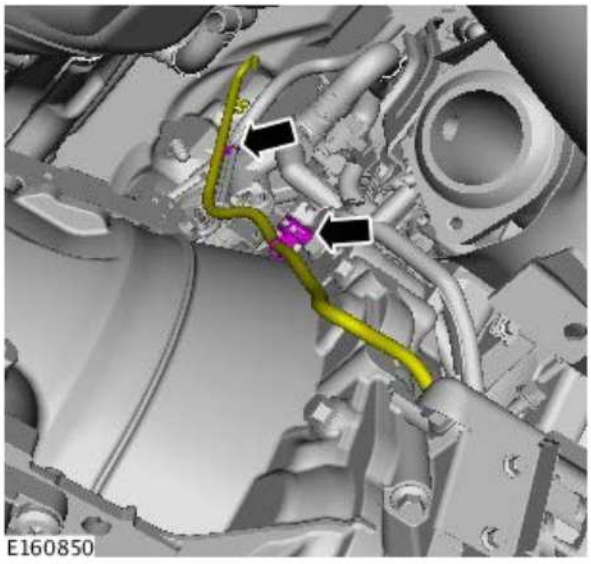
E160848

18. CAUTION: Make sure that all openings are sealed. Use new blanking caps.

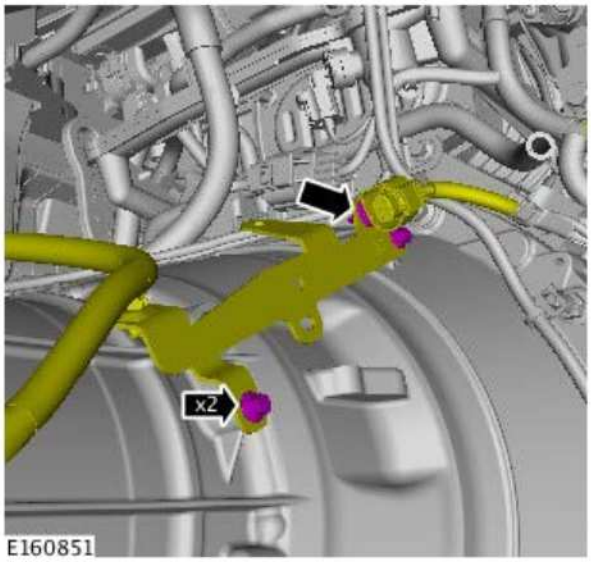
19. CAUTION: Make sure that all openings are sealed. Use new blanking caps.



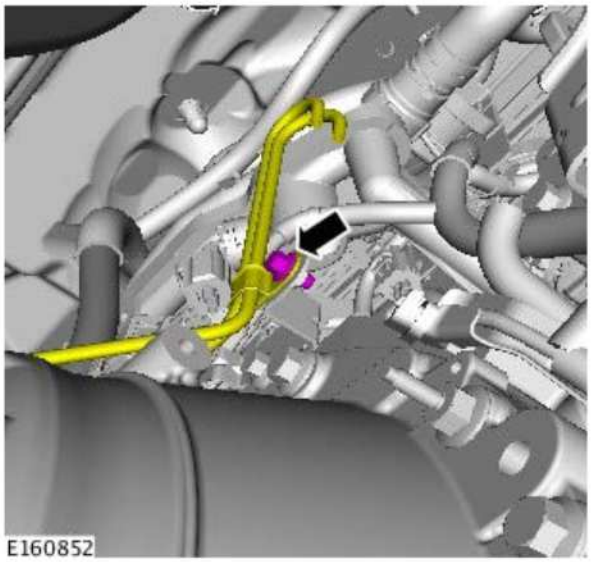
20.



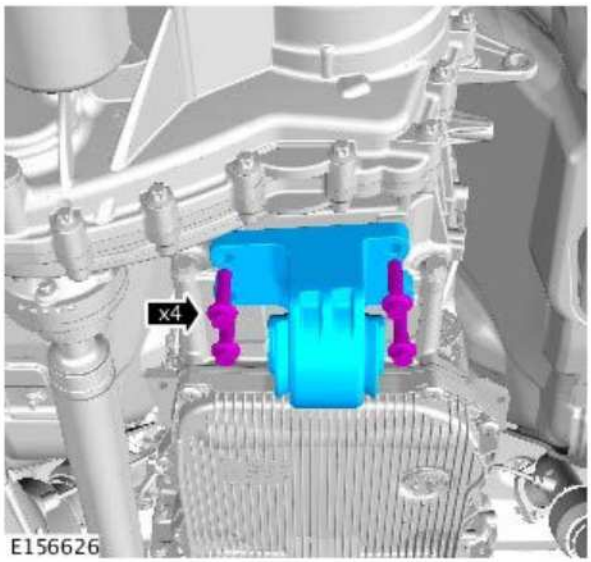
21.



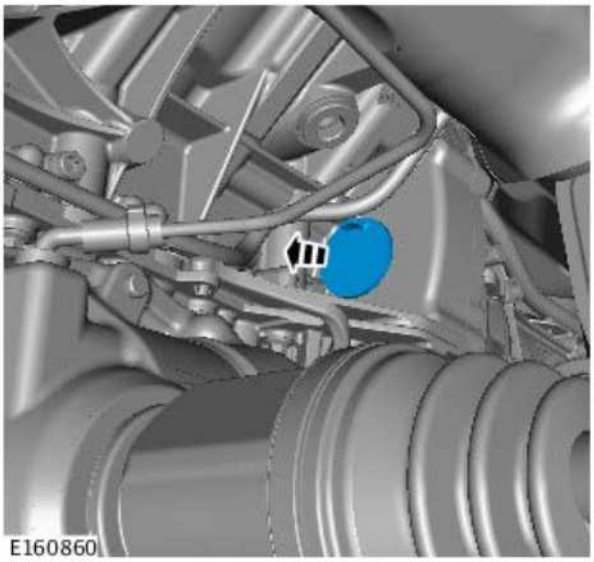
22.



23.



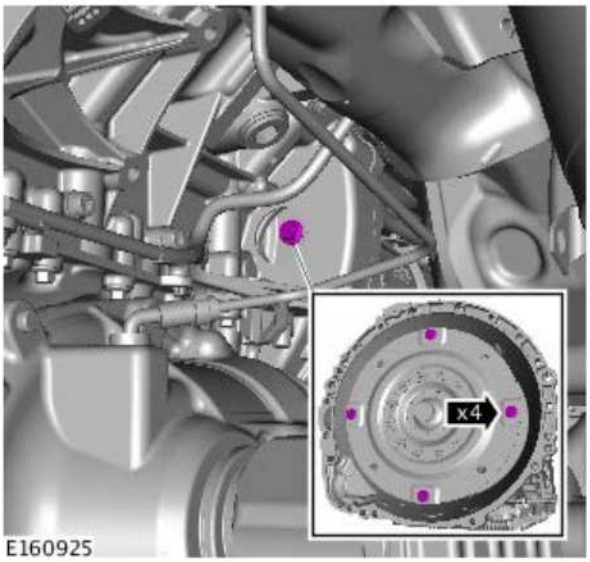
24.



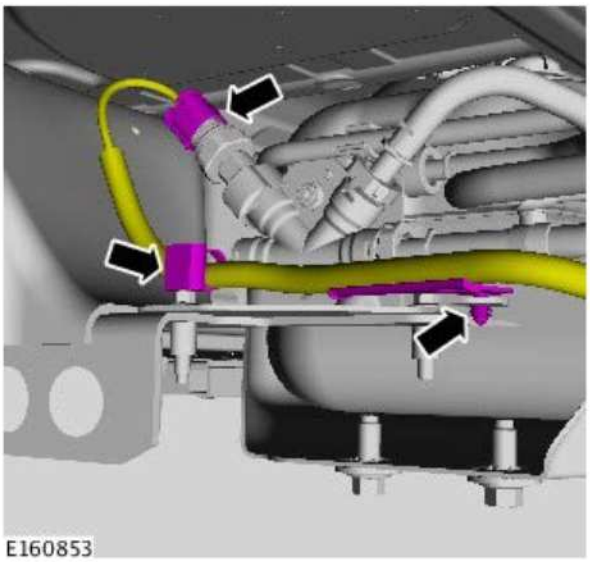
25. CAUTIONS:

⚠ Only rotate the crankshaft clockwise.

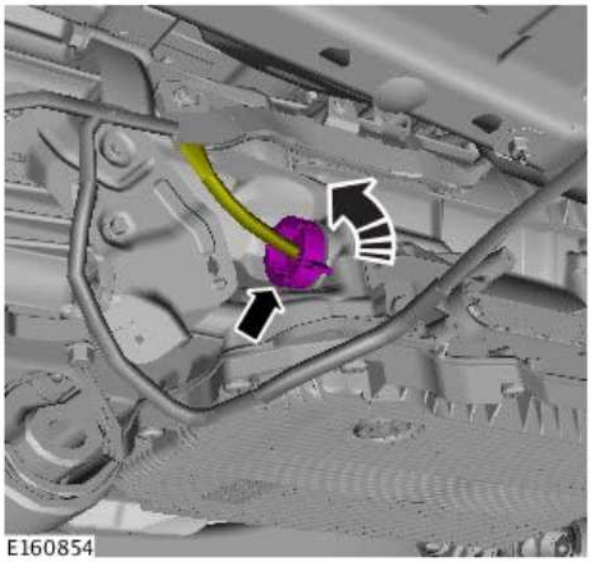
⚠ Discard the bolts.



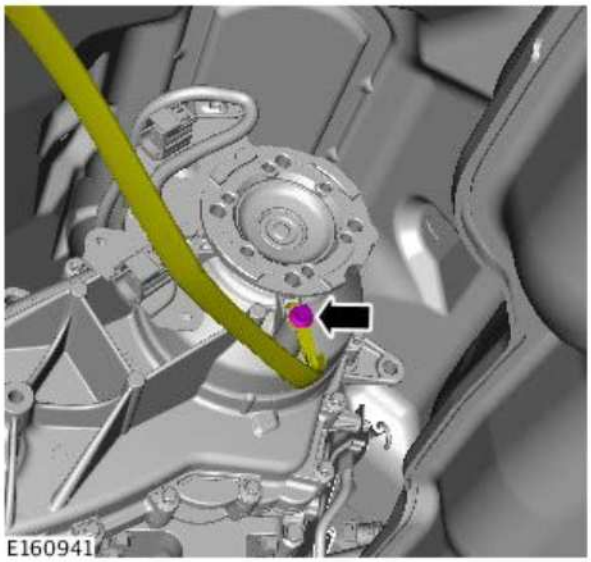
26.



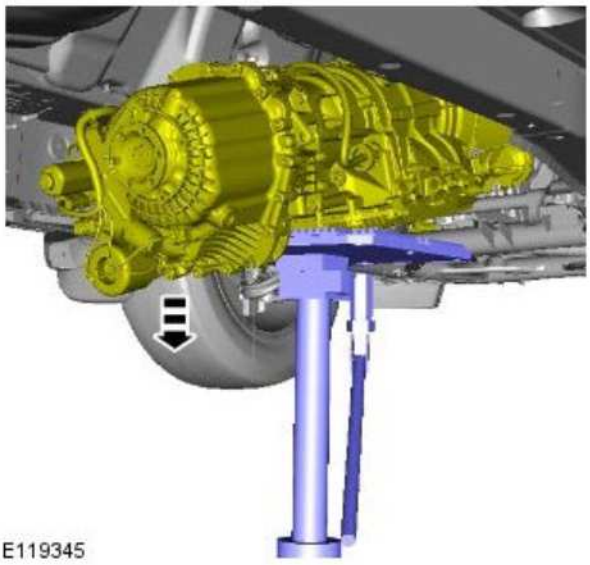
27.


E160854

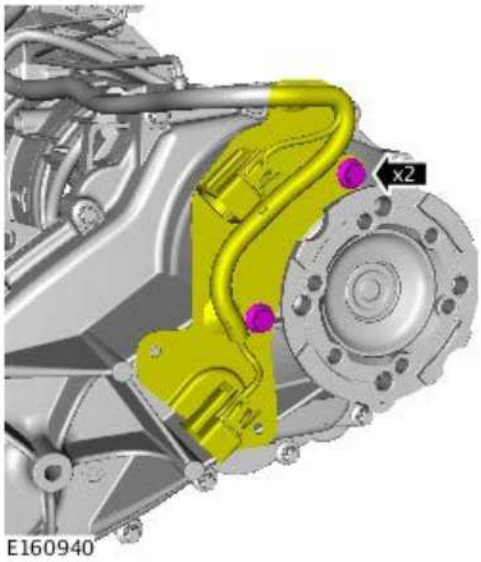
28.


E160941

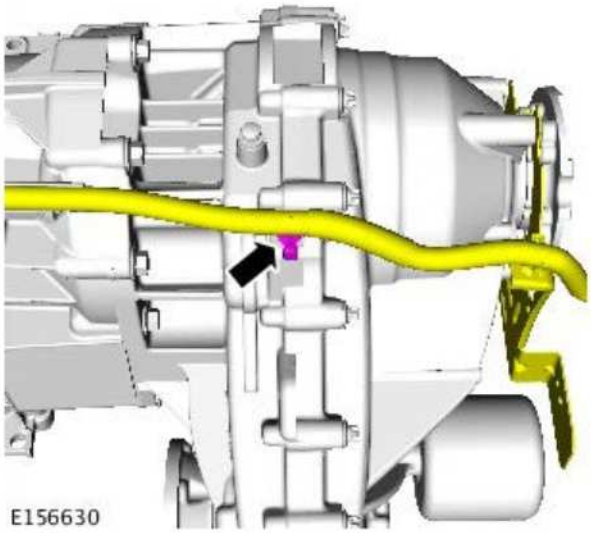
29. Lower the rear of the transmission for access.


E119345

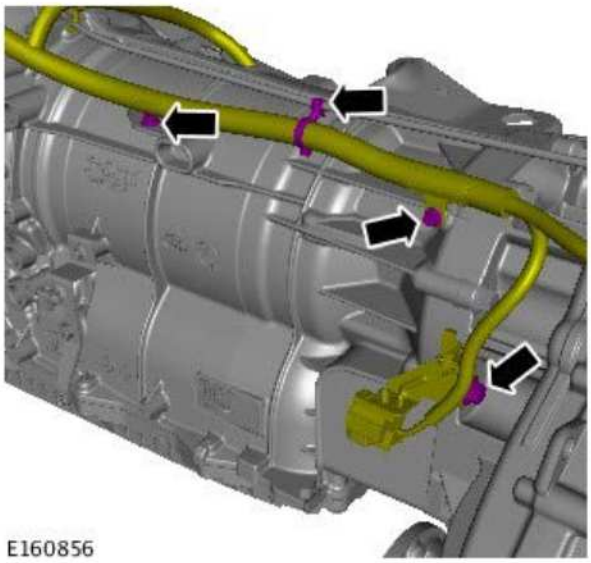
30.



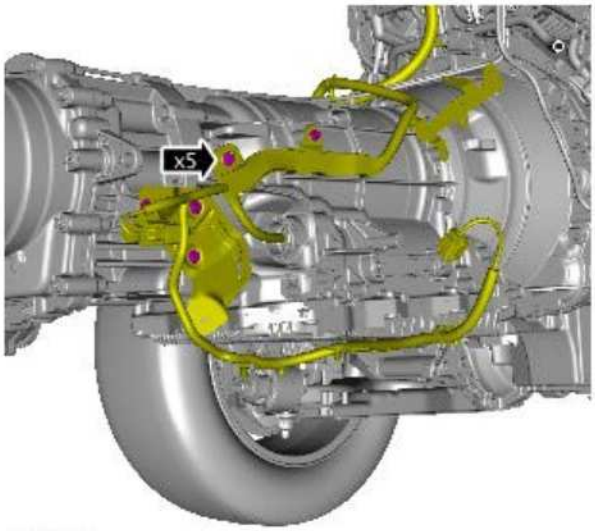
31.



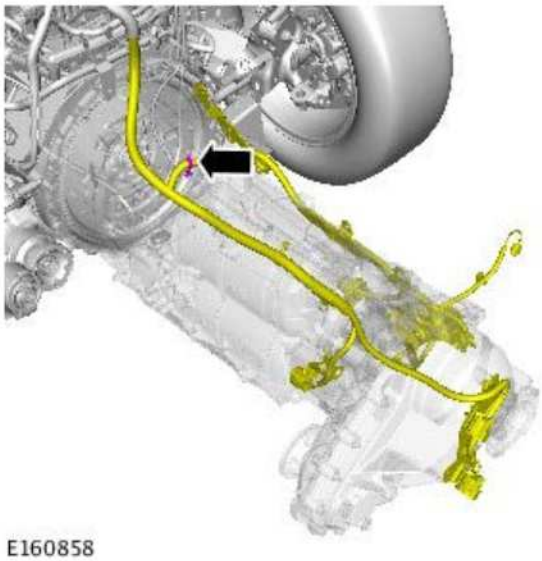
32.



33.

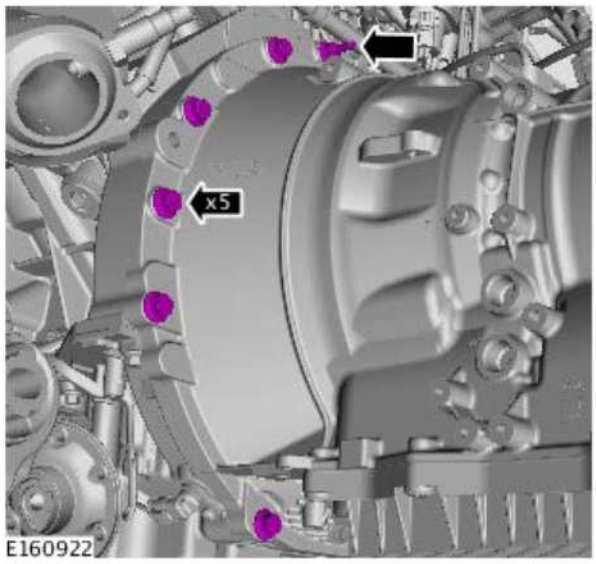


E160857



E160858

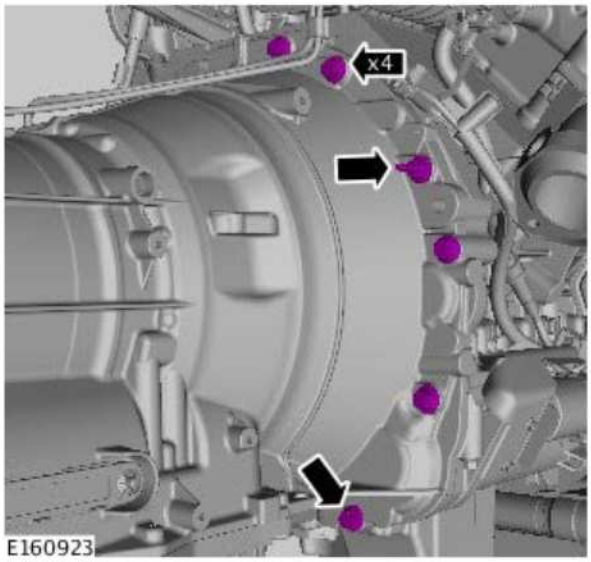
34. NOTE: Secure the wiring loom with suitable cable ties.

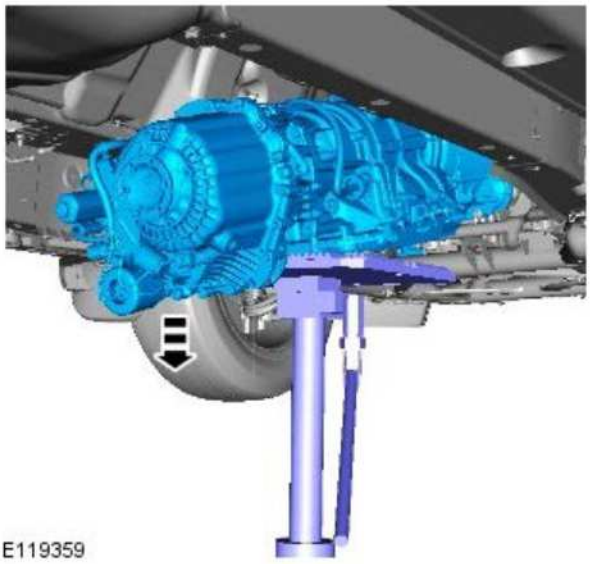


E160922

35. CAUTION: Note the fitted position of the retaining bolts prior to removal.

36. CAUTION: Note the fitted position of the retaining bolts prior to removal.





37. WARNINGS:

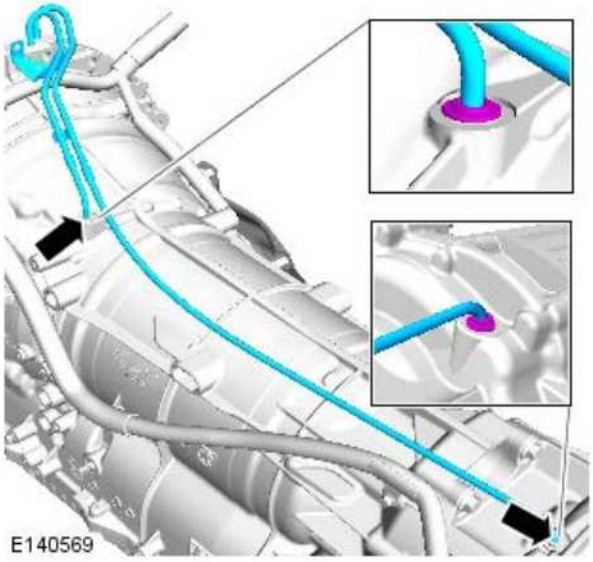
This step requires the aid of another technician.

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

CAUTIONS:

Make sure that the torque converter remains in the transmission.

Secure the torque converter to the transmission using suitable cable ties.



38. CAUTION: Always plug any open connections to prevent contamination.

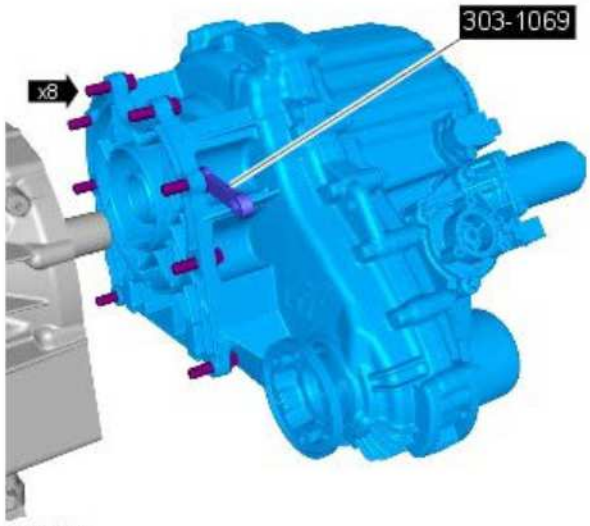
39.

E107972

40.

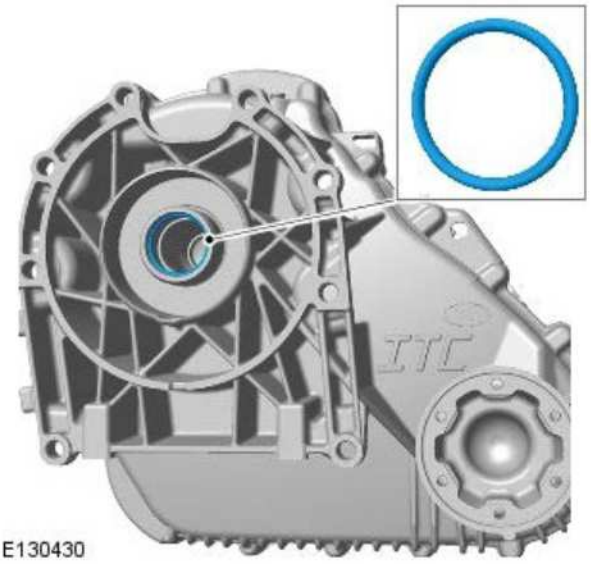
E160924

41. *Special Tool(s):* 303-1069

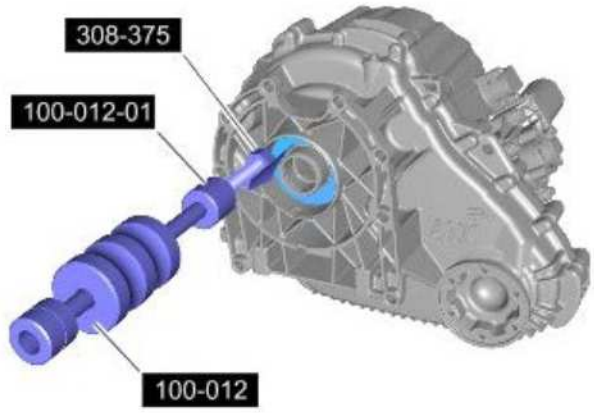


E130188

42. CAUTION: Do not carry of this step if a new transfer box is to be installed.



E130430



E131138

43. CAUTIONS:

⚠ Care must be taken to avoid damage to the seal register and running surface.

⚠ Note the installed position of the component(s) prior to removal.

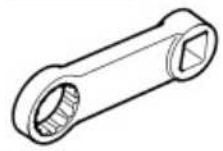
Special Tool(s): 100-012, 100-012-01, 308-375

Published: 02-May-2013

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission TDV6 3.0L Diesel

Installation

Special Tool(s)

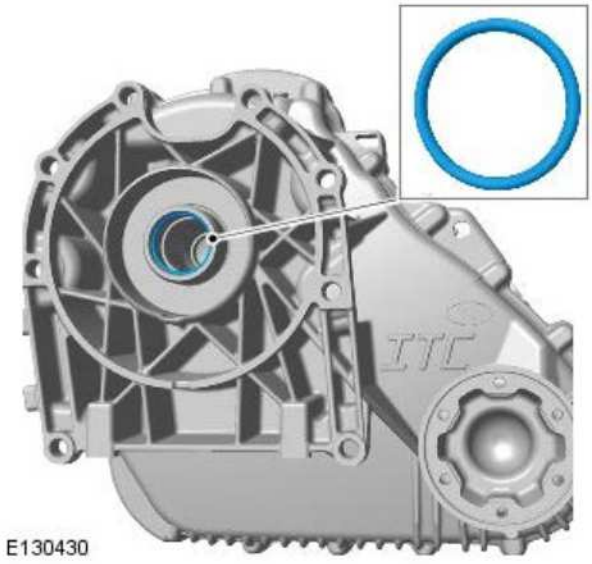
303-1069  E53727	303-1069 Adapter, Wrench

NOTES:

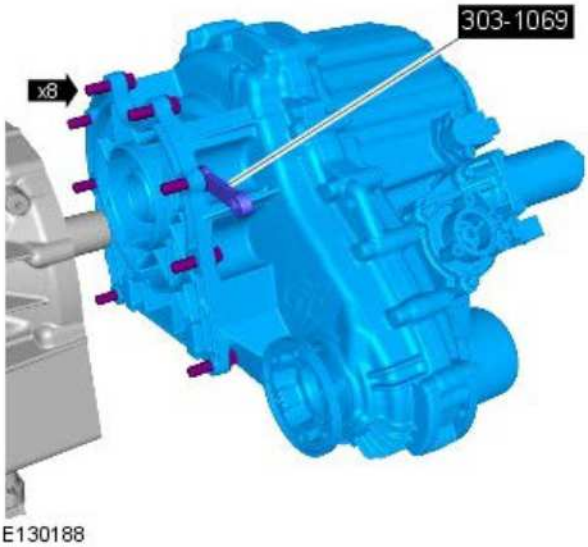
Some variation in the illustrations may occur, but the essential information is always correct.

Some illustrations may show the transmission removed for clarity.

Some illustrations may show the engine removed for clarity.

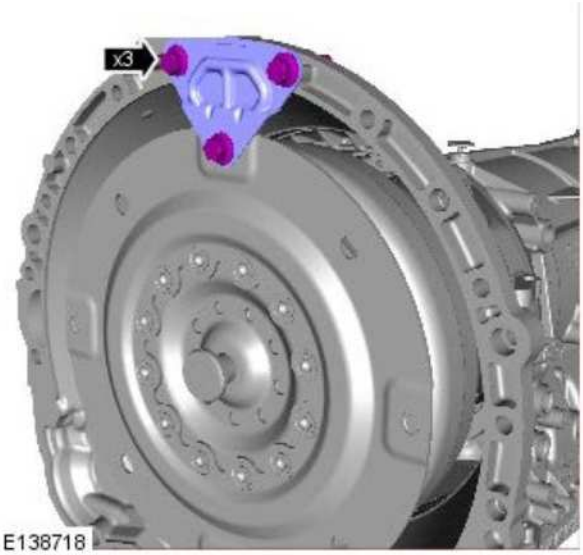

E130430

1. NOTE: Install a new O-ring seal.



E130188

2. NOTE: This step is only required if previously removed.
   - Clean the component mating faces.
   - Lubricate input shaft splines with 'Weicon TL7391' grease.
   - *Special Tool(s):* 303-1069
   - *Torque:* 45 Nm



E138718

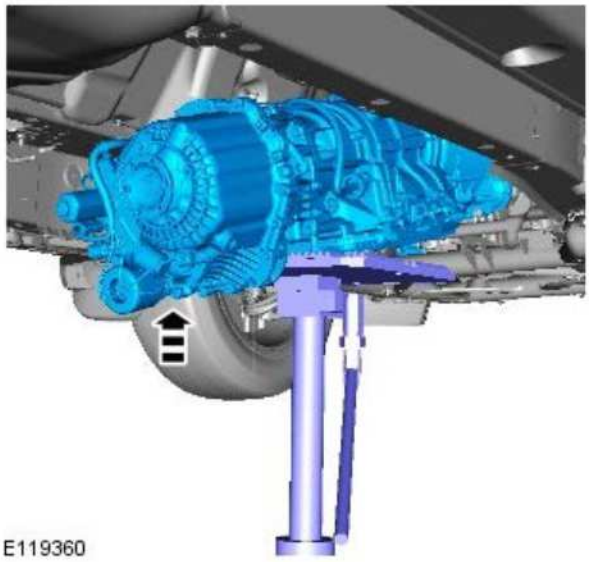
3. CAUTION: Make sure that the torque converter remains in the transmission.

4. NOTE: Make sure that the torque converter is fully engaged to the transmission.

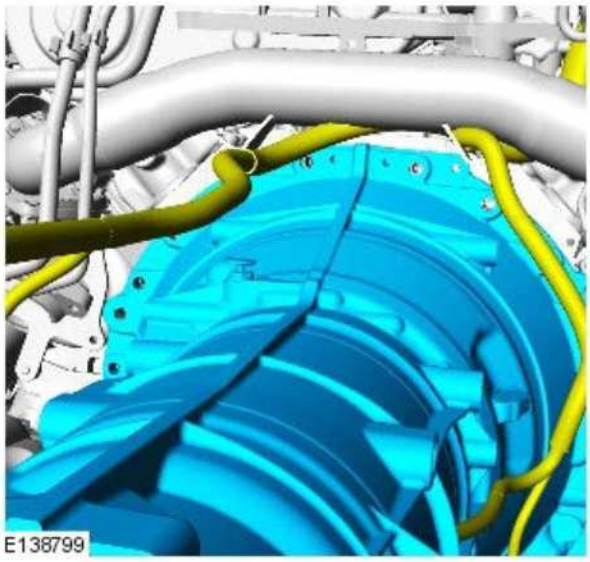
E138283

5. CAUTION: Apply grease of the correct specification to the torque converter spigot.

   Clean the component mating faces.



E119360

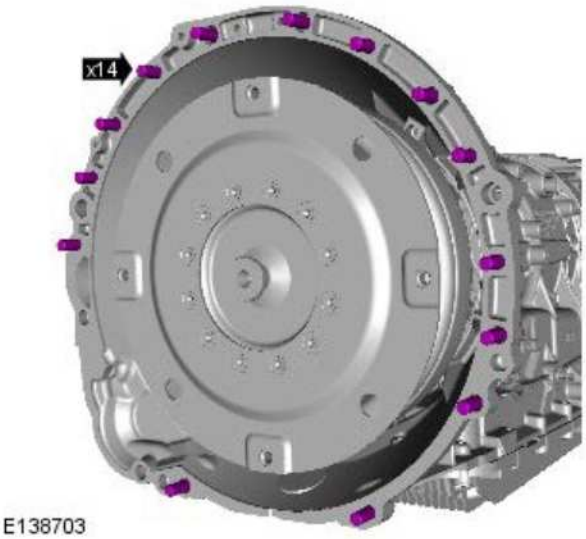


E138799

6. CAUTION: Care must be taken to avoid damaging the engine bay wiring harnesses.

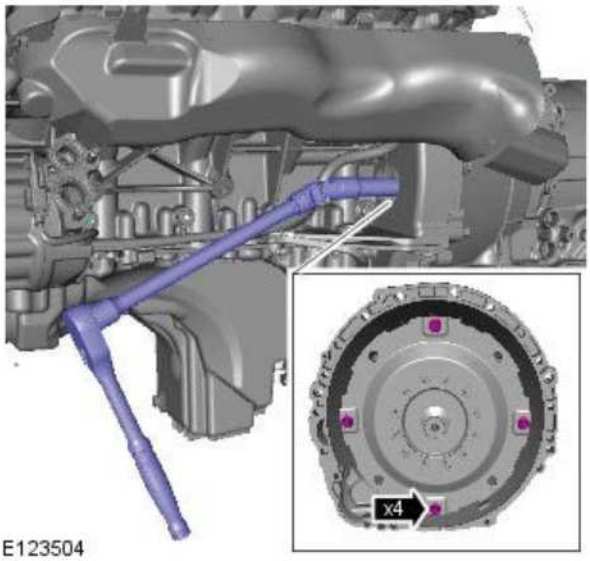
   Cut the cable ties that are holding the harnesses aside.

7. *Torque:* 40 Nm



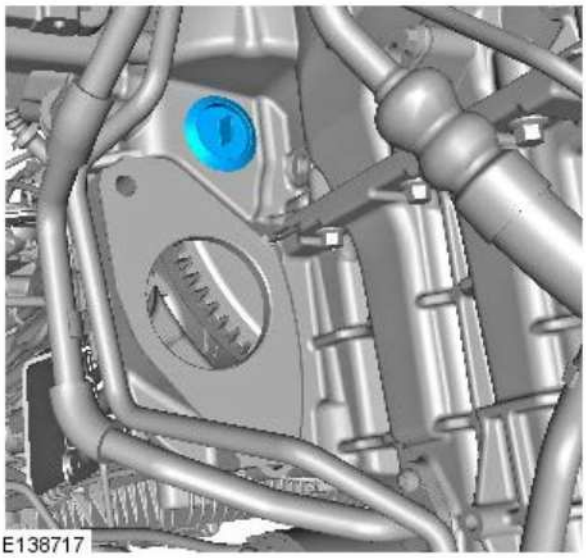
E138703

8. *Torque:* 63 Nm



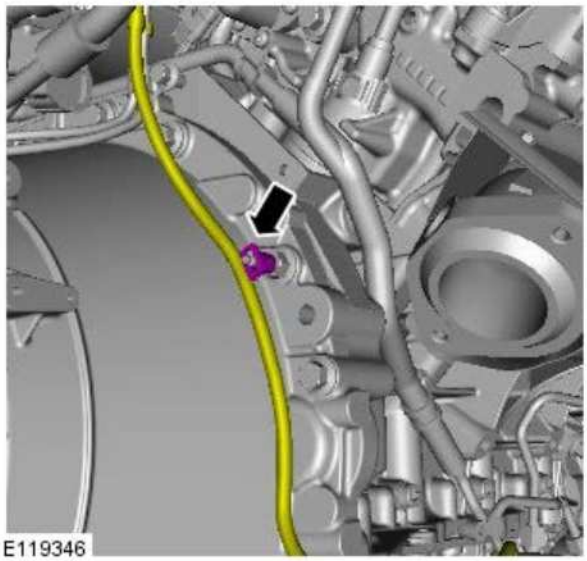
E123504

9.

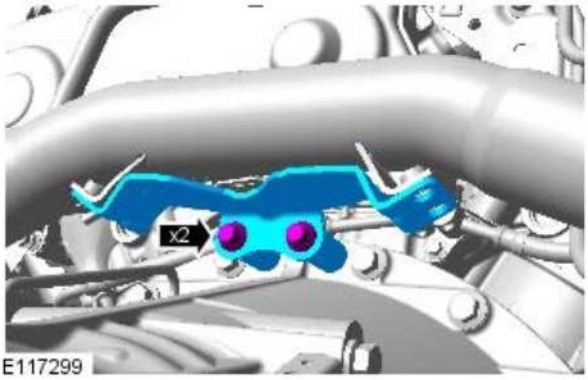

E138717

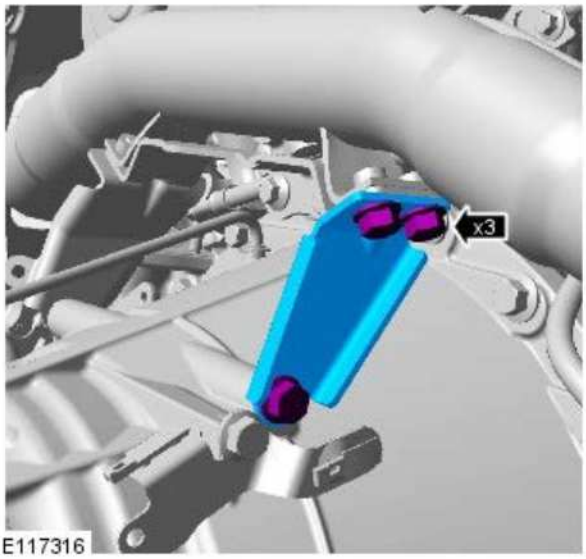
10. Refer to: Starter Motor (303-06 Starting System - TDV6 3.0L Diesel, Removal and Installation).

11.

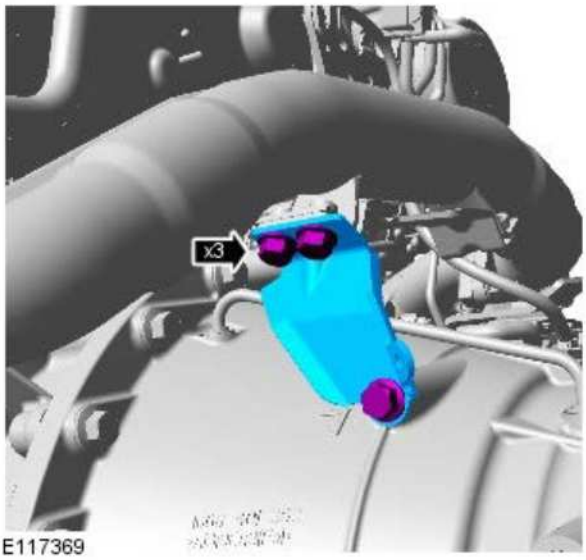

E119346

12. *Torque:* 23 Nm



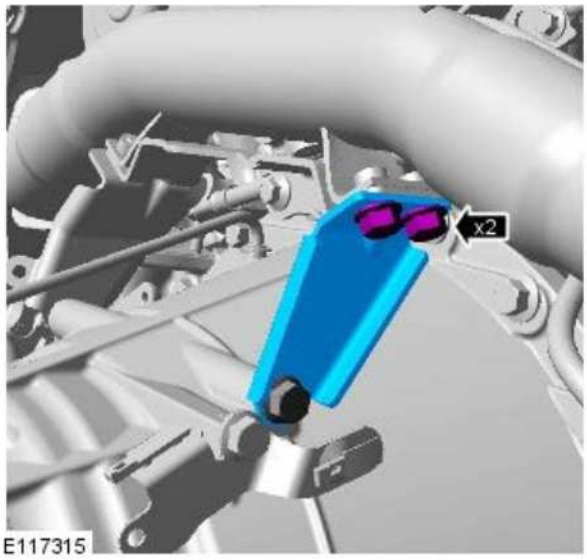


13. CAUTION: Only tighten the bolts finger-tight at this stage.

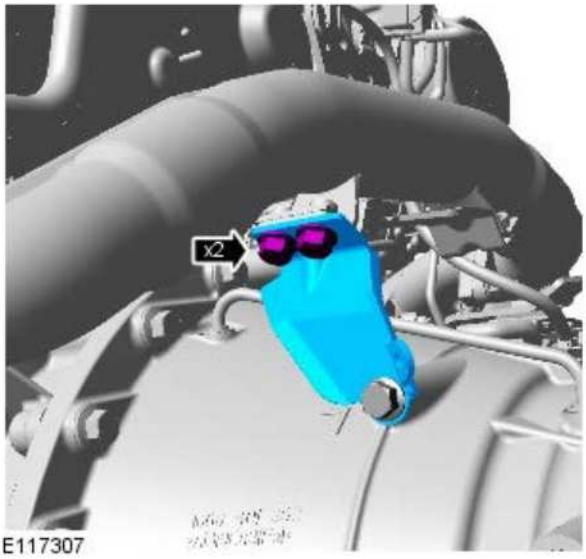


14. CAUTION: Only tighten the bolts finger-tight at this stage.

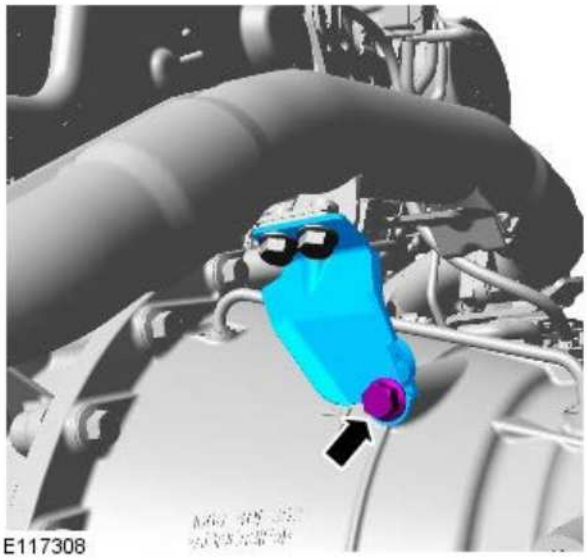
15. *Torque:* 23 Nm



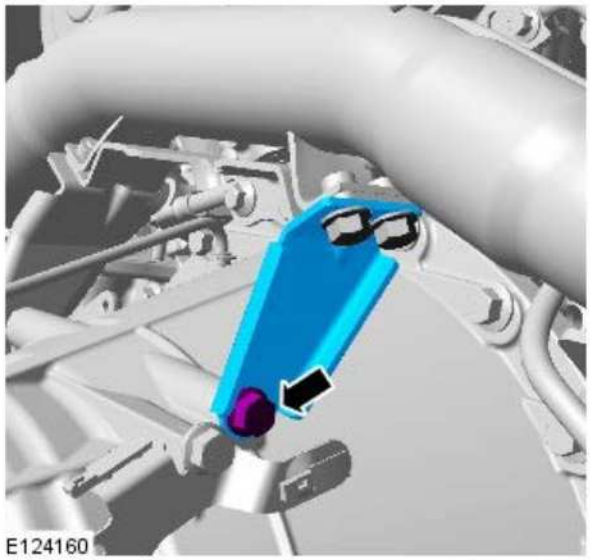
16. *Torque:* 23 Nm



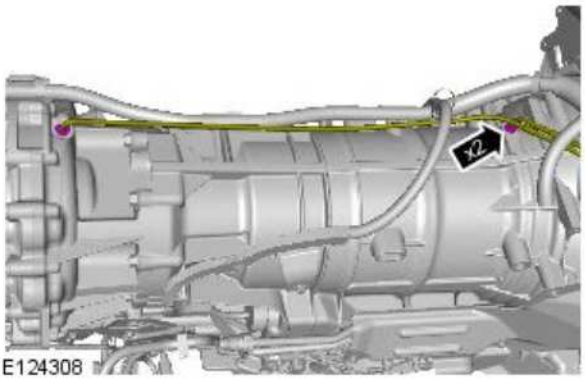
17. *Torque:* 23 Nm



18. *Torque:* 23 Nm

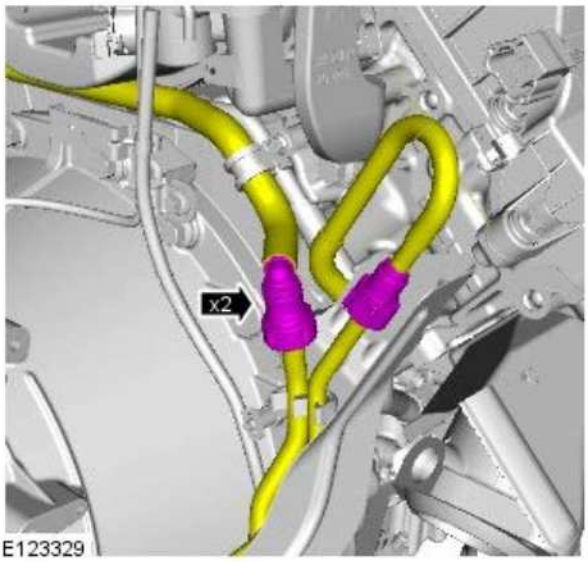


19.

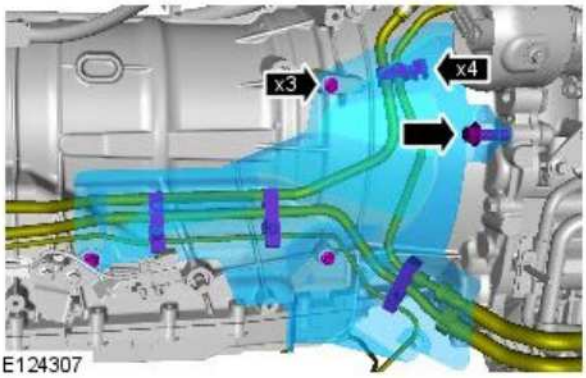


20. WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel related components. Highly flammable vapors are always present and may ignite. Failure to follow these instructions may result in personal injury.

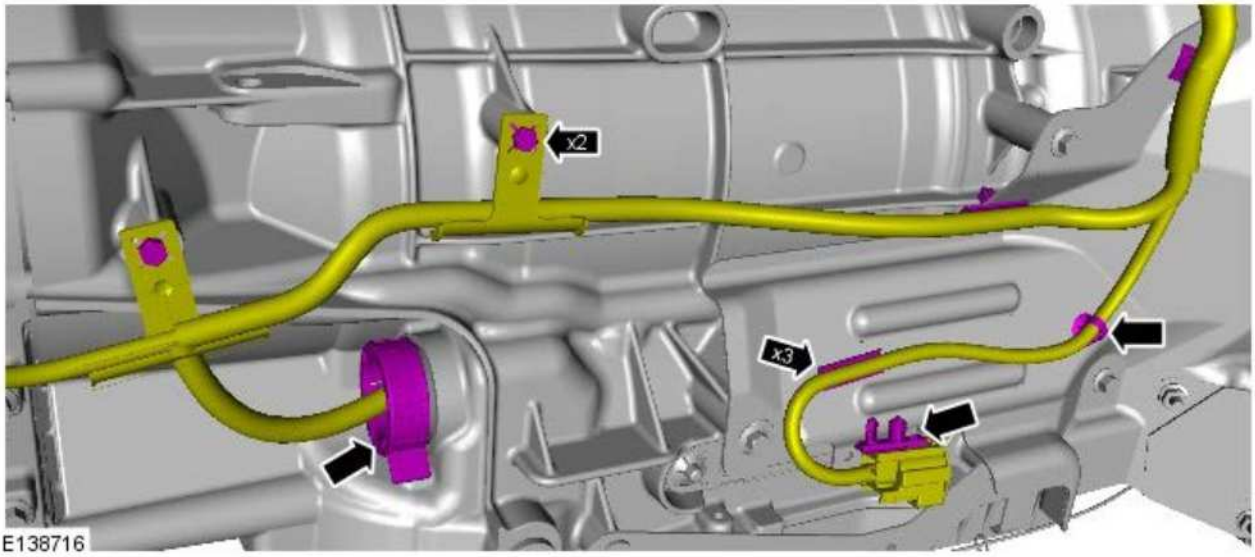
CAUTION: Be prepared to collect escaping fluids.



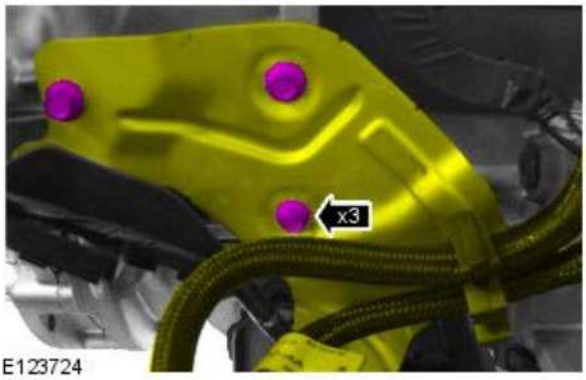
21. *Torque:*
M6 9 Nm
M10 40 Nm



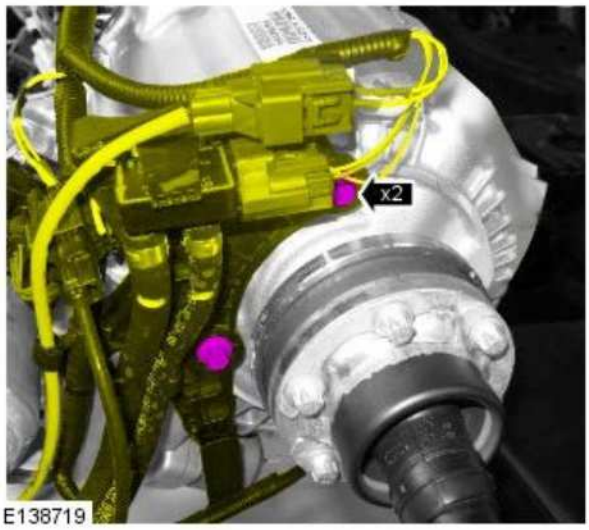
22. *Torque:* 9 Nm



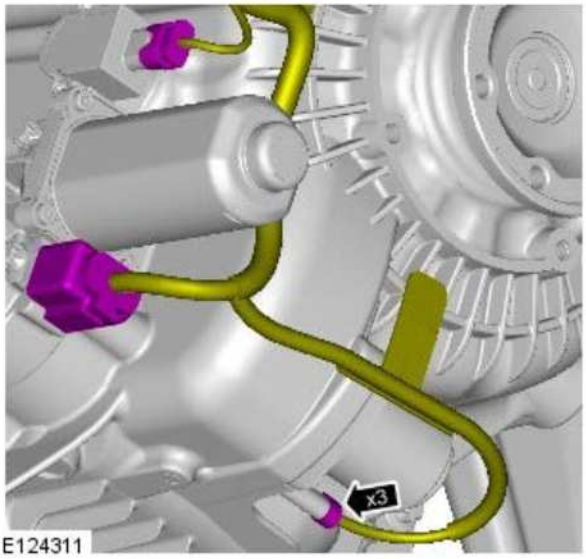
23. *Torque:* 9 Nm



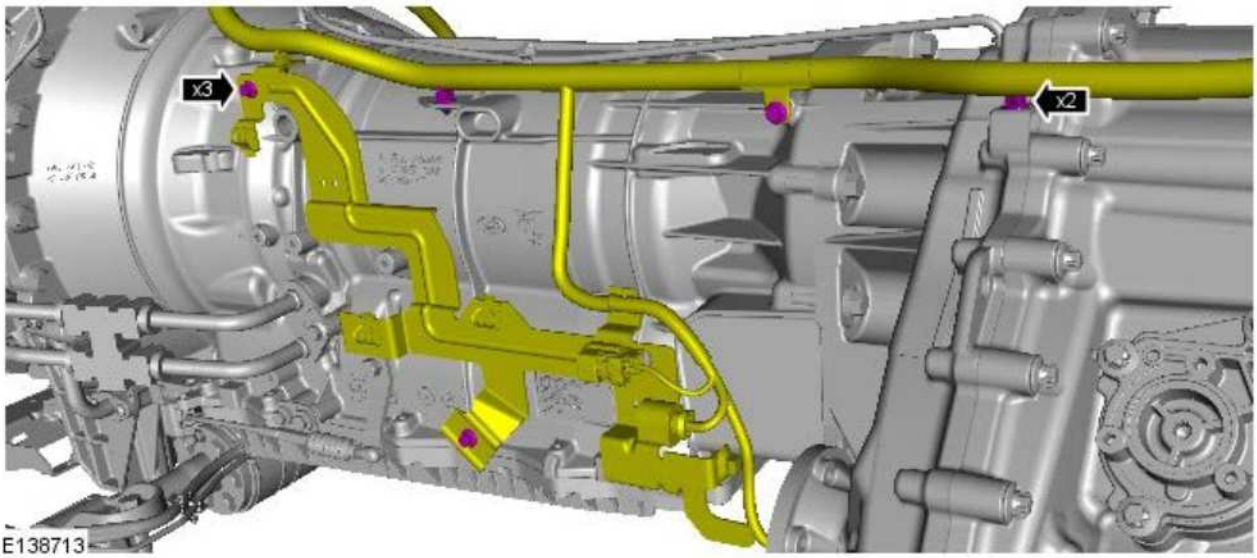
24. *Torque:* 9 Nm



25.

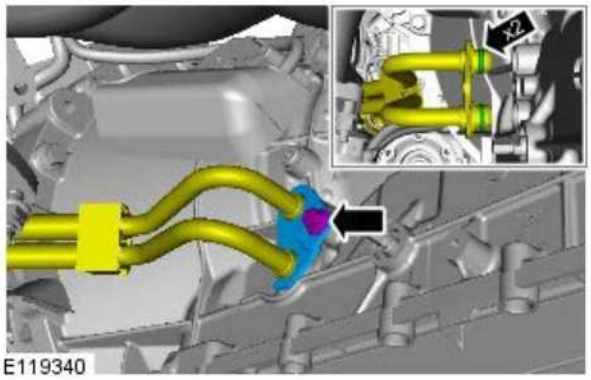


26. *Torque:* 9 Nm



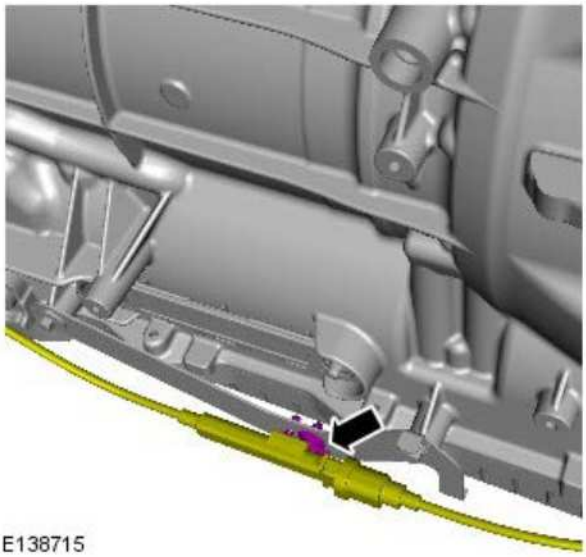
27. NOTE: Install new O-ring seals.

Torque: 12 Nm



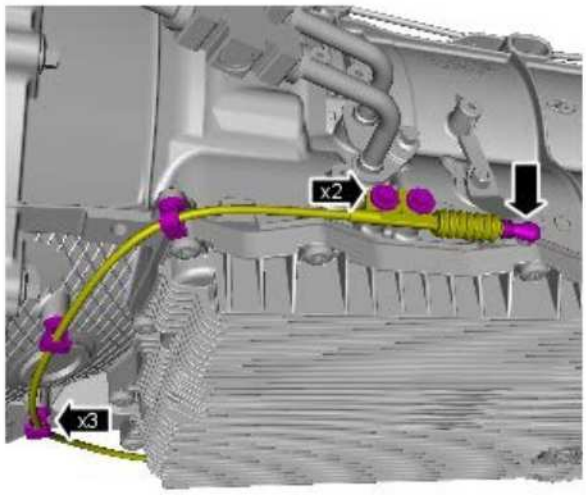
E119340

28. NOTE: Install a new retaining clip.



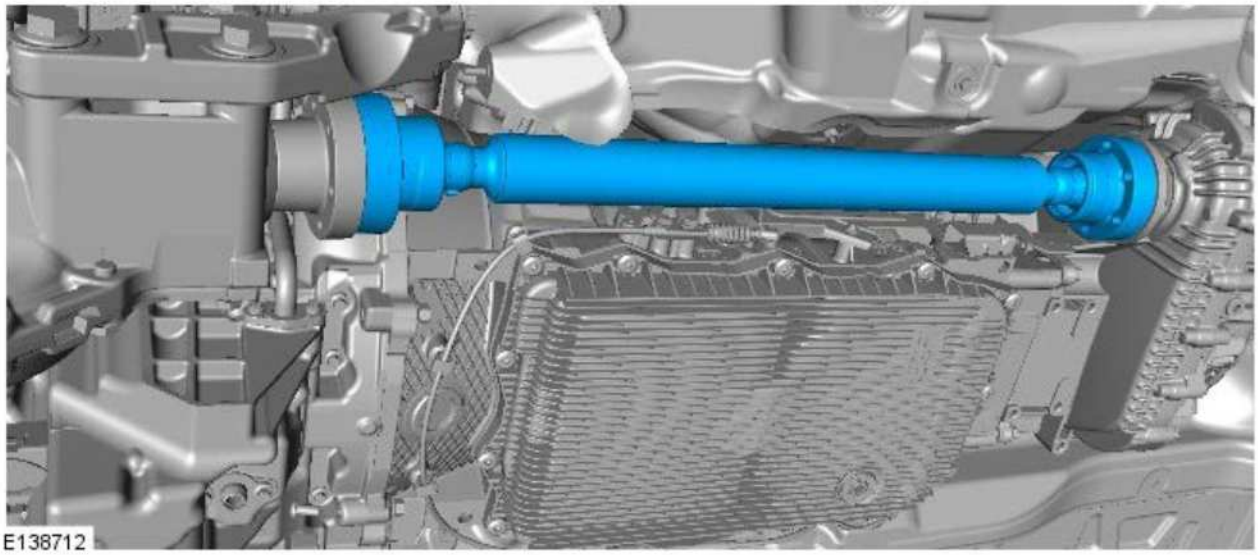
E138715

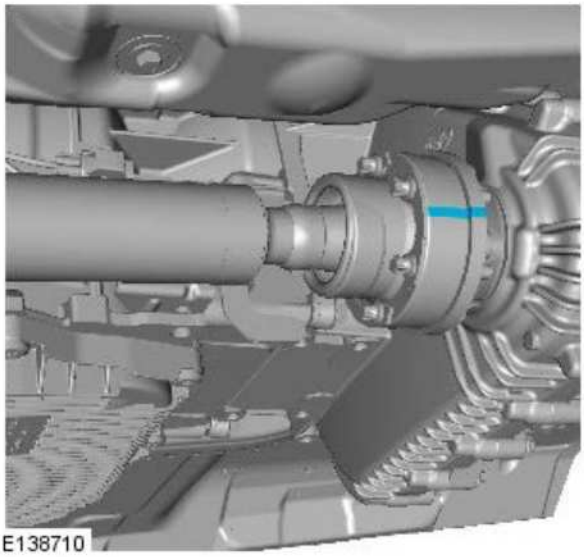
29. *Torque:* 10 Nm



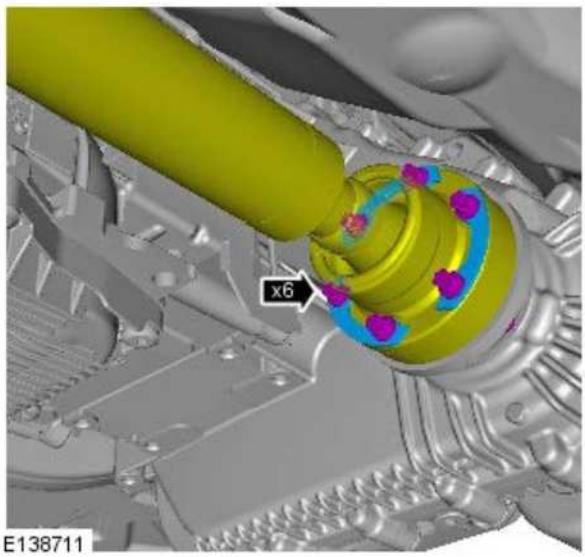
E138714

30.


E138712


E138710

31. NOTE: Make sure that the component aligns with the installation mark noted in the removal step.

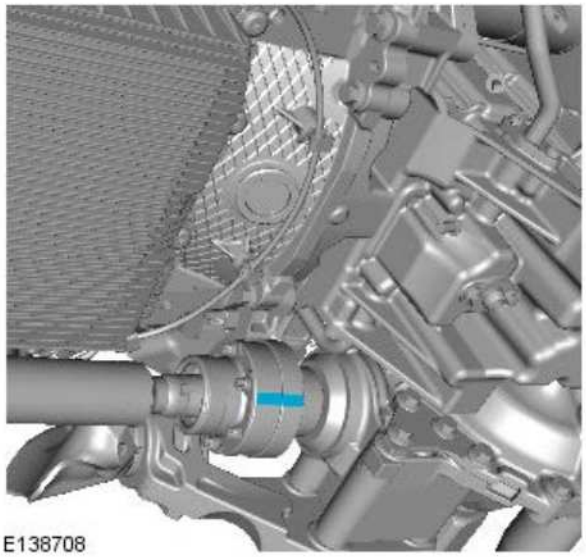


E138711

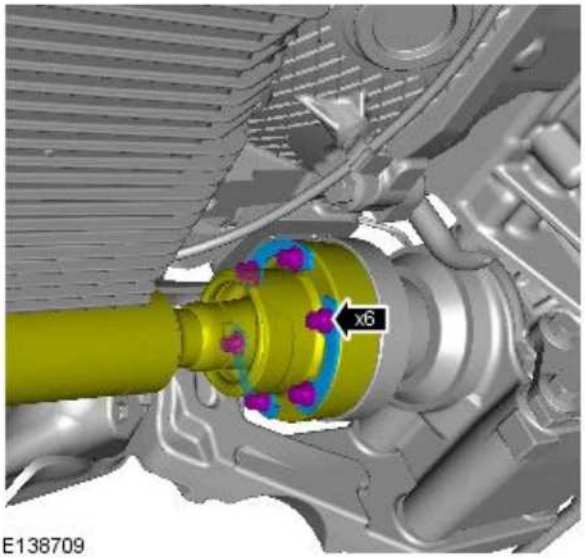
32. CAUTION: Make sure that new bolts are installed.

Torque:
Stage 1:45 Nm
Stage 2:90°

33. NOTE: Make sure that the component aligns with the installation mark noted in the removal step.



E138708



E138709

34. CAUTION: Make sure that new bolts are installed.

    Torque:
    Stage 1:45 Nm
    Stage 2:90°

35. Refer to: Rear Driveshaft (205-01 Driveshaft, Removal and Installation).

36. Refer to: Exhaust System (309-00A, Removal and Installation).

37.
    - Remove the securing straps.
    - Remove the jack supporting the transmission.
    - Lower the vehicle.

38. Connect the battery ground cable.

    Refer to: Specifications (414-00 Battery and Charging System - General Information, Specifications).

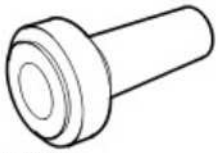
39. Refer to: Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle - TDV6 3.0L Diesel, Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).

Published: 05-Nov-2013

Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD - Transmission V6 S/C 3.0L Petrol

Installation

Special Tool(s)

 303-021	303-021 Engine support bracket
303-1069  E53727	303-1069 Adapter, Wrench
 E115255	303-1435 Engine Lifting Brackets Rear
307-520  E52536	307-520 Installer, Output Shaft Seal
 E158796	JLR-308-930 Installer, Oil Seal

General Equipment

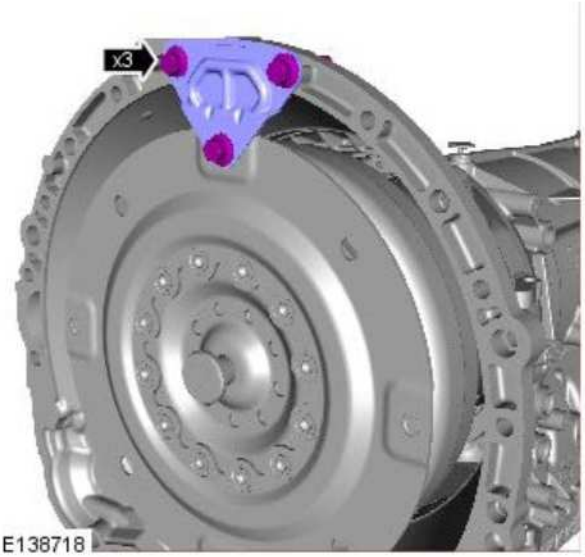
Transmission jack

NOTES:

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

Some illustrations may show the transmission removed for clarity.

1. CAUTION: This step is only required if a new component is installed.



E138718

2. CAUTION: Make sure that the torque converter is fully engaged to the transmission.

E138283

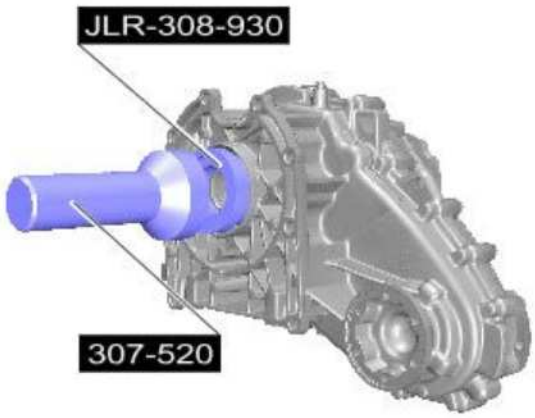
3. CAUTIONS:

Oil seals must be installed dry.

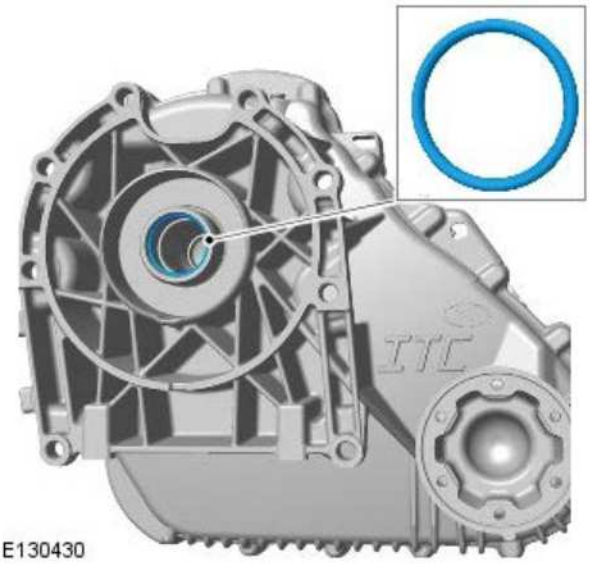
This step is only required if previously removed.

Make sure that the component is installed to the noted removal position.

Special Tool(s): JLR-308-930, 307-520



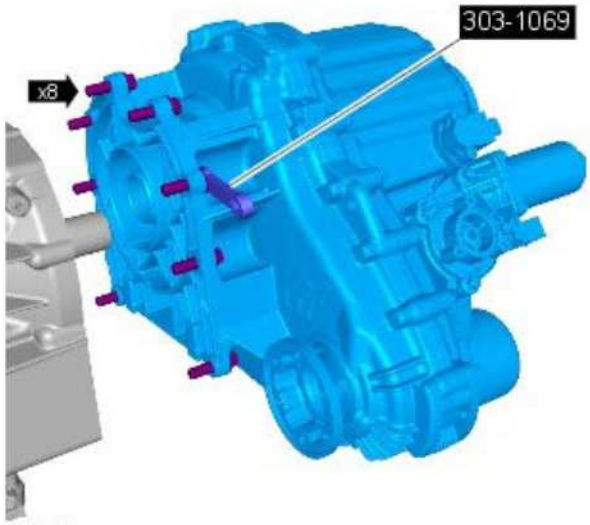
E158632



E130430

4. CAUTION: This step is only required if a new component is installed.

   NOTE: Install a new O-ring seal.



E130188

5. NOTE: This step is only required if previously removed.

   - Clean the component mating faces.
   - Lubricate input shaft splines with 'Weicon TL7391' grease.
   - *Special Tool(s):* 303-1069
   - *Torque:* 45 Nm

6. *Torque:* 12 Nm

E160924

7.

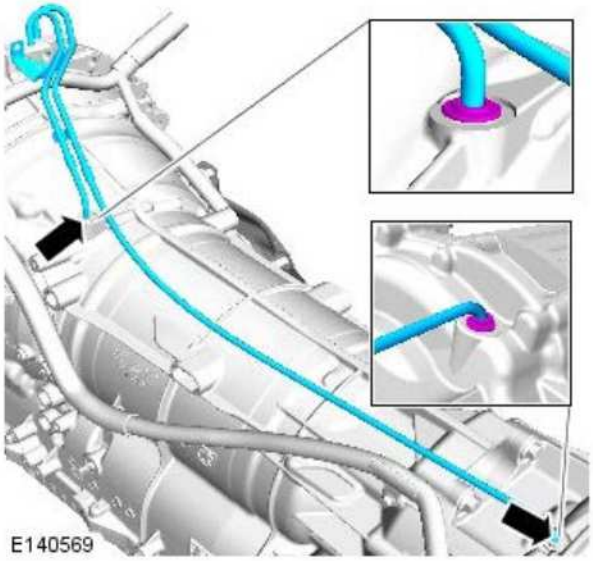
E107972

8. CAUTIONS:

To prevent water ingress and subsequent transmission damage, make sure that the breather is fully pushed home into the transmission casing. The whie line around the circumference of the pipe should not be visible when correctly installed.

Remove the blanking plugs.

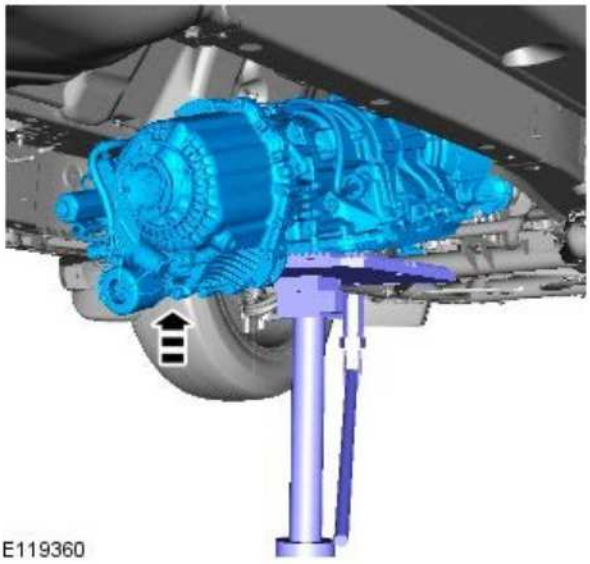
NOTE: This step is only required if previously removed.



E140569

9. WARNINGS:

This step requires the aid of another technician.



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

CAUTIONS:

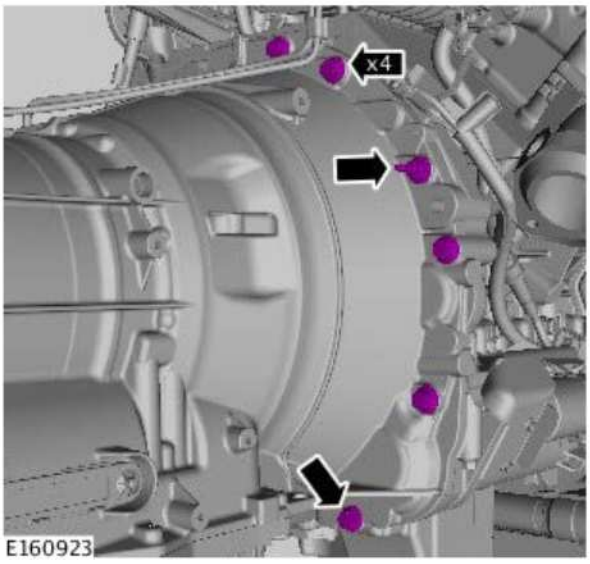
Apply grease of the correct specification to the torque converter spigot.

Make sure that the torque converter remains in the transmission.

Secure the torque converter to the transmission using suitable cable ties.

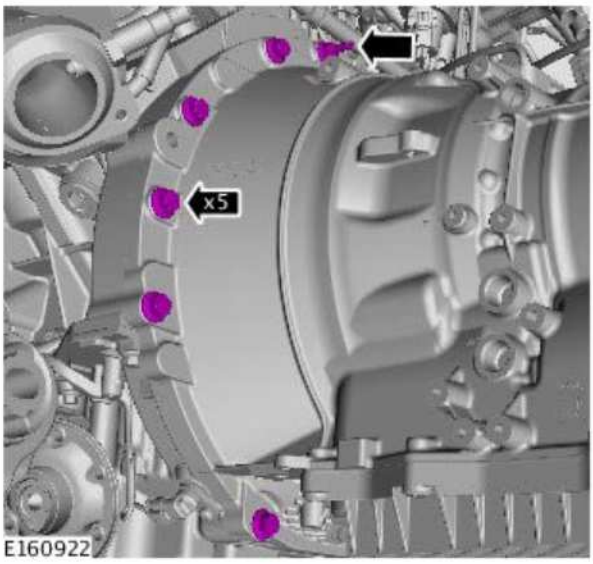
Using a suitable hydraulic jack, support the transmission.

10. *General Equipment:* Transmission jack



11. CAUTION: Install the bolts in the noted position.

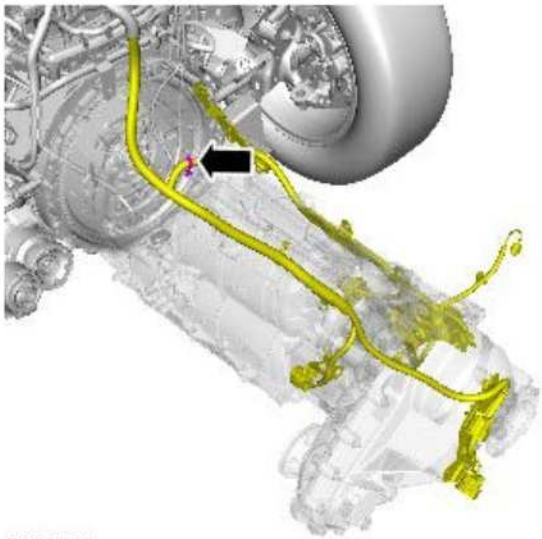
Torque: 40 Nm



12. CAUTION: Install the bolts in the noted position.

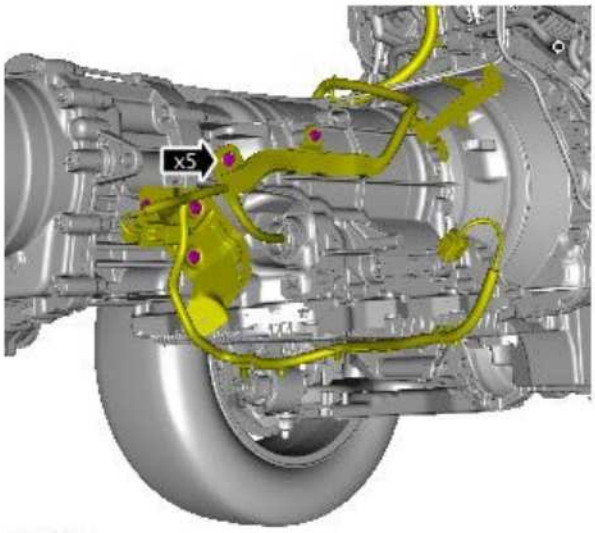
Torque: 40 Nm

13. NOTE: Remove the cable ties.



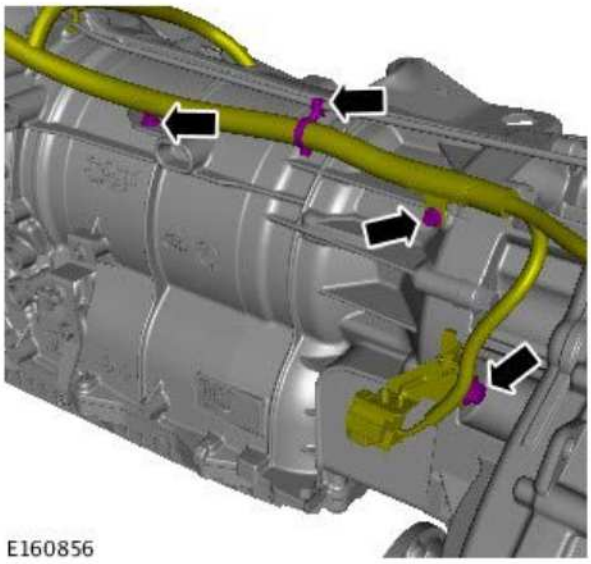
E160858

14. *Torque:* 10 Nm



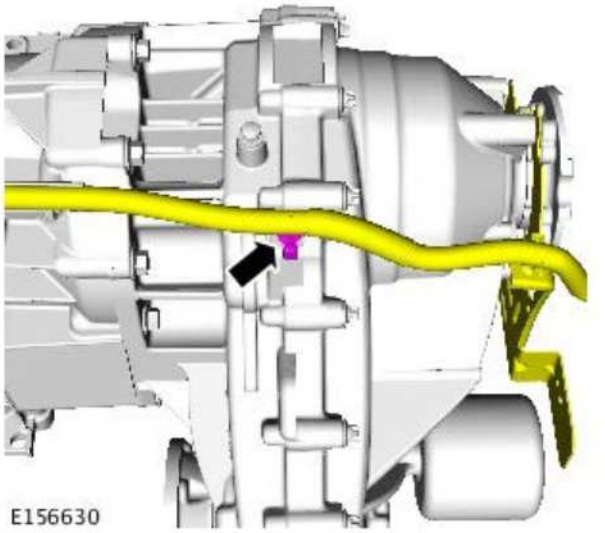
E160857

15. *Torque:*
M10 48 Nm
M6 10 Nm

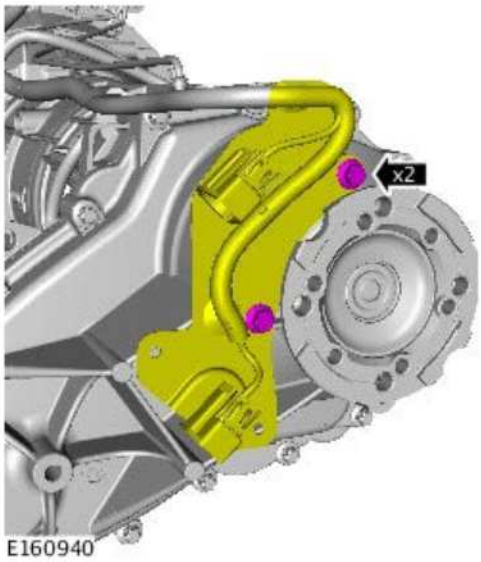


E160856

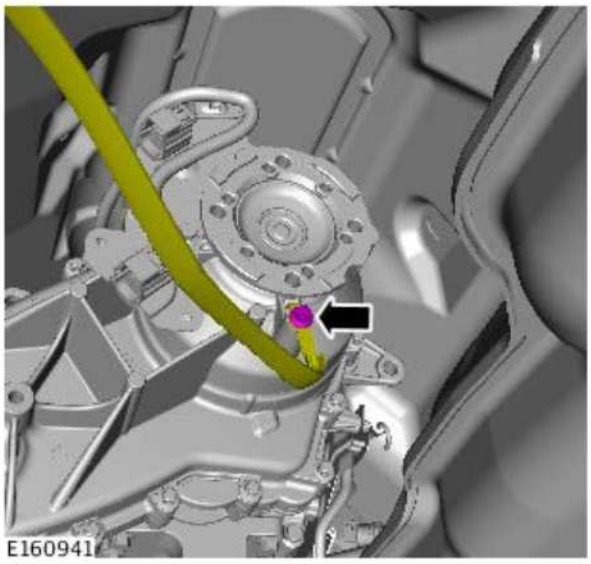
16.



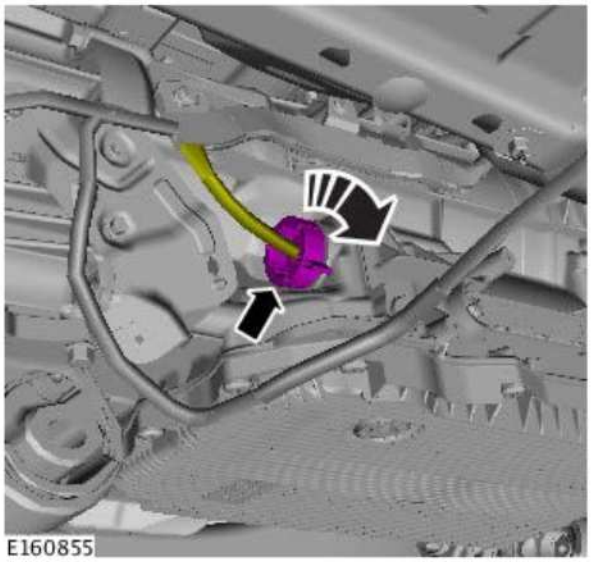
17. *Torque:* 25 Nm



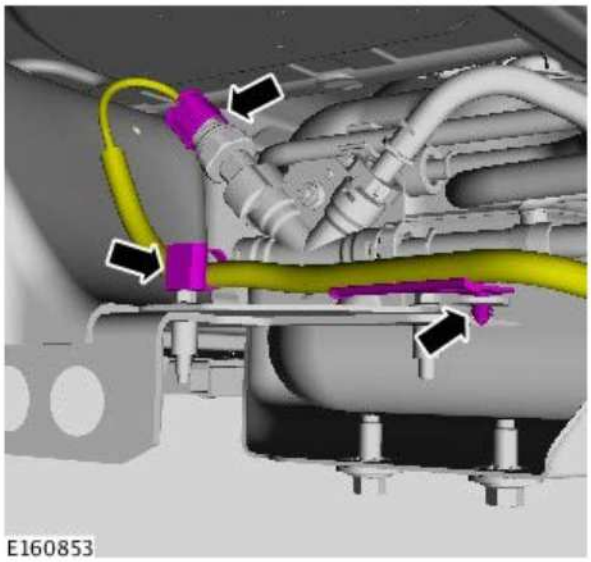
18. *Torque:* 25 Nm



19.



20.

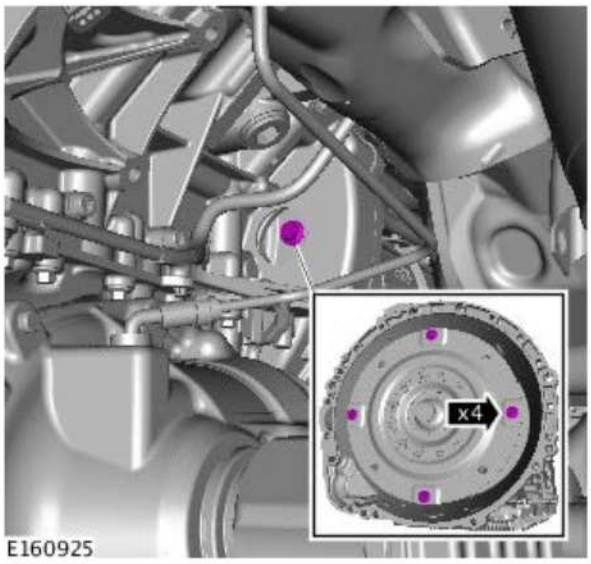


21. CAUTIONS:

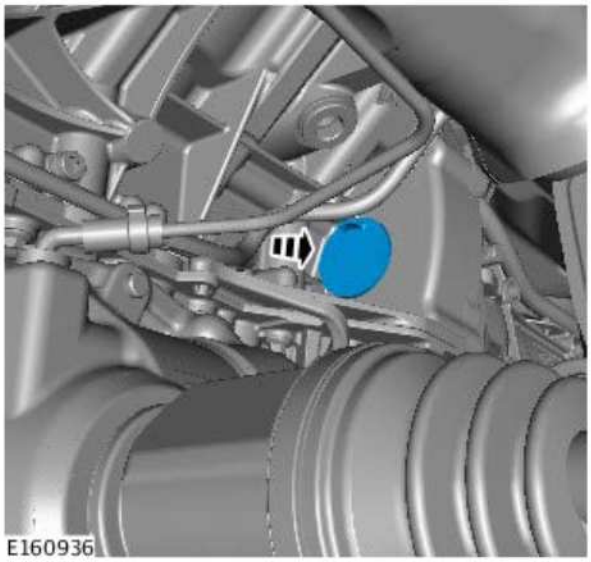
⚠ Only rotate the crankshaft clockwise.

⚠ Install new bolts.

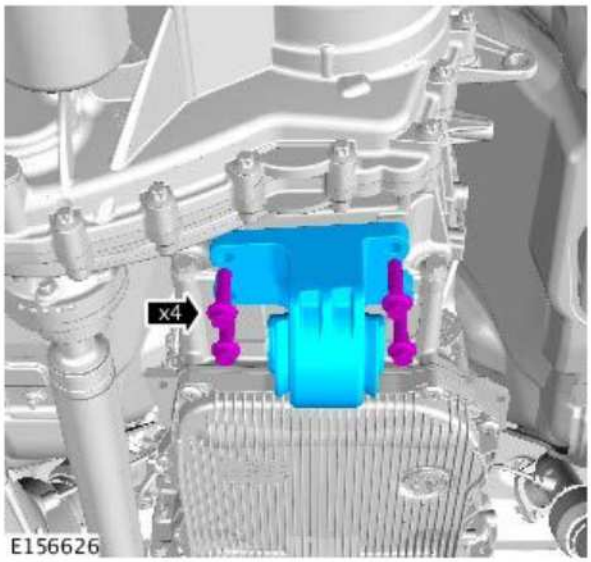
Torque: 63 Nm



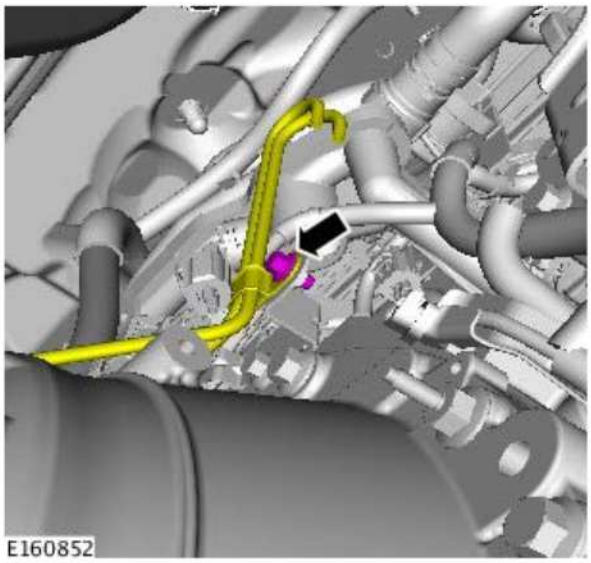
22.



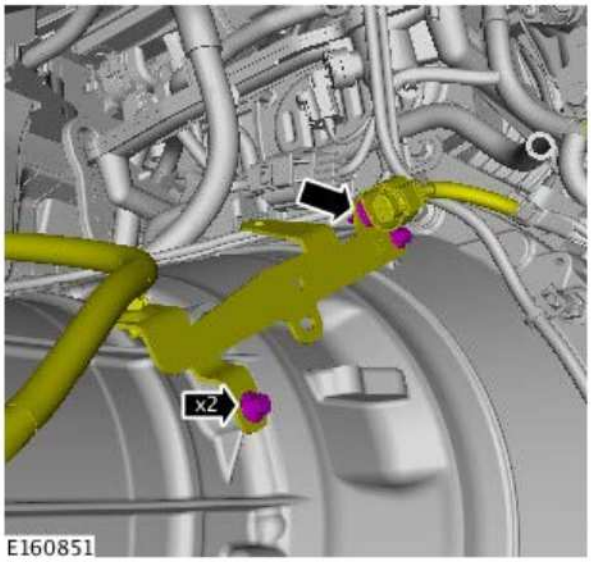
23. *Torque:* 60 Nm



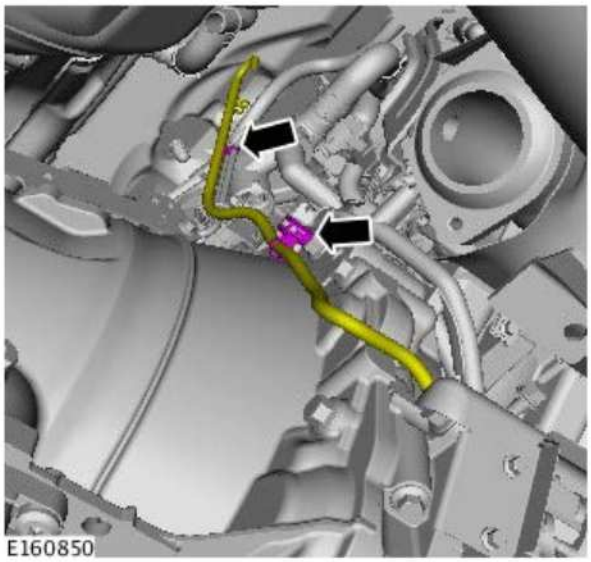
24. *Torque:* 10 Nm



25. *Torque:* 10 Nm

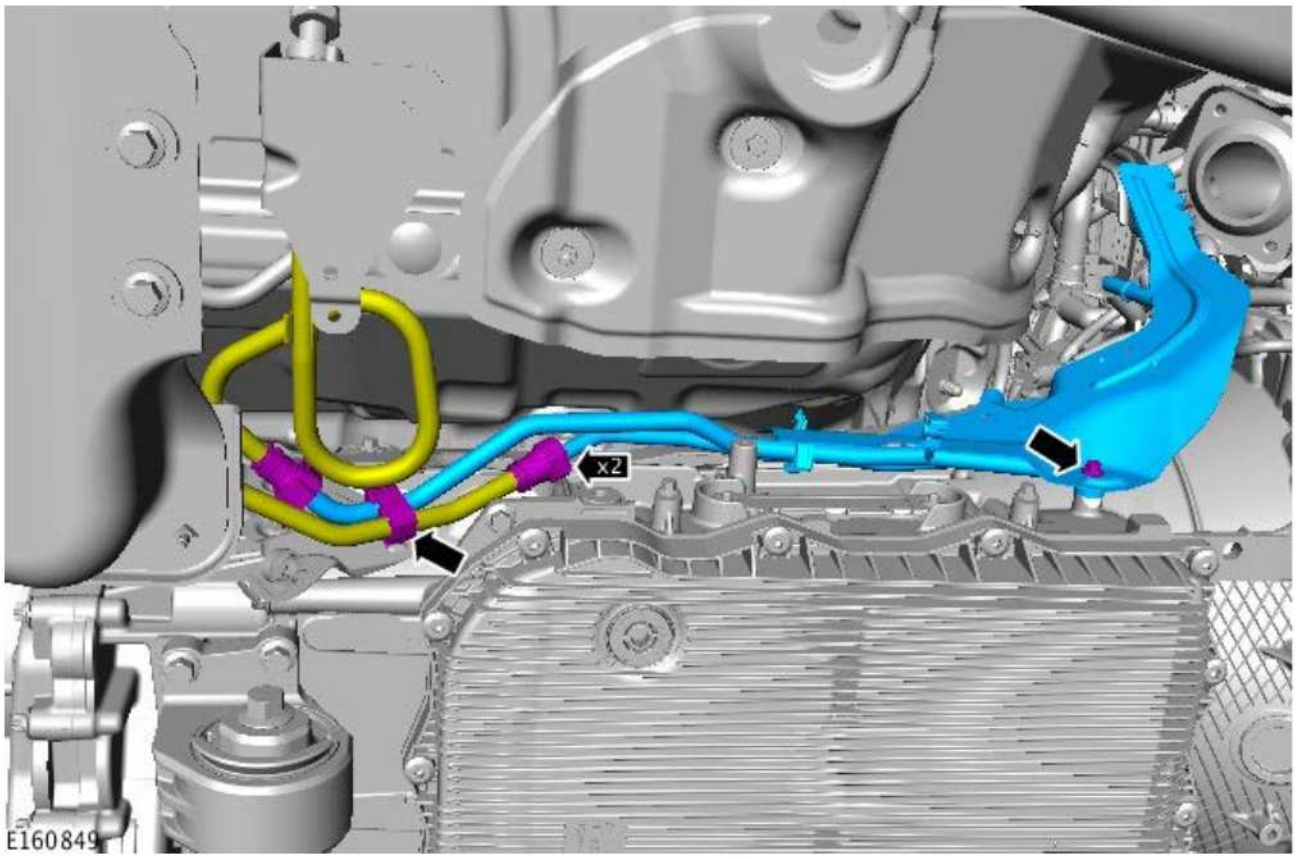


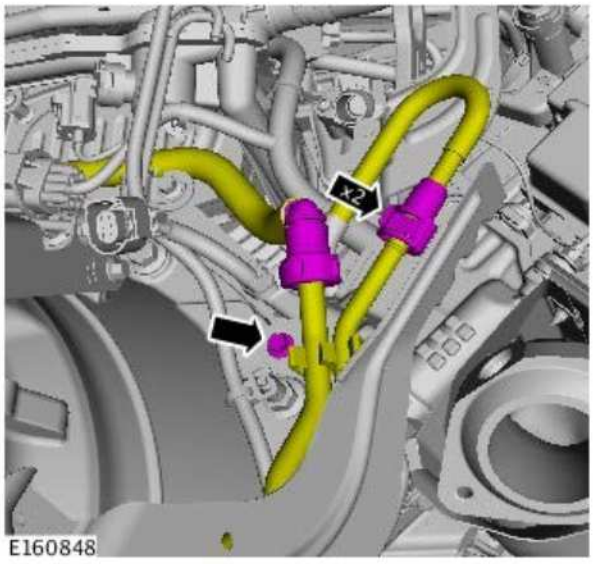
26.



27. CAUTION: Remove and discard the blanking plugs.

Torque: 9 Nm

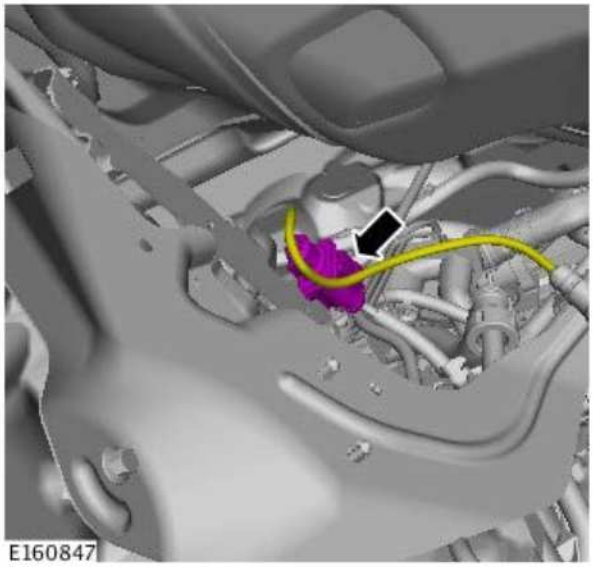




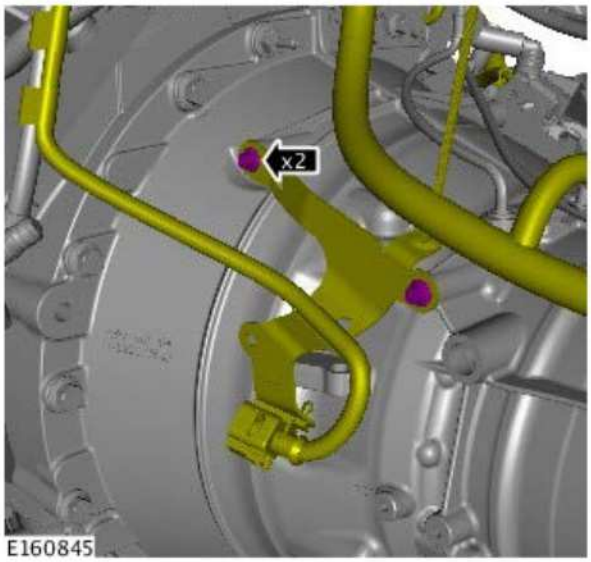
28. CAUTION: Remove and discard the blanking plugs.

Torque: 9 Nm

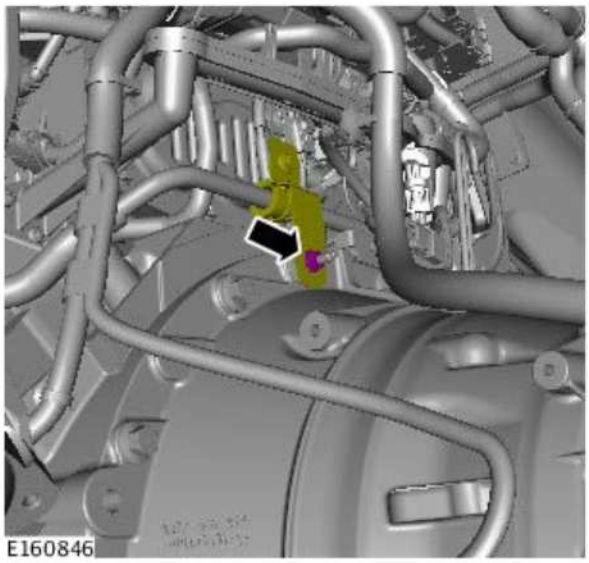
29.



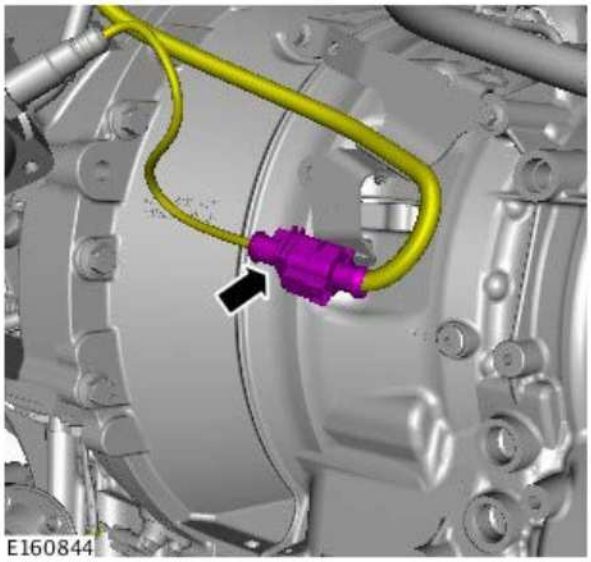
30. *Torque:* 9 Nm



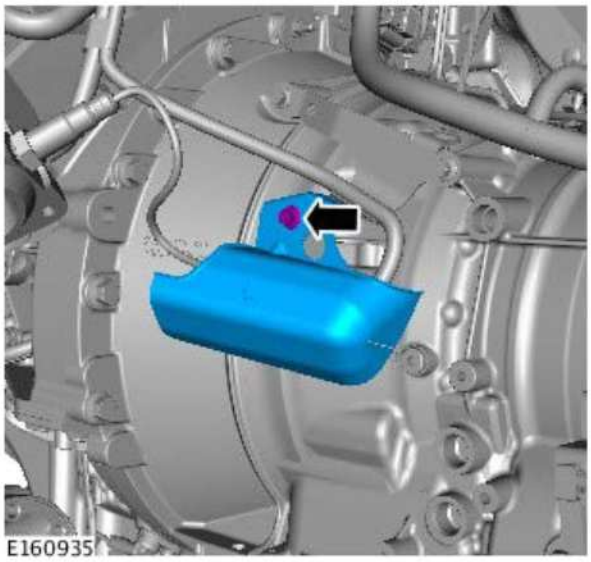
31. *Torque:* 12 Nm



32.



33. *Torque:* 15 Nm

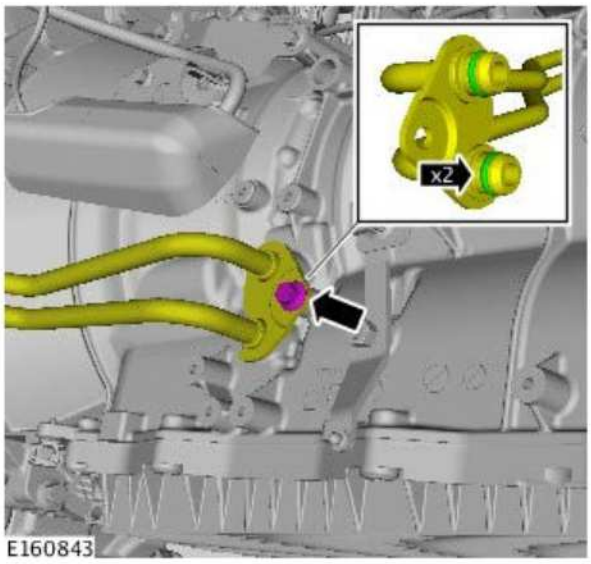


34. CAUTIONS:

⚠ Be prepared to collect escaping fluid.

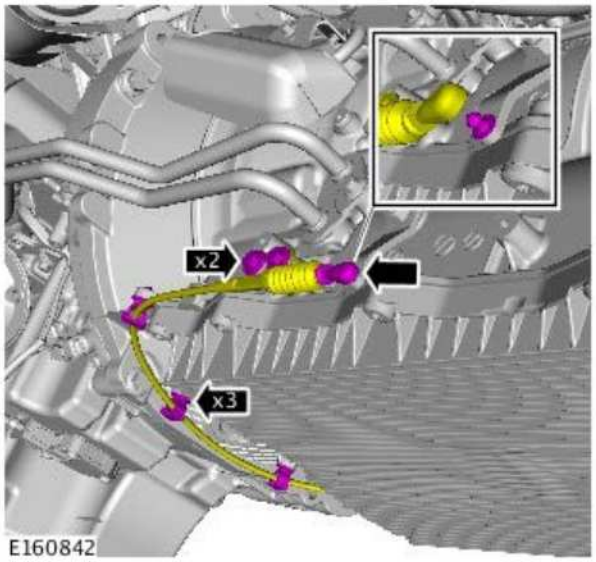
⚠ Install new O-ring seals.

Torque: 22 Nm

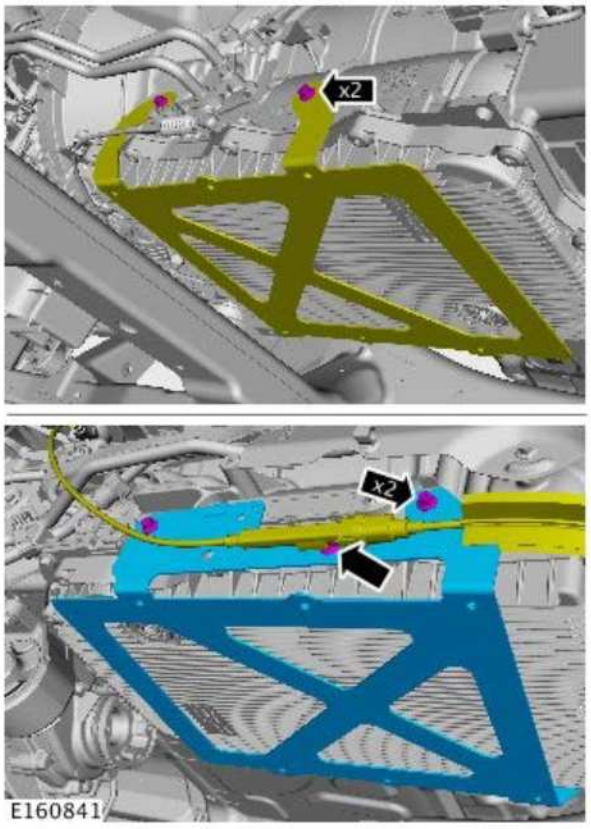


35. ⚠ CAUTION: If necessary, install new clips.

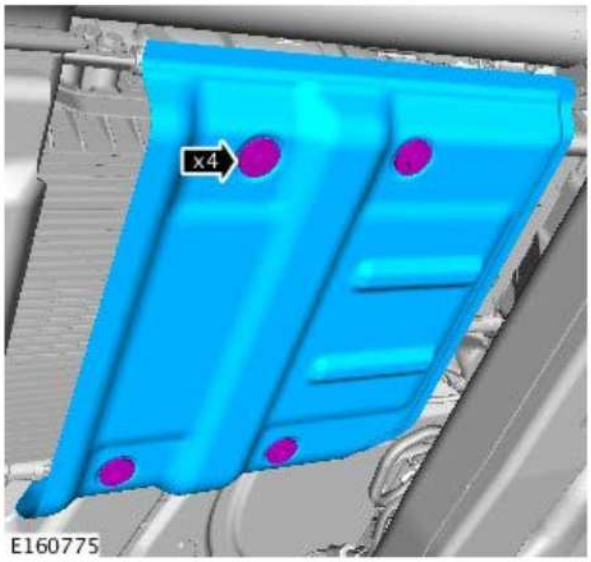
Torque: 11 Nm



36. *Torque:* 9 Nm



37. *Torque:* 9 Nm



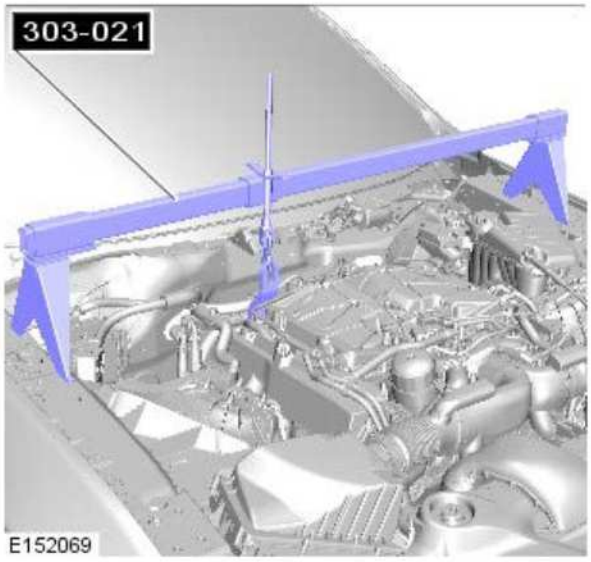
38. Refer to: Rear Driveshaft (205-01 Driveshaft, Removal and Installation).

39. Refer to: Front Driveshaft - V6 S/C 3.0L Petrol (205-01, Removal and Installation).

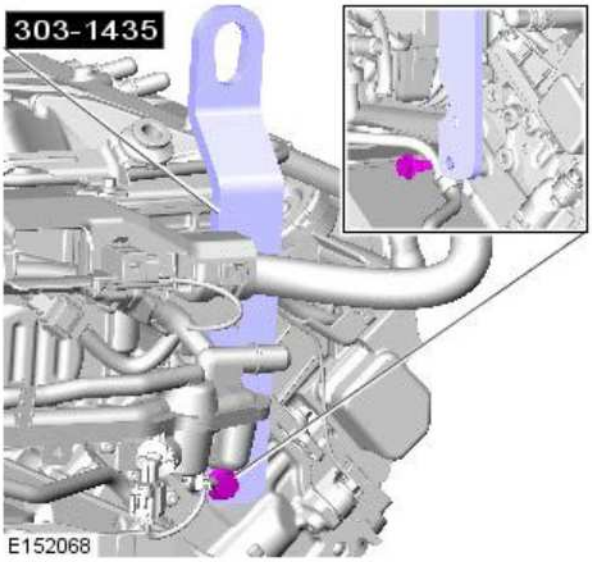
40. Refer to: Exhaust System (309-00B Exhaust System - V6 S/C 3.0L Petrol, Removal and Installation).

41. Refer to: Cooling System Partial Draining, Filling and Bleeding (303-03B Engine Cooling - V6 S/C 3.0L Petrol, General Procedures).

42. *Special Tool(s):* 303-021



43. *Special Tool(s):* 303-1435
Torque: 40 Nm



44. Refer to: Plenum Chamber (412-01 Air Distribution and Filtering, Removal and Installation).

45. Disconnect the battery ground cable.

    Refer to: Specifications (414-01 Battery, Mounting and Cables, Specifications).

46. Refer to: Transmission Fluid Level Check (307-01 Automatic Transmission/Transaxle - TDV6 3.0L Diesel /V6 S/C 3.0L Petrol , Vehicles With: 8HP70 8-Speed Automatic Transmission AWD, General Procedures).